Davis Farm Park
Natural Resources Management Plan

Prepared for:
The City of Otsego, Minnesota

Prepared by:
Friends of the Mississippi River
St. Paul, Minnesota

Spring 2024

This Natural Resources Management Plan and Work Plan has been reviewed and approved by:

City of Otsego Parks and Recreation Commission Chair

_____ Date: _____
Kitty Baltos

City of Otsego Parks and Recreation Director

_____ Date: _____
Nick Jacobs

This document can be changed only by written agreement by both the City of Otsego, Minnesota and Friends of the Mississippi River.

SITE INFORMATION

Owner name, address, city/township, county and phone:

City of Otsego, Minnesota
13400 90th St. NE
Otsego, MN 55330
Wright County
Contact person: Nick Jacobs, Otsego Parks and Recreation Director,
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Township, range, section:

T121, R023, Section 18.

Watershed:

Mississippi River – St. Cloud

Parcel Identification Numbers:

118247000020

Rare Features:

No occurrences on the property.

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EXECUTIVE SUMMARY

This Natural Resources Management Plan (NRMP) presents the site analysis and recommended land use activities for the 17-acre Davis Farm Park in Otsego, Minnesota. This document was drafted by Friends of the Mississippi River (FMR) in 2023-24 and is based on an assessment of site characteristics including natural resource and community access priorities, issues, and corrective actions. These actions reflect community values regarding Davis Farm Park's unique features, and protection of the park's natural areas suggests restoration and improvement of access for the health and well-being of the community. The NRMP provides a framework for those goals including recommended habitat restoration and public use enhancement activities, timing and costs for associated tasks, and long-term management objectives.

Davis Farm Park is facing threats and pressures related to habitat loss and fragmentation, non-native species, development pressure, uses that are incompatible with habitat protection, and climate change. These threats are meaningful even if they only affect certain aspects of the site because the park is seen as contiguous habitat. As a result, taking no action will ultimately result in degradation of the entire system.

BACKGROUND

Davis Farm Park's location on the Mississippi River may point to a long history of Indigenous use, and this is likely given archaeological records of nearby locations on the river. The land cover around the time of the public land survey of Minnesota (1847-1907) was classified as "Aspen-Oak Land." This cover type is most closely associated with today's dry-mesic oak-aspen forests with a canopy dominated by northern red oak, paper birch, red maple, quaking aspen, basswood, sugar maple, bur oak, and big-toothed aspen and saplings of these species plus ironwood in the subcanopy. The shrub layer would have been patchy to continuous with beaked hazelnut, chokecherry, downy arrowwood, and juneberries. The ground layer would have had variable cover of large-leaved aster, Pennsylvania sedge, wild sarsaparilla, bracken fern, and early meadow rue among others. While the landscape has changed considerably since the late 1800s, these plant communities can be referenced when setting restoration goals and target plant communities.

There has been a long history of agriculture in this area of the county, and while agriculture is still a fixture of the landscape, the city of Otsego is rapidly developing. The lands directly around the park are residential neighborhoods, and this land use will continue as Otsego grows. Historically, conversion of upland habitat has led to the loss of many native plant and animal species. Davis Farm Park offers an opportunity to protect native plant communities and the habitats they provide, create an easily accessible outdoor space for diverse communities, and benefit the health and wellbeing of a growing city.

Driven by the desire to preserve natural areas in this matrix of residential and agricultural lands, this plan recommends restoring and enhancing native plant communities on the site and improving access for the community. Restoration of forest, prairie and oak savanna communities on the site is prioritized as these habitats are among the most in need of restoration in this ecological subsection of the state, the Anoka Sandplain/Big Woods subsections. Because public use of the site is not well understood and access and site orientation are poor, involving the community in decision-making about management of the park is vital to its success as a community asset.

Figure 1: 2023 Aerial image of Davis Farm Park parcel.

INVENTORY AND ASSESSMENT

A natural resources inventory and assessment was conducted by FMR ecologists during the summer of 2023 to determine existing plant and wildlife communities, identify opportunities

for restoration, and develop guidance for long-term public use. The Davis Farm Park site consists of five primary vegetation cover types: upland old field, oak savanna, mixed deciduous forest, terrace forest, and floodplain forest. These cover types occur in eight distinct units across the park, and three of these units are further divided into subunits which are distinguished by changes in topography.

The **upland old field** units are characterized by herbaceous vegetation dominated by non-native, cool season grasses. The western area of the old field has been supplementally seeded to native prairie of moderate diversity. It is presumed that this seeding occurred in conjunction with the nearby residential development and creation of a stormwater basin. The old field acts as a quasi-transition area from the park to the neighborhood, and ornamental evergreens have also been planted in the unit.

The **oak savanna** unit is characterized by very large, open-grown bur and white oak within the park's transition from old field to forested areas. While oak savannas' typical open understory is maintained by regular burning, fire has been excluded from the landscape, and dense prickly ash and other native shrubs are present. Some herbaceous layer persists, but the structure and composition of the plant community is atypical of an oak savanna.

The **mixed deciduous forest** units are characterized by second-growth trees in the canopy. Hackberry and basswood are the dominant overstory species, and ironwood, green ash and white cedar comprise the understory. Prickly ash, gooseberry, and tree seedlings are present in the shrub layer, and the herbaceous layer is of moderate diversity with primarily native species.

The **terrace forest** units are characterized by moisture-tolerant canopy trees such as hackberry, cottonwood, and green ash with red oak in the more upland parts of the terrace. Gooseberry and prickly ash are dominant in the shrub layer, and the herbaceous layer is almost entirely made up of wood nettle with some garlic mustard. These plant communities are indicative of frequent disturbance by flood events.

The **floodplain forest** units are characterized by flood-tolerant canopy trees including silver maple, hackberry, green ash, and willow. Invasive common buckthorn is present but spotty in the shrub layer, and the herbaceous layer contains a diverse species list including American slough grass, hairy wood mint, clearweed, bidens, sweet cicely, jewelweed, Virginia waterleaf, and cut leaf coneflower among others.

Current management actions appear to have been limited to mowing the old field areas near the road. A single, partially paved trail connects the old field on the south end of the site to the river and appears to have once been used for boat access. No additional resource or park management has been documented.

PRIORITY ISSUES

Priority Issues are concerns that pose the greatest risk or threats to the ecological integrity of the site. They can be addressed through a variety of management actions and prevention over time. If left unchanged, current conditions will persist or worsen.

PRIORITY ISSUE 1: PRESENCE OF NON-NATIVE, INVASIVE SPECIES

Species including common buckthorn, Tartarian honeysuckle, garlic mustard and reed canary grass are present, but the populations are small. If left unchecked, these populations will expand further and continue to degrade habitat.

PRIORITY ISSUE 2: ABSENCE, SUPPRESSION, AND POOR REGENERATION OF NATIVE SPECIES

Native plant communities are present throughout the park either through planting or natural regeneration, but their presence is not continuous throughout the park, and the species do not represent a full complement of their subject plant communities.

PRIORITY ISSUE 3: ONGOING EROSION AND BANK SLOUGHING

Soil loss is occurring in some areas of the park due to erosion resulting from discontinuous vegetation cover, floodwaters, and the site's topography. The hill on the southwest side of the park grades into a steep bluff to the east where a side channel of the Mississippi joins with the main channel. River flow, frequent flooding, and sandy soils are contributing to sloughing of the bluff. Limited herbaceous vegetation on the face of the bluff and dense shade on the top of the bluff exacerbate the soil loss.

PRIORITY ISSUE 4: AGRICULTURE USE IN PUBLIC PARK

Approximately 0.8 acre at the northwestern corner of the park is used for row crop agriculture. The use of public land for this purpose is not compatible with community use of the public resource or long-term habitat management.

PRIORITY ISSUE 5: LACK OF ACCESSIBILITY FOR THE COMMUNITY

The park is not locatable with common navigation applications, the entrance is not signed, and the park lacks internal trail orientation or interpretive signage. The single trail within the park is over-widened and cuts directly down a steep hill to the river, and its alignment does not allow for safe exploration of most of the park. The scenic connection of the backwaters at the park to the main channel of the Mississippi is only accessible by steep social trails. The community's use of the park is limited by the lack of these features.

PRIORITY ISSUE 6: YARD WASTE DUMPING

Adjacent residential properties use the southeast edge of the park to dispose of yard waste. This issue is a priority to resolve because yard waste containing grass clippings contains high

levels of phosphorus. The decomposition of grass clippings sends phosphorus, a major driver of algae growth, to the river. Yard waste containing weeds and cultivated plant material can also create new invasive species populations.

PRIORITY FEATURES

Priority Features are key components of the park that require management attention to sustain ecological integrity and build resiliency in the face of Priority Issues. This NRMP will focus on four Priority Features listed below and provide associated management recommendations.

Natural resources management recommendations associated with each Priority Feature incorporate the resource assessment conducted by FMR ecologists and the identification of Priority Issues, past land use and management activities, goals and perspectives of the City of Otsego Parks and Recreation Department, and the community's values for the park. The recommendations also stem from general ecological guidelines for these types of landscapes set by the Minnesota Department of Natural Resources (MNDNR) in consideration of native plant communities of Minnesota.

PRIORITY FEATURE 1: MANAGEMENT AND ENHANCEMENT OF THE GRASSLAND AND OAK SAVANNA

The park contains an area that was historically oak savanna but has been overcome by woody encroachment. Directly adjacent is a linear old field that is degraded by non-native species but has been partially restored by seeding of native prairie species. Oak savanna and prairie are rare habitats in Minnesota due to conversion to agriculture and fire suppression. Both plant communities support songbirds, a range of mammal species, and pollinators, but have the potential to support more diversity within these groups. Restoration efforts to return this area to oak savanna and a complementary prairie are relatively straightforward.

Priority Management Objectives include:

1) Removal and management of non-native species, including common buckthorn, Tatarian honeysuckle, garlic mustard, smooth brome, and spotted knapweed.
2) Enhancement of habitat throughout the savanna and grassland through native planting, seeding, thinning of native shrub cover, and re-introduction of prescribed fire.

The primary goals will be to reduce non-native plant cover, increase native vegetation cover, diversity, and habitat structure, reintroduce a disturbance regime, and increase habitat for rare features like Species of Greatest Conservation Need (SGCN).

PRIORITY FEATURE 2: MANAGEMENT AND ENHANCEMENT OF THE FLOODPLAIN

The floodplain within Davis Farm Park is typical of many floodplain forests along the Mississippi. The tree canopy is dominated by native and flood-tolerant trees, and the shrub

layer is sparse. Compared to similar sites in this area, this specific section of floodplain has high levels of native plant diversity and very minimal presence of non-native or invasive species, making it a priority for management while populations are still small. Additionally, because agriculture fields to the west of the park drain into the floodplain and eventually to the river, an opportunity exists to enhance the floodplain with additional deep-rooted native plants and shrubs that will trap nutrients and sediment.

From a community use perspective, the floodplain is the only access to the river within the park. The former boat launch creates a canopy opening to view the river, but interacting with the river by boat or angling is not safe given the condition of the access.

Primary Management Objectives include:

1) Removal and management of small populations of common buckthorn and common burdock to prevent spread.
2) Enhancement of vegetation diversity and habitat throughout the floodplain through native planting and seeding.
3) Exploring options to attenuate off-site runoff.
4) Improved access to the river.

The primary goals will be to reduce non-native plant cover, increase native vegetation cover, diversity, and habitat structure, capture nutrient-laden farm runoff, improve community access, and increase habitat for rare features like Species of Greatest Conservation Need (SGCN).

PRIORITY FEATURE 3: MANAGEMENT AND ENHANCEMENT OF THE EASTERN WOODLAND SLOPE

The eastern woodland slope is situated on a bluff above the floodplain. This area has great views of the Mississippi and currently contains several social trails traversing down the bluff to the river. This slope has likely experienced sloughing due to undercutting during flood events, the instability of sandy soils, the lack of deep-rooted vegetation on the bluff, and tree loss. Management efforts prioritizing slope stabilization and re-vegetation will ensure this area of the park exists for many generations to come.

Primary Management Objectives include:

1) Very selective removal of canopy trees from the edge of the bluff that are in peril of toppling and causing soil loss from the bluff.
2) Seeding and planting on the top of the slope to establish continuous native herbaceous groundcover.
3) Reduction of social trails and establishment of a singular maintained trail and orientation signage. The trail should safely traverse the slope through switchbacks and allow access to the river.

The primary goals will be to attenuate slope soil loss and erosion, establish native vegetation cover, diversity, and habitat structure, establish, and maintain safe access, and increase habitat for rare features like Species of Greatest Conservation Need (SGCN).

PRIORITY FEATURE 4: MANAGEMENT AND ENHANCEMENT OF THE WESTERN WOODLAND

The western woodland currently consists of degraded woodland and an agriculture field. Compared to other areas of the park, this area has the highest amount of non-native invasive species presence, likely due to its location on the edge of the park and high nutrient loading from runoff. As such, it represents the greatest opportunity for habitat improvement. Management of this area will positively impact the remainder of the park by reducing nutrient loading and invasive species seed spread.

Primary Management Objectives include:

1) Removal and management of non-native species, including common buckthorn, Tatarian honeysuckle, garlic mustard, common burdock, among others.
2) Reduction of edge habitat by establishment of a native plant community in the farmed area.
3) Enhancement of habitat throughout the woodland through native planting, seeding, thinning of native shrub cover, and re-introduction of prescribed fire.
4) Improved access to the river.

The primary goals will be to reduce non-native plant cover, increase native vegetation cover, diversity, and habitat structure, reintroduce a disturbance regime, and increase habitat for rare features like Species of Greatest Conservation Need (SGCN).

ECOLOGICAL CONTEXT

GEOLOGY AND GROUNDWATER

The site is situated on geological terraces, or areas that were once the river channel or floodplains carved by rivers. The southern half of the site exists on top of a terrace, above the current river floodplain. The northern half exists within the floodplain. These terraces are principally sand, gravel, and some finer materials, especially along the Mississippi and its smaller tributaries (Hobbs and Goebel 1982).

Groundwater is visibly present on-site and can be seen seeping out along the terrace edge. In the upland areas, the depth to groundwater ranges from 30-50 feet, which is quite shallow. In the floodplain, the depth to groundwater is less than 10 feet.

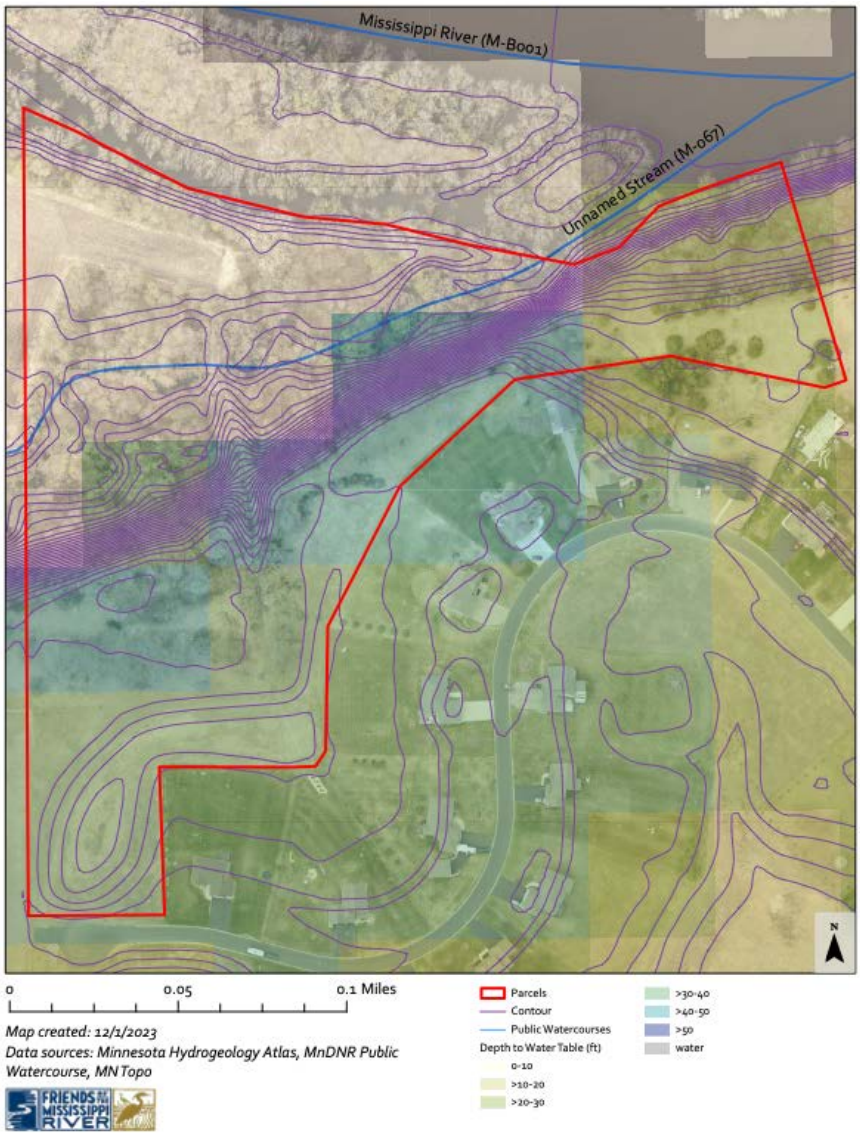

Figure 2: Map of groundwater at Davis Farm Park.

TOPOGRAPHY & ASPECT

Overall, the topography of the site slopes from the high point in the southwest corner to the low point in the northeast corner and creates 3 sections within the park. The southern half of the site is a relatively flat terrace that gradually begins to slope down toward the north. A steep north-facing slope exists bisects the site from southwest to northeast. This slope was likely carved by water from the Mississippi River and the unnamed creek meandering through the site. Elevation ranges from 920 feet above sea level to 866 feet, generally spanning variable distances and ranging from a 40% - 70% slope. In the northeast corner of the site, the slope transitions to an undercut wall approximately 40 feet tall. The third section of the site is the relatively flat floodplain which drains to the Mississippi River.

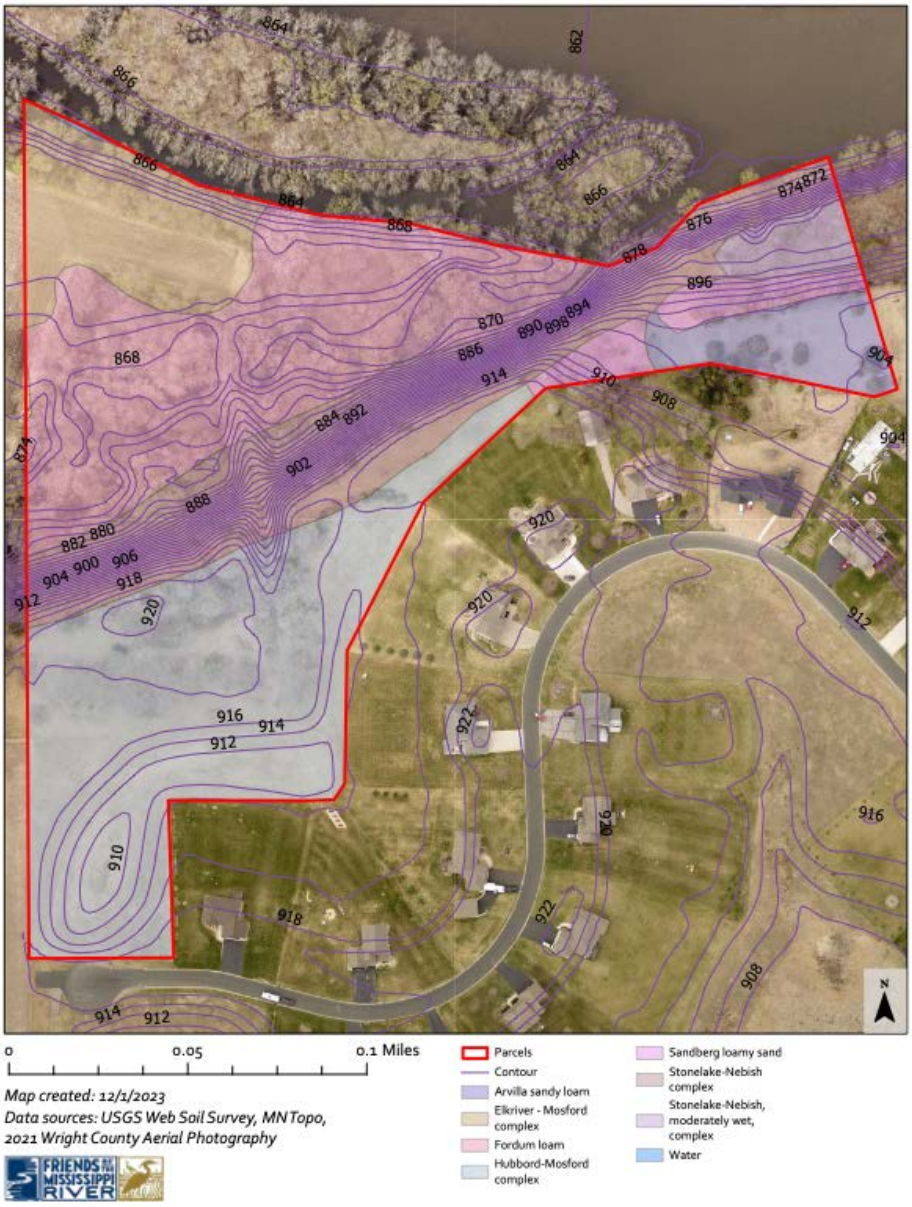

Figure 3: Map of topography and soils at Davis Farm Park.

SOILS

Soils largely align with topography across the site. The upland terrace consists of excessively well-drained loamy sand. The soils here are primarily not suitable for farming. The steep slope consists of gravelly coarse sandy loam and is excessively well drained. Groundwater seeps out of the soil and drains to the river. There are two dominant soil types in the floodplain. Most of the soil is classified as poorly drained loam. In the northwest corner of the site, there is one area classified as prime farmland, containing moderately drained fine sandy loam.

Image 1: Image of low-lying drainageway; illustrates saturated soils and steep topography at site.

SURFACE WATER RESOURCES

RIVERS

The site is directly connected to the Mississippi River and an unnamed stream. The Mississippi River flows from west to east along the northern boundary of the site with many depositional islands separating the park from the main channel of the Mississippi. Approximately one third of the site exists within the river's floodplain. A smaller, unnamed stream flows from west to east through the site, ultimately flowing into the Mississippi. This unnamed stream acts as a drainage ditch connecting to tiled farm fields to the west, carrying nutrients and sediments through the site to the Mississippi. Both rivers are listed on the Minnesota Public Waters Inventory, and the Mississippi is impaired for *E. coli* and mercury in fish tissue within this reach.

WETLANDS

According to the National Wetland Inventory (NWI), the low-lying area surrounding the unnamed stream is classified as a forested wetland that experiences seasonal flooding. It is in the Mississippi River floodplain and provides water storage during flood events.

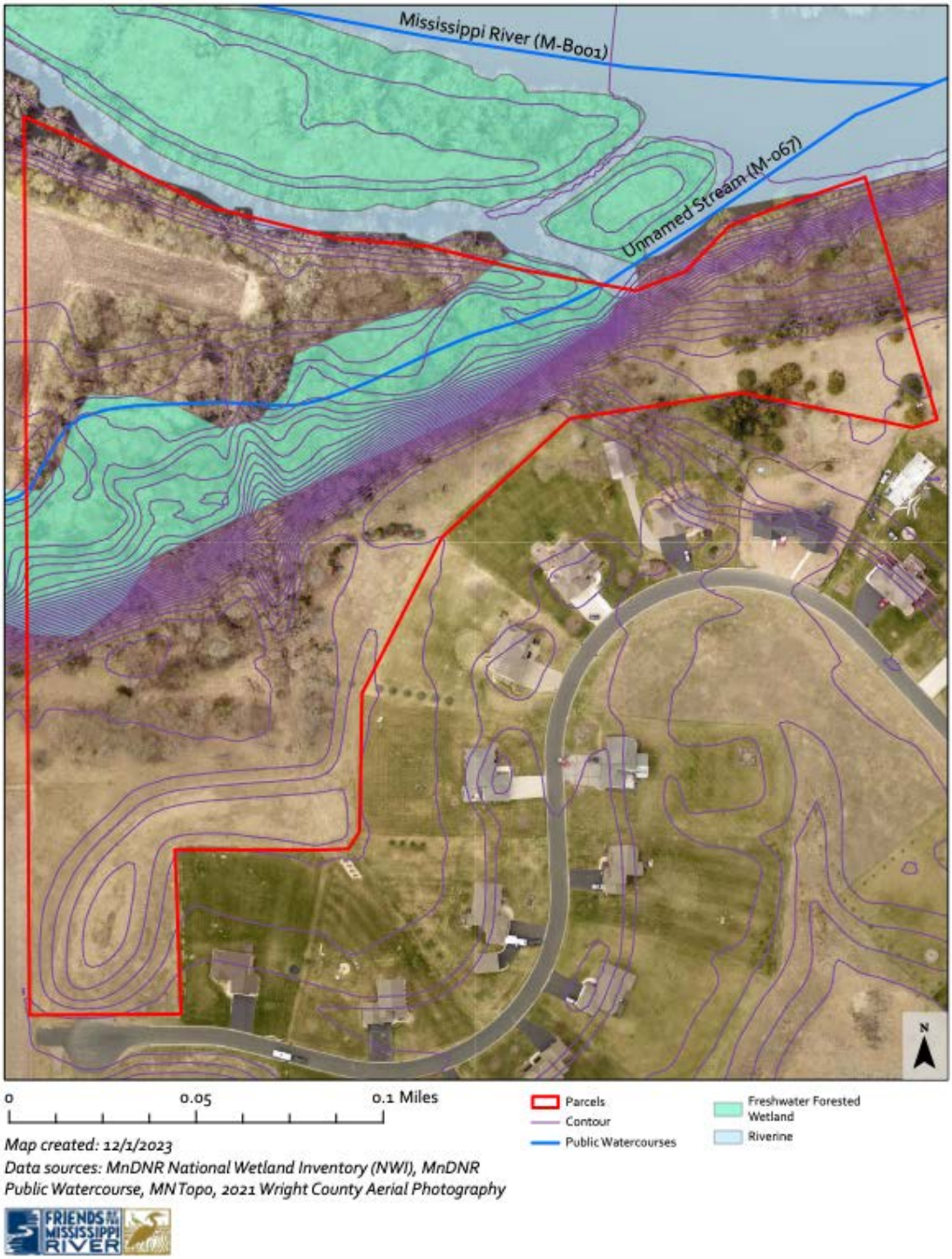

Figure 4: Map of surface water resources on the site.

HISTORICAL VEGETATION

This site is located at a transition point between forest and savanna. Technically, the site resides in the Anoka Sand Plain, an ecological subsection delineated by the Minnesota DNR that is characterized by flat, sandy soils, terraces along the Mississippi River, and plant communities such as prairies and savannas dependent on fire and drought (Anoka Sand Plain Subsection). Less than one mile to the south of this site, the ecological subsection changes to Big Woods, characterized by maples, basswood, elms, and oaks, forming a dense forest (Big Woods Subsection). Specifically, the plant community prior to European colonization at this site is described as an oak woodland and brushland. This indicates there was some level of historical fire disturbance to prevent this area from becoming dense forest.

Historical aerial photos can also explain the vegetation changes over the last 75 years (Wright County Historic Aerial Photo Indexes). In 1940, the site was largely dominated by large tree cover. Farm operations appear on the western and southeastern edges of the parcel, but the woodland tree cover appears largely intact. By 1953, a more uniform landscape appeared. Farming is present in the northeast corner. The tree canopy in the southern half appears more uniform, which could indicate the understory was grazed while large trees were maintained. By 1958, tree canopy in the southern half is further reduced to make way for crops. The 1963 and 1970 aerials are similar, with the tree canopy restricted to the steepest terrain. Then, there is a 40-year gap in the aerial records during a time of suburban expansion and development in Otsego. The 2008 aerial photo shows the beginnings of the neighboring housing development to the south and east, and agricultural expansion within the parcel boundaries to the northeast. Interestingly, there are several historic bur oak trees that remain on the southern edge of the terrace. Overall, the native plant communities that remain are largely located in areas inaccessible to agriculture and development – namely the steep slope and wetland areas.

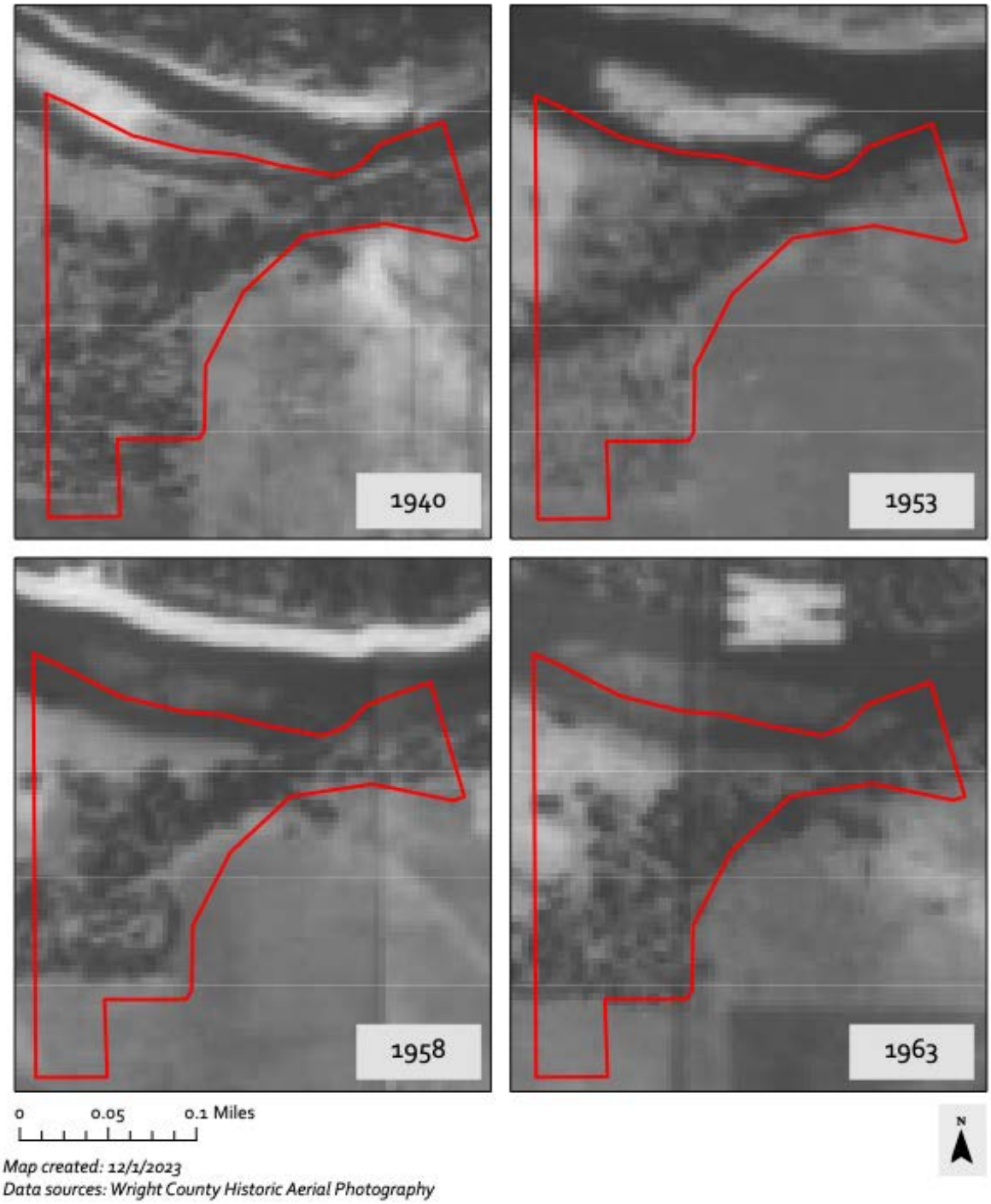

Figure 5: Historic aerial photos documenting land use change at Davis Farm Park.

Note: historical aerial photos from the mid-20th century lack fine resolution and do not reproduce well. The text description of these photos above describes the changes in land cover that can be generally identified in the images in Figure 5.

CONNECTIVITY

ADJACENT LAND USE

There are a mix of surrounding land uses adjacent to this site that have the potential to have impact to the park. Row crop agriculture exists to the west and within the parcel boundary of the site. Drainage moves through the unnamed creek and connecting floodplain wetland. On the terrace, a residential housing development abuts the property, and some landscaping from these properties extends into the park boundary. Based on aerial imagery, most houses likely have functioning irrigation systems and are hydrologically connected via groundwater to this site. The Mississippi River and the Mississippi River Islands Scientific and Natural Area (SNA) borders this site to the North.

PROXIMITY TO ECOLOGICAL CORRIDORS

This property is highly connected to several ecological corridors and natural areas within a 10-mile radius. It is located within the Metro Conservation Corridor, a regional land protection plan of the DNR (MN Geospatial Commons). Additionally, it is approximately 6 miles upstream of the Mississippi River Critical Area (MRCCA, MNDNR). It is also directly adjacent to one of the seven islands comprising the Mississippi River Islands Scientific and Natural Area (SNA). Additionally, it is less than 2 miles from the William H. Houlton Conservation Area and Camp Cozy Park in Elk River, two natural areas undergoing active ecological restoration to improve habitat. Camp Cozy Park is located within the Minnesota Wildlife Action Network (WAN, MNDNR), which distinguishes areas across the state that support existing biological diversity.

ECOLOGICAL SIGNIFICANCE AND WILDLIFE VALUE

The site is not currently ranked by the Minnesota County Biological Survey as biologically significant (MBS, MNDNR). However, rankings for the MCBS survey were conducted in this area between 1979-1998 and likely did not capture all sites of significance because of technology limitations. This site is highly connected to several ecological and riverine corridors, so it has inherent wildlife significance. Nearly all forms of wildlife depend on rivers for sustenance, especially invertebrates, amphibians, reptiles, and fish. Mammals and birds also benefit greatly from the water, shelter and nutrients provided by the river, and birds use the river corridor as an important migratory flyway.

Wildlife observed at the park during 2023 site surveys include: bald eagle, red-tailed hawk, American goldfinch, field sparrow, downy woodpecker, hairy woodpecker, black-capped chickadee, white-breasted nuthatch, American crow, blue jay, white-tailed deer, red fox, and evidence of American beaver. The outcomes of future restoration could be measured, in part, by a simple wildlife monitoring program.

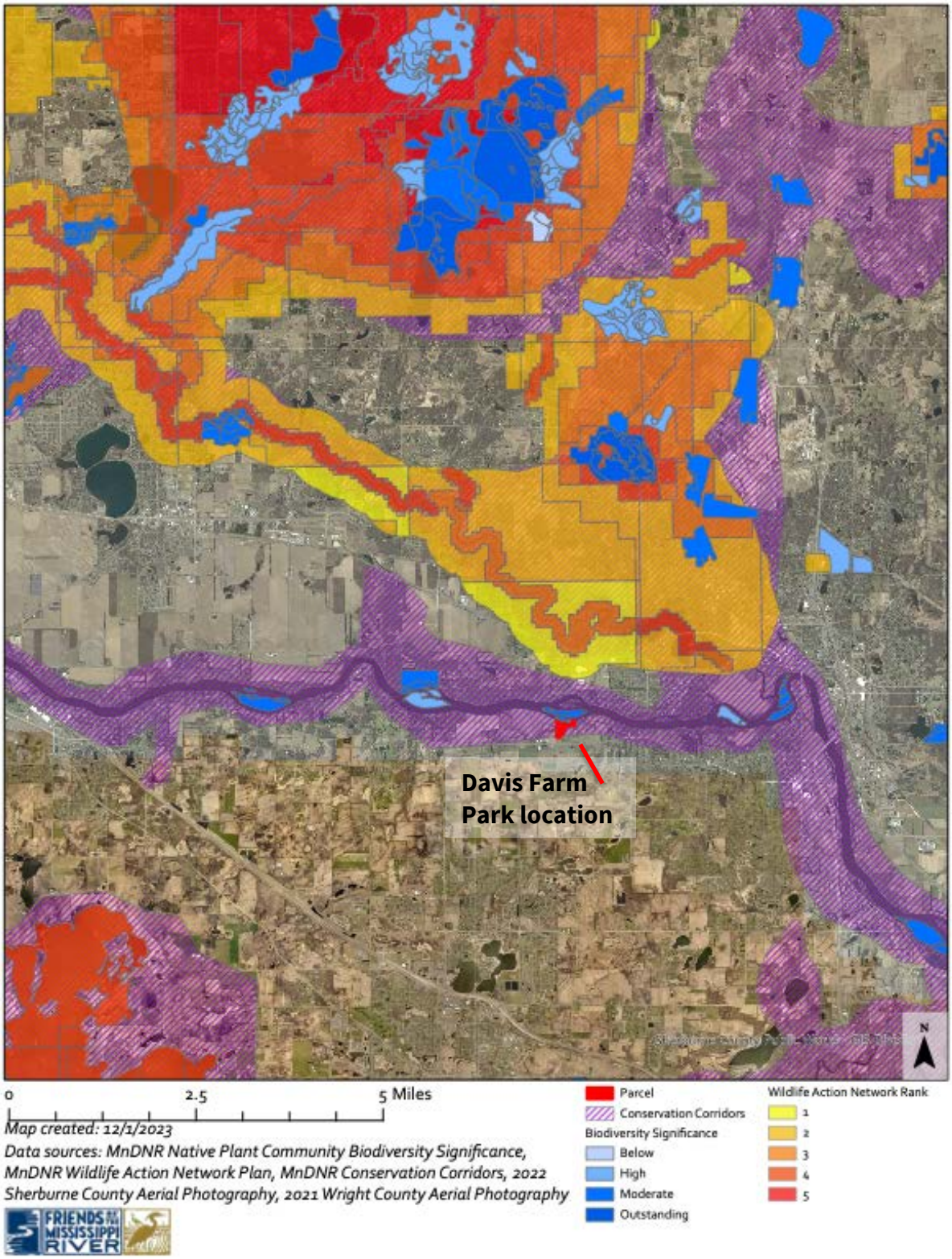

Figure 6: Proximity of Davis Farm Park to several other areas of ecological significance.

RARE SPECIES

According to the DNR natural heritage database, there are no rare species recorded within the site. However, 14 rare species have been recorded within five miles of the site. Ten of these rare species are designated as species of greatest conservation need (SGCN) in Minnesota (Table 1). Habitat loss and degradation have been primary drivers of decline for SGCN.

Table 1: Species of Greatest Conservation Need (SGCN) within 5-mile radius of site.

Common Name	Scientific Name	Category	SGCN
A Jumping Spider	*Pelegrina arizonensis*	Spider	Yes
Beach Heather	*Hudsonia tomentosa*	Plant	No
Black Sandshell	*Ligumia recta*	Mussel	Yes
Blandings Turtle	*Emydoidea blandingii*	Turtle	Yes
Butternut	*Juglans cinerea*	Plant	No
Creeping Juniper	*Juniperus horizontalis*	Plant	No
Loggerhead Shrike	*Lanius ludovicianus*	Bird	Yes
Peregrine Falcon	*Falco peregrinus*	Bird	Yes
Plains Pocket Mouse	*Perognathus flavescens*	Mammal	Yes
Prairie Vole	*Microtus ochrogaster*	Mammal	Yes
Red-shouldered Hawk	*Buteo lineatus*	Bird	Yes
Rusty-patched Bumblebee	*Bombus affinis*	Bee	Yes
Seaside Three-awn	*Aristida tuberculosa*	Plant	No
Uncas Skipper	*Hesperia uncas*	Butterfly	Yes

MANAGEMENT UNITS AND RECOMMENDATIONS

BACKGROUND DATA

The natural resources management plan uses the *Field Guide to the Native Plant Communities of Minnesota: The Eastern Broadleaf Forest Province* (MNDNR, 2005) to characterize the property's existing land cover and identify target plant communities for restoration. The guide identifies ecological systems and native plant community types in the state based on multiple ecological features such as major climate zones, origins of glacial deposit, and plant composition.

To simplify and summarize these data, Native Plant Community conditions (grades) were identified for each intact community and are ranked from A (excellent) to B (good), C (fair), and D (poor). This ranking considers abundance of non-native species, diversity, abundance, and health of native species, level of disturbance and degradation, and impacts or alterations to water features. Condition ranks are only assigned to native plant communities classified according to DNR guidelines; other plant communities are considered land cover types and are not assigned condition ranks.

The following site-specific factors were also considered when determining the target plant communities for restoration (Table 17): historic conditions, existing conditions, relative effort to derive benefits, and community values for the park. These considerations help to determine the optimal and most suitable goals for restoration of plant communities within the park.

MANAGEMENT UNITS OVERVIEW

A natural resources inventory and assessment was conducted by FMR ecologists during 2023 to determine existing plant and wildlife communities, identify opportunities for restoration, and develop guidance for long-term community use. This assessment was used to designate management units across the site and to categorize restoration tasks and costs.

Davis Farm Park contains eight management units (MUs), three with subunits defined by topographical changes or separated by existing land use: River Edge (MU1), Agriculture Field (MU2), Wooded Field Edge (MU3), Floodplain (MU4; with subunits), Terrace Forest (MU5; with subunits), Forest Slope (MU6), Savanna (MU7), and Old Field (MU8; with subunits).

The following sections include a description of each management unit, the plant communities or land cover types within each management unit, and possible management strategies. Unit descriptions also include a recommended plant community which can be used to guide restoration, based on the MNDNR Native Plant Communities. Full descriptions of each native plant community recommended for the property can be found in Appendix B. This section also contains representative photos of each Management Unit.

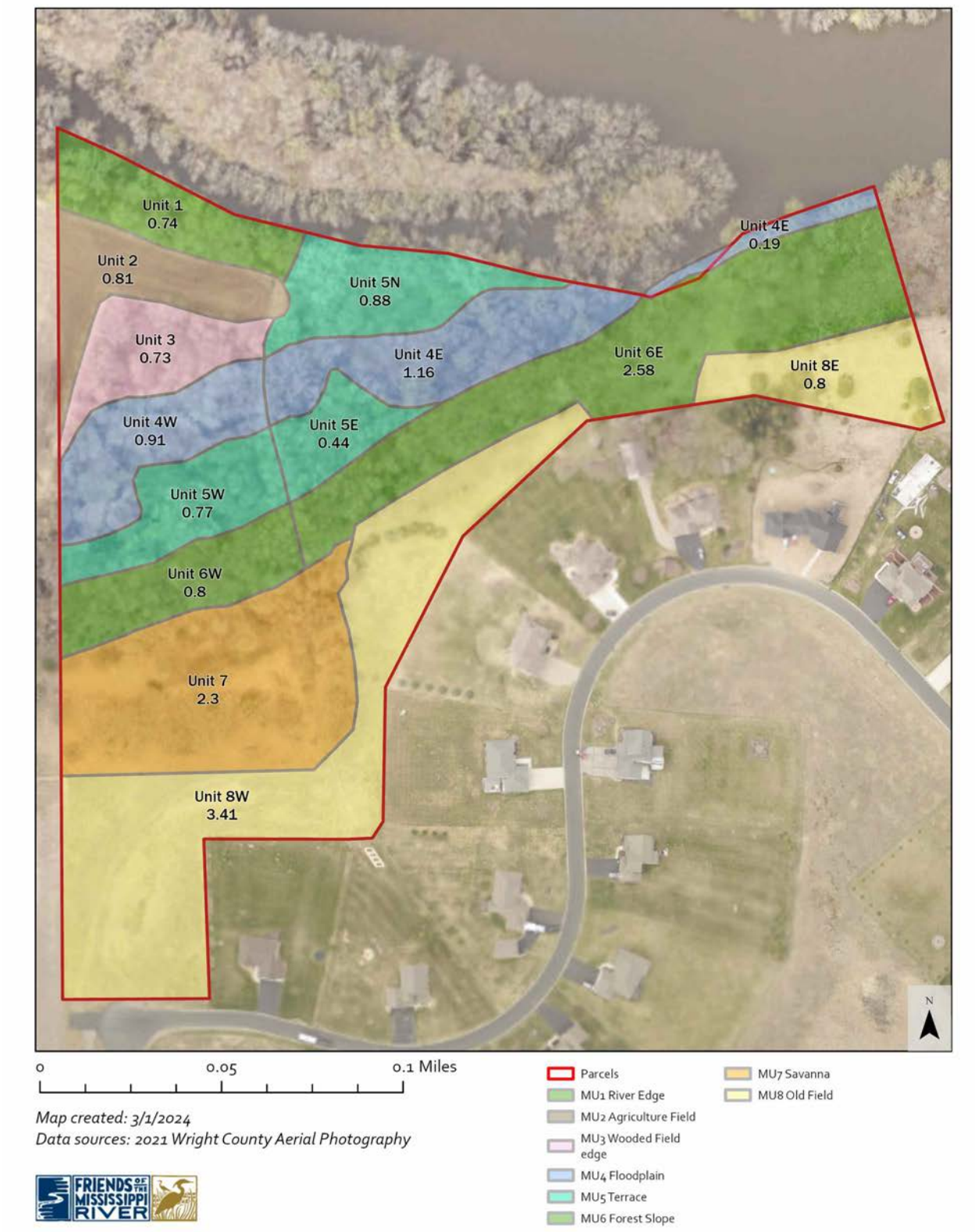

Figure 7: Management Unit map for Davis Farm Park.

MANAGEMENT UNIT 1: RIVER EDGE

Image 2: Riverbank within River Edge Management Unit, Davis Farm Park

Management Unit 1, the River Edge Unit (MU1,) consists of a narrow floodplain and terrace forest located in the northwest corner of the park and has a “C” grade native plant community condition. The 0.7-acre unit is linear and follows a back channel of the Mississippi River with an island of the Mississippi Islands SNA directly north across the back channel. The eastern edge of the unit is the location of a former boat launch at the end of the park’s main trail, though the access area to the river is muddy and unmaintained.

MU1 is stable with only small amounts of bank undercutting on the west end of the unit. A narrow floodplain of approximately 15 feet rises to a terrace forest to the south. The stabilization of this unit is likely owed to the separation from the currents of the Mississippi’s main channel and the presence of nearly continuous native understory vegetation such as American slough grass and cut-leaf coneflower. Abundant hackberry and green ash are in the canopy, which will open considerably as ash are lost to the Emerald ash borer. Non-native species such as smooth brome and garlic mustard are also present, and this unit could

benefit from supplemental planting or seeding to increase diversity and improve long-term soil stabilization and nutrient filtration.

While this unit contains the only formal access to the river in the park, the former boat launch is in poor condition and does not allow safe entry to the river or an opportunity to interact with the water. As future investments are made in the park, this location is both a Priority Feature and Priority Issue.

Table 2: Common and notable species observed in Management Unit 1

TREES	SHRUBS	GROUND COVER (WILDFLOWERS, GRASSES, SEDGES, FERNS, VINES)
• Hackberry • Green ash • Black willow • Boxelder	• Prickly ash • Riverbank grape • Missouri gooseberry • **Tatarian honeysuckle** • Red elderberry • Black cap raspberry	• **Smooth brome** • American slough grass • Wood nettle • **Creeping Charlie** • Virginia creeper • Common oxeye • Cut leaf coneflower • **Garlic mustard**

BOLDED: Non-native and/or invasive species

MANAGEMENT UNIT GOALS

The goals for this unit include:

1) Reduction or elimination of Tatarian honeysuckle, smooth brome, and garlic mustard to address Priority Issue 1 (presence of invasive species).
2) Enhancement of habitat through seeding, planting, and adaptive management to address Priority Issue 2 (poor native species regeneration).
3) Establishment of a safe and maintainable access to the river to address Priority Issue 5 (lack of interpretation) and Priority Feature 2 (floodplain enhancement).

DESIRED FUTURE CONDITION

A reasonable trajectory for the plant communities in MU1 is to work towards a B quality mesic forest plant community with reduced cover of non-native/invasive species and increased cover of native trees, shrubs, and woodland understory species. Target plant communities to consider include Southern Floodplain Forest (FFs68) and Southern Terrace Forest (FFs59). General guidelines for desired vegetation composition include:

- Continuous ground cover (50-100%) of plants such as wood nettle, Virginia waterleaf, jewelweed, tall coneflower, stinging nettle, Northern bedstraw, common blue violet, eastern

narrowleaf sedge, honewort, and Virginia bluebells. Woody vines such as Virginia creeper and riverbank grape.

- Sparse to patchy shrub cover (5-50%) of species such as American elm, hackberry, box elder, Missouri gooseberry, prickly ash, and chokecherry.
- Interrupted to continuous canopy cover (50-100%) of species such as American elm, green ash, hackberry, basswood, box elder, silver maple, black ash, and cottonwood.

MANAGEMENT ACTIONS

The following section summarizes the various actions that will support achieving the goals and desired future condition for MU1. The table below identifies the likely trajectory of the habitats and the effort associated with various actions. The paragraphs below provide a text summary and activities that will help support the Priority Features.

Table 3: Management Unit 1 Potential Management Actions.

Bolded items are considered priority and addressed in further detail in Table 18 of the Workplan section.

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
None	No management actions.	Non-native vegetation may spread and become denser, making future removal more difficult and further suppress native vegetation. Non-native vegetation will encroach on other areas of the park. Condition will remain the same or worsen.	C
Low	Monitor to assess management action.	No/low risk. Condition will be maintained. Issues will be identified before they become more costly. Effectiveness of management actions can be evaluated and inform future actions.	C
Medium	**Removal of non-native herbaceous species through mechanical and chemical means.**	**Risks include unintentional impacts from chemical overspray.** **Condition will improve via reduction of non-native plant cover and reduced suppression of native plant cover.**	**B**
Medium	**Planting native shrubs**	**Risks include soil disturbance, loss of investment if shrubs don't establish, and accidental invasive species reintroduction.** **Condition will improve early season nectar availability for pollinators, forest structure, and riverbank stabilization.**	**B**

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
High	**Removal of non-native and invasive woody species through mechanical and chemical means.**	**Risks include unintentional targeting of native species with chemical overspray and damage via mechanical removal.** **Condition will improve via reduction of non-native plant cover and reduced suppression of native plant cover.**	**B**
High	Removal of existing boat launch and construction of new river access.	Risks include unintentional root damage to adjacent large trees. Condition will reduce soil loss, allow for introduction of native species, and allow for community access and enjoyment of the river.	B

Restoration of Management Unit 1 will require woody non-native vegetation management followed by herbaceous non-native vegetation management. While Tatarian honeysuckle is patchy within MU1, it is a priority to manage it to preserve the native woodland diversity present within the unit. Cutting and treating stumps with herbicide is the best way to minimize chemical drift and avoid unnecessary impacts to the existing native plant community. After initial clearing of Tatarian honeysuckle, garlic mustard may increase in abundance. Given its current level of establishment, mechanical removal by hand-pulling or mowing second-year garlic mustard plants is recommended. If populations expand to large monocultures, chemical removal may be considered.

Improvement of the river access should be considered in this unit in alignment with protection of Priority Feature 2. A safe and maintainable access is essential to a riverfront park. Removal of asphalt within the trail corridor should also be considered. This large disturbance may result in the need for reforestation or planting efforts after removal, so timing is critical. Care should be taken to preserve existing large trees along the trail. If full removal is not possible, partial removal in addition to strategic planting to mask the remaining surface is an option. Species tolerant of soil compaction such as nodding wild onion, ostrich fern, bee balm, little bluestem, bush honeysuckle, and New England aster should be considered.

After initial management of non-native and invasive species, reestablishment of a native shrub layer is recommended. Mass planting of bare root shrubs within the understory will provide diversity and forest structure, and new plantings should be protected to prevent loss by deer and rabbit browse. Increased density of planting should be prioritized along the riverbank which is more vulnerable to erosion.

MANAGEMENT UNIT 2: AGRICULTURE FIELD

Image 3: Agriculture field from trail to boat launch looking West, Davis Farm Park

Management Unit 2, the Agriculture Field Unit (MU2), is 0.8 acres and is actively farmed as an extension of a farm field to the west. In 2023, the field was planted in soybeans. A review of aerial photos indicates that this unit was pastured in the 1940s and then a portion of it cleared for row crop agriculture by 1953. Since then, all aerial photos indicate this unit has been farmed or pastured. This type of agriculture use does not provide any habitat benefits and likely contributes to degradation of surrounding habitats via nutrient runoff, soil erosion, and increased edge habitat. Adjacent units (MU1, MU3) have a high presence of non-native invasive species, likely because this farm field bisects the woodland habitat with exposed soil, where weed seeds that land on the edges can easily germinate.

Despite its long history as a continuation of the farm field to the west, the encroachment is on public parkland. From a community standpoint, this area gives park users a false sense they are on private property when using the only paved trail in the park to access the boat launch in MU1. This unit will have its property line marked, and agricultural use will cease.

MANAGEMENT UNIT GOALS

The goals for this unit include:

1) Reduction or elimination of farming to address Priority Issue 4 (presence of an agriculture field).
2) Restoration of to a native plant community to address Priority Feature 4 (enhancement of western woodland).

DESIRED FUTURE CONDITION

A reasonable trajectory for the plant communities in MU2 is to work towards a B quality mesic forest plant community with cover of native trees, shrubs, and woodland understory species. Target plant communities to consider include Southern Floodplain Forest (FFs68) and Southern Terrace Forest (FFs59).

General guidelines for desired vegetation composition include:

- Continuous ground cover (50-100%) of plants such as wood nettle, Virginia waterleaf, jewelweed, tall coneflower, stinging nettle, Northern bedstraw, common blue violet, eastern narrowleaf sedge, honewort, and Virginia bluebells. Woody vines such as Virginia creeper and riverbank grape.
- Sparse to patchy shrub cover (5-50%) of species such as American elm, hackberry, box elder, Missouri gooseberry, prickly ash, and chokecherry.
- Interrupted to continuous canopy cover (50-100%) of species such as American elm, green ash, hackberry, basswood, box elder, silver maple, black ash, and cottonwood.

MANAGEMENT ACTIONS

The following section summarizes the various actions that will support achieving the goals and desired future condition for MU2. The table below identifies the likely trajectory of the habitats and the effort associated with various actions. The paragraphs below provide a text summary and activities that will help support the Priority Features.

Table 4 : Management Unit 2 Potential Management Actions.
Bolded items are considered priority and addressed in further detail in Table 18 of the Workplan section.

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
None	No management actions.	Unit will continue to be farmed. Risks include nutrient loading, increased invasive species presence, limitations on public access. Condition will remain the same or worsen.	N/A
Low	**Cease agricultural use**	**Risks include leaving soil bare, which could lead to erosion or increased weed establishment and seed production.** **Condition will improve via reduction of fertilizer and heavy machinery use**	**D**
Medium	**Seed native cover crop or buffer seed mix**	**Risks include poor seed establishment and not meeting desired plant community objectives.** **Condition will improve habitat for pollinators and other wildlife, soil health will improve, nutrients will be captured before reaching water bodies.**	**C**
High	Reforest unit to align with native plant communities in MU1 and MU3	Risks include difficulty with tree establishment in sandy soils, long term investment. Condition will reduce soil loss, allow for introduction of native species, increase public comfort accessing unit, and decrease edge effects.	B

Restoration of Management Unit 2 will require reforestation while concurrently monitoring and managing any invasive species that begin to establish on unit edges. The first step will be to establish native groundcover and protect the soil by seeding a cover crop or buffer seed mix. After establishment, targeted planting of several large native trees such as basswood, hackberry, silver maple, and cottonwood will jumpstart canopy cover. These trees should be protected from deer browse with tree tubes. Watering of these trees in the first few years is a priority. It is likely that prickly ash and boxelder from adjacent units will also seed itself during reforestation efforts. Continued invasive species management should occur via spot spraying or spot mowing to prevent invasive species from going to seed. After trees reach a height above deer browse, protection can be removed.

Care should be taken to avoid reforestation efforts within existing or planned trail corridors.

MANAGEMENT UNIT 3: WOODED FIELD EDGE

Image 4: Wooded Field Edge Management Unit, Davis Farm Park

Management Unit 3, the Wooded Field Edge Unit (MU3,) consists of a degraded mesic forest located on the western edge of the park and has a “D” grade native plant community condition. The 0.7-acre unit is triangular with two sides bordered by the agriculture field. A wire fence runs through a portion of the unit and will have to be removed prior to management. Its presence and the plant community suggest a grazing history.

MU3 is the most degraded of the eight management units in the park. In addition to its high ratio of edge in relation to its size, its ecology has been completely altered by non-native and invasive common buckthorn. The unit is nearly impassable due to the density of mature buckthorn and understory buckthorn saplings. Hackberry, box elder and green ash comprise the canopy, but these species are not regenerating under the dense buckthorn cover. Missouri gooseberry, prickly ash, and black cap raspberry are also present in the shrub layer. The understory is typical of a formerly grazed terrace or mesic forest with white snakeroot, wood nettle, American slough grass, and Virginia creeper in abundance. If restoration was

pursued in MU3, the restoration would be benefitted by restoration of the agriculture field and subsequent habitat connection to MU1 and the river's floodplain.

Significant invasive species management is needed in MU3 to both establish improved habitat and prevent the spread of invasive species to other areas within the park.

Table 5: Common and notable species observed in Management Unit 3

TREES	SHRUBS	GROUND COVER (WILDFLOWERS, GRASSES, SEDGES, FERNS, VINES)
• Hackberry • Boxelder • Crabapple • American elm	• **Common buckthorn** • Prickly ash • Riverbank grape • Missouri gooseberry • Black cap raspberry	• American slough grass • Wood nettle • **Creeping Charlie** • Virginia creeper • Stinging nettle • **Garlic mustard**

BOLDED: Non-native and/or invasive species

MANAGEMENT UNIT GOALS

The goals for this unit include:

1) Reduction or elimination of common buckthorn and garlic mustard to address Priority Issue 1 (presence of invasive species)
2) Enhancement of habitat through seeding, planting, and adaptive management to address Priority Issue 2 (poor native species regeneration) and Priority Feature 4 (western woodland enhancement).

DESIRED FUTURE CONDITION

A reasonable trajectory for the plant communities in MU3 is to work towards a B-C quality mesic forest plant community with reduced cover of non-native/invasive species and increased cover of native trees, shrubs, and woodland understory species. Target plant communities to consider include Southern Terrace Forest (FFs59) and Southern Wet-Mesic Forest (MHs49).

General guidelines for desired vegetation composition include:

- Continuous ground cover (75-100%) of plants such as false rue anemone, blue phlox, common blue violet, hispid buttercup, appendaged waterleaf, Virginia spring beauty, tall coneflower, white and yellow trout lilies, white bear sedge, and hairy-leaved sedge.
- Variable shrub cover (5-100%) of species such as chokecherry, Missouri gooseberry, basswood, sugar maple, black ash, hackberry, bitternut hickory, American elm, red elm, and rock elm.

- Patchy to continuous subcanopy with sugar maple, basswood, hackberry, ironwood, black ash, and elms.
- Interrupted to continuous canopy cover (50-100%) of species such as basswood, black ash, sugar maple, American elm, red elm, and rock elm, green ash, hackberry, box elder, and bur oak.

MANAGEMENT ACTIONS

The following section summarizes the various actions that will support the Management Objectives for Management Unit 3. The table below identifies the likely trajectory of the habitats and the effort associated with various actions. The paragraphs below provide a text summary and activities that will help support the Priority Features.

Table 6 : Management Unit 3 Potential Management Actions.

Bolded items are considered priority and addressed in further detail in Table 18 of the Workplan section.

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
None	No management actions	Non-native vegetation may spread and become denser, making future removal more difficult and further suppress native vegetation. Non-native vegetation will encroach on other areas of the park. Condition will worsen.	D
Low	Monitor to assess management action	Moderate risk. Known issues will worsen without active management. New issues will be identified before they become more costly. Effectiveness of management actions can be evaluated and inform future actions.	D
Medium	**Removal of non-native herbaceous species through mechanical and chemical means**	**Risks include unintentional targeting of native species with chemical overspray.** **Condition will improve via reduction of non-native plant cover and reduced suppression of native plant cover.**	**C**
Medium	**Planting native shrubs**	**Risks include soil disturbance, potential loss of investment if shrubs are lost due to browse or drought, and accidental invasive species reintroduction.** **Condition will improve early season nectar availability for pollinators, forest structure, and riverbank stabilization.**	**B**

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
High	**Removal of non-native and invasive woody species through mechanical and chemical means**	**Risks include unintentional targeting of native species with chemical overspray and damage via mechanical removal.** **Condition will improve via reduction of non-native plant cover and reduced suppression of native plant cover.**	**B**
High	Removal of wire fencing	Risks include unintentional root damage to adjacent trees. Removal will allow for invasive species management and better wildlife movement.	B

Restoration of Management Unit 3 will require woody non-native vegetation management followed by herbaceous non-native vegetation management in alignment with protecting Priority Feature 2 Forestry mowing of buckthorn followed by foliar herbicide application to reduce or eliminate resprouting is recommended. After initial clearing of buckthorn, invasive biennial weeds such as garlic mustard may increase in abundance. Given its current level of establishment, mechanical removal by hand-pulling second-year garlic mustard plants is recommended. If populations expand to large monocultures, chemical removal may be considered.

Concurrently with invasive woody management, removal of the wire fencing should occur to facilitate management and improve habitat.

After initial management of non-native and invasive species, reestablishment of an herbaceous understory is needed to prevent buckthorn seedbank germination and create fine fuels so that the unit could potentially be managed with prescribed fire. Reestablishment of a native shrub layer is also recommended. Mass planting of bare root or potted shrubs within the understory will provide diversity and forest structure, and new potted plantings should be protected to prevent loss by deer and rabbit browse.

MANAGEMENT UNIT 4: FLOODPLAIN

Image 5: Floodplain Management Unit (Floodplain West Subunit), Davis Farm Park

Management Unit 4, the Floodplain Unit (MU4,) consists of floodplain forest associated with the Mississippi, and the plant community is extended across two subunits divided by the primary north-south trail. The subunits, West and East, are hydrologically connected by a 60" inch culvert under the trail. The culvert carries agricultural drainage from the west side of the park to the river. While the floodplain subunits have grade "B" native plant community conditions, they differ in other characteristics.

The 0.9-acre Floodplain West Subunit is linear and contains a moderately deep drainage channel that carries water from the farm fields to the west. The channel is mucky and has likely filled with sediment over time as water has carried soil from the fields. The west floodplain has a nearly continuous canopy outside of the drainage channel with moderate cover of herbaceous species, but the combination of agricultural drainage and floodplain connection to the Mississippi creates enough disturbance to destabilize the banks of the drainage channel. This unit would benefit from a termination of agricultural drainage or in-channel structures to trap sediment and decrease the rate of flow.

Image 6: Floodplain Management Unit (Floodplain East Subunit), Davis Farm Park

The 1.2-acre Floodplain East Subunit is also linear and is stable on its north side. A wide floodplain of approximately 75 feet rises gently to a terrace forest within the Mississippi Islands SNA to the north. On the south side of the floodplain, the connection to adjacent uplands significantly increases in steepness towards the main channel of the Mississippi to the east with major bluff erosion and soil loss resulting from years of destabilizing flood flows and subsequent tree loss on the bluff. The floodplain itself contains large cobbles and boulders, as well as downed tree limbs that create good floodplain roughness to trap sediment and store floodwaters. The shallow banks of the floodplain are well vegetated with several native species adapted to frequent inundation.

The stabilization of this unit is likely owed to the separation from the Mississippi's main channel and the presence of native understory vegetation such as American slough grass and forbs. The canopy includes abundant silver maple, hackberry, black willow, and green ash. Non-native species are scarce in this unit with just small amounts of common buckthorn present on the wooded edges. This unit could benefit from a small amount of supplemental planting or seeding to increase diversity and improve long-term soil stabilization and nutrient filtration.

This unit is accessed by steep social trails on the east end of the park. The unit's beauty and connection to the river underlie the importance of establishing safe and maintainable access on this end of the park. As future investments are made in the park, this location is both a Priority Feature and Priority Issue.

Table 7: Common and notable species observed in Management Unit 4

TREES	SHRUBS	GROUND COVER (WILDFLOWERS, GRASSES, SEDGES, FERNS, VINES)
• Silver maple • Hackberry • Basswood • Green ash • Black willow • American elm	• **Common buckthorn**	• American slough grass • Clearweed • Wood nettle • Bidens • Jewelweed • Sweet cicely • Ontario aster • Hairy wood mint • Obedient plant • Cut leaf coneflower • **Garlic mustard**

BOLDED: Non-native and/or invasive species

MANAGEMENT UNIT GOALS

The goals for this unit include:

1) Reduction or elimination of common buckthorn to address Priority Issue 1 (presence of invasive species).
2) Enhancement of habitat through seeding, planting, and adaptive management to address Priority Issue 2 (poor native species regeneration) and Priority Feature 4 (western woodland enhancement).
3) Establishment of a safe and maintainable river access to address Priority Issue 5 (lack of interpretation) and Priority Feature 2 (enhancement of floodplain).

DESIRED FUTURE CONDITION

A reasonable trajectory for the plant communities in MU4 is to work towards a B quality floodplain forest plant community with increased cover of native trees, shrubs, and understory species tolerant of frequent inundation. The target plant community to consider is Southern Floodplain Forest (FFs68).
General guidelines for desired vegetation composition include:

- Very sparse to variable ground cover (5-50%) of plants such as false nettle, clearweeds, Ontario aster, Virginia wildrye, rice cut grass, hop umbrella sedge, and cattail sedge with wood nettle in dense patches. Climbing vines including riverbank grape, moonseed, and climbing poison ivy are also present.

- Sparse to patchy shrub cover (0-50%) of species such as silver maple, green ash, American elm, and hackberry with climbing poison ivy and silver maple seedlings present.
- Interrupted to continuous canopy cover (50-100%) of species strongly dominated by silver with occasional American elm, green ash, and cottonwood.

MANAGEMENT ACTIONS

The following section summarizes the various actions that will support the Management Objectives for Management Unit 4. The table below identifies the likely trajectory of the habitats and the effort associated with various actions. The paragraphs below provide a text summary and activities that will help support the Priority Features.

Table 8 : Management Unit 4 Potential Management Actions.

Bolded items are considered priority and addressed in further detail in Table 18 of the Workplan section.

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
None	No management actions.	Non-native vegetation may spread and become denser, making future removal more difficult and further suppress native vegetation. Non-native vegetation will encroach on other areas of the park. Condition will remain the same or worsen.	C
Low	Monitor to assess management action.	No/low risk. Condition will be maintained. Issues will be identified before they become more costly. Effectiveness of management actions can be evaluated and inform future actions.	C
Medium	**Removal of non-native herbaceous species through mechanical and chemical means.**	**Risks include unintentional targets from chemical overspray.** **Condition will improve via reduction of non-native plant cover and reduced suppression of native plant cover.**	**B**
Medium	**Planting native shrubs**	**Risks include soil disturbance, potential loss of investment if shrubs are lost due to browse or drought, and accidental invasive species reintroduction.** **Condition will improve early season nectar availability for pollinators, forest structure, and riverbank stabilization.**	**B**

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
High	**Removal of non-native and invasive woody species through mechanical and chemical means.**	**Risks include unintentional targeting of native species with chemical overspray and damage via mechanical removal.** **Condition will improve via reduction of non-native plant cover and reduced suppression of native plant cover.**	**B**
High	In-channel remediation of high flows from agriculture field.	Risks include disrupting agricultural drainage for neighboring farms. Condition will reduce soil loss, reduce nutrient transport to the river, and reduce tree loss in the floodplain.	B

Restoration of Management Unit 4 will require a small degree of woody non-native vegetation management followed by a small degree of herbaceous non-native vegetation management.

After initial management of non-native and invasive species, reestablishment of a native shrub layer is recommended. Mass planting of bare root shrubs within the understory will provide diversity and forest structure, and new plantings should be protected to prevent loss by deer and rabbit browse. Increased density of planting should be prioritized along the riverbank which is more vulnerable to erosion.

Additionally, remediation of effects from the agricultural drainage should be pursued.

MANAGEMENT UNIT 5: TERRACE

Management Unit 5, the Terrace Unit (MU5), consists of hardwood terrace forest situated adjacent to the Mississippi River floodplain and surrounding the agricultural drainage on either side of the large culvert in the park. As such, the topography of the unit effectively creates three areas of terrace forest. The subunits have the same target plant communities but differ in status and community composition. The variation in plant community across the subunits is due to slightly different hydrology. The terrace forest adjacent to the river is relatively flat with an open canopy of silver maple and cottonwood. The open canopy allows for a grassy and nearly continuous herbaceous layer. The western half of the terrace forest along the drainage is more obviously disturbed by flashy flood flows having a higher degree of downed woody material and a less continuous herbaceous layer of cut-leaf coneflower and other moisture-tolerant herbs. The eastern half of the terrace forest is likely disturbed by both dissipated flows from the drainage and river floodwaters. The canopy here is mostly open with sporadic green ash, red oak, and hackberry. The herbaceous layer is a nearly continuous stand of wood nettle.

Image 7: Terrace Management Unit 5, Davis Farm Park

The 0.9-acre Mississippi Terrace Subunit is linear and is slightly upland of the river back channel and adjacent floodplain to the south. This subunit ranks as a “C” native plant

community, largely because of its limited diversity. The tree canopy is dominated by hackberry and green ash. The shrub layer is sparse, with scattered groups of prickly ash and gooseberry. Buckthorn is present in this unit but does not dominate the shrub layer. The understory largely consists of American slough grass and rice cut grass with small pockets of reed canary grass.

The 0.8-acre West Terrace Subunit is also linear and lies adjacent to the agricultural drainage and the base of the western woodland slope; the topography is mostly flat. The canopy is open with green ash and hackberry most abundant. The ground layer is nearly continuous, and wood nettle, Virginia waterleaf, and white snakeroot the most common species. Still, a great deal of bare soil is present in the unit likely because of its hydrology.

The 0.4-acre East Terrace Subunit is less affected by the agricultural drainage but likely more affected by river flooding and drainage from the slopes on the south half of the park. The canopy is dominated by red oak and hackberry, and Missouri gooseberry and prickly ash are in the shrub layer. The herbaceous layer is a nearly continuous stand of wood nettle with small amounts of garlic mustard.

Table 9: Common and notable species observed in Management Unit 5

TREES	SHRUBS	GROUND COVER (WILDFLOWERS, GRASSES, SEDGES, FERNS, VINES)
• Hackberry • Green Ash • Basswood • Red Oak • Eastern cottonwood	• Missouri gooseberry • Prickly ash • Red elderberry • **Common buckthorn**	• Wood nettle • Virginia waterleaf • White snakeroot • **Garlic mustard** • Stickseed • Zigzag goldenrod • Cutleaf coneflower

BOLDED: Non-native and/or invasive species

MANAGEMENT UNIT GOALS

The goals for this unit include:

1) Reduction or elimination of garlic mustard to address Priority Issue 1 (presence of invasive species).
2) Enhancement of habitat through seeding, planting, and adaptive management to address Priority Issue 2 (poor native species regeneration) and Priority Feature 4 (western woodland enhancement).
3) Establishment of a safe and maintainable river access to address Priority Issue 5 (lack of interpretation) and Priority Feature 2 (floodplain enhancement).

DESIRED FUTURE CONDITION

A reasonable trajectory for the plant communities in MU5 is to work towards a B quality terrace forest plant community with increased cover of native trees, shrubs, and understory species tolerant of frequent inundation and disturbance. The target plant community to consider is Southern Terrace Forest (FFs59).

General guidelines for desired vegetation composition include:

- Continuous ground cover (50-100%) of plants such as wood nettle, Virginia waterleaf, jewelweed, tall coneflower, stinging nettle, Northern bedstraw, common blue violet, eastern narrowleaf sedge, honewort, and Virginia bluebells. Woody vines such as Virginia creeper and riverbank grape.
- Sparse to patchy shrub cover (5-50%) of species such as American elm, hackberry, box elder, Missouri gooseberry, prickly ash, and chokecherry.
- Interrupted to continuous canopy cover (50-100%) of species such as American elm, green ash, hackberry, basswood, box elder, silver maple, black ash, and cottonwood.

MANAGEMENT ACTIONS

The following section summarizes the various actions that will support enhancing the Priority Features in Management Unit 5. The table below identifies the likely trajectory of the habitats and the effort associated with various actions. The paragraphs below provide a text summary and activities that will help support the Priority Features.

Table 10 : Management Unit 5 Potential Management Actions.

Bolded items are considered priority and addressed in further detail in Table 18 of the Workplan section.

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
None	No management actions.	Non-native vegetation may spread and become denser, making future removal more difficult and further suppress native vegetation. Non-native vegetation will encroach on other areas of the park. Condition will remain the same or worsen.	C/B
Low	Monitor to assess management action.	No/low risk. Condition will be maintained. Issues will be identified before they become more costly. Effectiveness of management actions can be evaluated and inform future actions.	C/B
Medium	Seeding native terrace forest seed mix	Risks include poor establishment. Condition will improve by increasing herbaceous cover, where deep roots can hold the soil in place, prevent erosion, and filter nutrients.	B
Medium	Planting native shrubs	Risks include soil disturbance, potential loss of investment if shrubs are lost due to browse or drought, and accidental invasive species reintroduction. Condition will improve early season nectar availability for pollinators, forest structure, and riverbank stabilization.	B
High	**Removal of non-native species through mechanical and chemical means.**	**Risks include unintentional targeting of native species with chemical overspray.** **Condition will improve via reduction of non-native plant cover and reduced suppression of native plant cover.**	**B**

Restoration of Management Unit 5 will require herbaceous non-native vegetation management, planting and seeding native shrubs and forbs.

Vegetation within the terrace could be improved by removing non-native herbaceous species and identifying open soil areas and then seeding or planting within these areas to establish continuous vegetation, stabilize soils and increase nutrient filtration.

Native shrubs can also be replanted in areas least susceptible to erosion to provide floral resources for early-season pollinators and structural diversity to the forest.

MANAGEMENT UNIT 6: FOREST SLOPE

Image 8. Forest Slope Management Unit 6, Davis Farm Park.

Management Unit 6, the Forest Slope Unit (MU6), consists of hardwood forest situated along a north facing slope. The plant community is divided across two subunits, West and East, separated by the primary north-south trail. The western end of the slope is a steep hill, and the eastern end of the slope is situated on a bluff above the floodplain which drops off considerably from the top of the bluff. Past conditions of this portion of the site are not well understood, but it is suspected that this slope has experienced sloughing due to undercutting during flood events, the instability of sandy soils, the lack of deep-rooted vegetation on the bluff, and tree loss. The bluff has exposed subsoil, and several fallen trees lie at the base of the slope in the floodplain. The tree canopy is primarily closed despite the tree loss, and herbaceous vegetation at the top of the slope is present but sparse. The subunits have the same current and target plant communities but differ in status and community composition.

The 0.8-acre Forest Slope West Subunit is linear and separates the Savanna Unit to the South from Terrace West to the north. This subunit ranks as a “C” native plant community, largely because of its limited diversity. The tree canopy is dominated by hackberry, basswood, and

green ash. The shrub layer is sparse, with scattered groups of prickly ash along the top of the slope. Tatarian honeysuckle and buckthorn are present in this unit, but they do not dominate the shrub layer. The understory largely consists of bare soil with some patches of creeping Charlie, buckthorn seedlings, and Virginia creeper present. Invasive earthworms are present, but not overwhelmingly so because oak leaf litter is still present. Overall, this unit is relatively open compared to other forested areas within the park.

The 2.6-acre Forest Slope East Subunit is more diverse than the west subunit and ranks as a "B" native plant community. The tree canopy is similarly dominated by basswood, hackberry, and green ash, with some red and white oaks present near the eastern edge of the unit. Elderberry, prickly ash, Missouri gooseberry, and black cherry comprise the shrub layer. The understory has spring ephemerals including dutchman's breeches and columbine, as well as mid and late season forbs such as sweet cicely and wood nettle. Garlic mustard and buckthorn are present in the unit but are not dominant. This unit has been subject to undercutting and bank sloughing from the river over time. There are areas of steep drop-offs to the floodplain below that are estimated to be over 40 feet tall. Soil erosion is a priority issue.

Image 9: Image of 35-foot slope located in eastern subunit from the bottom.

Additionally, there is evidence that some tree and shrub removal has occurred within the northeast portion of this unit. Stumps, cut stems, and bare soil are common in the unit. This management by neighbors to improve viewsheds from homes may positively contribute to the minimal amount of buckthorn and a relatively diverse understory. Future management should be aligned with increasing soil stability efforts.

There are steep social trails that traverse the bluff slope and allow for connectivity to the floodplain and river. Formalization of one trail and erosion prevention measures would decrease erosion and increase community access to the river.

Table 11: Common and notable species observed in Management Unit 6

TREES	SHRUBS	GROUND COVER (WILDFLOWERS, GRASSES, SEDGES, FERNS, VINES)
• Basswood • Green Ash • Hackberry • Ironwood • Red Oak	• **Common buckthorn** • Missouri gooseberry • Prickly ash • **Tartarian honeysuckle**	• **Creeping Charlie** • Fowl manna grass • **Garlic mustard** • **Kentucky bluegrass** • Lady fern • Pennsylvania sedge • Sweet cicely • Virginia waterleaf • Wood nettle • Zig zag goldenrod

BOLDED: Non-native and/or invasive species

MANAGEMENT UNIT GOALS

The goals for this unit include:

1) Reduction or elimination of common buckthorn and Tartarian honeysuckle to address Priority Issue 1 (presence of invasive species).
2) Stabilization of bare slopes and rerouting of the trail to address Priority Issue 3 (erosion).
3) Establishment of clear boundaries between park and private property to address Priority Issue 6 (yard waste dumping).
4) Establishment of a safe and maintainable access to the river to address Priority Issue 5 (lack of interpretation) and Priority Feature 3 (slope enhancement).

DESIRED FUTURE CONDITION

A reasonable trajectory for the plant communities in MU6 is to work towards a B quality hardwood forest plant community with increased cover of native trees, shrubs, and understory species tolerant of frequent inundation. The target plant community to consider is Central Mesic Hardwood Forest (MHc36).

General guidelines for desired vegetation composition include:

- Patchy to interrupted ground cover (25 – 75%) of plants such as early meadow-rue, lady fern, large-flowered bellwort, Clayton's sweet cicely, Pennsylvania sedge, large-leaved aster, wild sarsaparilla, zigzag goldenrod, and yellow violet.
- Variable shrub cover of plants including chokecherry, pagoda dogwood, prickly gooseberry, and beaked hazelnut.
- Continuous canopy cover (> 75%) of species strongly dominated by such as basswood, northern red oak, and sugar maple with occasional paper birch, bur oak, red maple, and quaking aspen.

MANAGEMENT ACTIONS

The following section summarizes the various actions that will support enhancing the Priority Features in Management Unit 6. The table below identifies the likely trajectory of the habitats and the effort associated with various actions. The paragraphs below provide a text summary and activities that will help support the Priority Features.

Table 12: Management Unit 6 Potential Management Actions.

Bolded items are considered priority and addressed in further detail in Table 18 of the Workplan section.

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
None	No management actions.	Non-native vegetation may spread and become denser, making future removal more difficult and further suppress native vegetation. Non-native vegetation will encroach on other areas of the park. Condition will remain the same or worsen.	C/B
Low	Monitor to assess management action.	No/low risk. Condition will be maintained. Issues will be identified before they become more costly. Effectiveness of management actions can be evaluated and inform future actions.	C/B
Medium	**Seeding native forest seed mix**	**Risks include poor establishment.** **Condition will improve by increasing herbaceous cover, where deep roots can hold the soil in place and prevent erosion**	**B**

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
Medium	Planting native shrubs	Risks include soil disturbance, potential loss of investment if shrubs are lost due to browse or drought, and accidental invasive species reintroduction. Condition will improve early season nectar availability for pollinators, forest structure, and riverbank stabilization.	B
High	**Tree thinning on top of slope**	**Risks include increasing erosion potential by exposing bare soil.** **Condition will increase light availability to the understory, improving potential for native plant establishment**	**B**
High	**Removal of non-native species through mechanical and chemical means.**	**Risks include unintentional targeting of native species with chemical overspray.** **Condition will improve via reduction of non-native plant cover and reduced suppression of native plant cover.**	**B**

Restoration of Management Unit 6 will require woody non-native vegetation management, herbaceous non-native vegetation management, planting and seeding native shrubs and forbs.

Vegetation at the top of the slope could be improved by selectively thinning some trees to provide better light conditions to establish continuous vegetation and prevent the toppling of canopy trees which further destabilizes the slope. After selective thinning, a native seed mix with fast-germinating species should be seeded to increase groundcover and establish plants with deeper root systems.

At the same time as selective thinning, nonnative invasive woody plants including buckthorn and honeysuckle should be removed. Plants can be cut at the base and treated with herbicide to prevent resprouting. Woody material should be piled and burned where dense, and slashed where it is sparse and where topography allows. Following woody removal, invasive forbs such as garlic mustard can be managed by spot-treating with herbicide, or this could also be a great opportunity for volunteer help, where volunteers pull and bag garlic mustard in the spring.

After invasive woody and herbaceous removal, the remainder of the unit should be seeded to increase diversity and improve soil cover. In areas where earthworms are present, specifically in the West subunit, a specialized seed mix consisting of earthworm tolerant native plants should be used. Finally, native shrubs can be replanted in areas least susceptible to erosion to provide floral resources for early-season pollinators and structural diversity to the forest.

MANAGEMENT UNIT 7: SAVANNA

Image 10: Savanna management unit looking south from the top of the slope, Davis Farm Park.

Management Unit 7, the Savanna Unit (MU7), is 2.3 acres in size and acts as a transition zone from the upland prairie to the south (MU8) and the north-facing slope to the north (MU6). It currently ranks as a "D" grade native plant community, as the understory has a continuous shrub layer, and the understory species composition does not represent savanna. The canopy in this unit is dominated by open-grown bur oak trees. Trees with this growth pattern often exist in areas that were once much more open, either maintained by regular low-intensity fire or grazing. The shrub canopy is a dense thicket of prickly ash, with some scattered pockets of white cedar and Tartarian honeysuckle. The understory is dominated by smooth brome, an invasive cool season grass commonly planted in pastures or as erosion control, and creeping Charlie, an invasive vine.

Table 13: Common and notable species observed in Management Unit 7

TREES	SHRUBS	GROUND COVER (WILDFLOWERS, GRASSES, SEDGES, FERNS, VINES)
• Bur oak • Hackberry • Basswood • Green Ash	• Prickly ash • **Common buckthorn** • **Tartarian honeysuckle** • White cedar	• **Creeping Charlie** • **Smooth brome** • Virginia creeper • Pennsylvania sedge • **Motherwort** • **Garlic mustard** • **Mullein** • River grape • Missouri gooseberry

BOLDED: Non-native and/or invasive species

MANAGEMENT UNIT GOALS

The goal for this unit is to improve ecological diversity and restore a critically imperiled Minnesota native plant community, addressing Priority Feature 1.
The goals for this unit include:

1) Reduction or elimination of common buckthorn, Tartarian honeysuckle, smooth brome, and garlic mustard to address Priority Issue 1 (presence of invasive species).
2) Reduction of the shrub layer of prickly ash, a native, but aggressive shrub.
3) Enhancement of habitat through seeding, planting, and adaptive management to address Priority Issue 2 (poor native species regeneration) and Priority Feature 1 (grassland and savanna enhancement).
4) Establishment of clear boundaries between park and private property to address Priority Issue 6 (yard waste dumping).

DESIRED FUTURE CONDITION

A reasonable trajectory for the plant communities in MU7 is to work towards a B quality oak savanna plant community with cover of native grasses, forbs, shrubs, and sparse oak canopy. A target plant community to consider for this unit includes Southern Dry Savanna (UPs14).

General guidelines for desired vegetation composition include:

- Continuous native graminoid (grass) cover (25-100%) of plants such as little bluestem, porcupine grass, big bluestem, Indian grass, and Pennsylvania sedge.
- Patchy native forb cover (5 – 50%) of plants such as western ragweed, Virginia ground cherry, gray goldenrod, white sage, hairy puccoon, hoary puccoon, hoary frostweed, and starry false Solomon's seal.
- Sparse to patchy shrub cover (5-50%) of species such as leadplant, prairie rose, chokecherry, American hazelnut, and smooth sumac.
- Scattered individual trees (25-50%) of species such as bur oak, pin oak, and black oak.

MANAGEMENT ACTIONS

The following section summarizes the various actions that will support achieving the goals and desired future condition for MU7. The table below identifies the likely trajectory of the habitats and the effort associated with various actions. The paragraphs below provide a text summary and activities that will help support the Priority Features.

Table 14: Management Unit 7 Potential Management Actions.

Bolded items are considered priority and addressed in further detail in Table 18 of the Workplan section.

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
None	No management actions.	Non-native vegetation may spread and become denser, making future removal more difficult and further suppress native vegetation. Non-native vegetation will encroach on other areas of the park. Condition will remain the same or worsen.	D
Low	**Seeding native seed mix**	**Risks include poor establishment.** **Condition will improve by increasing native species diversity, providing habitat for pollinators and wildlife.**	**C/B**
Low	Thinning native tree canopy	Risks include over thinning, halting natural regeneration. Condition will improve by increasing light availability to the understory and allowing herbaceous establishment.	C
Medium	**Invasive woody species management**	**Risks include off-target impacts to oaks and other native plants.** **Condition will improve by limiting establishment of invasive plants in this unit and other areas of the park**	**C**
High	**Forestry mow to open understory**	**Risks include destroying habitat for woodland wildlife.** **Condition will move toward savanna habitat structure and provide habitat for species dependent on this imperiled community.**	**C**
High	Prescribed fire	Risks include insufficient burn, fire escape. Condition will improve habitat by reintroducing critical disturbance for this community. Shrub cover will be limited, herbaceous cover will thrive.	B

Restoration of Management Unit 7 will require opening the understory and subcanopy to recreate canopy structure that is typical of a savanna native plant community. The first step is identifying all sapling/sub-canopy trees to be saved. The next step is to remove all remaining shrub and sub-canopy trees by forestry mowing. Forestry mowing grinds up woody material and creates a thatch layer that later decomposes. It is a cost-effective way to remove woody material from a large area.

After forestry mowing, resprouts of non-native invasive plants such as buckthorn and Tatarian honeysuckle should be chemically treated with herbicide to prevent regrowth. Additionally, a grass-specific herbicide should be used to treat the areas where cool season grass growth is unaffected by forestry-mowed slash. One to three chemical applications may be needed depending on how the target species respond to forestry mowing.

Once invasive species cover is reduced, the area should be reseeded with a native dry savanna seed mix to increase forb diversity and provide resources for pollinators. Weeds should continue to be spot treated during the 2-3-year establishment window. After there is adequate fuel from senesced plants, managing the unit with prescribed fire should be considered to ensure long-term restoration to savanna.

Image 11: Another view of the mature oak canopy in the savanna unit.

MANAGEMENT UNIT 8: OLD FIELD

Management Unit 8, the Old Field Unit (MU8), is 4.2 acres in size and is divided into two geographically separate subunits, West and East. Both units currently rank as "D" quality native plant communities due to their limited native plant diversity and significant presence of nonnative invasive species. They are situated on the southern edge of the park in the topographically flat upland, where soil is very sandy and dry. Although ranking and management is similar, the units are further based on differences in current plant community composition.

Image 12: Old Field West subunit, Davis Farm Park

The Old Field West subunit is 3.4 acres and exhibits greater plant diversity than the east subunit. The western edge of the subunit is defined by a mowed path that leads to primary north-south park trail. Portions of this subunit appear to have been graded as a dry stormwater basin and planted with a native seed mix during adjacent subdivision development. There is some presence of native species including side oats grama, common milkweed, and purple prairie clover. Most of the groundcover is comprised of non-native, invasive grasses and forbs including smooth brome, Kentucky bluegrass, butter and eggs, absinthe wormwood, spotted knapweed, and Canada thistle. Some woody trees and shrubs

are beginning to establish in this area including bur oak, boxelder, and green ash, as well as invasive Siberian elm, white cedar, and white mulberry.

Image 13: Old Field East subunit, Davis Farm Park

The Old Field East subunit is 0.8 acres and is nearly a monoculture of smooth brome and scattered red cedars. The eastern and northern unit boundaries are lined with an unmaintained wire fence. The western edge of this unit is subject to encroachment including mowing and tree clearing, presumably for the viewshed to the river.

Both subunits lack accessibility, signage, and overall park user comfort when entering the park. Homeowner encroachment along the park boundary is an issue. Signage could be added to increase awareness of exactly where property lines lie. Additionally, park signage should be placed in the west subunit by the cul-de-sac entrance to inform visitors that this area is public land. Formal trails should be added to allow the community to feel comfortable using the park.

Table 15: Common and notable species observed in Management Unit 8

TREES	SHRUBS	GROUND COVER (WILDFLOWERS, GRASSES, SEDGES, FERNS, VINES)
	• **Siberian elm** • Boxelder • Northern white cedar • Red mulberry	• **Smooth brome** • Side oats grama • **Spotted knapweed** • **Kentucky bluegrass**

BOLDED: Non-native and/or invasive species

MANAGEMENT UNIT GOALS

The goals for this unit include:

1) Reduction or elimination of smooth brome, Kentucky bluegrass, spotted knapweed, and Siberian elm to address Priority Issue 1 (presence of invasive species).
2) Enhancement of habitat through seeding and adaptive management to address Priority Issue 2 (poor native species regeneration) and Priority Feature 1 (grassland and savanna enhancement).
3) Establishment of clear boundaries between park and private property to address Priority Issue 5 (lack of interpretation) and Priority Issue 6 (yard waste dumping).

DESIRED FUTURE CONDITION

A reasonable trajectory for the plant community in MU8 is to work towards a B quality dry prairie plant community with cover of native grasses, forbs, and shrubs. Target plant communities to consider include Southern Dry Prairie (UPs13) and Southern Dry Savanna (UPs14).

General guidelines for desired vegetation composition include:

- Continuous native graminoid (grass) cover (25-100%) of plants such as little bluestem, porcupine grass, side oats grama, prairie dropseed, June grass, hairy grama, big bluestem, Indian grass, and Pennsylvania sedge.
- Patchy native forb cover (5 – 50%) of plants such as silky aster, aromatic aster, dotted blazing star, hairy golden aster, pasqueflower, harebell, false boneset, flowering spurge, western ragweed, Virginia ground cherry, gray goldenrod, white sage, hairy puccoon, hoary puccoon, hoary frostweed, and starry false Solomon's seal.
- Sparse to patchy shrub cover (5-50%) of species such as leadplant, prairie rose, and sage wormwood.
- Scattered individual trees (5-25%) of species such as bur oak.

MANAGEMENT ACTIONS

The following section summarizes the various actions that will support achieving the goals and desired future condition for MU8. The table below identifies the likely trajectory of the habitats and the effort associated with various actions. The paragraphs below provide a text summary and activities that will help support the Priority Features.

Table 16: Management Unit 8 Potential Management Actions.

Bolded items are considered priority and addressed in further detail in Table 18 of the Workplan section.

MANAGEMENT EFFORT	MANAGEMENT ACTIONS	RISKS & LIKELY TRAJECTORY	PROJECTED GRADE
None	No management actions.	Non-native vegetation may spread and become denser, making future removal more difficult and further suppress native vegetation. Woody vegetation will encroach into unit. Condition will remain the same or worsen.	D
Low	**Add signage to increase accessibility and access**	**Risks include push back from adjacent landowners about park utilization.** **Condition will improve access for community members who do not live directly adjacent to park.**	**N/A**
Low	**Spot treatment of invasive woody species**	**Risks include off target chemical impacts to native plants.** **Condition will limit shading and encroachment of invasive species into old field.**	**C**
Medium	**Seeding native seed mix**	**Risks include poor establishment.** **Condition will improve by increasing native species diversity, providing habitat for pollinators and wildlife.**	**C/B**
High	Mechanical or chemical nonnative species management	Risks include off-target impacts to oaks and other native plants. Condition will improve by reducing cover of invasive plants in this unit and other areas of the park	C
High	**Prescribed fire**	**Risks include insufficient burn, fire escape.** **Condition will improve habitat by reintroducing critical disturbance for this community. Shrub cover will be limited, herbaceous cover will thrive.**	**B**

Restoration of Management Unit 8 is relatively straightforward. Conversion of old fields to prairie restoration is common. Prior to site prep, all trees and shrubs should be removed from the east subunit and stumps should be chemically treated to prevent resprouts.

Site preparation for prairie restoration includes 1-2 years of herbicide treatment to reduce current invasive species populations. Care should be taken to avoid areas where the largest amounts of native species are present. In those areas, spot-mowing can negatively impact invasive species while not drastically harming natives. After site preparation, the unit can be drill or broadcast seeded with a diverse native shortgrass prairie seed mix. The next growing season, the unit should be mowed when the vegetation reaches 12-18" high. After one year of mowing, continued weed pressure should be assessed. Small populations of invasives can be hand pulled or seed heads clipped to limit the use of herbicide near newly seeded areas. The site should be managed with prescribed fire in the long term.

Efforts should be taken to preserve bur oak regeneration from the neighboring savanna unit (MU7). The boundary between prairie and savanna can shift over time. For park users, added shade could be a nice benefit. Bur oaks should not be treated with chemical herbicide and should be left to grow, if canopy cover does not reach more than 25% in any given area.

WORKPLAN

RESTORATION PRIORITIZATION

Ecological restoration can be costly and time-consuming during the first few years. Often, it is advisable to prioritize by starting on a subset of units first, rather than starting in all units and potentially sacrificing follow up steps. This section contains a map (Figure 11) of target native plant communities for each unit and a table prioritizing which units to start first. Prioritization is based on invasive species establishment, potential for erosion, cost, and potential to increase habitat quality.

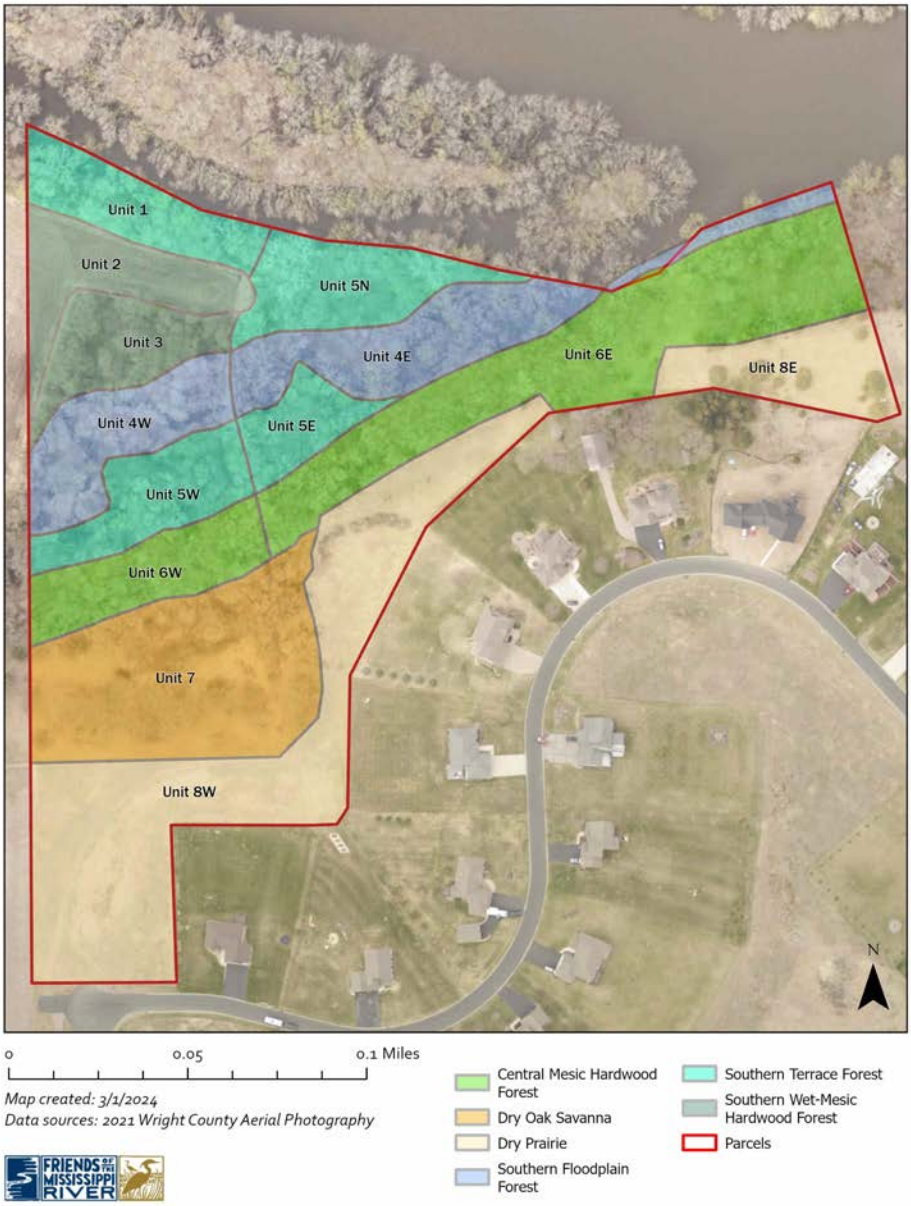

Figure 8: Target native plant communities for each management unit at Davis Farm Park.

Table 17: Summary of management units, target plant communities, and prioritized restoration ranking.

UNIT	SIZE (ACRES)	UNIT NAME	TARGET PLANT COMMUNITY	CURRENT GRADE	PRIORITY LEVEL	5-YEAR RESTORATION COST
MU1	0.7	River Edge	FFs68 or FFs59	C	1	$5,585
MU2	0.8	Agriculture Field	MHs49	N/A	1	$30,770
MU3	0.7	Wooded Field Edge	MHs49	D	1	$9,390
MU4	2.3	Floodplain	FFs68	C	4	$8,185
MU5	2.1	Terrace	FFs59	B/C	4	$8,590
MU6	3.4	Forest Slope	MHc36	B/C	2	$30,240
MU7	2.3	Savanna	UPs14	D	3	$20,980
MU8	4.2	Old Field	UPs13	D	2	$37,150
TOTAL						**$150,890**

Target Plant Community Abbreviations:

- FFs68 - Southern Floodplain Forest
- FFs59 - Southern Terrace Forest
- MHs49 – Southern Wet-Mesic Hardwood Forest
- MHc36 – Central Mesic Hardwood Forest
- UPs14 - Southern Dry Savanna
- UPs13 - Southern Dry Prairie

More information for each target plant community is included in Appendix B.

5-YEAR WORKPLAN

A general time frame is shown in Table 17, but the year for any given task may shift, depending on when restoration is initiated. The costs shown are estimates, based on recent and similar work at other sites, but actual costs may be higher based on prevailing wages.

Table 18: Restoration Schedule and Cost Estimates

This table provides estimated schedules and approximate costs for restoration and management tasks for Davis Farm Park. Both the project tasks and costs are likely to change as the project progresses. Tasks are suggested to be phased. Work units correspond with those shown in Figure 11.

MU1: RIVER EDGE (0.7 ac) TARGET: SOUTHERN TERRACE FOREST FFs59					
Year	Season	Activity	Acres	Unit cost	Total
Year 1	Early fall	Hand cut Tatarian honeysuckle; immediately treat stumps with 20% solution of aquatic-approved glyphosate	0.3	$2,500	$750
	Winter	Selective thinning of mature trees. Chip in place or haul material away.	0.5	$750	$375
Year 2	Spring	Hand-pull 2nd year garlic mustard (optional volunteer event)	0.5	$1,000	$500
	Spring	Mow patches of smooth brome at boot stage	0.3	$1,000	$300
	Summer	Treat regrowth of smooth brome and patches with aquatic-approved glyphosate at 1.5% solution	0.3	$950	$285
	Fall	Treat resprouts of Tatarian honeysuckle with aquatic-approved glyphosate at 1.5% solution	0.3	$600	$180
	Fall	Hand-broadcast moisture-tolerant graminoid seed mix in open areas of unit; includes seed cost	0.3	$750	$225
Year 3	Spring	Hand-pull 2nd year garlic mustard (optional volunteer event)	0.5	$1,000	$500
	Summer	Plant 15 bare root shrubs in open areas of unit and along riverbank; protect with Plantra tree tubes (optional volunteer event)	15 shrubs	$38	$570
Year 4	Spring	Hand-pull 2nd year garlic mustard and water new trees (optional volunteer event)	0.5	$1,500	$750
Year 5	Fall	Hand-broadcast moisture-tolerant forb and graminoid seed mix in open areas where garlic mustard has been suppressed; includes seed cost.	0.5	$2,300	$1,150
MU1 TOTAL YEARS 1-5					**$5,585**

MU2: AGRICULTURE FIELD (0.8 ac) TARGET: SOUTHERN WET-MESIC HARDWOOD FOREST MHs49					
Year	Season	Activity	Acres	Unit cost	Total
Year 1	Summer	Site prep broadcast spray one time.	0.8	$300	$240
	Fall	Drill / broadcast seed shade-tolerant native savanna/woodland seed mix. BWSR mix 36-211 or similar.	0.8	$1,500	$1,200
Year 2	Summer	Site establishment mow twice during growing season	0.8	$750	$600
	Fall	Plant 20 potted trees (10 gallon or larger). Cost includes plant material and installation.	20 trees	$650	$13,000
	Fall	Install tree protection around newly planted trees. Cost includes Plantra tree tubes.	20 trees	$50	$1,000
	Fall	Water trees	1 event	$1,200	$1,200
Year 3	Spring	Spot treat / mow invasive forbs (garlic mustard)	0.8	$650	$520
	Summer	Water trees three times. Reliable volunteers could perform this task.	3	$1,200	$3,600
	Summer	Spot treat / mow invasive forbs	0.8	$650	$520
	Summer	Broadcast seed bare spots with native savanna/woodland seed mix. BWSR mix 36-211 or similar. Cost includes seed mix.	0.3	$1,500	$450
Year 4	Summer	Water trees three times. Volunteers could perform this task.	3	$1,200	$3,600
	Summer	Spot treat / mow invasive forbs	0.8	$550	$440
Year 5	Summer	Water trees three times. Reliable volunteers could perform this task.	3	$1,200	$3,600
	Fall	Broadcast seed to increase species diversity. Include a minimum of 3 early season and 3 late season flowering species.	0.8	$1,000	$800
MU2 TOTAL YEARS 1-5					**$30,770**

MU3: WOODED FIELD EDGE (0.7 ac) TARGET: SOUTHERN WET-MESIC FOREST MHS49					
Year	Season	Activity	Acres	Unit cost	Total
Year 1	Fall	Remove fence within unit	1 removal	$2,000	$2,000
	Winter	Forestry mow entire unit protecting all native trees and upright snags. Conduct mowing during frozen ground conditions.	0.7	$1,750	$1,225
Year 2	Spring	Hand-pull (by volunteers) or spot treat second-year garlic mustard	0.7	$1,000	$700
	Early fall	Treat resprouts of common buckthorn with 5% triclopyr solution	0.7	$600	$420
Year 3	Spring	Hand-pull (by volunteers) or spot treat second-year garlic mustard	0.7	$1,000	$700
	Early fall	Treat resprouts of common buckthorn with 5% triclopyr solution	0.7	$600	$420
	Fall	Hand-broadcast graminoid seed mix to suppress buckthorn resprouts	0.7	$750	$525
Year 4	Spring	Hand-pull (volunteers) or spot treat second-year garlic mustard	0.7	$1,000	$700
	Summer	Plant 100 bare root trees and shrubs.	100 trees	$20	$2,000
Year 5	Spring	Hand-pull (volunteers) or spot treat second-year garlic mustard	0.7	$1,000	$700
MU3 TOTAL YEARS 1-5					**$9,390**

MU4: FLOODPLAIN (2.3 ac) TARGET: SOUTHERN FLOODPLAIN FOREST FFs68					
Year	Season	Activity	Acres	Unit cost	Total
Year 1	Fall	Cut/treat/stack/burn common buckthorn over 0.5" DSH. Buckthorn is patchy, assume 1/4 of unit.	0.6	$1,300	$780
Year 2	Spring	Broadcast graminoid-dominated, moisture-tolerant seed mix. Cost includes seed mix.	0.6	$2,300	$1,380
	Spring	Spot treat invasive herbaceous plants including garlic mustard. Presence is currently minimal; assume 1/3 of unit.	0.7	$950	$665
	Early fall	Follow up foliar treat buckthorn resprouts	0.6	$550	$330
Year 3	Spring	Spot treat invasive herbaceous plants including garlic mustard. Presence is expected to be minimal; assume 1/4 of unit.	0.6	$950	$570
	Fall	Native shrub planting to increase diversity (volunteer event). Cost includes shrubs, not labor.	100 shrubs	$8	$800
	Fall	Broadcast diverse, moisture-tolerant native seed mix to increase cover and prevent erosion. Assume 1/2 unit is open ground for seeding. Cost includes seed.	1.2	$2,300	$2,760
Year 4	Summer	Spot treat invasive species as needed.	0.6	$750	$450
Year 5	Summer	Spot treat invasive species as needed.	0.6	$750	$450
MU4 TOTAL YEARS 1-5					**$8,185**

MU5: TERRACE (2.1 ac) TARGET: SOUTHERN TERRACE FOREST FFs59					
Year	Season	Activity	Acres	Unit cost	Total
Year 1	Fall	Cut/treat/stack/burn common buckthorn over 0.5" DSH. Buckthorn is patchy, assume 1/4 of unit.	0.5	$1,300	$650
Year 2	Spring	Broadcast graminoid-dominated, moisture-tolerant seed mix. Assume bare ground is present across 1/2 of unit. Cost includes seed.	1	$2,300	$2,300
	Spring	Spot treat invasive herbaceous plants including garlic mustard. Presence is currently minimal; assume 1/3 of unit.	0.7	$950	$665
	Early fall	Follow up foliar treat buckthorn resprouts	0.5	$550	$275
Year 3	Spring	Spot treat invasive herbaceous plants including garlic mustard. Presence is expected to be minimal; assume 1/4 of unit.	0.5	$950	$475
	Fall	Native shrub planting to increase diversity (volunteer event). Cost includes shrubs, not labor.	100	$8	$800
	Fall	Broadcast diverse, moisture-tolerant native seed mix to increase cover and prevent erosion. Assume 1/2 unit is open ground for seeding. Cost includes seed.	1	$2,300	$2,300
Year 4	Summer	Spot treat invasive species as needed.	0.5	$750	$375
Year 5	Summer	Spot treat invasive species as needed.	0.5	$750	$375
	Fall	Spot treat invasive species as needed.	0.5	$750	$375
MU5 TOTAL YEARS 1-5					**$8,590**

MU6: FOREST SLOPE WEST (0.8 ac), FOREST SLOPE EAST (2.6 ac) TARGET: CENTRAL MESIC HARDWOOD FOREST MHc36					
Year	Season	Activity	Acres	Unit cost	Total
Year 1	Fall	Cut/treat/stack/burn invasive woody shrubs over 0.5" DSH including buckthorn and Tartarian honeysuckle. Material is patchy, assume 1/4 of unit.	3.4	$1,300	$4,420
	Winter	Selective thinning of mature trees in MU6E. Chip in place or haul material away.	6 trees	$750	$4,500
Year 2	Spring	Broadcast seed graminoid dominated buckthorn replacement mix. Cost includes seed.	3.4	$1,000	$3,400
	Spring	Spot treat invasive herbaceous plants including garlic mustard.	3.4	$950	$3,230
	Early fall	Follow up foliar treat buckthorn and honeysuckle resprouts	3.4	$550	$1,870
Year 3	Spring	Spot treat invasive herbaceous plants including garlic mustard.	3.4	$750	$2,550
	Fall	Native shrub planting to increase diversity (volunteer event). Cost includes shrubs, not labor.	200 shrubs	$8	$1,600
	Fall	Broadcast seed diverse native seed mix to increase cover & prevent erosion. Cost includes seed.	3.4	$2,000	$6,800
Year 4	Summer	Spot treat invasive species as needed.	3.4	$550	$1,870
MU6 TOTAL YEARS 1-5					**$30,240**

MU7: SAVANNA (2.3 ac) TARGET: SOUTHERN DRY SAVANNA UPs14					
Year	Season	Activity	Acres	Unit cost	Total
Year 1	Summer	Mark all save trees that would otherwise be destroyed with forestry mower (oaks only)	2.3	-	-
	Fall / Winter	Forestry mow all accessible areas when ground is frozen. Avoid save trees.	2.3	$1,600	$3,680
Year 2	Spring / summer	Spot treat monoculture patches of smooth brome and other nonnative cool season grasses	2.3	$950	$2,185
	Summer	Spot mow invasive forbs to reduce seed production	2.3	$1,000	$2,300
	Late Summer	Follow up foliar treat invasive woody resprouts	2.3	$550	$1,265
	Fall / Winter	Broadcast seed graminoid dominated buckthorn replacement mix. Cost includes seed mix.	2.3	$1,000	$2,300
Year 3	Summer	Spot mow invasive forbs and cool season grasses. 2 visits	2.3	$1,000	$2,300
Year 4	Spring	Prescribed burn. Protect save trees.	2.3	$1,000	$2,300
	Spring	Broadcast seed diverse dry savanna seed mix. Minimum of 25 forbs and 10 grasses. Local ecotype. Cost includes seed.	2.3	$1,500	$3,450
	Summer	Spot mow invasive forbs to reduce seed production. Assumes 1/4 of unit.	0.6	$1,000	$600
Year 5	Summer	Spot mow invasive forbs to reduce seed production. Assumes 1/4 of unit.	0.6	$1,000	$600
MU7 TOTAL YEARS 1-5					**$20,980**

MU8: OLD FIELD WEST (3.4 ac), OLD FIELD EAST (0.8 ac) TARGET: DRY SHORTGRASS PRAIRIE UPs13					
Year	Season	Activity	Acres	Unit cost	Total
Year 1	Spring	Mark all save trees (bur oaks only, density less than 25% cover)	4.2	-	-
	Spring	Fell and treat all trees. Stack and burn if material is small enough, haul away large trees.	8 trees	$500	$4,000
	Summer	Site prep broadcast spray. Avoid areas of high native diversity as indicated by project manager.	4.2	$300	$1,260
	Fall	Spot mow any remaining invasive species. Assumes 1/4 of unit.	1	$1,000	$1,000
Year 2	Spring	Rx burn to remove thatch. Mowing is an acceptable alternate to reduce cost.	4.2	$1,200	$5,040
	Spring	Drill diverse native seed mix. Minimum of 35 forbs and 10 grasses. Local ecotype. Includes seed cost	4.2	$1,500	$6,300
	Summer	Site establishment mow 2-3 times during growing season.	4.2	$1,500	$6,300
Year 3	Spring	Site establishment mow 1 time.	4.2	$750	$3,150
	Summer	Spot treat invasive forbs. Assumes 2 visits, 1/4 of unit.	2	$950	$1,900
Year 4	Summer	Spot treat invasive forbs, mowing or targeted herbicide application. Assumes 1 visit, 1/4 of unit.	1	$950	$950
	Fall	Prescribed burn	4.2	$1,000	$4,200
	Fall	Broadcast seeding of thin areas post-burn. Includes seed cost.	4.2	$500	$2,100
Year 5	Summer	Spot mow invasive forbs as needed. Assumes 1 visit, 1/4 of unit.	1	$950	$950
MU8 TOTAL YEARS 1-5					**$37,150**

LONG TERM MONITORING AND MANAGEMENT

Restored areas will need to be regularly monitored to identify ecological issues, such as erosion and sedimentation, invasive species, and disease. Early detection of concerns enables quick, cost-effective responses to address them before significant problems evolve.

Once the primary restoration tasks are completed, the restoration process converts to an adaptive management phase. Long-term management for all units is an important piece of maintaining the habitat over time. It is difficult to predict specifically how these areas will change over time, so being flexible and responding to needs as they arise is important. Without continued monitoring and management, these areas will likely degrade rapidly, and efforts will be undone in 5-10 years. Three critical long-term management actions are described below.

SEEDING AND PLANTING (ALL UNITS, AS NEEDED)

Over time, it is likely that some areas may benefit from seeding and planting to maintain ground cover or increase species diversity. The sloped areas of the park are prone to erosion and may require occasional reseeding along trail edges and slopes. Additionally, as the tree canopy changes in the ag field and wooded field edge units, it may be necessary to seed with a mix more adapted to updated light conditions. Planting trees, shrubs, and plugs can be a faster way to increase diversity and respond to changing light conditions in units with tree canopy. If the primary park trail is rerouted, seeding and planting will be necessary to revegetate the slope.

INVASIVE SPECIES MONITORING AND MANAGEMENT (ALL UNITS)

Both herbaceous and woody invasive species are a continued threat to the ecosystem health of these restored areas. Seeds from invasive species are constantly being transported by wind, water, and wildlife, so there is not a way to mitigate this threat. The best long-term strategy to prevent invasive species establishment is to regularly monitor the area to any presence of invasive plants can be caught early. It is relatively easy to manage a small population in the first or second year after arrival. If left to proliferate, invasive species can rapidly expand and have much larger ecological and monetary impacts over time.

PRESCRIBED BURNING (SAVANNA, OLD FIELD)

Savanna and Old Field (future prairie) units are dependent upon regular prescribed fire. Prescribed burns are an essential tool for managing woody encroachment and controlling invasive species. Additionally, burns stimulate grass and herbaceous growth in the understory by warming the soil and encouraging early growth and regeneration of these plants. Prairie burns should be conducted every 2-3 years. Savanna burns can be conducted every 3-4 years, depending on fuel accumulation. Planning to burn a subset of the acres annually is a good long-term strategy to allow refuge for pollinators.

Table 19: Long-Term Management Schedule and Cost Estimates

UNIT NAME	LONG-TERM MGMT TASK	FREQUENCY	COST RANGE
All Units	Seeding	As needed	Seed cost: $300 - $1,000 per acre. Contractor implementation cost: $600 per acre
All Units	Planting*	As needed	Plant material cost: $4 - $30. Volunteer event advised for implementation.
Savanna, Old Field	Prescribed burning	Every 2-3 years. Half the acres should be burned at any given time.	$1,000 - $1,200 per acre
All Units	Invasive species monitoring	3x annually	$1,000 - $1,500 annually
All Units	Invasive species spot-treatment	As needed	Contractor cost: $1,000 per acre
All Units	Invasive species management / planting volunteer event	Annually, as needed	$2,000 - $2,500 for FMR-sponsored public event

* Items with an asterisk are lower priority and should be undertaken only if funds and logistics allow.

OTHER CONSIDERATIONS

TREE DISEASE

DUTCH ELM DISEASE AND EMERALD ASH BORER

There are many elms and large green ash trees growing within the floodplain forests along the Mississippi River at Davis Farm Park. These trees are not only ecologically valuable but are also at high risk to attack from tree pests. Elms are susceptible to Dutch Elm Disease and ash are susceptible to Emerald Ash Borer. These tree pests have caused widespread mortality of elms and ash throughout the eastern United States and specifically in Minnesota.

Dutch Elm disease is a fungal infection caused by the fungus *Ceratocystis ulmi*, which is native to Asia, and is spread by both native and non-native bark beetles (family: Curculionidae). Once the fungus is introduced onto a tree, the tree reacts by sealing its own xylem tissues (conduits of water and nutrients) to prevent further spread. This effectively prevents water and nutrients from reaching the upper branches, causing gradual die-off as more and more of the xylem is sealed. Symptoms include a yellowing and browning of leaves spreading from the outer crown toward the trunk. Dutch elm disease was first recorded in Minnesota near Monticello in 1961 and has since spread throughout the state. Minnesota relied heavily on American elms (*Ulmus americana*) as shade trees on streets, with about 140 million in the

state at the time of the outbreak. The disease is now present in all Minnesota counties, though elms remain an important component of many Minnesota forests.

Emerald ash borer (EAB) is a wood-boring beetle from Asia that was first identified in the United States in the summer of 2002. Likely transported from Asia to Michigan in ash wood used for pallets and other shipping materials, the beetle has now been confirmed in 36 states and the District of Columbia, including Minnesota. The beetle works by depositing larvae under the bark of the tree; these larvae then feed on the wood, eventually disrupting enough of the phloem to prevent the transport of nutrients throughout the tree. While Minnesota's cold weather can stymie the of the extent of the beetle, it continues to spread.

Unless viable control or treatment options are developed, the elms and ash at Davis Farm Park are at risk of dying soon. When such large trees die, a pronounced effect will be seen on the vegetation and the river. These trees act to shade the water and provide habitat and improve water quality for fish and other species. When large trees die, they open the canopy and create gaps, which in turn releases understory formerly suppressed by the shade from such trees. If desirable species like native forbs, grasses, sedges, and shrubs exist in the understory, the canopy gap will lead to an increase in bank stability and diversity. In the case of this property, these canopy gaps should be actively managed with seeding and planting to ensure that native vegetation persists. Native shrubs and trees can also be planted to support the stability of the native plant community.

For green ash in particular, the loss of these trees is especially significant as this species makes up over 25% of the canopy in many areas of the floodplain forest. The principle of risk is highly applicable here; risk is defined as the probability of a negative event weighted by its consequences. In the case of EAB, the consequences will be large and quite negative, as a loss of half the canopy in the park could have cascading consequences for invasive species, water quality, and wildlife. Proactive management including ash removal along trail corridors is recommended. Replanting with climate-adapted species could also be undertaken.

OAK WILT AND BUR OAK BLIGHT

Oak wilt is an increasingly common tree disease caused by the fungus *Ceratocystis fagacearum*. While the disease is present in many eastern US states, it is most prevalent in the Midwestern US. Within Minnesota, it is an issue of serious concern in and around the seven-county metro area. Oak wilt affects all of Minnesota's most common oak species (red oak [*Quercus rubra*], pin oak [*Q. ellipsoidalis*], bur oak [*Q. macrocarpa*], and white oak [*Q. alba*]), though it does not affect these species equally. Red and pin oak are the most susceptible species, with infected individuals wilting in six weeks or less. Bur and white oaks may take years to wilt completely and may only do so one branch at a time. The fungus can be transported from tree to tree by sap beetles, but most commonly spreads through root grafts. The beetles are attracted to the fungal mats created when mature oaks die from oak wilt, and to wounds on uninfected oaks, providing a convenient pathway of spread for the fungus.

Oaks commonly form root grafts between individuals, allowing direct transfer of the fungus from infected to healthy individuals.

While Davis Farm Park has scattered red and pin oaks, many large bur oaks are present, especially in the remnant savanna area on the southeast side of the park. While this provides some hope that an outbreak of oak wilt at the property is less likely, the risk of infection remains. Careful monitoring of individuals will be necessary to identify and manage infected individuals. If infected individuals are found, root barriers may be installed around infected trees using a vibratory plow. Other options include soil sterilization and inoculation of high value individual trees. Care should also be taken to avoid injuring trees during the early growing season (April to July), when trees are most susceptible to the fungal spread. If a tree is injured during this time, covering the wounds is recommended. If pruning or other activities must be done, waiting for the winter is the safest option.

Bur oak blight (BOB) may be a more serious threat to the oaks on the property. BOB affects only bur oaks and is most injurious to upland individuals in savanna remnants. Caused by a species of fungus in the *Tubaki* genus, BOB causes lesions and discoloration of the veins on the underside of the leaves, eventually causing large portions of the leaf to die. In many cases, severe infections will cause tree death, though individual susceptibility to the disease varies. The fungus can overwinter on leaf petioles that remain attached to trees and is primarily spread by rain droplets moving spores throughout the tree. Early results suggest that inoculation of trees with fungicide may help slow or stop the spread of the disease within individual trees. At Houlton, monitoring existing oaks for symptoms will be an important first step; moreover, if oaks are planted in the future, it may be beneficial to avoid planting the variety *Q. macrocarpa var. oliviformis*, which has shown the most severe susceptibility to BOB.

EROSION CONTROL

The soil types at Davis Farm Park include excessively well-drained loamy sand in the uplands, and the steep slope consists of gravelly coarse sandy loam and is excessively well drained. These soil types are erosion-prone, and the steep slopes throughout the park and the lack of deep-rooted plant cover all contribute to areas of significant erosion. Several gullies and small ravines are present within the slope units, and extreme bluff sloughing is occurring on the east end of the park.

Bare soil resulting from the effects of invasive plants and earthworms also leads to splash erosion. While frequent, this does not result in much sediment transport in the units. In all units, there is some sheet erosion, evidenced by sediment accumulation behind trees or at the base of portions of the steeper slopes. This is a chronic phenomenon that can also be attributed to the lack of fine-rooted vegetation on these slopes. A denser vegetation layer throughout these units would act to break the impact of raindrops and dissipate the energy of stormwater running on these slopes, but in some cases larger interventions will be required.

All units should be seeded with native forb and graminoid (grass and sedge) mixes once removal of non-native shrubs is complete. Installing natural wood erosion bars in areas where erosion (sheet and rill) is progressing is recommended. This is a relatively simple volunteer task that can be accomplished by placing poles of cut buckthorn perpendicular to the slope and anchored between two trees. In areas where erosion is present, but tree cover is lacking, bars can be anchored by pounding wood stakes into the slope. These stakes can be purchased at hardwood stores or crafted from additional cut vegetation. In areas where erosion is worsening, erosion blankets, grass strips, seeding and other means may be necessary to further control erosion. These should be purchased and installed with supervision by parks staff or subcontractors.

Because the primary trail through the park follows a straight path to the river down a rather steep hill, rerouting the trail and incorporating switchbacks should be considered. In addition to making the trail more accessible, a meandering trail would slow sheet erosion, move water into the landscape, capture soil and nutrients in the landscape and prevent their movement to the river, and work to stabilize the slope in the long term. The trail would also likely require less intensive maintenance.

COMMUNITY USE, SITE ACCESS AND SIGNAGE

The opportunities for exploration and connection to natural areas at Davis Farm Park can be elevated with the addition of park signage and an improved trail system. While this NRMP does not intend to plan recreation within the park, some consideration of use and interaction with the natural resources, and especially the river, is needed to contemplate how community use and natural resources protection should be balanced and enhance each other.

Recently, Otsego Parks and Recreation completed a wayfinding plan for its parks and a precedent of park signage exists. As such, a park name sign and simple orientation and interpretive signage is recommended to bring awareness to the park and be more welcoming to community use.

Similarly, an improved trail system with the park should be considered. A rerouting of the primary trail to include switchbacks that traverse the slope more gradually would create greater accessibility and prevent soil loss down the steep slope during precipitation events. The river is such a beautiful feature of the park, and safe access to it should be prioritized.

Currently, only narrow and steep social trails to the river are present on the east end of the park where the river's floodplain is wide and quite spectacular. Establishment of safe and maintainable trails to the river from the neighborhood to the south should also be prioritized.

Ongoing park planning should consider how site improvements can better function for underserved and diverse communities. All of the ways that people interact with the forests, river, and trails should be held in equal regard, and the development of amenities should reflect how people are accessing the park, how to make the park safe and inviting, and how people might interact with the park. This input should be gathered through community information sessions; park planning is made more robust when the entire community has guided decision-making.

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APPENDICES

APPENDIX A: PLANT SPECIES RECORDED AT DAVIS FARM PARK

The following plant species were identified at the site by Friends of the Mississippi River.

	Scientific name	Common Name	Management Units
Trees	Acer negundo	Boxelder	1, 3, 6E, 7, 8E
	Acer saccharinum	Silver maple	4E
	Betula papyrifera	Paper birch	4W, 6E
	Celtis occidentalis	Hackberry	1, 3, 4W, 4E, 5W, 5E, 6W, 6E, 7
	Fraxinus pennsylvanica	Green ash	1, 4E, 5E, 5W, 6W, 6E, 7, 8E
	Juglans nigra	Black walnut	4W
	Juniperus virginiana	Red cedar	6E
	Malus sp.	Apple	3
	Ostrya virginiana	Ironwood	6W, 6E
	Picea pungens	Colorado blue spruce	8E
	Populus deltoides	Cottonwood	5E
	Prunus serotina	Black cherry	6E
	Quercus alba	White oak	6E
	Quercus macrocarpa	Bur oak	6W, 7, 8W
	Quercus rubra	Red oak	5E, 6E, 7
	Salix nigra	Black willow	1, 4E
	Salix sp	Willow tree	6E
	Thuja occidentalis	White cedar	6W, 7, 8E
	Tilia americana	American basswood	4W, 5W, 5E, 6W, 6E, 7, 8W
	Ulmus americana	American elm	3, 4W, 4E

	Scientific name	Common Name	Management Units
Shrubs	Artemisia absinthum	Absinthe wormwood	8E
	Lonicera tartarica	Tatarian honeysuckle	1, 6W, 6E, 7
	Morus rubra	Red mulberry	8E
	Rhamnus cathartica	Common buckthorn	3, 4E, 5E, 6W, 6E, 7
	Ribes missouriense	Missouri gooseberry	1, 3, 5W, 5E, 6W, 6E, 7, 8E
	Rubus occidentalis	Black raspberry	1, 3, 5W, 6E, 7
	Sambucus racemosa ssp. pubens	Red-berried elder	1, 5E, 6E
	Ulmus pumila	Siberian elm	8W, 8E
	Zanthoxylum americana	Prickly ash	1, 4W, 5E, 6W, 6E, 7, 8W

	Scientific name	Common Name	Management Units
Forbs and Graminoids	Ageratina altissima	White snakeroot	1, 4W, 5W
	Allium canadense	Garlic mustard	1, 4W, 5W, 5E, 6E, 7
	Ambrosia artemisiifolia	Common ragweed	8W, 8E
	Amphicarpaea bracteata	Hog peanut	4W, 6E
	Andropogon gerardii	Big bluestem	8W, 8E
	Aquilegia canadensis	Columbine	6W, 6E
	Arctium minus	Common burdock	4W, 6E
	Arisaema triphyllum	Jack-in-the-pulpit	4W, 5W, 5E, 6E
	Asarum canadense	Wild ginger	6E
	Asclepias syriaca	Common milkweed	4W, 8W, 8E
	Asclepias verticillata	Whorled milkweed	8W, 8E
	Asparagus officinalis	Asparagus	8E
	Athryrium filix-femina	Lady fern	5W, 6W, 6E
	Beckmannia syzigachne	American slough grass	3, 4E
	Berteroa incana	Hoary alyssum	8E
	Bidens cernua	Nodding bur marigold	4E
	Bouteloua curtipendula	Side-oats grama	8W, 8E
	Brassica rapa	Field mustard	8E
	Bromus inermis	Smooth brome	1, 7, 8W, 8E
	Campanula rotundifolia	Harebell	6E
	Carex hirtifolia	Hairy-leaved sedge	6E, 7
	Carex lupulina	Common hop sedge	4W
	Carex pensylvanica	Pennsylvania sedge	5W, 6E, 7
	Carex rosea	Rosy sedge/ starry edge	6E
	Centaurea maculosa	Spotted knapweed	8W, 8E
	Cerastium vulgatum	Mouse-ear chickweed	3,
	Chenopodium album	Lamb's quarters	7, 8E
	Circaea leutetiana	Enchanter's nightshade	4E
	Cirsium arvense	Canada thistle	8W
	Cirsium vulgare	Bull thistle	8E
	Conyza canadensis	Horseweed	8E
	Dalea purpureum	Purple prairie clover	8W
	Dicentra cucullaria	Dutchman's breeches	6E
	Elymus canadensis	Canada wild rye	3
	Elymus villosus	Silky wild rye	6E
	Elymus virginicus	Virginia wild rye	4W
	Equisetum arvense	Horsetail	6E
	Eragrostis spectabilis	Purple lovegrass	8W, 8E

Scientific name	Common Name	Management Units
Erigeron annuus	daisy fleabane	8W, 8E
Galium boreale	Northern bedstraw	4W, 5E, 6E, 8E
Geranium maculatum	Wild geranium	4W, 6W
Geum canadense	White avens	6E
Glechoma hederacea	Creeping Charlie	1, 3, 4W, 6W, 6E, 7
Glyceria striata	Fowl manna-grass	4W, 6E
Hackelia virginiana	Virginia stickseed	4W, 5E, 6W, 7
Helenium autumnale	Sneezeweed	4W
Heliopsis helianthoides	Early Sunflower	1
Heracleum lanatum	Cow parsnip	4W
Hydrophyllum virginianum	Virginia waterleaf	4W, 5W, 6W, 6E
Impatiens capensis	Spotted touch-me-not	4W
Laportea canadensis	Wood nettle	1, 3, 4W, 5W, 5E, 6E
Leersia oryzoides	Rice cut grass	4W
Lemna sp	Duckweed	4E
Leonurus cardiaca	Motherwort	3, 6W, 7, 8E
Linaria vulgaris	Butter and eggs	4W, 7, 8W, 8E
Maianthemum racemosa	False Solomon's seal	6E
Medicago lupulina	Black medick	8W, 8E
Melilotus alba	White sweet clover	8E
Menispermum canadense	Moonseed	6E
Mentha arvensis	Common mint	4W
Mimulus ringens	Monkey flower	4W
Myosotis scorpioides	True forget-me-not	4W
Nepeta cataria	Catmint	6W, 6E
Osmorhiza claytonii	Sweet cicely	4W, 6E
Oxalis stricta	Wood sorrel	5E, 7, 8E
Panicum virgatum	Switch Grass	8W
Parthenocissus quinquefolia	Virginia creeper	1, 3, 6W, 6E, 7, 8E
Phalaris arundinaceae	Reed canary grass	4W, 6E, 8W, 8E
Physallis virginiana	Clammy ground-cherry	8W, 8E
Physostegia virginiana	Obedient plant	4W, 4E
Pilea pumila	Clearweed	4W, 4E
Poa pratensis	Kentucky bluegrass	6E, 8W, 8E
Polygonum saggitatum	Arrow-leaved tearthumb	4W
Rudbeckia laciniata	Cut leaf coneflower	1, 5E
Rumex crispus	Curly dock	8W, 8E
Sagittaria latifolia	Broad-leaved arrowhead	4W

Scientific name	Common Name	Management Units
Sanguinaria canadensis	Bloodroot	5W
Schizachrium scoparium	Little bluestem	8W
Scirpus atrovirens	Dark-green bulrush	4W
Scutellaria lateriflora	Mad-dog skullcap	4W, 4E
Silene latifolia	White campion	6E, 7, 8E
Smilax tamnoides	Bristly greenbrier	4W
Solidago canadensis	Canada goldenrod	3, 8W, 8E
Solidago canadensis	Canada goldenrod	6E
Solidago flexicaulis	Zigzag goldenrod	5E, 6E
Solidago gigantea	Late goldenrod	4W
Symphyotricum novae-angliae	New England Aster	6E
Symphyotricum cordifolium	Blue wood aster	6E
Symphyotricum drummondii	Drummond's aster	4E
Symphyotricum lateriflorum	Calico aster	4E
Thalictrum dasycarpum	Tall meadowrue	4W
Toxicodendron rydbergii	Poison ivy	6E
Tragopogon dubius	Goat’s beard	8E
Trifolium arvense	Rabbit-foot clover	8E
Urtica dioica	Stinging nettle	3, 8E
Verbascum thapsus	Common mullein	7, 8W
Verbena stricta	Hairy vervain	8W
Vicia villosa	Hairy vetch	8E
Viola sp.	Violet	4W
Vitis riparia	Wild grape vine	1, 7, 8E

APPENDIX B: PLANT SPECIES FOR RESTORATION AT DAVIS FARM PARK

Plant species recommended for restoration of Davis Farm Park are based on MNDNR Native Plant Communities of Minnesota: Ecological System Summaries and Class Fact Sheets which are linked below.

Management Unit 1: Southern Floodplain Forest FFs68 or Southern Terrace Forest FFs59
Management Units 2, 3: Southern Wet-Mesic Hardwood Forest MHs49
Management Unit 4: Southern Floodplain Forest FFs68
Management Unit 5: Southern Terrace Forest FFs59
Management Unit 6: Central Mesic Hardwood Forest MHc36
Management Unit 7: Southern Dry Savanna UPs14
Management Unit 8: Southern Dry Prairie UPs13

APPENDIX C: METHODS FOR CONTROLLING INVASIVE PLANT SPECIES

TREES AND SHRUBS

Common buckthorn, Tatarian honeysuckle, Siberian elm, and Black locust are some of the most common non-native, invasive woody species likely to establish in woodlands or prairies in Minnesota. Buckthorn and honeysuckle are European species that escaped and became abundant in woodlands in many parts of the country. They are highly aggressive and, lacking natural diseases and predators, can out-compete native species. They remain photosynthetically active longer than most other native shrubs and trees, which gives them a competitive advantage. The seeds are spread by birds, which make the species especially problematic in open woodlands, savannas, and overgrown prairies. They also benefit from the net actions of invasive earthworms, fire suppression, and high deer populations, forming a synergy that helps set the stage for their establishment and dominance. Invasions eventually result in dense, impenetrable brush thickets that greatly reduce ground-level light availability and can cause declines in native species abundance and diversity.

Siberian elm, native to eastern Asia, grows vigorously, especially in disturbed and low-nutrient soils with low moisture, such as prairies. Seed germination is high, and seedlings establish quickly in sparse vegetation. It can invade and dominate disturbed areas in a few years. Black locust is native to the southeastern United States and the very southeastern corner of Minnesota. It has been planted outside its natural range (it was promoted as an erosion control species and a soil stabilizer partly because it was falsely assumed to be a nitrogen fixer, and since it quickly colonizes bare slopes), and readily invades disturbed areas. It reproduces vigorously by root suckering and can form monotypic stands.

Biological Control

Currently there are no biological control agents for non-native woody plants in Minnesota. Recently, an 11-year study conducted by the DNR and University of MN resulted in the conclusion that there were no viable biological control agents for common or glossy

buckthorn, based in part on the lack of damage to the host plants and a lack of host specificity (http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/biocontrol.html).

Chemical Control

The most efficient way to remove woody plants that are 1/2 inch or more in diameter is to cut the stems close to the ground and treat the cut stumps with herbicide immediately after they are cut, when the stumps are fresh, and the chemicals are most readily absorbed. Failure to treat the stumps will result in resprouting, creating the need for future management interventions.

In non-freezing temperatures, a glyphosate herbicide can be used for most woody species. It is important to obtain the concentrated formula and dilute it with water to achieve 10% glyphosate concentration. Adding a marker dye helps to make treated stumps more visible, improving accuracy and overall efficiency. In winter months, an herbicide with the active ingredient triclopyr must be used. *Garlon 4* is a common brand name, and it must be mixed with a penetrating oil, such as diluent blue. *Garlon* 4 will also work throughout the year. Diesel fuel should not be used as it is much more toxic in the environment and to humans.

Brush removal work can be done at any time of year except during spring sap flow, but fall is often ideal because buckthorn retains its leaves longer than other species and is more readily identified. Moreover, once native plants have senesced, herbicide will have fewer non-target effects on native vegetation. Cutting can be accomplished with loppers or handsaws in many cases. Larger shrubs may require brush cutters and chainsaws, used only by properly trained professionals.

For plants in the pea family, such as black locust, an herbicide with the active ingredient clopyralid can be more effective than glyphosate. Common brand names for clopyralid herbicides are Transline, Stinger, and Reclaim.

In the year following initial cutting and stump treatment, there will be a flush of new seedlings as well as possible resprouting from some of the cut plants. Herbicide can be applied to the foliage of these plants. Fall is the best time to do this, when desirable native plants are dormant and when the plant is pulling resources from the leaves down into the roots. Glyphosate, triclopyr and Krenite (active ingredient – fosamine ammonium) are the most used herbicides for foliar application. Krenite prevents bud formation, so the plants do not grow in the spring. This herbicide can be effective, but results are highly variable. Glyphosate or a triclopyr herbicide such as Garlon 3A can also be used. Glyphosate is non-specific, while triclopyr targets broadleaf plants and does not harm graminoids. All herbicides should be applied by licensed applicators and should not be applied on windy days. Care should be taken to avoid application to other plants. “Weed Wands” or other devices that allow dabbing of the product can be used rather than spraying, especially for stump treatment.

Basal bark herbicide treatment is another effective control method. A triclopyr herbicide such as Garlon 4, mixed with a penetrating oil, is applied all around the lower 6-12 inches of the tree or shrub, taking care so that it does not run off. If the herbicide runs off it can kill other plants nearby. More herbicide is needed for effective treatment of plants that are four inches or more in diameter.

Undesirable trees and shrubs can also be destroyed without cutting them down. Girdling is a method suitable for small numbers of large trees. Bark is removed in a band around the tree, just to the outside of the wood. If girdled too deeply, the tree will respond by resprouting from the roots. Girdled trees die slowly over the course of one to two years. Girdling should be done in late spring to mid-summer when sap is flowing, and the bark easily peels away from the sapwood. Herbicide can also be used in combination with girdling for a more effective treatment. Girdling has the added benefit of creating snags for wildlife habitat. While girdling many trees is not feasible, girdling the occasional large tree will provide a matrix of habitat for species that depend on standing dead trees for food or nesting opportunities.

Mechanical Control

Three mechanical methods for woody plant removal are hand pulling (only useful on small seedlings and only if few), weed wrenching (using a weed wrench tool to pull stems of one to two inches diameter), and repeated or "critical" cutting. Pulling and weed wrenching can be done any time when the soil is moist and not frozen. The disadvantage to both methods is that they are somewhat time-consuming, as the soil from each stem should be shaken off. Weed wrenching also creates a great deal of soil disturbance and should not be used on steep slopes or anywhere that desirable native forbs are growing. The soil disturbance also creates opportunities for colonization by other non-native plants. This method is the least preferable and is probably best used in areas that have hardly any desirable native plant cover.

Repeated cutting consists of cutting the plants (by hand or with a brush cutter) at critical stages in its growth cycle, typically twice per growing season. Cutting in mid spring (late May) intercepts the flow of nutrients from the roots to the leaves and cutting in fall (about mid-October) intercepts the flow of nutrients from the leaves to the roots. Depending on the size of the stem, the plants typically die within three years, with two cuttings per year.

Prescribed Fire

Prescribed burning is the most efficient, cost effective, and least harmful way to control very small stems, seedlings, and resprouts of all woody plants. It also restores an important natural process to fire-dependent natural communities (oak forests, for example). Burning can only be accomplished if adequate fuel (leaf litter) is present and can be done in late fall or early spring, depending on site conditions.

Prickly Ash (Native)

A common native shrub, prickly ash can become excessively abundant, especially in areas that have been disturbed or grazed. Complete eradication may not be necessary, but management may target reducing the extent of a population. Removal is most easily

accomplished in the same manner as for buckthorn – cutting shrubs and treating cut stumps with glyphosate herbicide. Cutting can be completed at any time of the year.

Smooth Sumac (Native)

Like prickly ash, smooth sumac can become excessively abundant, especially in areas where fire has been suppressed for long periods of time. It can form dense, clonal stands that dominate other vegetation. Unlike prickly ash or buckthorn, however, controlling smooth sumac does not require herbicide applications, since that would require a tremendous amount of herbicide, be quite labor intensive, and probably cause heavy damage to surrounding plants. Control of smooth sumac can be easily accomplished by cutting and burning, or a combination of these two methods. To be effective, the sumac must be burned or cut twice a year: the first time in the late spring, just after it has fully leafed out (expended maximum energy), and the second time in late summer, after it has re-sprouted. Repeat this method annually for two to five years to deplete the clone of its energy, working back at the edges of the clone and reducing cover from the outside of the area towards the center. If cutting or burning is performed only once a season, the clone will persist, since this will not be enough to drain the root system of stored energy. Cutting twice a year without burning will be effective, but burning is doubly so, since fire tends to benefit herbaceous plants and suppress woody ones.

Disposal

The easiest and most cost-effective method to handle large amounts of woody brush is usually to stack it and burn it. This is most typically done during winter to lessen the impacts to soil (compaction, erosion, rutting, etc.), though often brush will be piled soon after the removal and burned during the winter. In areas where brush is not dense, it can be cut up into smaller pieces, scattered, and left on the ground where it will decompose in one to three years (this method is especially useful on slopes to reduce erosion potential). Small brush piles can also be left in the woods as wildlife cover. Where there is an abundance of larger trees, cut trees may be hauled and chipped and used for mulch or as a biofuel. Alternatively, the wood can be cut and used for firewood, if a recipient can be found, or perhaps saved to be used later as water bars for slope stabilization.

FORBS

Spotted knapweed

Knapweed is a perennial species that has become a troublesome prairie invader. Of all the typical prairie weeds, spotted knapweed is probably the most difficult to manage. It cannot be controlled with burning—like sweet clover it increases with fire. Hand-pulling individuals or small groups of individuals can be effective for small infestations and is often a good volunteer group task. However, knapweed has a large tap root and can be difficult to pull. Pulling is typically more difficult when soil is hard (dry), clayey, or compacted, but easier when soil is wet (following a rain), sandy, and friable. If knapweed populations are large, a biocontrol (knapweed weevils) is recommended. Knapweed beetles (weevils) are released

during the summer. Weevils can be purchased online, and they are sent via the mail. Knapweed populations should be monitored each year to keep a record of the effectiveness of the biocontrol.

Weevils are effective for long-term control, but not a good short-term control option. Spot treatment with a systemic herbicide such as Milestone or Transline can be effective for short-term control. Applying herbicide to prairie restoration areas should be done with care. Remnants with high diversity should be spot treated, not broadcast-treated. It is recommended to treat first with the least impactful chemical, monitor to see if that works, and then try another if it does not work. Degraded and highly disturbed areas can be treated a little less gently, perhaps using broadcast applications. Always follow the product label when using any chemical for weed control. Treatment should be done before the target plants form seed, so late spring and early summer are best. Professional pesticide applicators are required for herbicide treatment.

Canada thistle

While native thistles are not generally problematic, non-native thistles like Canada thistle are clone-forming perennials that can greatly reduce species diversity in old fields and restoration areas (Hoffman and Kearns 1997). A combination of chemical and mechanical control methods may be needed. Chemical control is most effective when the plants are in the rosette stage and least effective when the plants are flowering. Where native grasses and sedges are present, use of a broadleaf herbicide such as 2,4-D is recommended, since 2,4-D only affects dicots. 2,4-D is most effective when applied 10-14 days before the flowering stems bolt. It is applied at a rate of 2-4 lb/acre using a backpack or tractor-mounted sprayer or in granular form. Dicamba could also be used, with the advantages that it can be applied earlier in the spring at a rate of 1 lb/acre. Another chemical that has been used for thistles is aminopyralid ("Milestone"), which can be applied at bud stage. Aminopyralid will affect other species and it has longer residual activity than some other chemicals, so use with caution—typically use it on large patches/clones of thistles and avoid areas of higher diversity. Plants that do not respond to treatment or that are more widely dispersed could be controlled mechanically.

Mechanical control, involving several cuttings per year for three or four years, can reduce an infestation if timed correctly. The best time to cut is when the plants are just beginning to bud because their food reserves are at their lowest. If plants are cut after flowers have opened, the cut plants should be removed because the seed may be viable. Plants should be cut at least three times throughout the season. Late spring burns can also discourage this species, but early spring burns can encourage it. Burning may be more effective in an established prairie, where competition from other species is strong, rather than in an old field, where competition is likely to be weaker.

Sweet clover

White and yellow sweet clover are very aggressive biennial species that *increase* with fire. Where sweet clover is found, it should be controlled in conjunction with treatment that attempts to eliminate smooth brome, if prairie restoration occurs. Sweet clovers are common plants in agricultural areas, so if restoration is implemented, the project area should be surveyed for this species on an annual basis. Often, following initial brush removal and/or burning, a flush of weedy annuals and biennials such as sweet clover can occur. Well-timed mows and burnings are usually adequate to control these species. Mowing the site, as is typically prescribed for prairie restoration maintenance, should occur when all plants on the site (including sweet clovers) are approximately 12 inches in height. Sweet clover can bloom even at a height of 6 inches, but if it is burned or mowed in the following year in the late spring, it should be controlled. On steep sites, brush cutting can be substituted for mowing. Individual plants or small populations can be removed by hand-pulling. If seed production occurs, prodigious amounts of seed can be produced and spread, so pull before seeds appear or bag seed producing plants. Competition from native species also helps control sweet clovers and other weedy annuals and biennials.

To some extent, *Common burdock* and *common mullein* can be treated similarly to sweet clover, since they are both non-native, biennial forbs that are typically found in disturbed areas or restoration projects.

Garlic mustard

Garlic mustard is a non-native, biennial forb of woodlands and woodland edges that is very invasive and aggressive. Following the introduction of just a few plants, populations can rapidly increase, and a dramatic "explosion" of garlic mustard plants can occur. In some areas it can form monotypic stands that crowd out other species, while recent studies have shown that in other locations it may simply occupy open ecological niches. Nevertheless, garlic mustard can be very invasive in woodlands, and it is recommended to monitor and remove it as soon as it is detected (early detection and rapid response). Garlic mustard also produces a flavonoid (root exudate) that suppresses mycorrhizal inoculation. Thus, species that are mycorrhizae dependent, like oaks, will become stunted and easily outcompeted by garlic mustard. The flavinoid persists in the soil years after garlic mustard plants are removed, which is a good reason to keep woodlands garlic mustard-free.

Probably the best way to control garlic mustard is to closely monitor your site, and if garlic mustard is found, hand pull it before it spreads. Hand-pulling should occur before siliques (seed pods) form. Once siliques form, removed plants should be bagged and transported from the site, since the plant may have enough energy in the stem and root to make viable seeds, even though it is not growing in the ground. If bagging and transporting are not an option, making weed piles is an option, but prepare to deal with garlic mustard plants in the future at each pile. Garlic mustard plants produce hundreds of seeds per plant—they are very prolific. When pulling garlic mustard plants, take care to remove the entire root, since they

may re-sprout if part of the root is left in the ground. This can be difficult since roots are "S-shaped" and tend to break off at ground level.

Chemical control is not recommended except in cases where garlic mustard is growing in large monoculture patches. In such cases, a systemic herbicide may be appropriate. Glyphosate is non-specific and will kill any actively growing plant. One technique that has been effective is applying a water-soluble herbicide during warm days in the winter, when no snow cover or only a thin snow cover exists. Garlic mustard rosettes (first year plants) remain green mostly all year round and can be killed during the winter when nearly all other plants are dormant. Another successful technique is to use an herbicide specific to broadleaved plants, like triclopyr ("Garlon"), but one that is water soluble, which can be dispensed with a backpack sprayer or the like; this will not kill grasses or sedges.

There are studies underway by the Minnesota DNR and University of Minnesota that show good potential for biocontrol of garlic mustard via a weevil: (http://www.legacy.leg.mn/projects/biological-control-european-buckthorn-and-garlic-mustard). The testing phase is complete, but the approval process still needs to be performed. If approved, this method could revolutionize garlic mustard control. However, whether it will be effective or not on a landscape scale is yet to be determined.

GRASSES

Smooth brome

Smooth brome is a cool season grass —active early in the growing season in southern Minnesota (April-May-June) and then going semi-dormant in July-September. It reproduces by means of underground stems (stolons and rhizomes) called "tillers". The most effective treatment is timed to occur at the same time as the brome is "tillering"—mid to late May in southern Minnesota. Burning two years in a row (late-season burns in June) followed by seeding has been shown to be effective in controlling smooth brome. Consider that this timing may be a week or two earlier on steep south-facing slopes or in very sandy or sand-gravel soils. Following this method will usually be sufficient to control smooth brome. Seeding following burns, preferably with native seed collected on-site, or purchased from a seller that provides local ecotypes, is important for restoring cover at the site. Evaluation can occur each year, and especially after two years. If this is not working, perhaps try a cool-season overspray of a grass-specific herbicide either in the spring (April) or in the fall (October). Using glyphosate as a cool-season overspray herbicide application is a last resort since it is non-specific.

Kentucky bluegrass and *creeping fescue* can be treated similarly to smooth brome, since like smooth brome, they are both non-native, stoloniferous, cool-season grasses. Spring burns are the most effective tool against all these species.

Reed canary grass

This species is extremely difficult to eradicate and requires repeated treatment over a period of one to three years. A combination of burning, chemical treatment and mowing can be used in accessible areas, or chemical treatment alone in inaccessible areas. The combination method starts by burning in late spring to remove dead vegetation and to stimulate new growth. When new sprouts have reached a height of 4 to 6 inches, the site can be sprayed with a 5% solution of a glyphosate herbicide appropriate for wetland habitat (e.g., Rodeo). The site is then mowed in late summer, followed by chemical application after re-growth. This treatment will stimulate new growth and germination to deplete the seed bank. The sequence of chemical treatment and mowing are repeated for at least a second season, and possibly a third until the grass is completely eradicated. Then native grass and forb seed can be broadcast or drilled.

If reed canary grass is eradicated from an area, future management of the grassland, namely burning, will likely keep the reed canary in check. Monitoring and mapping new individuals or clumps should continue, however, and those individuals should be treated if burning is not adequately controlling them. If the plants are small, they can be removed by digging out the entire root. Generally, chemical treatment is more feasible. If plants are clumped, they can be treated by tying them together, cutting the blades, and treating the cut surface with herbicide. Otherwise, herbicide should only be applied in native planted areas on very calm days to avoid drift to non-target plants.

APPENDIX D: ECOLOGICAL CONTRACTORS

Friends of the Mississippi River (FMR) has extensive experience working with landowners to implement natural resource management plans. FMR can assist landowners with obtaining funding for restoration and management projects and providing project management, including contractor negotiations, coordinating restoration and management work, and site monitoring and evaluation.

Following is a list of contractors to consider for implementing the management plans. While this is not an exhaustive list, it does include firms with ecologists who are very knowledgeable in natural resource management. Unless otherwise noted, all firms perform prescribed burning.

Conservation Corps Minnesota
60 Plato Blvd E Ste 210
Saint Paul, MN 55107
(651) 209-9900
www.conservationcorps.org

Great River Greening
251 Starkey St #2200
St Paul, MN 55107
(651) 665-9500
www.greatrivergreening.org

Minnesota Native Landscapes (MNL)
8740 77th St NE
Otsego, MN 55362
(763) 295-0010
www.mnlcorp.com

Prairie Restorations, Inc.
31646 128th St.,
Princeton, MN 55371
(763) 389-4342
www.prairieresto.com

Stantec
733 Marquette Avenue, Suite 1000
Minneapolis, MN 55402
(612) 712-2000
www.stantec.com

Resource Environmental Solutions, LLC (RES)
20276 Delaware Avenue
Jordan, MN 55352
(217) 979-2415
www.res.us

Native Resource Preservation
260 Wentworth Ave E Suite 155
West St Paul, MN 55118
(320) 413-0015
www.nativeresourcepreservation.com

Natural Resource Services, Inc.
PO Box 544
Cambridge, MN 55008
(763) 656-8587
www.naturalresourceservice.com

Landbridge Ecological, Inc.
670 Vandalia St.
St Paul, MN 55114
(612) 503-4420
www.landbridge.eco