Spring Lake Park Reserve

Natural Resources Management Plan

Prepared for
Dakota County Parks

Adopted June 20, 2021

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Natural Resources Management Plan

June 20, 2021

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Executive Summary

Spring Lake Park Reserve is a 1,097-acre reserve located in Nininger Township, just west of the City of Hastings. A park reserve has a higher degree of protection for natural resources than does a Regional Park, thus natural resources are a very important component of this site. Now inundated by the waters of the Mississippi River, due to the Lock and Dam No. 2 that was constructed in the 1930s, historically, "Spring Lake" was once a diverse mix of river floodplain, marsh, slough, and scattered oak savanna. The resulting shallow lake, which is actually outside the boundaries of the park reserve, is the most prominent natural feature of the area. Interestingly, very few water resources or wetlands occur on the park proper, with the exception of a black ash seepage swamp located at the lower end of a large ravine in the middle east section of the park.

Other prominent features include river terraces and steep, north- as well as west-facing limestone and sandstone bluffs and ravines that support natural communities that are rare in the region. For instance, Canada yew occurs as a disjunct population (otherwise found in northern Minnesota) and grows commonly on the steeper north-facing slopes. Other shady slopes contain a diverse array of spring ephemeral wildflowers beneath their forest canopies. Remnant bedrock bluff prairies occur sporadically across the bluff, especially in the middle and eastern sections. The tops of the bluffs were historically dominated by prairie but, in the latter part of the 19th and early part of the 20th centuries, were converted to agricultural fields. The area between the bluff tops and the steep bluff slopes is occupied by moderate slopes and relatively flat terraces dominated by oak forest (towards the shadier end of the moisture gradient) and oak woodland and oak savanna (at the drier end of the moisture gradient). The flatter parts of the site, toward the tops of the bluffs, are degraded due to past agricultural practices. Moderately steep slopes adjacent to the upper ag fields were often grazed by domestic livestock and thus became somewhat degraded and less diverse. The steeper areas were mostly spared from overgrazing and cropping; therefore, today these areas are in the best condition, ecologically. Much of the central and eastern portions of the park were ranked as having "high biodiversity significance" by the Minnesota Biological Survey in the 1990s, and a large area in the western portion of the park was ranked as "moderate" biodiversity.

Archaeological discoveries made by the Science Museum of Minnesota during the 1950s demonstrated that indigenous societies have used the area for some 8,000 years. Several mounds (Bremer Mound) and some small caves (Lee Mill Cave) near the old mill site were identified, and artifacts were described and removed. Also habitation and/or hunting sites were identified, for example the Ranelius site and Bremer Village site in the middle of the park and the Sorg Site at the east end of the park near Schaar's Bluff. In updating the park's Master Plan in 2020, the Upper Sioux Community Tribal Historic Preservation Office conducted a Traditional Cultural Properties (TCP) Survey in the Park Reserve, the purpose of which was to provide needed information that will assist in planning, park management, and consultation. It also provides preliminary recommendations to the County on best practices for preservation and protection of cultural resources. In addition to the already known Cultural Areas, the Survey found that the park is rich in cultural resources, including TCPs and Culturally Sensitive Areas. Eight focus areas that intersect proposed

development areas in the Master Plan were identified and described: New Cabin Area at existing Retreat Center, Camping Area, Interpretive Center Area, River Landing Use Area, Natural Surface Train in center of park, Mill Site and trail along shoreline, Trail/Stair Connection between Schaar's Bluff and Mill Site, and Picnic-Play Area improvements/New Parking Area. Significant cultural features such as these, in addition to significant natural resource features, will help inform and guide the future development of the park.

Wildlife of the park is varied and rich, including large mammals such as whitetail deer, fisher, and badger; small mammals such as shrews and mice; several species of bats in the caves that occur throughout the bluffs; and reptiles and amphibians such as red-bellied snakes and tree frogs. Being located along the Mississippi River, an international migration corridor, the park provides critical habitat for untold numbers of migrating birds. The County is currently scheduled to reintroduce bison to the prairies located in the western-central section of the park in 2022. Bison, a keystone prairie species, would be a huge benefit to the site's grassland ecosystems, as well as a boon for park visitorship.

Recently, a regional trail was built through the middle of the park, providing great access and viewing spots for visitors; but it came at a cost to the site's natural resources by disturbing and bisecting habitat, opening up forests, and placing barriers for animal movement. The trail also can act as a conduit for invasive species. It will be an ongoing challenge and goal to manage the park so that these disruptions are minimized and lessened over time.

Select areas of the park have undergone ecological restoration; primarily old agricultural fields that have been taken out of production have been restored to upland prairie. The oldest prairie restoration in Dakota County parks, 11 acres done in 1995, is located next to the Youth Lodge in the western portion of the park. Since 2014, there have been three more large restoration projects added to the park (Mississippi Flyway, Plateau Prairie, and Archery Range Prairie). During the last two years, areas along most of the length of the Mississippi Greenway have been planted to prairie in lieu of eventually returning to woodland and savanna. All told, there have been approximately 300 acres restored in the park.

Because of the dramatic bluffs, the lush vegetation, and the adjacent lake and river, SLPR provides some of the most scenic views of any of the County parks and offers some of the most interesting places to visit, too.

Natural Resource Management Plan

Although there have been Natural Resource Management and Stewardship Plans for Spring Lake Park Reserve in the past, they have always been embedded within the park's Master Plans. This will be the first time that it will be a plan that stands on its own, which has certain advantages, including being able to provide a better blueprint for natural resources managers and staff and to provide more in-depth information and detail concerning natural resources of the park and the region. That said, this Natural Resource Management Plan (NRMP) was not developed in a vacuum, so to speak, but rather was developed in conjunction with the Master Plan update during 2019–2020; as such, the two plans informed and

helped guide one another. This NRMP will lay the foundation for managing the natural resources of the Park Reserve both short-term (for the next five years) and long-term (for the next 20 years).

Purpose and Vision

The purpose of protecting and restoring natural resources at Spring Lake Park Reserve is multifaceted and includes the following:

- Allow people to experience the natural heritage of the area and improve their experience in the park
- Provide habitat for native plants, birds, insects, mammals, amphibians, and reptiles
- Demonstrate the native ecosystem regeneration process
- Foster and build a resilient, mature, and high-functioning ecosystem
- Collaborate and partner with adjacent landowners to achieve the best joint management of natural resources for the area
- Conserve wildlife species of Conservation Need (MN DNR designation)
- Mitigate impacts of climate change
- Achieve regionally outstanding ecological quality

History and Background

Pre-Settlement Ecology

At the time of pre-European-American settlement, the site consisted of a mosaic of prairie, oak savanna, oak woodland, and hardwood forests on the north-facing bluff slopes and in the ravines (Figure ES-1). Soils of the site consist primarily of sandy loams, on which these plant communities thrive. Natural disturbance regimes, especially fire and grazing, were also very important in maintaining these communities. It is well known that oak savanna and prairie was perpetuated by Native Americans who deliberately set fires to provide productive hunting-and-gathering food sources.

Given the diversity of habitat types at this site, it would have provided for a large diversity of wildlife, too. Prairie species such as bison, bull snakes, badger, ground squirrels, grassland birds, and many more would have been prevalent. Woodland and forest species such as elk, bear, mountain lion, and interior forest birds would also have been present. Today, some of those species have vanished from the site, while a few have managed to remain, including badger, which has been recently recorded on trail cameras in the park.

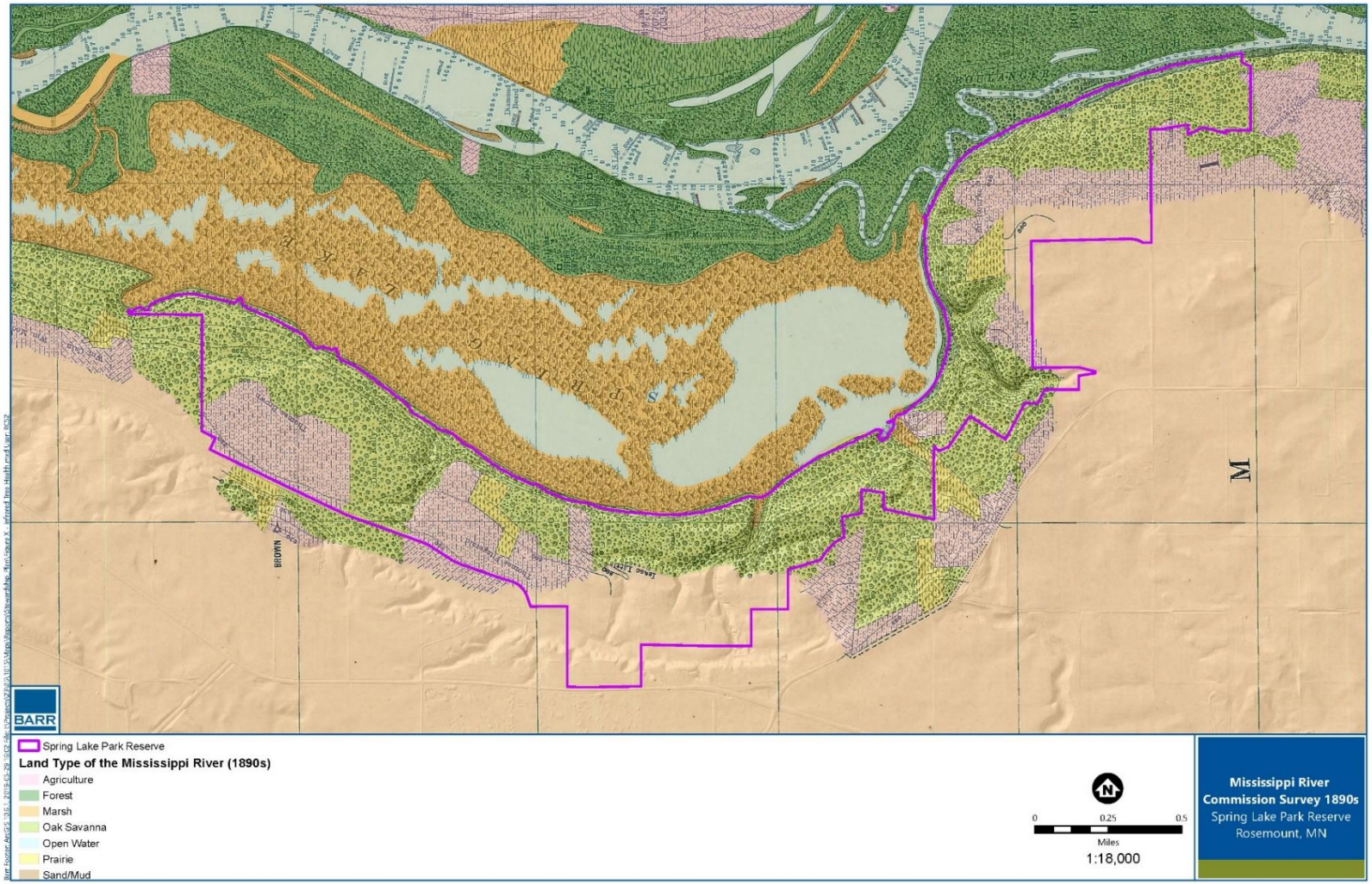


Figure ES-1 Presettlement map of the Spring Lake Park Reserve Area, from Mississippi River Commission Survey of the 1890s.

The flooding of the Mississippi River in the 1930s, including that of Spring Lake from Lock and Dam #2 at Hastings, radically changed the condition of the Spring Lake area, which used to contain a large freshwater, spring-fed lake and a variety of terrestrial communities including floodplain forest, wetlands, and oak savanna. Today, it is a large, slack-water pool that fills with sediment and needs continual dredging to maintain an open navigation channel.

Other impacts since Euro-American settlement include land use changes such as farming and agriculture, which dramatically affected the natural communities by suppressing fire regimes, shifting grazing patterns from bison to domestic cattle, changing nutrient cycling such as nitrogen cycling, opening up vast areas of soil to erosion, and causing habitat loss and fragmentation. Another significant ecological disruption was the introduction of exotic species, many of which became invasive, including buckthorn and Tatarian honeysuckle in the savannas and woodlands and smooth bromegrass, Canada thistle, and other upland herbaceous weeds in the prairies and savannas. Notably, some other historical industries that occurred at the site were quarrying along the limestone bluffs and tourism, including a resort on the south end of Spring Lake, which also negatively impacted the natural communities and ecosystem processes.

Current Conditions

The legacy of past impacts have left its mark on the park area. These have resulted in loss of key ecological processes such as lack of fire and grazing, diminished biodiversity, and degradation by invasive species. But more recently, regional and even global activities and processes, such as climate change, erosion/sedimentation from adjacent farm fields, and habitat fragmentation from regional trail projects, continue to impact the natural resources of the park. On the other hand, there have been significant efforts to protect and restore natural features and processes in the park over the last 25 years, such as the discontinuation of farming and agriculture, the restoration of prairie and savanna plant communities, the control of invasive species, the reintroduction of fire and grazing/mowing, and the monitoring of wildlife populations.

Goals of this Natural Resource Management Plan

There are several goals that have been formulated in this NRMP. If attained, these goals will help protect, conserve, and restore the native resources, ecological processes, and ecosystem services of the site in the face of historical, present, and predicted future disruptions and impacts. The goals include the following:

- Regenerate a landscape that contains a mosaic of upland plant communities across a continuum from oak forest to oak savanna to prairie
- Increase native plant diversity and reintroduce extirpated animal species
- Minimize the invasive species cover

- Prevent new non-native species encroachment
- Reduce the impact of people, for example, by maintaining and establishing new sustainable trails that allow them to explore the park without adverse impacts
- Reduce erosion and stabilize ravines
- Protect lake water and groundwater quality
- Adapt to climate change by facilitating the introduction of appropriate species native to northern Iowa, southwestern Wisconsin, and Southern Minnesota

Natural Resources Protection and Regeneration Strategies

Native Plant Community Restoration

The restoration of native plant communities within Spring Lake Park Reserve will begin within four nodes of highest ecological potential. Here an intense focus on invasive species removal will begin, with an aim of eliminating competition and protecting native plants and creating conditions for species diversity enhancement. The strategy is to first protect the highest ecological quality areas (areas of greatest native plant diversity) through invasive species eradication and then to move restoration efforts out to lower diversity areas. Eventually the entire park may be restored and transition to the management phase where burning, supplemental planting, and other management activities will encourage native plant proliferation and discourage invasive plant establishment. A system of Target Plant Communities and Work Units were developed for each area of the park that will guide the restoration efforts (Figure ES-2).

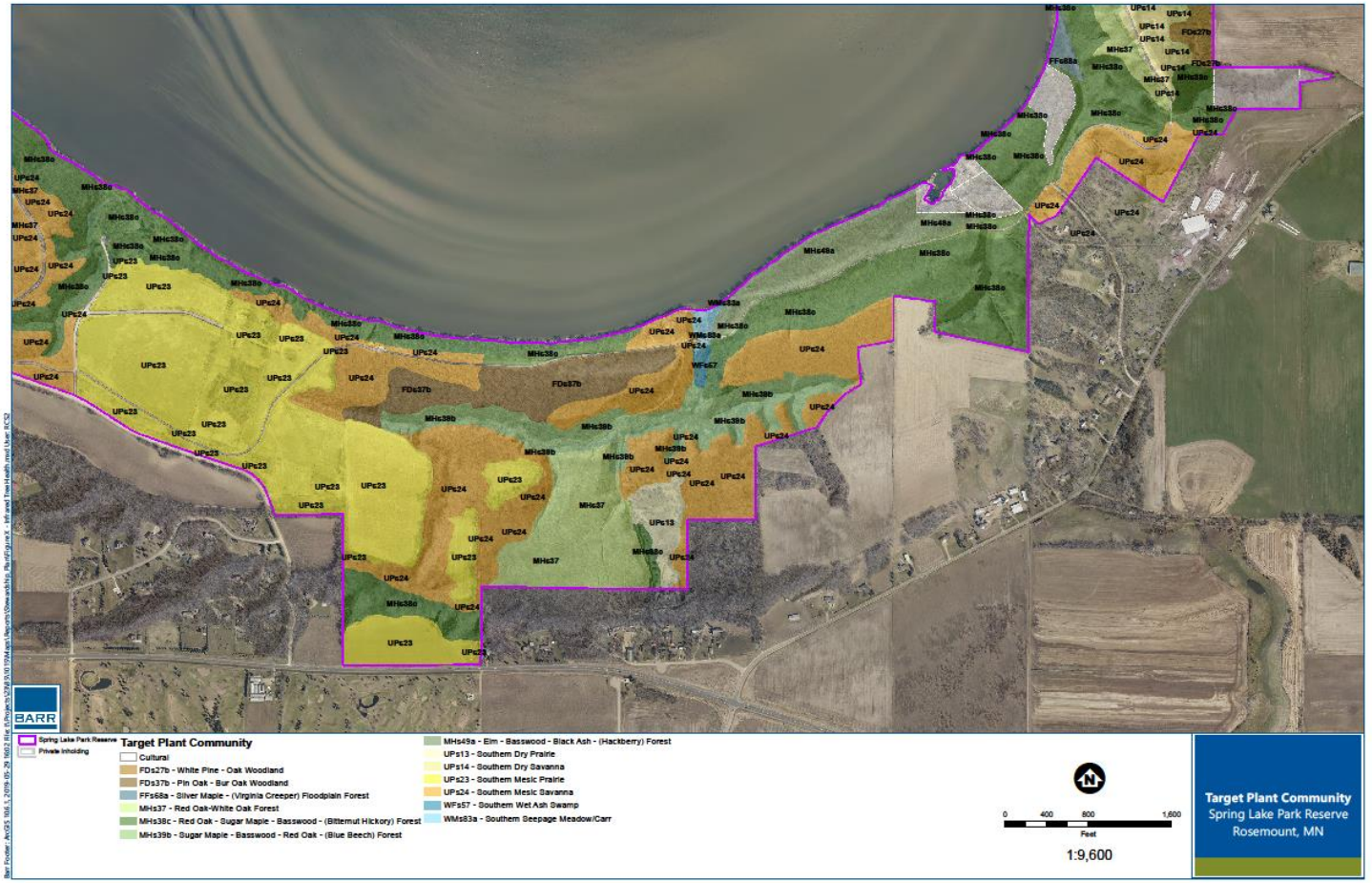


Figure ES-2 Target plant community classes for the center portion of the Park Reserve.

Restoration can be phased, depending on priorities and available resources. The speed at which restoration is to be implemented will also depend upon funding (external and internal) and Dakota County staff capacity to oversee the process. Figure ES-3 shows the recommended phasing of restoration at the Park Reserve.

Figure ES-3 Recommended phasing of restoration in the Park Reserve.

Wildlife Management

The primary goal for SLPR wildlife management is to enhance habitat so that a diversity of wildlife species thrive. This is a "build it and they will come" approach. Restoring a diversity of habitat types and a diversity of native plant species provides wildlife the food, shelter, and space to reproduce and thrive in the park.

Species of Greatest Conservation Need (see Table 3-2) are priority species for habitat management in the Park Reserve. Restoring lost or uncommon plant communities such as prairie and savanna will help to establish habitat that is vital to most of the species of greatest conservation concern, since the primary reason for their need is habitat loss and habitat fragmentation. Park managers will consider reintroducing extirpated animals as opportunities arise. Bison, after careful consideration, are scheduled to be reintroduced in 2022. Other species may include a variety of herptiles such as bull snake and rat snake and insects such as regal fritillary, but many other species may be considered.

Deer management is a key to ecosystem restoration and management since deer have become far too overabundant and effect changes across the landscape, including over-browsing and grazing of certain plant species which leads to significant changes in plant community structure and an inability to successfully restore certain aspects of the system. Other species that have deleterious effects are earthworms, which are exotic and occur throughout the park and lead to degraded soil conditions that impact flora and fauna.

Soil and Stormwater Management

When undertaking construction projects within the park, it is important that sufficient budget and planning occur to protect soil structure and to implement soil regeneration within the construction disturbance zone. This may include importing topsoil or the incorporation of soil amendments and/or breaking up compacted soil to restore porosity. It will also involve the implementation and management of appropriate native plant communities. Therefore, the design of native plant communities around designed facilities will improve overall ecological quality.

Park managers should continue to work with neighboring property owners to manage stormwater running into the park from their properties. Options include seeking agricultural and natural area easements, offering to provide technical assistance or cost-share to manage the natural communities on their properties, and collaborating on projects that benefit the natural resources of the park reserve and possibly of the private properties too. For example, decreasing the volume and rate of stormwater runoff from surrounding properties will go a long way to stabilizing the ravines of the park. There are state and federal grant opportunities available to help fund these types of water quality projects.

Monitoring Recommendations

The monitoring of native plant communities and wildlife in Spring Lake Park Reserve can provide park managers with an understanding of populations and their condition. This information allows for informed management decisions. Furthermore, Adaptive Management, which includes monitoring as a key component, should be used for all restoration projects in the park reserve.

Native Plant Community Restoration and Maintenance Costs

The tables below present projected costs for the restoration and management of native plant communities within Spring Lake Park Reserve. The costs reflect the phasing that was presented in the previous section and are broken out into three phases: Phase 1 (years 1–5), Phase 2 (years 6–10), and Phase 3 (years 11–20). They were developed from costs incurred from similar projects in the region, including County projects, for the years 2017–2019. External funding will be aggressively sought and in line with NRMSP goals of 80 percent of total project costs.

Table ES-1 Native Plant Community Restoration Cost

Cost to Restore per Phase		
Restoration Phase	**Total Acres to Restore**	**Cost Estimate**
1. Years 1–5	294	$1,024,000
2. Years 6–10	310	$1,389,000
3. Years 11–20	208	$716,000
Total	**811**	**$3,129,000**

Table ES-2 Native Plant Community Maintenance Cost

Cost to Maintain per Phase		
Restoration Phase	**Existing and Newly Restored Acres to Maintain**	**Cost Estimate**
1. Years 1–5	462	$1,005,000
2. Years 6–10	819	$1,571,000
3. Years 11–20	1037	$1,659,000
Total		**$4,235,000**

Table ES-3 Native Plant Community Maintenance and Restoration Combined Costs

Restoration Phase	Total Acres to Restore and Maintain	Cost Estimate
1. Years 1–5	462	$2,029,000
2. Years 6–10	819	$2,960,000
3. Years 11–20	1037	$2,375,000
Total		**$7,364,000**

Wildlife Resources Projects and Cost Estimates

Each species has different habitat requirements, and these should be given consideration during vegetation management. Managing for the community, i.e., managing for a general plant community type, is what is typically done and what is recommended here; but staff must also be mindful of the specific conservation requirements of rare and declining species, so that species diversity is maximized. To date, the biggest potential wildlife project that is being planned for the Park Reserve is the re-introduction of bison. This project has advanced to the point of producing a draft proposal for Board review. The cost estimate for that project is approximately $1.2 million, of which approximately $160,000 will be needed for match, provided by the County.

The NRMSP allocated approximately $300,000 the first five years for wildlife management for each County park, including SLPR. The costs for specific projects will be determined when they are identified and implemented. Some grant money can be used to enhance the vegetation for specific wildlife habitat improvement needs.

Water Resources Projects and Cost Estimates

The recommended water resources projects and associated cost estimates are the following:

Table ES-4 Water Resources Projects and Associated Estimated Costs

Project Name	Timing and Years	Cost Estimate	External Funding Estimate	County Funding Estimate
Ravine 1 and 2 Stabilization Design	2020–2021	$20,000–$30,000	None	$20,000– $30,000
Ravine 1 and 2 Stabilization Implementation	2021–2024	Approximately $600,000–$800,000	Approximately $450,000–$600,000	Approximately $150,000– $200,000
Trail Erosion Stabilization Design	Completed	Completed	Completed	Completed
Trail Erosion Stabilization Implementation for four sites	2021–2022	Approximately $150,000	None	Approximately $150,000
Habitat Islands in Spring Lake (potential partner with USACE)	TBD	TBD	USACE Habitat Restoration Grants provide 65% cost share (up to $10M) for approved projects	35% cost share to be provided by the sponsor
Enhancement of the Black Ash Seepage Swamp	2022–2025	$50,000	$40,000	$10,000

Funding

There are a variety of funding sources available for ecological restoration activities, which provide grants that require match, including Minnesota DNR, US Fish and Wildlife Service, US Army Corps of Engineers, Metropolitan Council, Minnesota Board of Water and Soil Resources, and Minnesota Pollution Control Agency. These are listed in the plan in Section 6.7.

1 Introduction

Spring Lake Park Reserve displays an impressive assemblage of natural landscape features, ranging from dramatic views of the Mississippi River and Spring Lake to unique natural landscapes internal to the park. A significant portion of the park consists of north-facing limestone bluffs, steep slopes, and ravines that compose an ecosystem that has become rare in the region. Bottomland and upland terraces, remnants of the former glacial river, are also prevalent. The site offers a fascinating diversity of landscape with its limestone bluffs, forests, prairies, shoreline, and ravines. Figure 1-1 shows key natural features in the park. The innate natural qualities of the park provide a strong foundation for public enjoyment and enrichment. These same qualities also provide a unique opportunity to protect a natural environment for its intrinsic values, such as biodiversity, preservation of our natural heritage, open space, scenery, and respite from the built environment.

This document provides a vision for the future and a framework for restoring and managing the natural resources within Spring Lake Park Reserve. The term management in this Natural Resources Management Plan refers to the thoughtful care of the park's natural resources and is of paramount importance to preserving and protecting its intrinsic values.

The vision for Dakota County Parks, as written in the 2017 Dakota County Natural Resources Management Systems Plan:

The water, vegetation, and wildlife of Dakota County parks, greenways, and easements, will be management to conserve biodiversity, restore native habitats, improve public benefits, and achieve resilience and regionally outstanding quality, now and for future generations.

This Management Plan incorporates the goals developed in the Natural Resources Management System Plan for Spring Lake Park Reserve.

1.1 Location

Spring Lake Park comprises an ecosystem that has become rare in the region due to extensive urbanization and agriculture in the region. The park sits within the Mississippi Flyway, a major migratory route linking central Canada and the Gulf of Mexico, and hosts a diversity of waterfowl that feed in Spring Lake. The south of the park mostly borders agricultural land with privately owned woodlands and homesteads. Looking down from 10,000 feet, the park is a jewel of habitat anchored along the Mississippi River, while set in a developed landscape near the Twin Cities metropolitan area. Figure 1-1 shows other significant natural areas of the region, and Figure 1-2 shows the location of the park. Figure 1-3 focuses in on the park and highlights the parks key natural and man-made features.

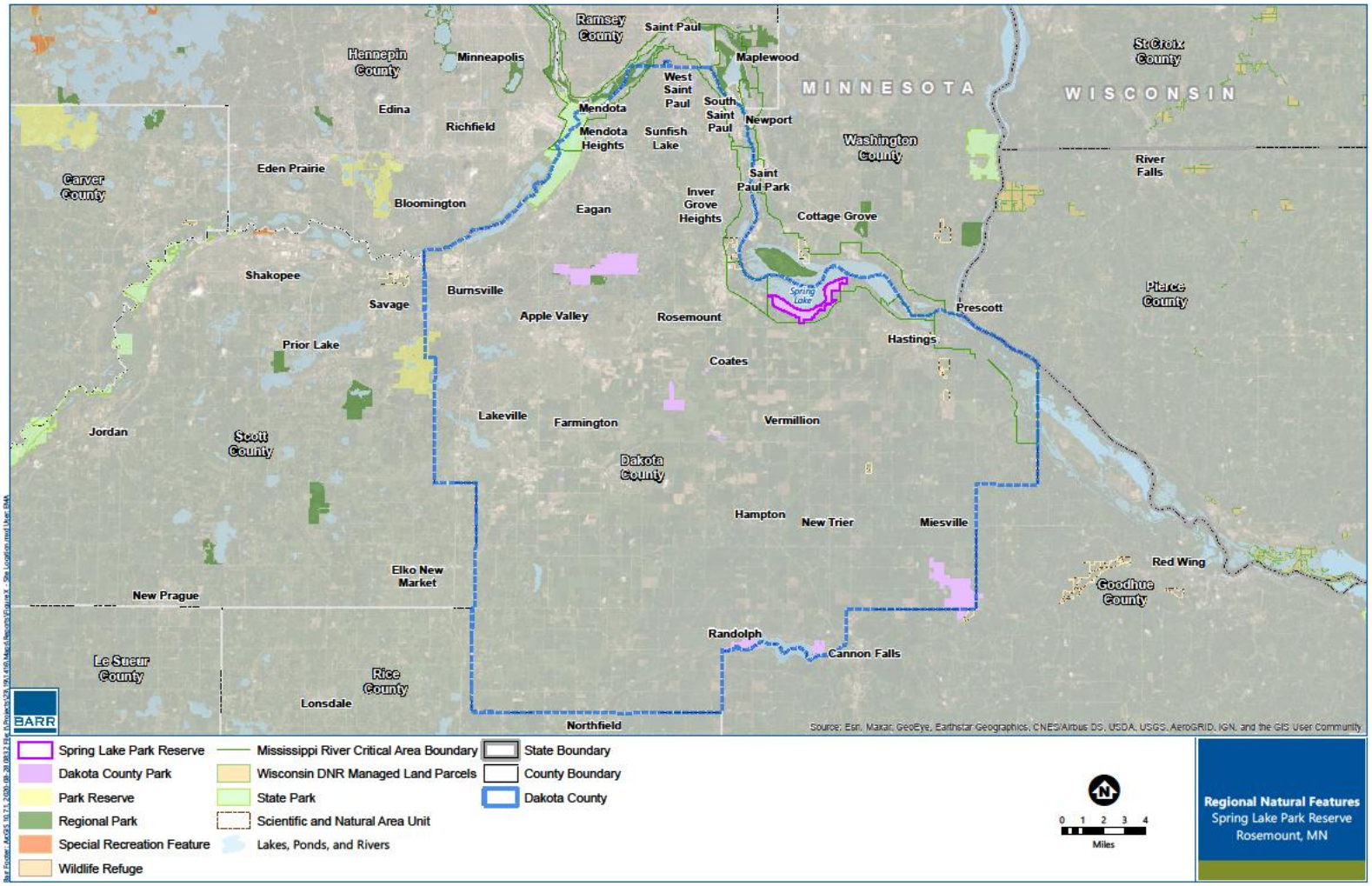


Figure 1-1 Regional Natural Features

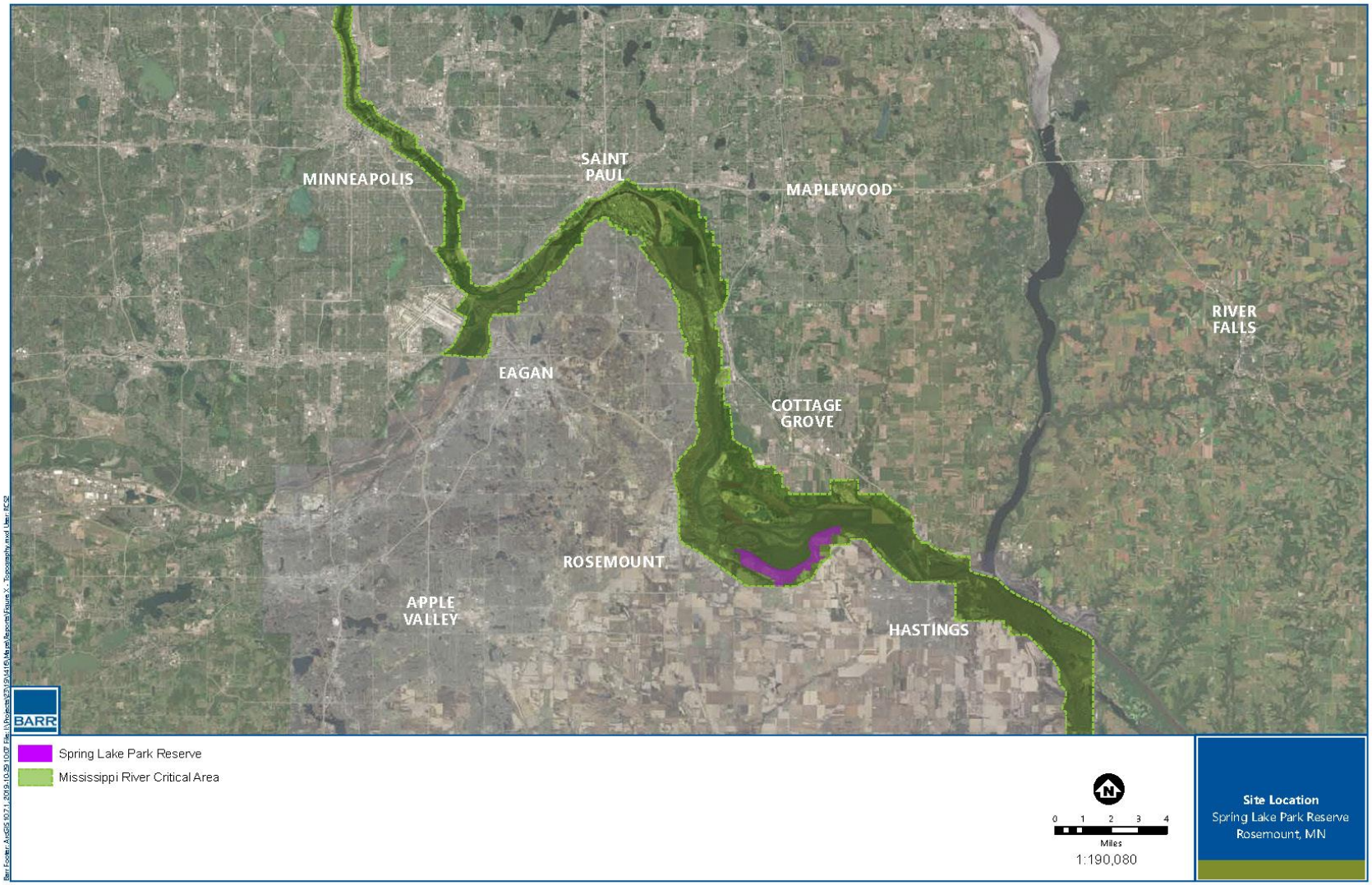


Figure 1-2 Park Location

1.2 Precedent Planning Efforts

This plan has been preceded by plans that have brought the park to where it is today and helps direct the current planning efforts of the park. These plans include:

The Natural Resources Management System Plan: Dakota County developed the Natural Resource Management System Plan to guide natural resources management of its parks, conservation easements, and greenways. It is updated every five years. The plan includes a long-term vision (for the next 20 years) and outlines more specific implementation steps over the next five years.

The Visitor Services Plan: Dakota County developed a Parks Visitor Services Plan to improve services that enrich the overall parks experience, including events, outdoor education, volunteerism, rentals, customer service, and community outreach and awareness. The plan includes:

1. A contemporary understanding of residents' expectations for County Parks services

2. An inclusive vision that:

    - Builds a stronger park system identity based on unique park characteristics and features
    - Continues to offer what current park visitors like
    - Offers opportunities for residents who are not using County parks

3. A responsive overall approach for providing recreation services, including steps to achieve the vision

2003 Spring Lake Park Reserve Master and Stewardship Plan: Developed by Brauer and Associates, Barr Engineering Co., and Applied Ecological Services, this Master Plan contained the first natural resource management plan for the park, which included a natural resources inventory, and identified natural resource impacts and offered strategies to mitigate for these impacts. The County has a tradition of developing natural resource management plans with master plans, with the intent of informing the master plan and protecting the resources as much as possible.

The County is developing an updated master plan for the park reserve with the current NRMP. One of the new approaches will be to focus on highly used areas to naturalize them as much as possible while making them aesthetically pleasing and functional to the park user. Examples would include the Schaar's Bluff area, along the Mississippi River Greenway, and the area near the archery range.

Land Conservation Plan for Dakota County: Developed by the County, and in final draft form as of 2020, the Land Conservation Plan (LCP) represents a comprehensive approach to conserving, protecting, and, in some instances, managing land throughout Dakota County. The LCP has designated "Conservation Focus Areas" throughout the County, one of which is the "Mississippi River Conservation Focus Area", which includes Spring Lake Park Reserve. The LCP and the SLPR NRMP could potentially work together to help protect the resources of the park. For instance, in some cases, the County could work with adjacent landowners to determine if they are interested in selling a natural area conservation easement on their property for the primary purpose of preventing future residential development next to the park reserve and making them eligible for use of public funds for natural resource restoration and enhancement.

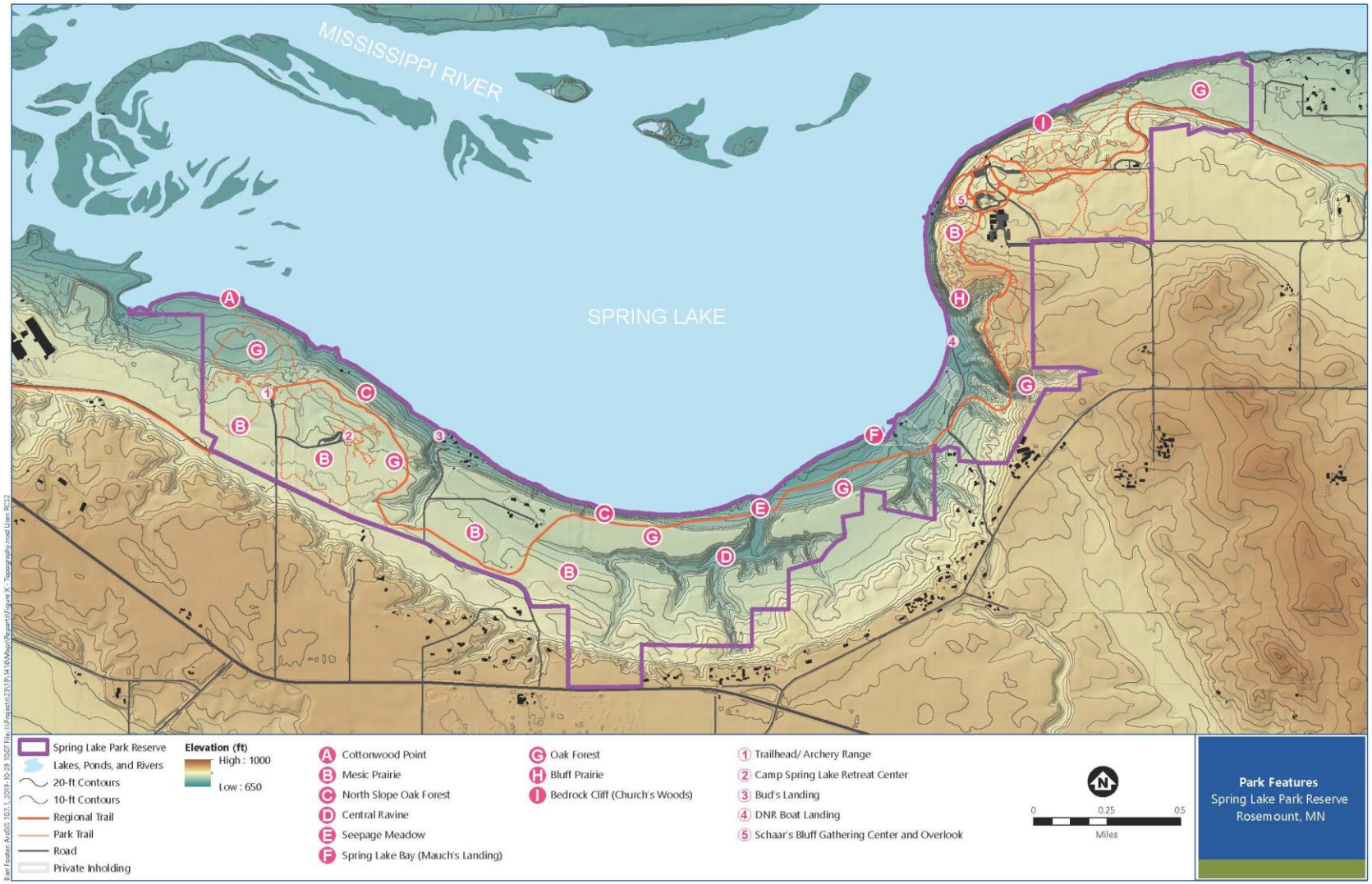


Figure 1-3 Key natural and human-made features of the park

2 Cultural and Historic Context

Beginning in the 1850s, the landscape underwent a dramatic transition from oak savanna, prairie, mesic forest, and floodplain wetlands to plowed crop land. Early Euro-American farmsteads within the study area were typically planted in grains, including wheat, oats, and corn. These family farms were typically supported by small numbers of livestock and a vegetable plot to support limited farm income.

Agriculture continued as the dominant land use within the study area during this period. Primary agricultural production shifted from grain to livestock in the 1930s and 1940s with the expansion of dairy farming and turkey growing. Other industries within the study area during this time period included quarrying along the limestone bluffs and a resort near the south end of Spring Lake.

The land that is today Spring Lake Park Reserve has formed over millennia from geologic and biological forces but has also been altered through time by humans and their activities and development. Prior to European settlement, a mosaic of prairie and oak savanna biotic communities covered the park with the exception of the bluffs, shoreline, and steep ravines where oak forest thrived. The vegetation of oak savannas are described as consisting of scattered trees and groves of scrubby-form oaks with some shrub thickets, all within a matrix of grasses and wildflowers. This community thrived well on the predominantly sandy loam soils of the park. A key natural disturbance that helped produce and maintain grassland systems in the region is fire. Fires are often ignited naturally, for instance by lightning strikes. It is also well known that oak savannas and prairies were perpetuated by Native Americans who deliberately set fires to provide productive hunting and gathering food sources. The 1890 Mississippi River Commission map Figure 2-1 shows some of the land cover in the park just after European settlement. It gives clues as to what the first settlers found when they came on the scene (as described above). The map also shows the condition of the Mississippi River floodplain and Spring Lake before the construction of Lock and Dam#2 at Hastings, Minnesota in 1930.

Typical Oak Savanna

Beginning in the 1850s, the landscape underwent a dramatic transition from oak savanna, prairie, mesic forest, and floodplain wetlands to plowed crop land. Early Euro-American farmsteads within the area were typically planted in grains, including wheat, oats, and corn. These family farms were typically supported by small numbers of livestock and a vegetable plot to support limited farm income.

Agriculture continued as the dominant land use during this period. Primary agricultural production shifted from grain to livestock in the 1930s and 1940s with the expansion of dairy farming and turkey growing. Other industries within the study area during this time period included quarrying along the limestone bluffs and a resort near the south end of Spring Lake.

Farming eliminated two natural influences that has also altered the landscape: fire and grazing. The suppression of fire and the extirpation of bison and elk stopped putting a check on the growth of woody plants that prevented a succession to woodland and forest (see pp. 46-47 for more information on succession). By the time the aerial photo in 1951 (Figure 2-3) was taken, most of the land of the park, except for the steepest slopes, had been impacted and ecosystem processes had been altered. For a view of the area as seen from the oldest available historical aerial photos, from 1927, see Appendix A. Figure 2-3 is an interpellation that speculates the types of activities that altered the land. Farming gradually ceased as park property was purchased and managed by Dakota County Parks. The ecological integrity of the park continues to evolve under the influences of climate and people. Figure 3-7 shows the extent to which woodlands have established in the park with the suppression of fire.

Spring Lake Park Reserve was first proposed as a County park in the 1970 Dakota County Parks and Recreational Facilities Plan. Property acquisition for the new park began with the Carl and Dorothy Schaar property in 1973, and Park additions and boundary revisions continued through the 1970s and 1980s.

As the park has grown, the character of the landscape once again changed. Buildings and structures were removed, and extensive ecological restoration projects were undertaken to preserve and reintroduce approximately 200 acres of prairie and oak savanna in the park.

An in-depth description of the cultural and historic landscape of the park can be found in the companion document to this plan, the 2020 Spring Lake Park Reserve Master Plan.

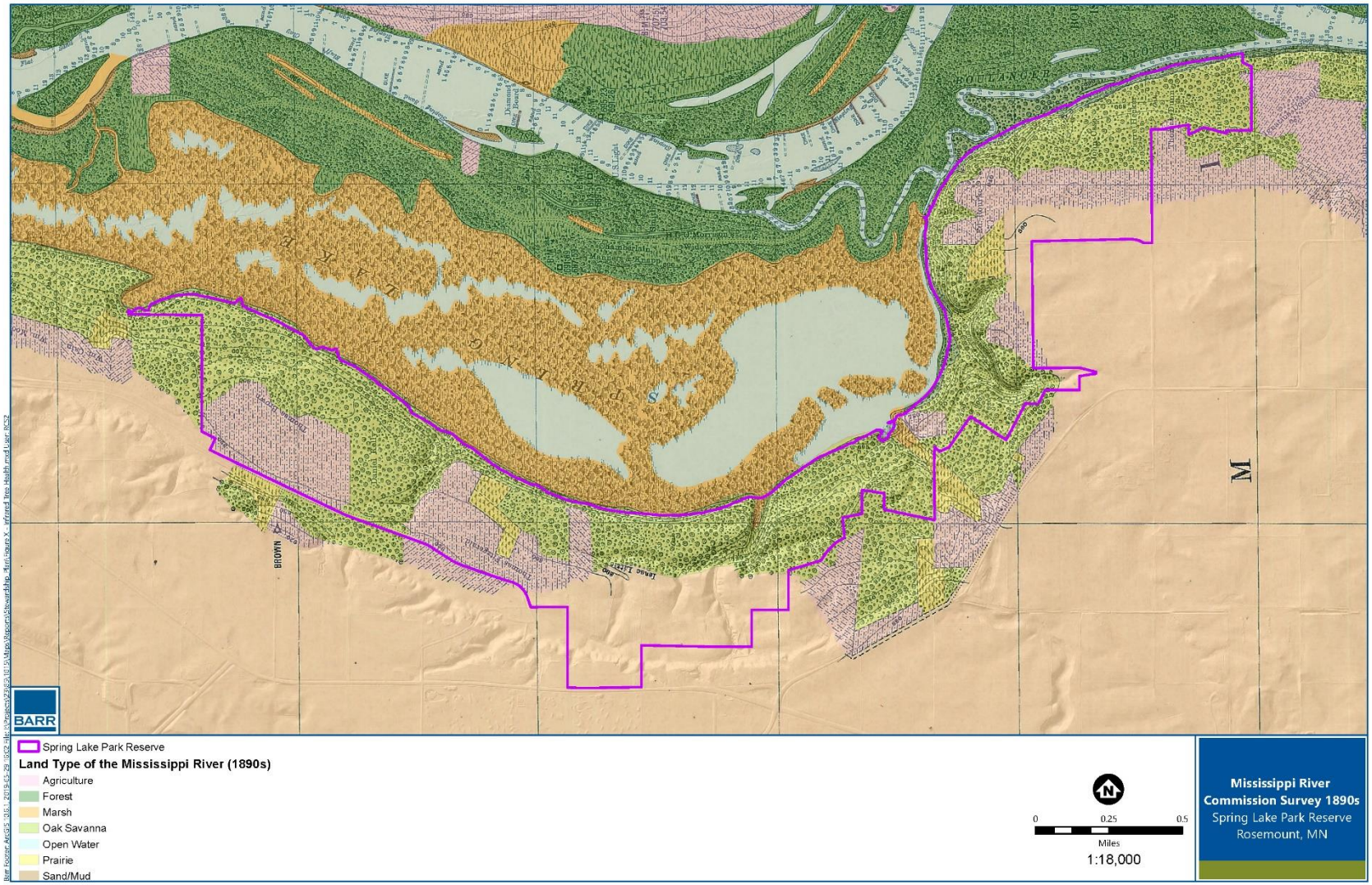
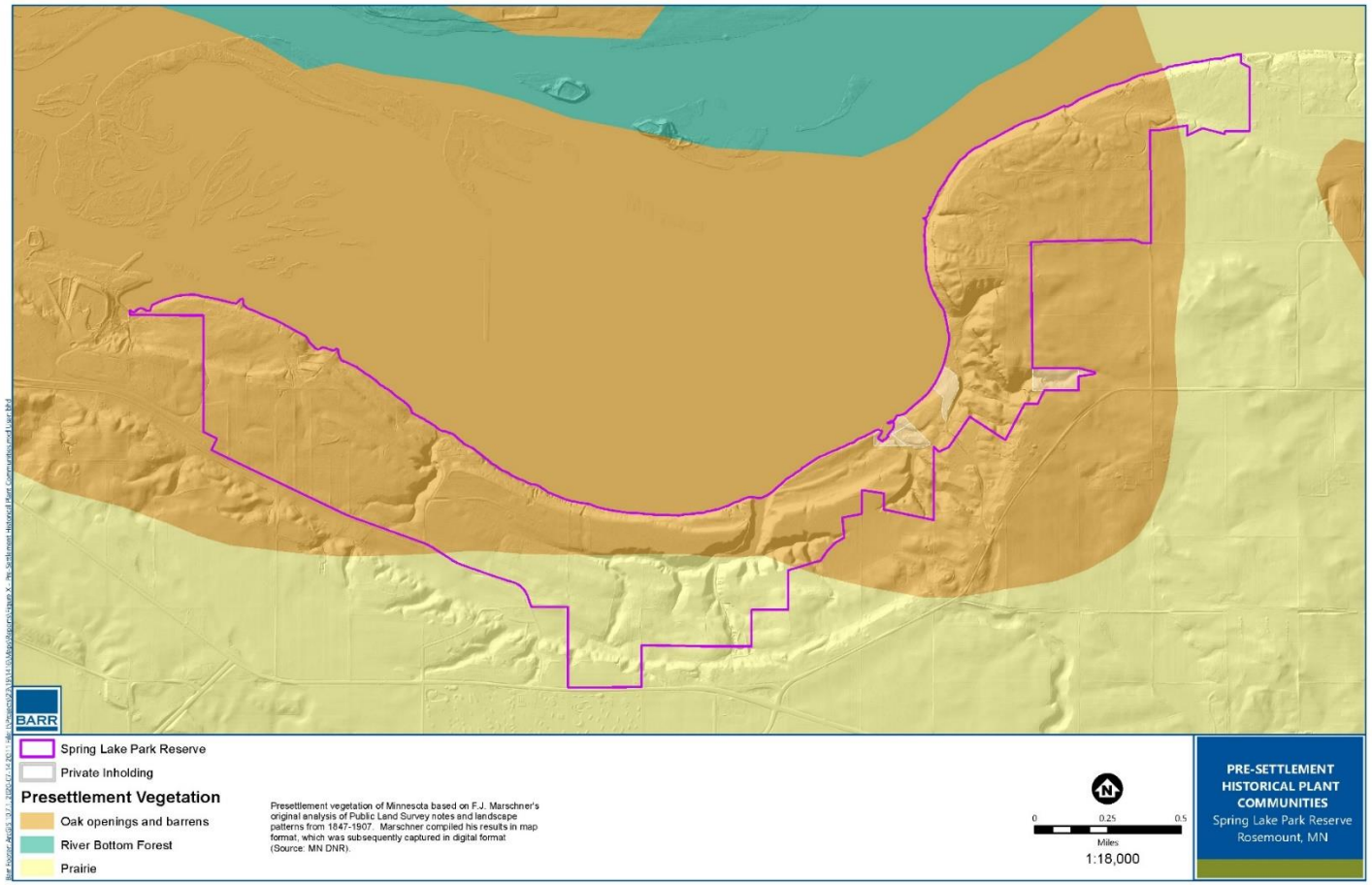


Figure 2-1 1890 Mississippi River Commission Map



Through the interpretation of original survey notes taken around 1847, James Marschner developed this map (compiled in 1930) of the approximate extent of plant communities at the time. Because it is based on information taken at the intersection of section markers (one mile apart), detail at this scale is lacking; but it is still helpful to show large-scale vegetation patterns. The 1937 River Commission Map shows better detail of likely plant communities at the time.

Figure 2-2 Pre-Settlement vegetation in the Spring Lake Park Reserve area. Source: Marschner 1974

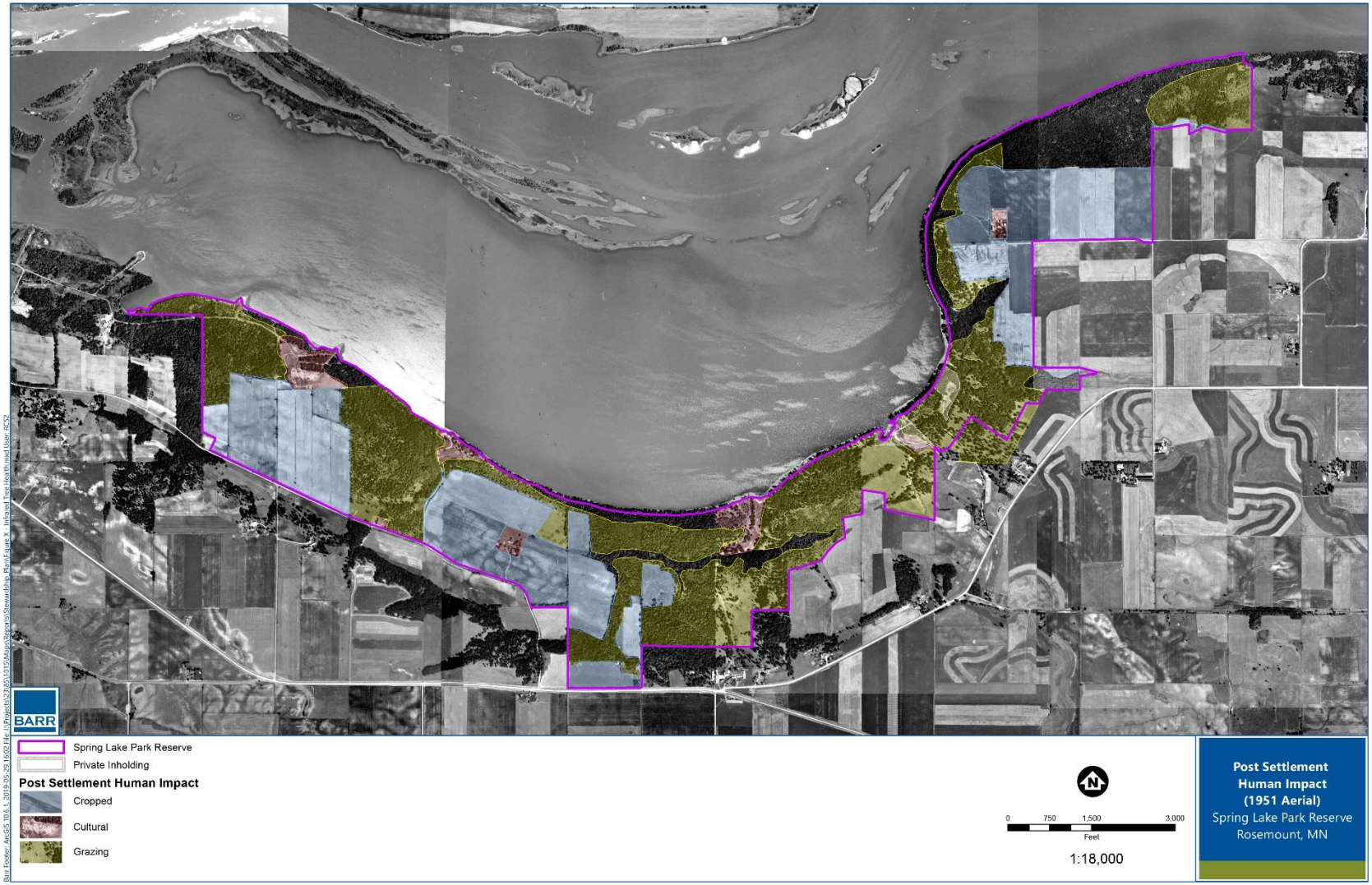


Figure 2-3 Post-Settlement Human Impact Zones

3 Current Conditions

There are a number of dominant physical features of the park that make it unique. Proximity to the Mississippi River, unique geology (occurrence of river bluffs and terraces), high topographic relief, and high ecological diversity provide a compelling park setting that is uncommon and distinctive in the regional park system. The following provides an overview of these features.

3.1 Water Resources

Mississippi River and Spring Lake

The most compelling physical feature of the park is its location along the Mississippi River and adjacency to Spring Lake. Situated within the Mississippi Flyway, the river and lake provide essential stopovers for migratory waterfowl and habitat for an impressive variety of wildlife species.

As the third largest river in the world, the size and scale of the Mississippi naturally draws people to its scenic valley for observation of nature, water-based recreation, hunting, and fishing. Although not the boundaries of the park proper, the prominence of the river and lake is illustrated in Figure 3-1, which underscores the inherent value of these features to the park's master plan.

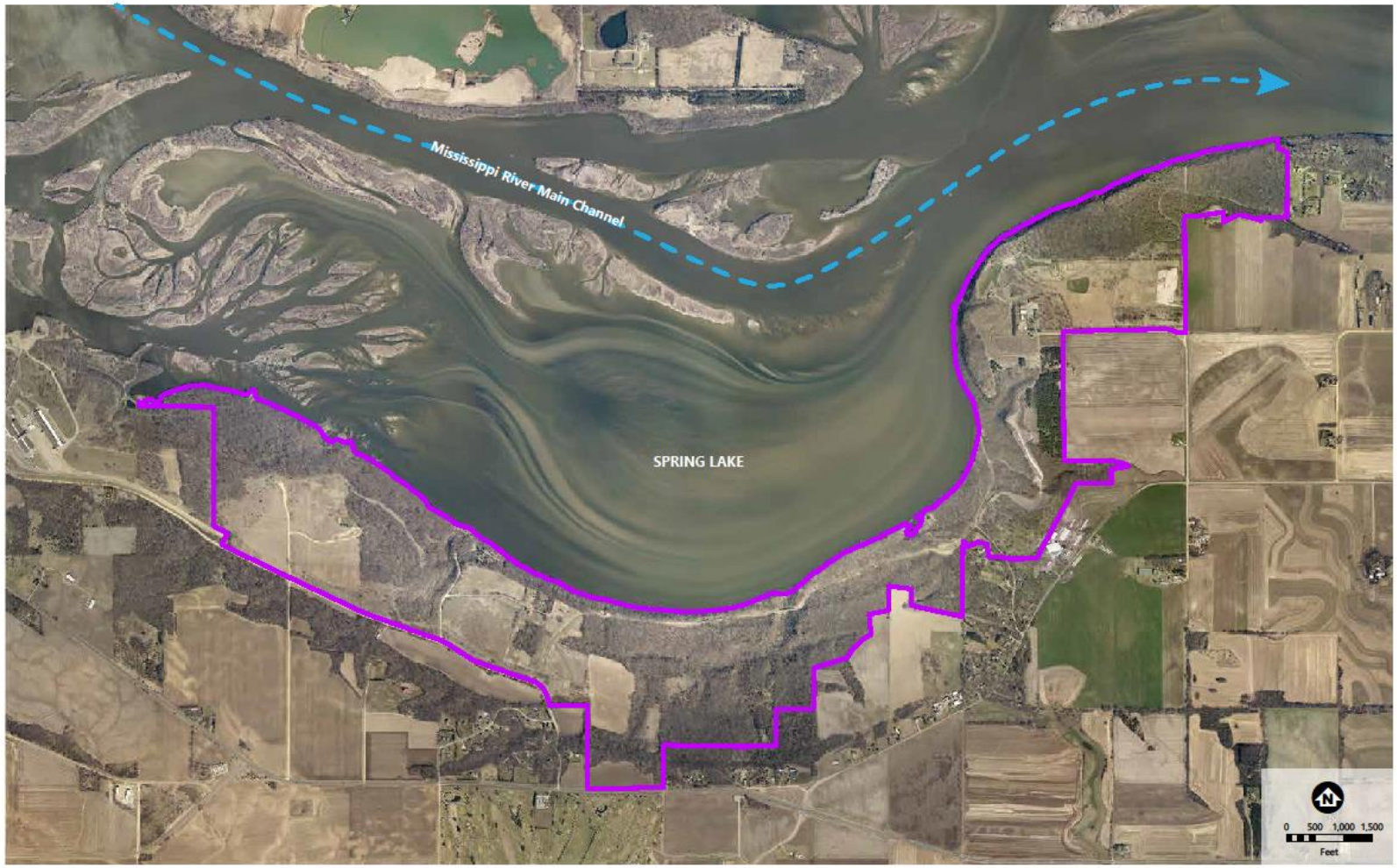


Figure 3-1 Mississippi River and Spring Lake

The wave battered shoreline of Spring Lake is stabilized by naturally occurring rock.

Pool 2 of the Mississippi River, which includes Spring Lake, is an impoundment of the river resulting from the construction of Lock and Dam#2 at Hastings, MN, in 1930. Pool#2 includes the reach of river from Lock and Dam 1 (known as the Ford Dam) downstream 32 miles to Lock and Dam#2 and includes the Minnesota River from Savage, MN, down to its confluence with the Mississippi River. The river from Lower Grey Cloud Island to Lock and Dam#2 is the portion of Pool#2 most affected by the 1930 impoundment. In pre-European times, it was a floodplain forest and marsh (Figure 2-1). Stumps of trees growing in the current area of Spring Lake are still found underwater today. Spring Lake is now a shallow water area swept by wind and battered by barge-generated waves that experiences high turbidity. The turbidity has led to the exclusion of aquatic plants (except for in the shallowest waters and areas sheltered by islands), negatively impacting fish and aquatic wildlife habitat.

Improvements in wastewater treatment over recent decades have improved much of this reach of the river to better support aquatic life, including an emerging game fishery and a rebounding mussel community, but much more improvement is needed. Although improvements to point source pollution has occurred, non-point source pollution is still a significant problem.

The Minnesota River has a profound effect on the Mississippi River and Pool 2, both on its size and water quality. Because it drains a watershed dense with agricultural fields, the Minnesota River contributes large sediment and nutrient loads to the Mississippi. When this sediment encounters the reach at Spring Lake, water movement slows and becomes still, which induces fine particles to drop out. Sediment accumulates here, especially at the mouth of Spring Lake (west end), which deters the growth of aquatic flora and fauna. Many of the islands in the lake have been formed from

accumulating sediment. Aquatic vegetation surveys completed by the EPA's Environmental Monitoring and Assessment Program, 2006–2008, documented the absence of submerged aquatic vegetation at the sites sampled in Spring Park.

State and federal water quality reports for Mississippi River Pool 2 (including Spring Lake) generally show improvement in the river's health over the past decades. The river remains on state and federal lists of impaired waters. Impaired uses include fish consumption impairments due to mercury, polychlorinated biphenyls (PCBs), and perfluorooctanesulfonic acid (PFOS) in the water. Additional impaired uses include aquatic life impairment due to high nutrient and total suspended solids and impairment for recreation due to elevated fecal coliform numbers. Mercury and PCBs are persistent toxins that have been detected in Pool 2 sediments and in various fish species. The State of Minnesota has issued advisories recommending restricted consumption of eight species of fish caught in Pool 2.

Spring Lake supports a wide variety of fish species, including some game species such as walleye and channel catfish. Special regulations for Mississippi River Pool 2 allow only catch and release fishing for walleye, sauger, smallmouth bass, and largemouth bass.

Perfluorooctanesulfonic acid (PFOS) is an anthropogenic Fluor surfactant and global pollutant. PFOS was the key ingredient in Scotchgard. Polychlorinated Biphenyls (PCBs) are industrial products used for such things as microscope oils, electrical insulators, capacitors, and electric appliances such as television sets or refrigerators

Surface Water Flow in the Park

Five large ravines have formed in the park. Ravine formation occurs over time as water moving from south of the park, downward towards the river, has etched its path into the geological formations of the park. These ravines are relatively stable, with the exception of the large, branched central ravine that is experiencing erosion and sediment deposition due to large volumes of water that occasionally enters the park from the agricultural land beyond its borders.

The eastern ravine, in which Hilary Path was constructed, is also badly eroding. A gully has repeatedly been repaired along Hilary Path. This will continue until the ravine is stabilized and stormwater can be held up stream. Since the park is entirely vegetated and has very limited impervious surface, the surface water quality within park boundaries is high. A great percentage of precipitation landing on the park infiltrates into its permeable soils, which is beneficial.

Soil deposition at the base of Hilary Path

Seeps and Springs

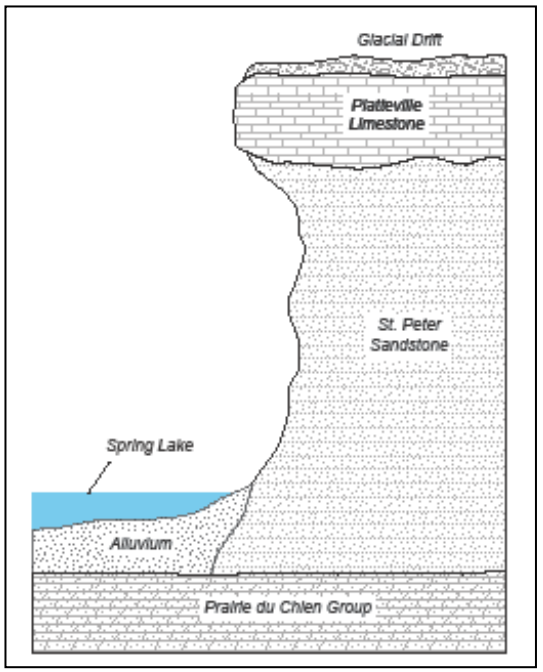
The geology of the park has resulted in water seepage through layers of limestone that emerge out the face of Schaar's bluff. This has allowed for the formation of unique plant communities, especially on the north facing bluffs, that benefit from a near continuous supply of calcareous water. A good place to see these seeps is in the area of Church's Woods (Figure 1-3). A significant spring exists in the large central ravine just to the south of the new regional trail bridge (Figure 1-3). Groundwater flows to the surface in the ravine, yet just up the ravine it is dry. Here unique plant communities thrive: a lush wet meadow and a black ash seepage swamp. Other small or ephemeral seeps may occur in spots that are too steep to access below the bluffs of the Schaar's Bluff Gathering Center and Church's woods.

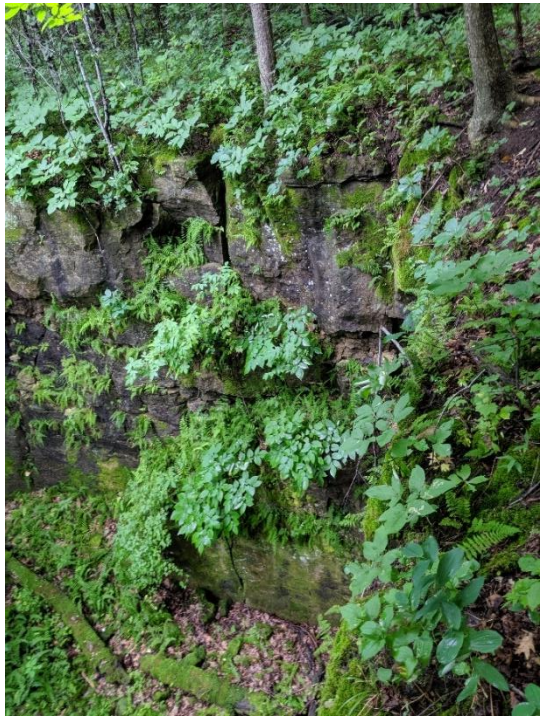

The spring at the bottom of the central ravine continuously supplies water to this diverse wet meadow. In the middle ground of the left photo are black ash trees. Note the brown color of the water in the right photo, which is caused from sediment that was loosed by eroding ravine heads due to run off from adjacent agricultural fields.

3.2 Geology

Bluffs

The park exhibits a dominant bedrock cliff, Schaar's Bluff, which rises 150 feet from Spring Lake (as illustrated on the graphic). This bluff is characteristic of the Upper Mississippi River basin, whose banks are flanked by iconic bedrock strata that were deposited in ancient beach and sea floor environments. Deposition and wave action along the shores of ancient Lake Ordovician about 440–460 million years ago produced Saint Peter Sandstone, a friable sandstone with extremely well-rounded white grains. As sea levels rose into the Devonian (fourth Paleozoic period 416–359 million years ago), the remains of organisms with carbonate shells were precipitated and lithified atop the Saint Peter, which was at the sea floor. These carbonate strata formed the fossiliferous Platteville Limestone layer visible in the park bluff.





The striking bluffs visible at Spring Lake Park are the direct result of the differing resistance to physical erosion between the friable Saint Peter Sandstone and the indurated and durable Platteville Limestone. The Platteville protects the Saint Peter from erosion from above, allowing the bluffs to stand high above the river valley. However, the weak foundation of the Saint Peter forms a base that is easily eroded by the lateral migration of the Mississippi and the stream power along its banks. This erosion undercuts the rigid cap of the Platteville producing evidence of geology in action in the form of limestone rock falls at the base of the bluffs. The cliff area is an exemplary location that captures the geologic history of the Upper Mississippi's response to, and influence on, Minnesota geology. In addition to providing dramatic views of the river, lake, and surrounding landscape, the cliff area also harbors several unique plant communities such as the fern and Canada yew colonies near Church's Woods. Possible animal species that occupy the bluff habitats in the park include cave and big brown bats. Birds that utilize the bluffs include red-shouldered hawk, red-tailed hawk, broad-winged hawk, bald eagles, turkey vultures, and nesting birds such as swallows and swifts.

Ravines, Slopes, and Terraces

In addition to its bluffs, Spring Lake Park Reserve also holds other dramatic landforms that add to its natural qualities. Following the recession of the glaciers, meltwater worked and reworked sediment and eroded rock to form ravines and terraces that provide the basis for much of the topographic characteristics of the site. These features establish the framework upon which the biotic communities established and changed over time. Although not as readily observable from a specific point on the ground, these features nonetheless are integral to the unique experience that is offered by the park today.

As illustrated on Figure 3-2, the landforms along the river are characterized by steep slopes, relatively flat but rolling terraces and bluff lines—many slopes well in excess of 30 percent. A series of terraces occur from the river up to the bluff land. Specific to the park, three main terraces are carved in the Saint Peter Sandstone and form a contrast to the steep bluffs on the east end of the park. The contrast and formation of these terraces represent an area where the thick Platteville Limestone cap that protects the eastern bluffs was thinner and more readily eroded, allowing the river more freedom in its bedrock valley to planate the Saint Peter below. As base level for the Mississippi lowered over geologic time, the river bed was sequentially abandoned in three main episodes, leaving behind the three terraces characteristic of the park today. This lowering of the river water level in turn lowered the local base level for small tributary streams in the park. These streams have since carved small, steep-sided ravines into the Saint Peter sandstone as they drop in elevation to the meet the base level of the Mississippi.

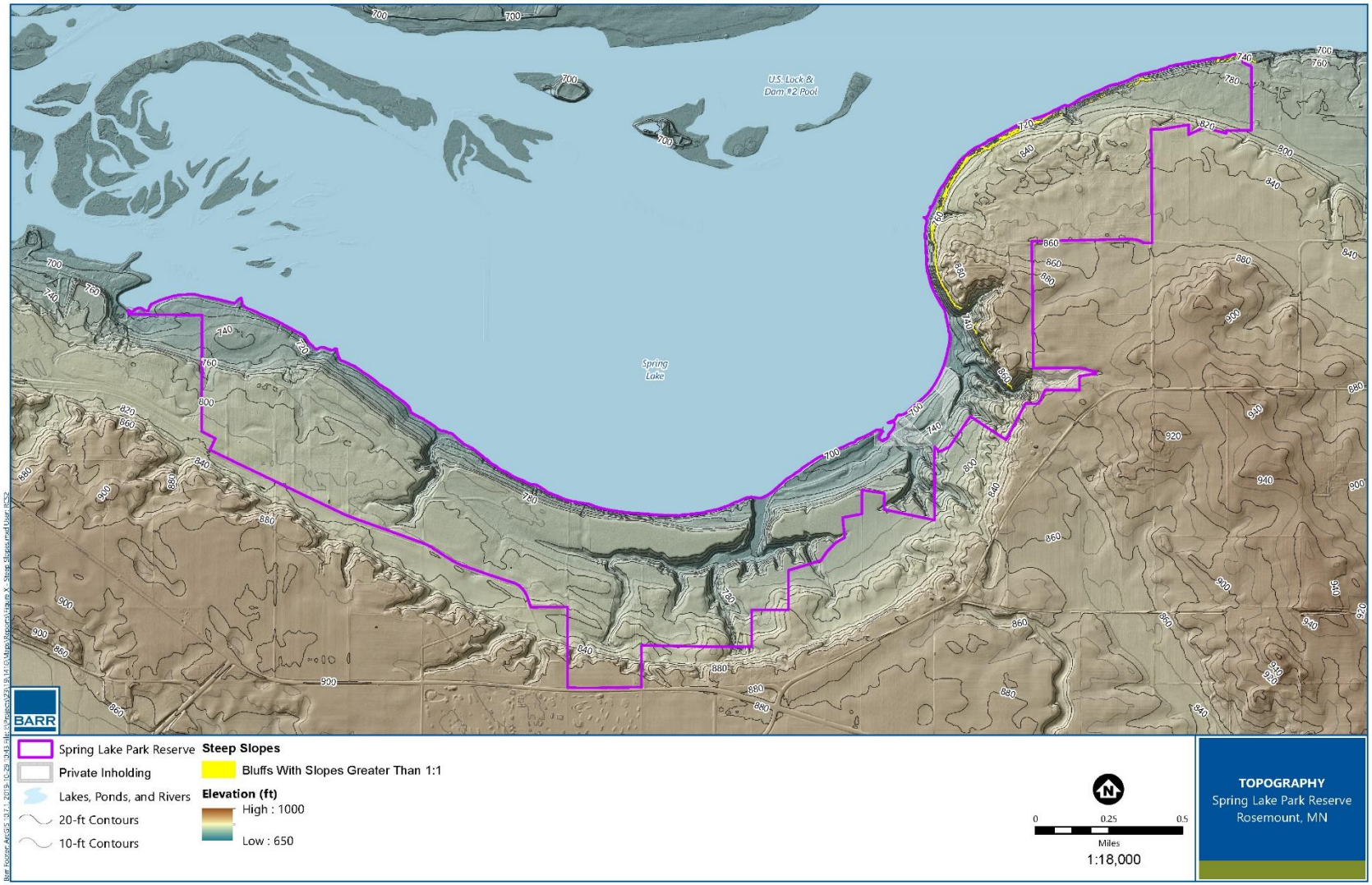


Figure 3-2 Slope analysis exhibiting topographic changes across the site

Soils

Figure 3-3 illustrates the major soil types found in the park. Much of the western end of the park is covered by a sand terrace, which transitions to a silty loam under a number of soil classifications in the eastern end of the park. These soils range from well-drained to excessively drained. There is also a loamy sand concentrated along the heads of major ravine branches. Silt loam covers much of the flat land above the bluff lines. Soils associated with the low areas near the river's edge are seasonally inundated with water. The bluff lines and ravine sides are composed of steep, well-drained soils and bedrock outcrops. From an ecological perspective, the plant communities that are to be restored in the park should match the characteristics of the soil. In other words, prairie and savanna floral communities would probably have been the dominant vegetation types of the dry, flat to rolling topography and soils of the southern part of the park, above the bluffs. On the steep, north-facing slopes along the river, oak forest would have been dominant and is best suited today. In between, plant communities would transition from forest on the bluff slopes to woodland and then to savanna on the upland plains, moving from north to south across the site.

Restored Prairie on the Hubbard Sand Terrace South of Bud's Landing

Soil erodibility can limit park development (see Figure 3-4). A primary concern is soils with the propensity for erosion on steep slopes, especially in poorly vegetated areas and adjacent to the newly created areas of hard surface where runoff can become concentrated. Particular attention to soils must be given to trail development and trail placement. In terms of erodibility, the ravines, steep slopes, and rocky bluffs inherently pose severe constraints on development; and, for the most part, these areas are best left undisturbed. In general, existing development is located where the soils are reasonably conducive to supporting built structures. New facilities must only be proposed for areas where soils offer the least limitations on development. The placement of trails is likewise a very delicate matter and should be very carefully and thoughtfully designed so that soil erosion never gets a chance to occur, or at the very least is minimized and stabilized. Working with the contours of the site and keeping as much vegetation intact during and after construction are essential.

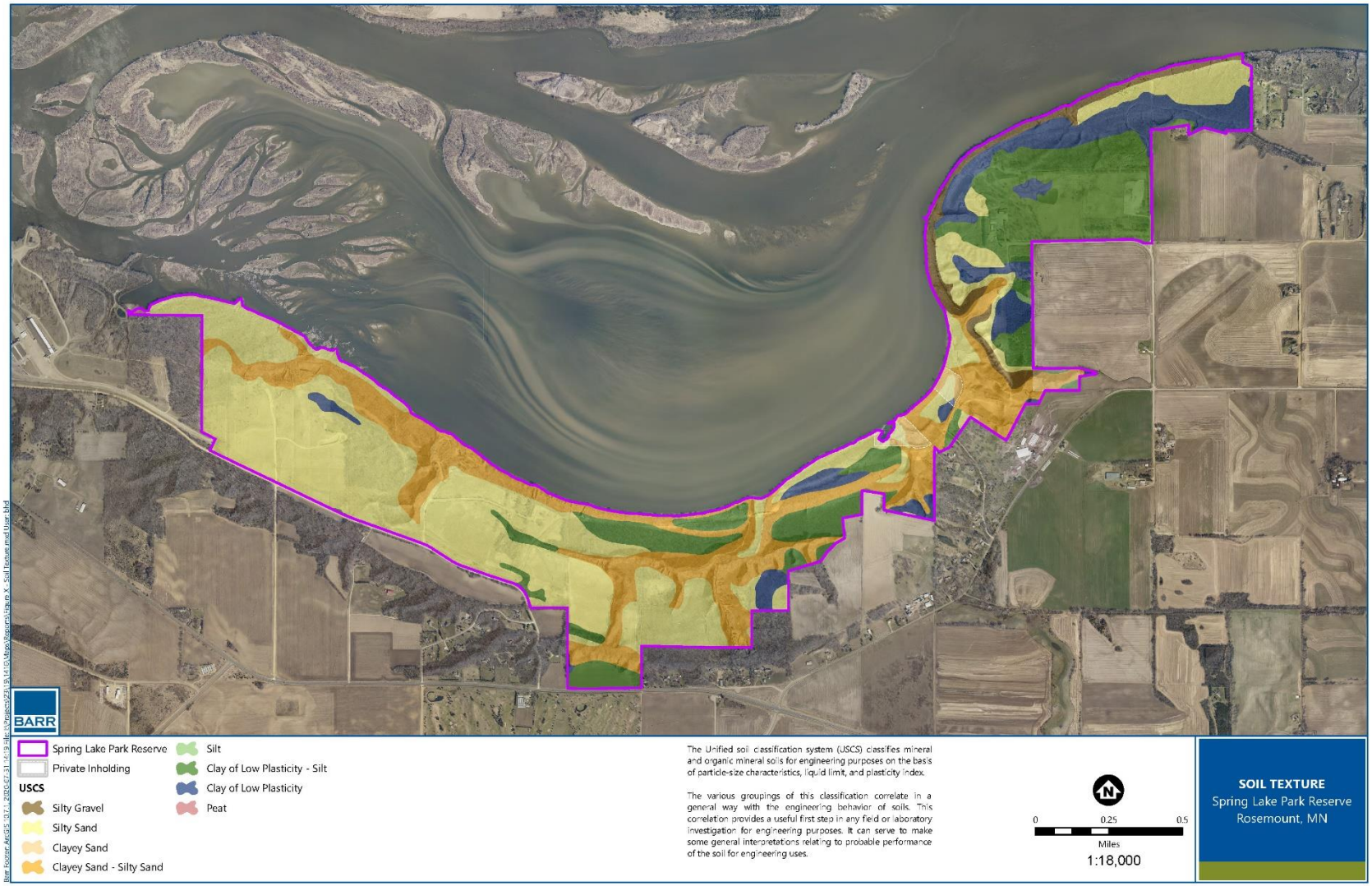


Figure 3-3 Soil textures found across the park

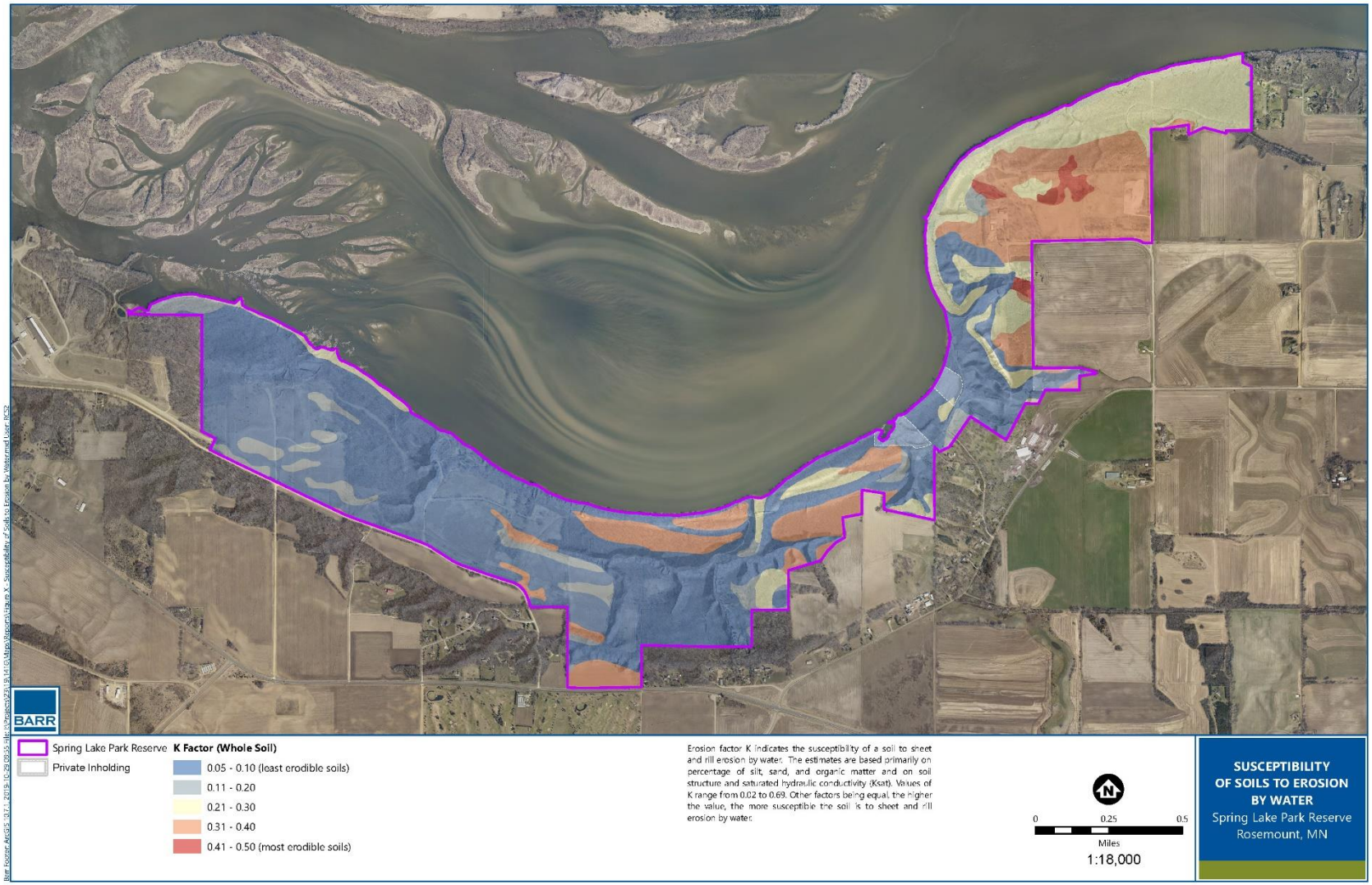


Figure 3-4 Soil susceptibility to water erosion

3.3 Current Plant Communities

Section 2 described the historical vegetation of this site, including what it would have been at the time just before Euro-American settlement. Now this section describes what the current plant communities look like on the site.

In the summer of 2019, several field investigations focusing on natural resources were conducted as part of this planning process. The goals of the field reconnaissance were to review the Minnesota Land Cover Classification System (MLCCS) data, assess biome ecological quality, and inspect for other environmental issues such as erosion, soil degradation, and invasive species.

This former oak savanna on Schaar's bluff is being shaded out by establishing trees.

Figure 3-5 highlights the ecological communities of the park as they exist today. The park has evolved from its oak savanna pre-settlement landscape to forest, aided by peoples' suppression of fire and the elimination of elk and bison as well as overgrazing of domestic livestock and land use changes. Most of the original oak savanna has succeeded to forest.

One significant landscape change since 1995 is that over two hundred acres of agricultural fields have been restored to prairie. This land is being maintained through diligent work of park managers.

Native ecosystem restoration projects since 1995:

- Plateau Prairie and Woodland Restoration. A 2015 CPL grant-funded project which includes restoring a 10-acre crop field and eight acres of old fields into native prairie, as well as enhancing 31 acres of oak forest/woodland by removing invasive species.
- Mississippi River Flyway Restoration. A 2014 CPL grant-funded project, which includes restoring 63 acres of old field to native prairie and 18 acres of degraded forest to oak savanna, as well as enhancing 32 acres of mixed forest, 12 acres of oak forest, and 13 acres of a walnut grove by removing invasive species and opening up some canopy gaps.

- Archery Range Restoration. An Outdoor Heritage grant-funded project completed by Friends of the Mississippi River (FMR) in 2014 and 2016, which includes restoring 33 acres of prairie and 2 acres of woodland.
- Restoration of24 acres of prairie close to the Maintenance Shop in 2012.
- Management of woody invasive species in Church's Woods in 2010–2011 by FMR.
- Restoration of eight acres of prairie south of the previously planted Youth Lodge prairie in 2010.
- Restoration of four acres of prairie around the Gathering Center in 2009–2010.
- Restoration of 20 acres of prairie east of the Youth Lodge off of Pine Bend Trail in 2003.
- Restoration of 11 acres of prairie by the Youth Lodge in 1995.

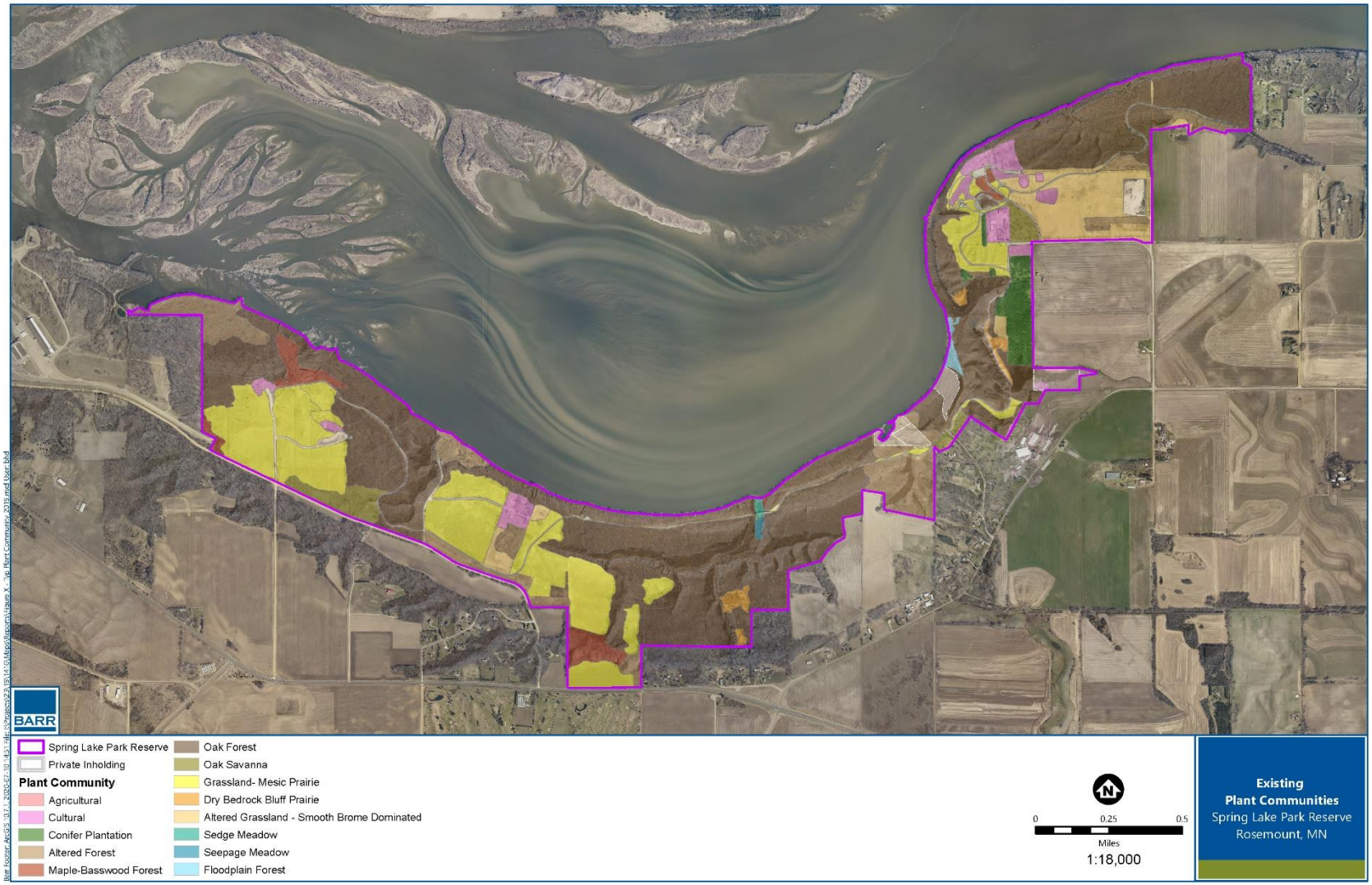


Figure 3-5 Natural Resource Inventory—Existing Ecological Communities

Land Classification Categories: The land cover categories defined in Figure 3-5 based on the Minnesota Land Cover Classification System (MLCCS) developed by the Minnesota Department of Natural Resources. The categories as shown represent a simplification of these classifications for planning purposes. The following table provides a brief description of the most significant cover types that characterize the general condition of the park's ecological communities.

Land Cover Type	Characteristics	Plant Communities	Ecological Quality	Wildlife Habitat Quality
Cultural (Turf/Built Features)	Areas developed for recreational uses, park facilities, and trails. Includes maintained lawn areas, pastures, maintenance facility grounds, and picnic and playground areas.	Fescue lawns; pasture lands include some oak and other tree species.	Low ecological quality in most developed areas. Long-term use of lands for pastures has degraded trees and natural vegetation. Trees can be prone to being blown over in strong winds.	Low overall wildlife value.
Conifer Plantation	Single-species stands of white or red pine planted as conservation efforts 30–50 years ago. Typically, no native herbaceous plant cover and a significant presence of invasive shrubs (primarily buckthorn and honeysuckle).	Monocultural conifer stands.	Very low ecological quality, with low overall plant species diversity and little regeneration of native species.	Provides cover for birds, especially in winter. Owls roost in this habitat. Provides habitat for fisher. Conifer plantations play an important food source role; seed production, needles, twigs, and even bark can be used for food. This is especially important during the harsh winter months. It would be best to have multiple species in the plantation, but otherwise it can still serve a purpose.
Oak Savanna	Very limited stands of degraded (overgrown) oak savanna remaining within the park. Small openings are being steadily encroached upon by red cedar, buckthorn, and sumac.	Remnant oak systems with dry prairie ground cover. Mostly older-age classes of trees with significant invasion of buckthorn, cedar, and other woody species. Herbaceous species are steadily dying out.	Degrading ecological quality, especially in terms of invasion of non-native invasive species. Virtually no regeneration of new oaks and other desirable canopy trees. Relatively recent restoration efforts have resulted in increased diversity and ecological quality (savanna	Diminishing habitat value as invasive plant species become more dominant. Important mast species (heavy seed production) that provides a food source for mammals and birds. Many mature trees in oak savannas are sometimes used for nesting or denning. Cavity nesting for black-capped chickadee, pileated woodpecker, and red-headed woodpecker to name a few birds. Due to the

Land Cover Type	Characteristics	Plant Communities	Ecological Quality	Wildlife Habitat Quality
			near campground and oak opening near Schaar's Bluff have undergone woody species removal).	encroachment of buckthorn and other invasive species, habitat quality for the above mentioned species will likely decrease.
Forests (all types)	Stands of trees with a closed canopy of 70 to 100 percent cover.	Remnant oak systems, with sugar maples, basswood, black cherry, green ash, and other species mixed in. Oak system merging with other forest types due to lack of natural processes, especially fire, and active management.	Degrading ecological quality, especially in terms of the invasion of non-native understory invasive species. Limited regeneration of new oaks and other desirable canopy trees. Native ground cover also lacking due to invasion by buckthorn.	Diminishing habitat value as invasive plant species become more dominant. Large un-broken patches of forest have high habitat value potential for songbird species.
Altered Grassland: Smooth Brome Dominated	Areas dominated by smooth brome grass and other non-native, voluntary vegetation.	Ranges from open grasslands to shrub-dominated plant communities.	Currently low ecological quality but offering the opportunity for improvement through a sound stewardship program.	Ground cover providing some wildlife habitat value. Used for nesting and cover. Lack of plant diversity limits wildlife species diversity.
Grassland: Prairies (Dry and Mesic)	Restored prairie systems that have been established in recent years.	Fair diversity of tallgrass prairie plant species, including big bluestem, switchgrass, wild bergamot, blazing star.	Restored prairie systems offer high ecological quality. Current acreage of restored prairie within the park provides habitat for ground nesting birds as well as a diversity of pollinator species.	High value to wildlife when plant diversity is robust. Large expanses of prairies create an opportunity for bison grazing. Many grassland animal species use prairies for cover, nesting, and forage (e.g., Henslow's and grasshopper sparrow). Insects also need the diversity of the prairie to thrive (e.g., Dakota skipper). Structural heterogeneity can play a big role in prairie species diversity, vertical cover, and vertical patchiness (e.g., bison wallows).
Meadow: Sedge and Seepage	Diversity of indigenous wet meadow species in	An excellent diversity of native forbs, grasses, and sedges. Some shrubs	High-quality plant communities with an excellent diversity of species.	Excellent habitat for a great diversity of amphibians, insects, birds, and fur-bearers. Northern map turtle and other turtle species

Land Cover Type	Characteristics	Plant Communities	Ecological Quality	Wildlife Habitat Quality
	continually saturated organic soils.	such as willow and redtwig dogwood. Black ash on the drier fringe of these wetlands.	Water regime is fairly stable except for occasional inundations from extreme storm events. Some sedimentation occurring up-ravine that threatens to spread down-ravine to the community.	may be using these wet meadow seepages that are connected to the Mississippi River.
Floodplain Forest	Tall arching native trees with sparse herbaceous layer. No mid-story.	Canopy dominated by silver maple and green ash. Mostly wood nettle in herb layer.	Good ecological quality for a floodplain forest which typically are of lower floristic diversity.	Excellent songbird habitat for nesting and foraging. Larger and small raptors use the floodplain for nesting (especially mature cottonwoods) and foraging. Mammals feed here. Fur-bearing species (e.g., beaver and otter) use habitat extensively for food and cover. Smaller mammals use heavier mast trees for food and cover.

Ecological Quality

The ecological quality of communities within the park have been assessed based on the definitions below. Figure 3-6 maps ecological quality in the park.

A. **High Quality: Important to Protect and Preserve.** Highest-quality plant communities with less than five percent invasive plant species. There is little or no evidence of human disturbances such as logging, grazing, or soil compaction. These communities should be preserved, and disturbance such as placement of trails should be undertaken with extreme care. Monitor these areas for invasive species and control as they establish.
B. **Restored): Important to Protect and Preserve.** High-quality prairie restorations. These communities should be preserved, and disturbance such as placement of trails should be undertaken with extreme care. Monitor these areas for invasive species and control as they establish.

C. **Degraded Remnant Native Plant Communities: Excellent Potential for Restoration to Enhance Biodiversity**. Natural communities that show signs of disturbance since the time of Euro-American settlement but are still clearly recognizable as native plant communities.

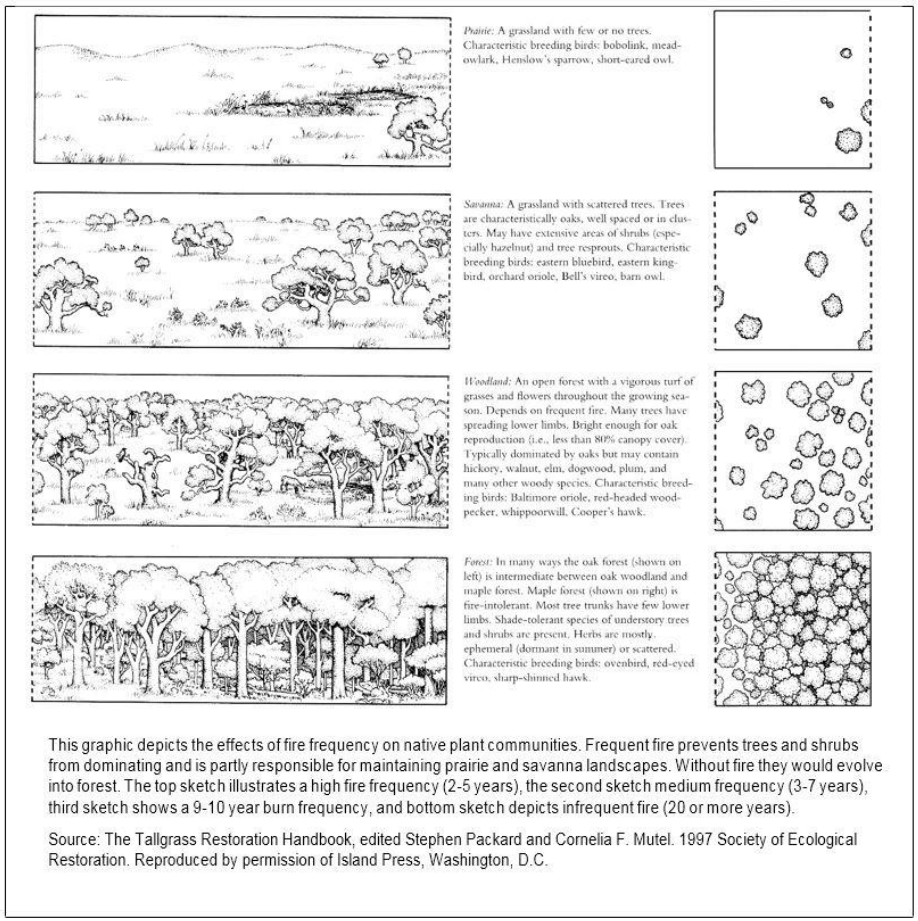
Invasive species encroachment is currently low (5–50%). Primary natural disturbances such as intentional use of fire and mob grazing by bison have been suppressed in recent times. These areas should be carefully managed to avoid further damage. Native plant community restoration is highly feasible.

D. **Lowest-Quality Native Plant Community: Aggressive Stewardship to Increase Plant Diversity, Wildlife, and Aesthetic Value Required.** Sites that were highly disturbed by previous land uses such as clearing and over grazing and whose plant species diversity is therefore very low. The shrub and/or groundcover layers are dominated by invasive species (>50%), and these communities generally have a low diversity of native plant species. Natural processes have been altered by soil disturbance through tilling or compaction, fire suppression, or altered hydrology. The community may not resemble any naturally occurring community (one described by DNR Natural Heritage Database). In forested areas, mid-story and ground layers consist primarily of invasive species. In grasslands, they are dominated by non-native cool season grasses with minimal wildflower diversity and abundance. These communities are restorable, but a greater effort is required to restore native plant diversity. Depending on the soil types and slope steepness, these areas would perhaps be the most appropriate for trails and recreational features.

Figure 3-6 Ecological Quality of Plant Communities

Observed Trends in Ecological Systems

As a result of disrupted ecological processes and loss of biological diversity, it is expected that, without proper management and conscientious stewardship, the overall trend of the ecological systems within the park will be toward continued decline, as measured by biodiversity and general ecological health. Figure 3-7 graphically illustrates the current trend in a typical oak savanna system found in this and many other Midwestern regions.



This graphic depicts the effects of fire frequency on native plant communities. Frequent fire prevents trees and shrubs from dominating and is partly responsible for maintaining prairie and savanna landscapes. Without fire they would evolve into forest. The top sketch illustrates a high fire frequency (2-5 years), the second sketch medium frequency (3-7 years), third sketch shows a 9-10 year burn frequency, and bottom sketch depicts infrequent fire (20 or more years).

Source: The Tallgrass Restoration Handbook, edited Stephen Packard and Cornelia F. Mutel. 1997 Society of Ecological Restoration. Reproduced by permission of Island Press, Washington, D.C.

Figure 3-7 The Prairie-Forest Continuum

Due to lack of grazing and suppression of fire, open grasslands have been succeeding to forest, to varying degrees, throughout the park. Although some of the ecological degradation will have lasting effects, there are many opportunities to forestall further decline and make substantial progress toward achieving a more sustainable and healthier landscape for the future.

Also important to note is the shape of the site and its impact on the changing systems. The site is relatively long and narrow, following the river but not extending too far into the upland. This shape inherently produces a lot of edge and not as much interior. Therefore, the interior that does occur should be protected as much as possible from being disrupted, fragmented, or bisected. Furthermore, since invasive plant species are able to invade edges easily, it is very important to closely monitor for new invasive species and eradicate them right away. Also, since whitetail deer prefer forest edge habitat, this site will make it difficult to control that species, which means that more resources will need to be devoted to this activity.

Many forests within the park have a near monotypic stand of wood nettle on the ground plain. This low diversity indicates impact from past grazing. Interestingly, buckthorn and honeysuckle have not invaded many areas.

In addition to the inventory mapping, some general characterizations are worth noting to greater define the existing ecological conditions of the site:

Primary Ecological Systems: Upland oak forest, oak woodland, savanna, and prairie are the dominant park ecological systems. In most of the park, native savanna areas have succeeded to oak woodland and mesic oak forest that are somewhat degraded.

Other general observations include:

- Remnant prairie/savanna species occur in the remaining oak openings along Schaar's bluff. Most are being crowded/shaded out by invasive honeysuckle and buckhorn.
- Restored prairies are relatively young and have low diversity compared to remnant, undisturbed prairies of the region.
- In most woodlands, herbaceous plant cover is sparse and diversity is low. Large monocultures of nettle occur in moist woodland areas. This may be due to a lack of fire disturbance and because of earthworms.

- There is very little garlic mustard invasion in the park (except along the regional trail). Common buckthorn and Tartarian honeysuckle invasion is significant in the western reaches of the park.
- Oaks are low in numbers throughout the park. This is likely due to extensive logging and oaks' inability to regenerate in the shade of other trees. Green ash is expected to become infected with emerald ash borer within the park. It can be expected that most of the green ash in the park will not survive through the next 10 years.
- Higher forest plant diversity occurs in the ravines, moist woodlands, and seepages that were less likely to have been grazed by cattle in the past.
- The regional trail disturbed a considerable amount of land and created a significant habitat divide through the center of the park.

Bur oaks emerging from a dense thicket of buckthorn near Cottonwood Point. This area was likely oak savanna 100 years ago.

Ecological Observations of the Western Section of the Park (Figure 3-8): A mix of mesic oak forest, restored prairies, and a minor component of oak savanna. This area was most likely dominated by oak savanna and prairie in pre-settlement times (see Figure 2-1 and Figure 2-2).

Most trees range from 80 to 100 years old and many have heart-rot. The poor condition of the trees is attributed to soil constraints (sandy with low fertility). Mid-story trees are between 35 and 45 years old, likely regenerating from a past period of intense grazing. The native groundcover systems (prairie and savanna) most likely collapsed due to shading and fire suppression. Invasive shrubs (honeysuckle and buckthorn) are common throughout. Stump sprouts from oaks near the Youth Lodge area indicate logging activity 75 or more years ago.

Other observations of the western section of the park include:

A. Large patches of prairie have been successfully restored on previously farmed land.

B. The most mature prairie restorations are located on the west side of the park near the day camp/youth lodge. These older prairies hold good plant diversity including cream gentian, meadow blazing star, leadplant, and white wild indigo.

C. One brome field still occurs in the west central section of the park.

D. Black walnut is reproducing and encroaching into grassland areas near the day camp and archery range. Black walnut is not native to the park. Sumac is becoming an issue in this area as well.

E. The far western woodland portions of the park are much degraded. Large mature buckthorn shades out ground plane species resulting in bare soil.

F. Some of the best bur oak stands occur just east of the camp sites. Recent efforts have been completed to help oak saplings establish (deer protection fencing).

G. The largest patch of garlic mustard in the park has established in the area of the campground.

H. Large red oak, basswood, hackberry, bitternut hickory, and maple trees grow on the slopes extending up from the lake. The 1937 aerial photographs show dense canopy in ravines and along these north-facing slopes. Honeysuckle and buckthorn are found throughout but generally comprise less than 20 percent of the understory.

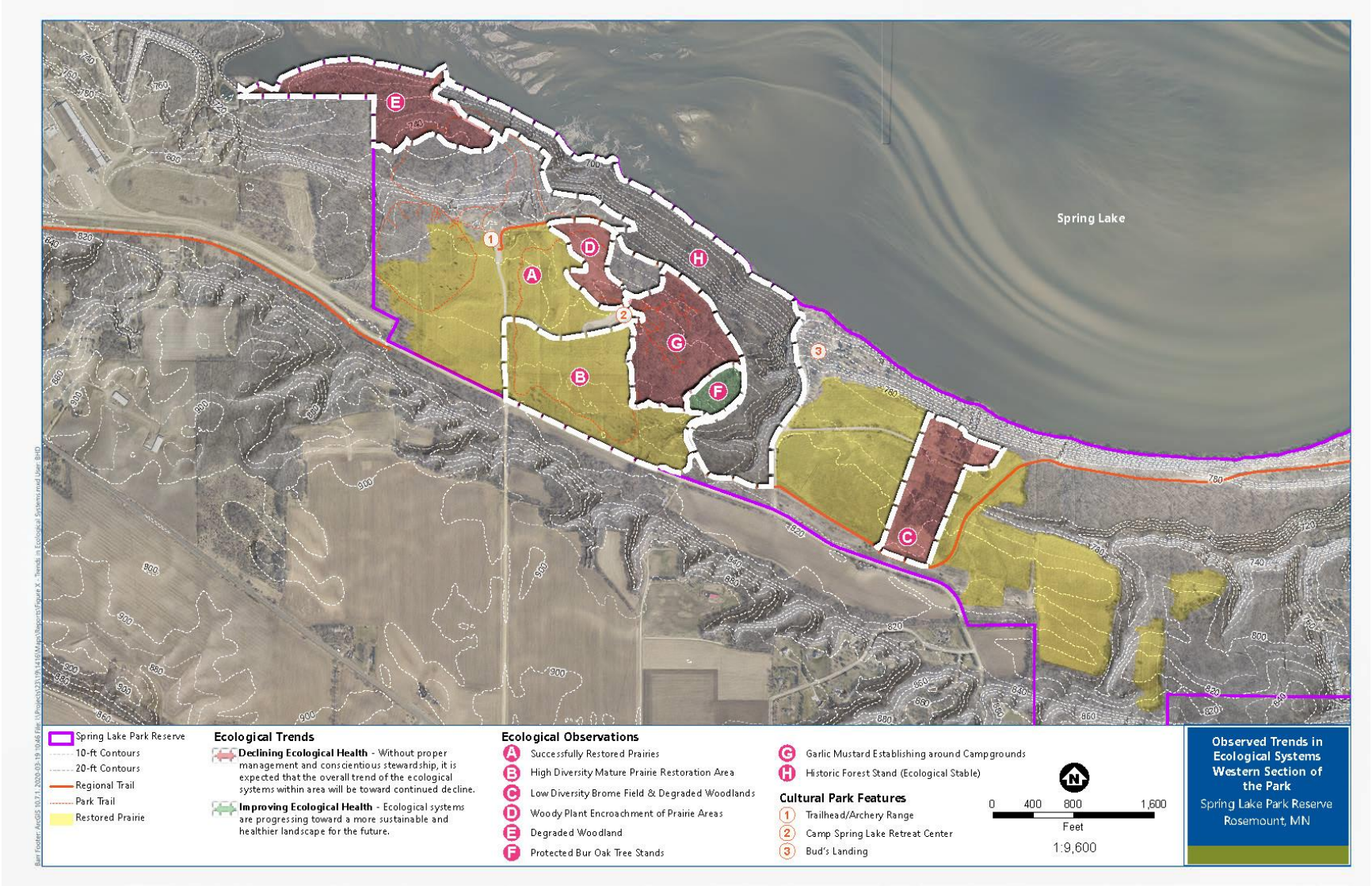


Figure 3-8 Ecological Observations of the Western Section of the Park

Ecological observations of the Central Ravine Area (Figure 3-9):

The bluff prairies and savannas identified in the 2003 Park Stewardship Plan are now overgrown with honeysuckle, buckthorn, and establishing trees. Native species are being lost; yet it is not too late for these communities to recover if properly managed. Stands of ironwood, above the large central ravine, and some nice oak stands just east of the park's central ravine identified in the 2003 plan were eliminated by the construction of the regional trail. Oak wilt was noted in some areas. Coring tests found that trees on the slopes range in age from 140–300 years, with more in the 180–300-year range. Coring also demonstrated four fire scars. Understory trees range in ages of 60–85 years, and honeysuckle was 40–55 years old; perhaps it began growing after cattle were taken off the land and grazing pressure ceased.

Sediment accumulation in the central ravine.

Other observations of the central ravine area include:

A. Two small oak openings near the south east portion of the central ravine have remnant dry prairie species. Anecdotally, these were habitat for kittentails but are being aggressively encroached upon by honeysuckle and red cedar.

B. Erosion is occurring in the central ravine where there is stormwater runoff from adjacent farmland. Some accumulation of sand and fine sediment is present in the bottom of the ravine.

C. The oak forests within and around the ravine are some of the best in the park with good diversity in both the canopy and ground plane. Canopy trees include ironwood, bitternut hickory, basswood, maple, hackberry, red oak, elm, and green ash. Blue cohosh, maidenhair fern, spotted touch-me-not, elderberry, and Virginia waterleaf are present throughout. Wood nettle is dense through the bottom of the ravine with little plant diversity due to sediment accumulation.

D. A beautiful black ash seepage plant community and wet meadow occur from just south of the regional trail bridge to the mouth of the ravine where it meets Spring Lake.

E. The regional trail was cut through the bluff face just north of the central ravine bridge. This stark, newly created bluff face has no vegetation. Nor can vegetation establish at the base of the cut.

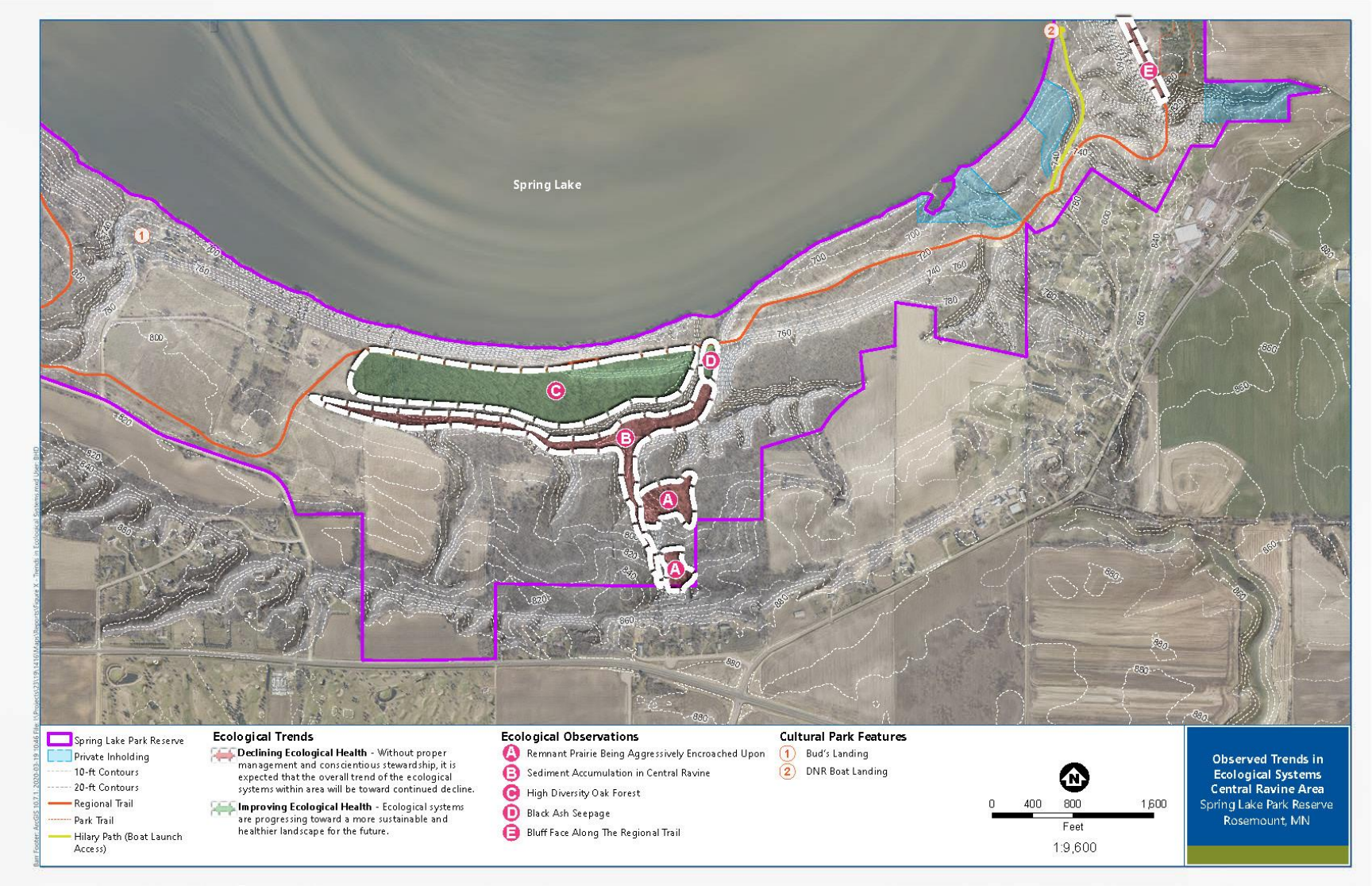


Figure 3-9 Ecological Observations of the Central Ravine Area

Ecological Observations of the Eastern Section of the Park (Figure 3-10): At the time of the 2003 Park Stewardship Plan, the west face of Schaar's bluff had high-quality oak savanna with red cedar. Today, the area is thickly overgrown, and the diversity of herbaceous species is rapidly declining. Restoring these savannas should be a high restoration priority for the park. County staff has begun some restoration work here. Tree ages around Schaar's bluff were estimated to be between 145 and 300 years, with most between 160 and 185 years. The oldest trees are bur oaks and generally are found on rocky or steep soils on the western side of the bluff.

Initial oak savanna restoration on Schaar's bluff is releasing native species that have been suppressed by shade from encroaching shrubs.

Other observations of the eastern section of the park include:

A. A high-quality, mixed deciduous forest exists on the northern slopes of Schaar's bluff extending south towards the DNR boat launch. Ranging further east, the western arm of Church's Woods has some of the best diversity of woodland plants in the park including Canada yews along the top of the bluff.

B. The far eastern portion of Church's Woods is completely degraded with low diversity, probably due to grazing and logging. Large areas of bare soil have formed where earthworms occur.

C. The large brome field east of the main park entrance demonstrates the effects of past agriculture, compaction, invasive species encroachment, and lack of management. This is a prime site for prairie restoration.

D. Hilary Path is extremely eroded on the slopes leading down to the DNR boat launch. Water is deeply cutting the side of the road, and sediment is accumulating in the riparian forest at the bottom of the hill.

E. A pine plantation is located just south of the park maintenance facility. Pines have not been properly thinned, and there is very little groundcover. Buckthorn and other invasive species make up the majority of understory and mid-story species within these plantations.

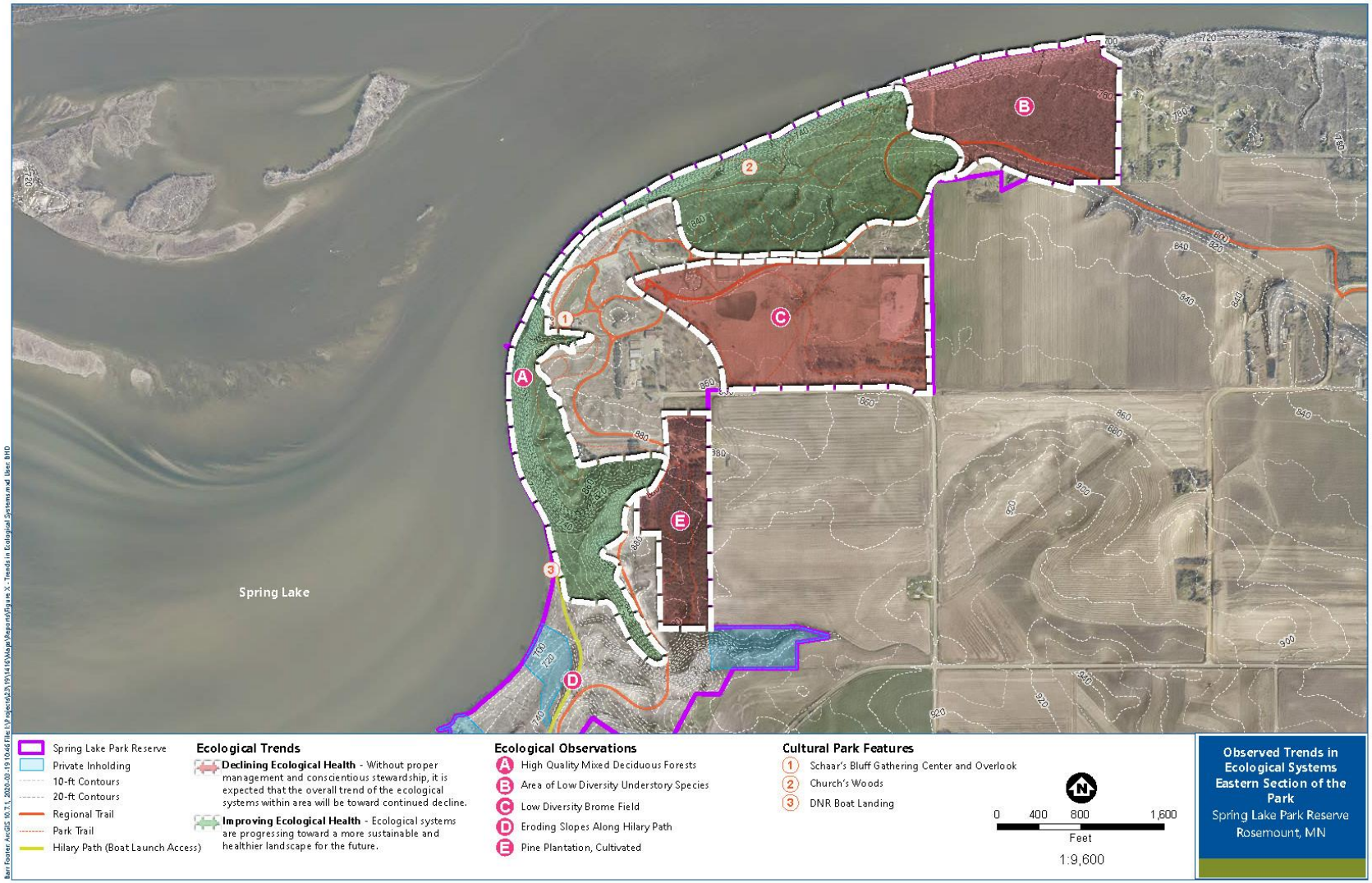


Figure 3-10 Ecological Observations of the Eastern Section of the Park

3.4 Wildlife

Historic Wildlife

Prior to European settlement, Spring Lake was not connected to the Mississippi River waterway, as it is at the present day. The spring-fed lake was comprised of marsh and shallow water habitat, which provided foraging and nesting areas for a large variety of shorebirds including sandpipers and yellowlegs. In addition, the area provided ample waterfowl habitat for a number of local breeding waterfowl species including blue-winged teal and lesser scaup. As part of the Mississippi Flyway, migratory waterfowl utilized the area during migration extensively for feeding and resting. A variety of amphibians, reptiles, mollusks, and fish were found in abundance throughout the area. Although wildlife still use this area today, the species would have been different in the past, and the abundance and diversity of species would have been greater in the past.

The upland habitat within Dakota County was historically oak savanna and mesic prairie. These habitats were once rich with elk, bison, bear, and, to a lesser extent, whitetail deer. Small mammal species such as beavers, otters, muskrats, fishers, and mink were abundant throughout the region. Predatory species such as wolf and mountain lion existed in healthy populations throughout the county in the 18th and 19th centuries. The prairies and savannas were filled with a diverse array of bird species including red-headed woodpeckers, bobolinks, loggerhead shrike, and lark sparrows. Snakes would have been abundant within the prairie including the now state-threatened timber rattlesnake.

Populations of many species declined with the onset of European settlement. Fur markets were a driving factor in the decline in furbearer populations. Species such as beaver, mink, otter, and muskrat decreased markedly. The decline in large ungulates was due in large part to market hunting in the 19th century and included elk and bison, extirpating them from the landscape.

European settlement fragmented the once complex and diverse habitat within the county. Fire suppression facilitated encroachment of trees and allowed savanna and prairie habitats to become forested. Wetlands were drained or tiled and used for agriculture. Additionally, some areas were converted to industrial, housing, and other urban uses. Much of the remnant prairies and savannas were converted to agriculture. The creation of Lock and Dam 2 elevated water levels in Spring Lake, causing it to be connected to the Mississippi River. This caused a loss in the shallow water habitat available, seriously effecting animal and insect species of the area.

Wildlife Today

The diversity and health of current wildlife populations found in the park are directly related to the quality and connectedness of the habitat within and outside of the park. The diminishing quality of the plant habitats in the park is discussed in detail above. Connectedness refers to the degree to which a habitat 'patch' (sometimes called an island—the park, in this instance) is isolated from other habitats by developed lands. Landscape Ecologists describe habitat connectedness as the relationship between patches and corridors. The park has two habitat advantages: first, it is a

large patch (about 1,100 acres); and second, it is connected with other patches by the forests and marshes along the Mississippi River. Beyond its southern boundary, however, the park 'patch' is separated from other habitats by agricultural fields and industrial land where many species including plants cannot exist or move across. Regardless of the quality of habitats in the park, they will only be able to support species to the extent that plants and animals can move in and out of the park.

Only general wildlife information is available for the park, since few wildlife surveys have been conducted to document wildlife species. Further study is recommended to fully understand the status of wildlife species in the park.

Birds

SLPR provides feeding and nesting habitat to a great diversity of birds. Many migratory birds utilize Spring Lake as a stopover for feeding and resting including common loons, egrets, ducks, geese, swans, grebes, gulls, terns, and pelicans. The prairie and forest of the park are home to a variety of migratory bird species including passerines (perching birds), raptors, and owls. In 2018–2019, 47 avian species were counted in the annual breeding bird count conducted by County Staff. Eleven species of warblers were identified utilizing the park (2019 Minnesota Breeding Bird Atlas). Warblers such as the ovenbird, American redstart, and common yellowthroat nest within the deciduous forests. Some of the birds found in the park are identified in the 2015–2025 MN DNR, *Minnesota Wildlife Action Plan; Species of Greatest Conservation Need* (SGCN) including Dickcissel, field sparrow, lark sparrow, grasshopper sparrow, eastern towhee, and brown thrasher.

Pelicans on Spring Lake

The park provides habitat for owls such as the northern saw-whet owl, great horned owl, and the long-eared owl which utilize the deciduous forest habitats for cover and the open grassland habitat for hunting. Red-tailed hawks within the park can be seen hunting the open prairie habitats or using the thermals produced from the bluffs for soaring. Eagles, vultures, and other buteos (soaring birds) also utilize these thermals. Additional unique bird species found in SLPR include red-headed woodpecker and loggerhead shrike (state-listed special concern); both species are listed under the SGCN, and their populations are likely to decline due to habitat loss and fragmentation. These species rely on healthy habitats including open savanna, forest, and grassland habitats.

Grassland birds have been in decline in Minnesota, and for many species the decline has been quite steep. Some populations, like the loggerhead shrike, have declined over 50 percent in the last 50 years. With the restoration of over 200 acres of prairie in the park, renewed opportunities for nesting have been provided for species like dickcissel, grasshopper sparrow, lark sparrow, and field sparrow. Habitat for these species could be expanded in the park with the further restoration of prairie and the expansion of oak savanna.

> SLPR has been designated as part of the Audubon Mississippi River Twin Cities Important Bird Area that includes the Mississippi River and its adjacent floodplain forest and uplands extending 38 river miles through four Minnesota counties from Minneapolis to Hastings. The Audubon Important Bird Area program helps Audubon, its partners, and landowners identify and protect natural areas and landscapes that are critical to maintaining bird populations, diversity, and habitat

Mammals

Several bat species including northern long-eared bat (NLEB), tri-colored bat, big brown bat, little brown bat, evening bat, silver-haired bat, hoary bat, and red bat have recently been reported in Dakota County. In the park, a number of these species utilize the limestone bluffs and roost within the forested areas of the park. It is possible that hibernacula exist within the crevices and caves within SLPR, specifically cave dwelling bats including the NLEB. According to calling surveys conducted by park staff in 2017, an abundance of NLEB calls were detected within the park. Further surveys could be conducted to document trends in local populations and measures taken to accommodate these species if possible. Suitability of hibernacula and habitat quality could be a focus, as well as any effects that white-nose syndrome might have on cave dwelling bats within the park. This could be an important focus for wildlife management in the park since many species of bat are in drastic decline in Minnesota.

Today a variety of four-legged mammals continue to utilize the park. SLPR provides suitable habitat within the forest, prairie, and savanna habitats for small mammals including pocket gophers, ground squirrels, shrews, voles, and mice which are prey for raptors and larger furbearers. Local prey abundance near suitable resting/denning sites is favorable for furbearers including fisher and badger. Fishers are indicators of quality habitat and have been identified through trail camera surveys within the park. They use structurally complex forest habitats with mature forest features, some of which are provided within SLPR.

A list of species captured on trail cameras in the park include:

Table 3-1 Species Captured on Trail Cameras

Taxa	Common Name	Scientific Name
Mammal	American Badger	*Taxidea taxus*
Mammal	American Red Squirrel	*Tamiasciurus hudsonicus*
Mammal	Coyote	*Canis latrans*
Mammal	Domestic Cat	*Felis catus*
Mammal	Domestic Dog	*Canis lupus familiaris*
Mammal	Eastern Cottontail	*Sylvilagus floridanus*
Mammal	Eastern Grey Squirrel	*Sciurus carolinensis*
Mammal	Fisher	*Martes pennanti*
Mammal	Fox Squirrel	*Sciurus niger*
Mammal	Mouse	*Peromyscus spp.*
Mammal	Raccoon	*Procyon lotor*
Mammal	Red Fox	*Vulpes vulpes*
Mammal	Virginia Opossum	*Didelphis virginiana*
Mammal	White Tailed Deer	*Odocoileus virginianus*
Birds	American Robin	*Turdus migratorius*
Birds	Blue Jay	*Cyanocitta cristata*
Birds	Dark-Eyed Junco	*Junco hyemalis*
Birds	Downy Woodpecker	*Picoides pubescens*
Birds	European Starling	*Sturnus vulgaris*
Birds	Great Horned Owl	*Bubo virginianus*
Birds	Wild Turkey	*Meleagris gall*

Deer populations within the park fluctuate and are influenced by the deer population in the adjacent lands surrounding the park. When the populations are elevated within the park, and/or there is potential for increased immigration from the population outside of the park, park managers authorize annual hunting to control the deer population. Keeping deer populations under control allows for the regeneration of vegetation in the park and ensures that habitat is provided for many other species.

Other methods of deer control should also be considered, such as protecting seedlings with tree protectors, placing paper caps on the buds of desirable trees, applying chemical deterrents to new plantings, and installing exclusion fencing around protection zones. Some of these methods will also help reduce herbivory by other animals such as rabbits and mice. Since deer prefer landscapes that have an abundance of "edge", sharp boundaries between vegetation cover types, for example between forest and meadow/grassland, will reduce edge effects and thus lower the habitat's attractiveness to deer. "Softening" edges, by removing trees and shrubs on the forest-sides of sharp boundaries and by planting a few trees and shrubs on the grassland/meadow-sides of sharp boundaries, will help to reduce edge effects. In addition, increasing the size and amount of core habitat, such as interior forest or prairie/savanna, should also help to deter deer.

Amphibians and Reptiles

Reptiles and amphibians can be found in the park. Snakes include fox, red belly, and garter snakes. Race runners have been found near the park. A few frogs and toads exist in the park, but the lack of ephemeral ponds limit their populations. A northern cricket frog has been seen near Hastings in the wetlands along the river. They may also exist in SLPR but have not been documented. Painted turtles have been documented adjacent the park; however, the park is lacking sufficient clear water streams and open water to provide habitat for a variety of turtles.

Insects

The restoration of prairie within the park has provided suitable habitat for a variety of insects, especially pollinators. Pollinator populations have been on a decline, some quite severely such as Rusty-patched bumblebee which have declined by 90 percent over the last 20 years, due to habitat loss and agricultural pesticide use. This is deeply concerning, ecologically, and demonstrates the urgent need to protect and expand prairie. Prairies within SLPR have the potential to provide suitable habitat for the rusty patched bumblebee (Federally Endangered). The site is located within the federally designated Primary Dispersal Zone, which is an area identified as important areas for conservation. Monarch butterflies are located within the prairie and forest edges of the park. Monarch populations have declined and the butterfly is under consideration for listing as threatened by the USFWS for 2020. The species relies on milkweed which can be found throughout the parks open areas. Additional prairie restoration and maintenance is needed to enrich pollinator diversity. For instance, planting prairie violets could enhance habitat to make them suitable for the Regal Fritillary butterfly.

Bison

Bison do not currently exist in the park but roamed through the region through the beginning of European settlement. Bison grazing in natural patterns, like fire, is an important ecological process that has been eliminated in the park. Disturbance through the random patterns of bison mob grazing increases native plant diversity and prevents savannas from closing in to become forests. The key to improving habitat is to provide a shifting mosaic of habitat patches that helps ensure that all potential grassland habitat types are always available somewhere in a prairie for the animals that need them. The basic approach is to split a prairie into management units (habitat patches) and then manage them so that each contributes toward a broad spectrum of vegetation structure types -- very short in some patches, very tall/dense in others, and mixed height/density in the rest. Then, you can just change the location of each of those habitat types, year to year. This can be done by using the technique called "patch-burn grazing" by alternating prescribed burning and grazing across the landscape in patches and resting the land in between.

At the time of writing this document, the bison reintroduction project has advanced to the point of producing a schematic design for the bison range that was approved by the Board (Meeting 11/17/20). The cost estimate for this project is approximately $1.2 million, of which the majority of the funding is from external grants with approximately $160,000 local match provided by the County. Figure 3-11 is a map of the schematic design that shows the extent of the bison grazing range within the park, as well as other infrastructure elements. The pink areas, on the map, are paddocks, or management units (habitat patches). Paddocks are enclosed by permanent fencing (woven fence at approximately a 7' height) with the ability to further delimit the bison's grazing in specific areas, utilizing temporary fencing. Fencing will not go all the way to the ground, but will be approximately 6" above the ground near high use visitor areas and 12" above the ground in other areas, to allow for the movement of small animals while containing bison and discouraging human entry. Larger animals will have to go around the fence. There is also an area for a handling facility, and there are gates and water sources identified. The Mississippi River Greenway will stay in its present alignment, but the design of the range will still be functionally effective, as it wraps around existing infrastructure. A future Interpretive Center and Viewing Platform are also identified. Prior to the release of bison into the Park Reserve, staff will develop operational documents, including the following: Bison Operational Plan, Bison Escape Plan, and Bison Range Management Plan. Reintroducing bison to SLPR will require additional staff resources to manage the bison and the range in which they will live.

Rare Wildlife Species

The 2015-2025 MN DNR Minnesota Wildlife Action Plan emphasizes wildlife species of greatest conservation need (SGCN). These species, habitats or populations are at risk of declining within a significant portion of their range. The habitats associated with these at-risk species are typically rare or declining due to trends in land use, such as farming and development. SGCN can also include those species whose populations are stable within Minnesota but are declining is a significant portion of their range outside of the state.

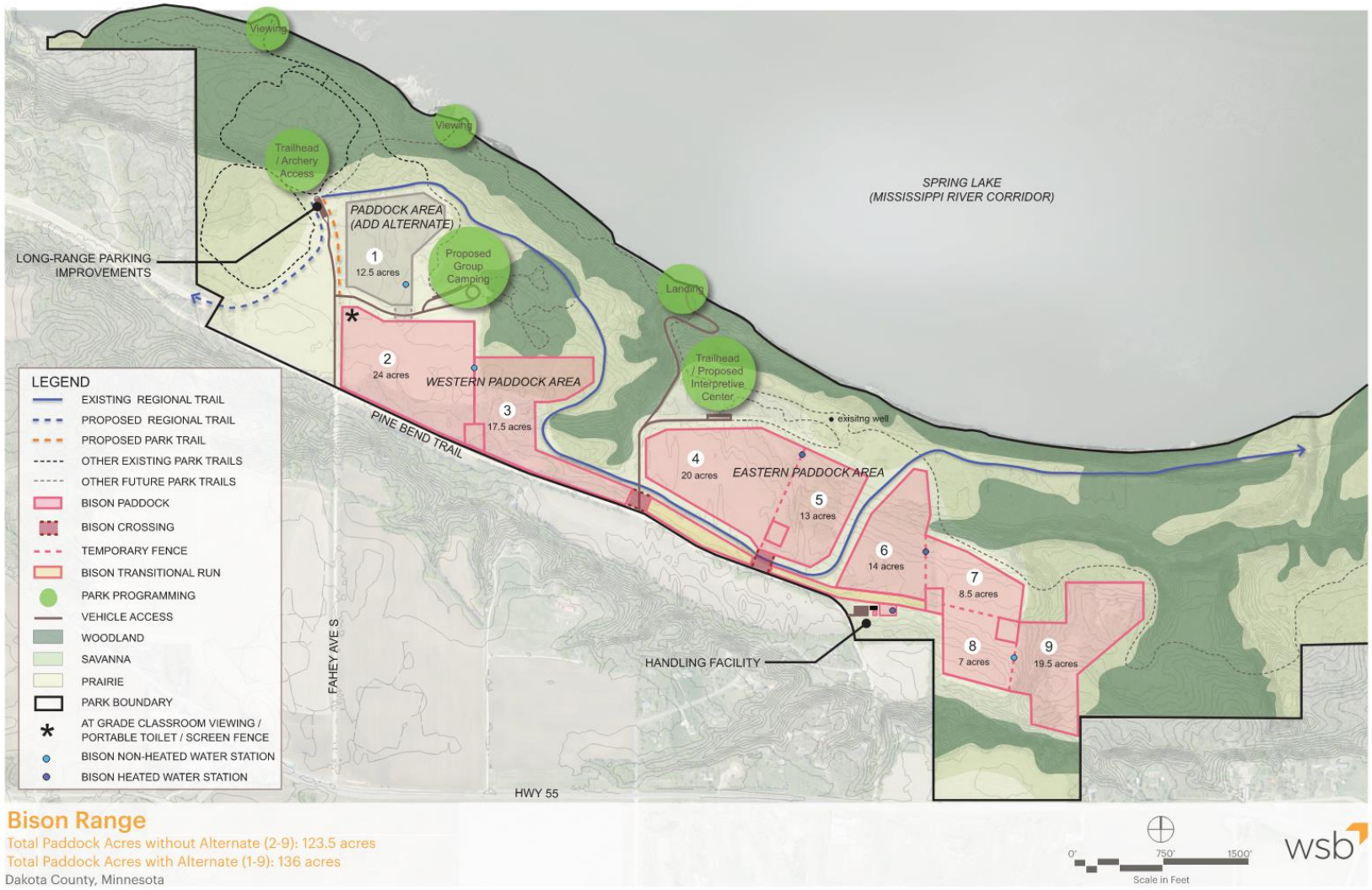


Figure 3-11 County Board-Approved Schematic Design of Bison Range

Information from eBird, Minnesota Breeding Bird Atlas, Dakota County Parks Staff, National Parks Service and the MN DNR natural heritage database was used to compile the list of species (Table 3-2) of SGCN observed within Spring Lake Park Reserve.

Today, much of the parks agricultural areas have been restored to prairie and savanna habitat. Habitat outside of the park is mainly developed or farmed with the exception of the Spring Lake Islands WMA which is a series of islands located immediately north of SLPR.

The wildlife composition of the park has degraded along with habitat quality within the park but has also degraded because of adjacent land use changes with regional destruction of habitat. The incredible value of the park is its position along Spring Lake and within the Mississippi National Flyway. A great diversity of waterfowl feed in Spring Lake and beautiful passerines such as the warblers feed in the prairies and forests of the park as they migrate. Some stay in the park to nest. Mammals, reptiles, amphibians and insects also abound in the park even though their numbers and diversity have dwindled since the time of settlement. Of note are recent sightings of Fishers in the park that may have taken up residence. This

NRMP will focus on the further enhancement of habitats in the park. Preliminary public surveys show that natural habitat is a primary value of this well situated park.

There are a variety of mammals that continue to utilize the park. As mentioned previously, several bat species have been reported in Dakota County in recent years. Some of these species utilize the limestone bluffs and roost in habitat within the forested areas of the park. Whitetail deer populations bounced back with the game regulations set forth during the 1930's. Whitetail deer populations within the park fluctuate and are influenced by the population in the adjacent lands surrounding the park. Agriculture outside the park can provide a food source for deer. SLPR authorizes annual hunting seasons to control the deer population. Currently, deer populations within the park are adequate and the annual special hunt did not commence in 2019, and was cancelled due to the pandemic in 2020, but will most likely start up again in years ahead.

SLPR is located within a major migratory pathway and is visited by a number of avian species. SLPR is part of the Mississippi River Twin Cities Important Bird Area (IBA). The IBA is located within the Mississippi Flyway which accounts for 40% of North America's water bird and shorebird population. Upland portions of the park are home to a variety of bird species including some identified in the 2015-2025 Minnesota Wildlife Action Plan, Species of Greatest Conservation Need (SGCN); listed in Table 3-2. Birds surveyed within the park during the 2018 breeding bird survey are provided in the table below (Table 3-3).

Table 3-2 Species of Greatest Conservation Need determined from information provided for wildlife surveys within SLPR (2016 – 2019).

Taxa	Scientific Name	Common Name	State Status	Federal Status
Birds	*Ammodramus leconteii*	LeConte's Sparrow	NL	
Birds	*Ammodramus savannarum*	Grasshopper Sparrow	NL	
Birds	*Chondestes grammacus*	Lark Sparrow	SPC	
Birds	*Coccyzus americanus*	Yellow-billed Cuckoo	NL	
Birds	*Empidonax virescens*	Acadian Flycatcher	SPC	
Birds	*Falco sparverius*	American Kestrel	NL	
Birds	*Hylocichla mustelina*	Wood Thrush	NL	
Birds	*Lanius ludovicianus*	Loggerhead Shrike	END	
Birds	*Melanerpes erythrocephalus*	Red-headed Woodpecker	NL	
Birds	*Pipilo erythrophthalmus*	Eastern Towhee	NL	
Birds	*Setophaga citrina*	Hooded Warbler	SPC	
Birds	*Setophaga tigrina*	Cape May Warbler	NL	
Birds	*Spiza americana*	Dickcissel	NL	
Birds	*Spizella pusilla*	Field Sparrow	NL	
Birds	*Toxostoma rufum*	Brown Thrasher	NL	
Mammal	*Taxidea taxus*	American Badger	NL	
Mammal	*Eptesicus fuscus*	Big Brown Bat	SPC	
Mammal	*Lasiurus borealis*	Red Bat	NL	
Mammal	*Lasiurus cinereus*	Hoary Bat	NL	
Mammal	*Lasionycteris noctivagans*	Silver-haired Bat	NL	
Mammal	*Myotis lucifugus*	Little Brown Bat	SPC	
Mammal	*Myotis septentrionalis*	Northern Long-eared Bat	SPC	THR
Mammal	*Perimyotis subflavus*	Tri-colored Bat	SPC	

Taxa	Scientific Name	Common Name	State Status	Federal Status
Insect	*Danaus plexippus*	Monarch	NL	
Insect	*Bombus affinis*	Rusty Patched Bumble Bee	NL	END
Insect	*Bombus terricola*	Yellowbanded Bumble Bee	NL	
Insect	*Bombus fervidus*	Yellow Bumble Bee	NL	

Table 3-3 2018 Bird Species List from the annual breeding bird survey.

Taxa	Scientific Name	Common Name
Birds	*Corvus brachyrhynchos*	American Crow
Birds	*Spinus tristis*	American Goldfinch
Birds	*Septophaga ruticilla*	American Redstart
Birds	*Turdus migratorius*	American Robin
Birds	*Haliaeetus leucocephalus*	Bald Eagle
Birds	*Icterus galbula*	Baltimore Oriole
Birds	*Hirundo rustica*	Barn Swallow
Birds	*Poecile atricapilus*	Black-capped Chickadee
Birds	*Cyanocitta cristata*	Blue Jay
Birds	*Polioptila caerulea*	Blue-gray Gnatcatcher
Birds	*Toxostoma rufum*	Brown Thrasher
Birds	*Molothrus ater*	Brown-headed Cowbird
Birds	*Bombycilla cedrorum*	Cedar Waxwing
Birds	*Spizzela passerina*	Chipping Sparrow
Birds	*Spizzela pallida*	Clay-colored Sparrow
Birds	*Geothylpis trichas*	Common Yellowthroat

Taxa	Scientific Name	Common Name
Birds	*Accipiter cooperi*	Copper's Hawk
Birds	*Spiza americana*	Dickcissel
Birds	*Picoides pubescens*	Downy Woodpecker
Birds	*Sialis sialis*	Eastern Bluebird
Birds	*Tyrannus tyrannus*	Eastern Kingbird
Birds	*Sayornis phoebe*	Eastern Phoebe
Birds	*Pipilo erythrophthalmus*	Eastern Towhee
Birds	*Contopus virens*	Eastern Wood Pewee
Birds	*Spizella pusilla*	Field Sparrow
Birds	*Ammodramus savannarum*	Grasshopper Sparrow
Birds	*Dumetella carolinensis*	Gray Catbird
Birds	*Myiarchus crinitus*	Great-crested Flycatcher
Birds	*Troglodytes aedon*	House Wren
Birds	*Passerina cyanea*	Indigo Bunting
Birds	*Charadrius vociferus*	Killdeer
Birds	*Zenaida macroura*	Mourning Dove
Birds	*Cardinalis cardinalis*	Northern cardinal
Birds	*Chondestes grammacus*	Lark Sparrow
Birds	*Colaptes auratus*	Northern Flicker
Birds	*Icterus spurius*	Orchard Oriole
Birds	*Seiurus aurocapilla*	Ovenbird
Birds	*Dryocopus pileatus*	Pileated Woodpecker
Birds	*Melanerpes carolinus*	Red-bellied Woodpecker
Birds	*Vireo olivaceus*	Red-eyed Vireo

Taxa	Scientific Name	Common Name
Birds	*Phasianus colchicus*	Ring-necked Pheasant
Birds	*Pheucticus ludovicianus*	Rose-breasted Grosbeak
Birds	*Piranga olivacea*	Scarlet Tanager
Birds	*Melospiza melodia*	Song Sparrow
Birds	*Vireo gilvus*	Warbling vireo
Birds	*Meleagris gallopavo*	Wild Turkey
Birds	*Setophaga petechia*	Yellow Warbler

Habitats in the park have expanded since the 2003 Stewardship Plan with the restoration of prairie. Other habitats have degraded due to a lack of fire and the encroachment of invasive species. Undisturbed habitat is critical for many species. Limiting development in the central portion of the park and continuing its designation as "Preserve", as indicated in the 2003 Stewardship Plan, would go a long way to protect existing habitats in the park. Other habitats could be enhanced through restoration to bolster their ability to host wildlife species. See Section 6 below for recommendations for habitat restoration.

Literature Cited:

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State of Minnesota, Department of Natural Resources, 2019. Natural Heritage Information System (NHIS), accessed October 2019.

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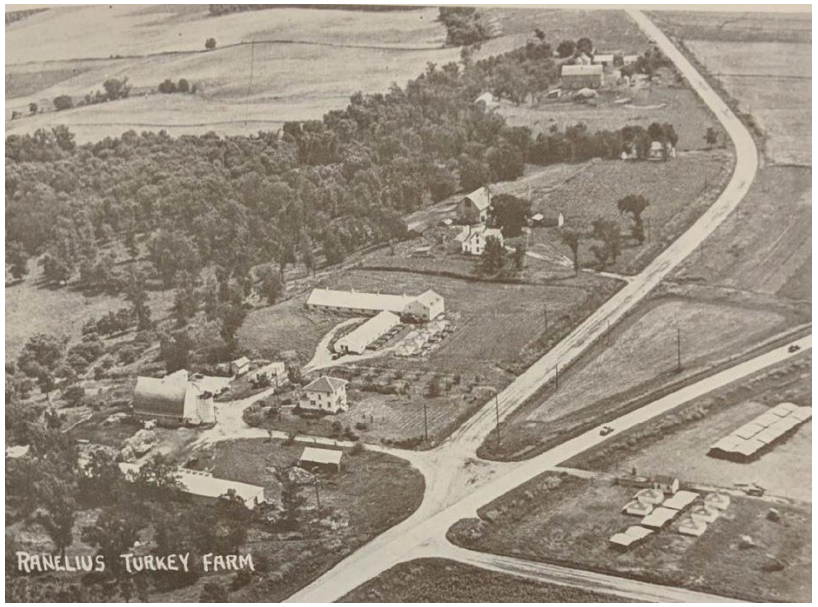
2019 Minnesota Breeding Bird Atlas, accessed November 2019.

4 Natural Resources Issues and Opportunities/Recommendations

Ecological degradation in SLPR has been addressed through past efforts such as land purchase, dump clean-up, erosion control, and prairie establishment. This positive momentum can continue as further impacts to the park are addressed. Issues of concern and the opportunities for improvement are discussed below.

4.1 History of Post-Settlement Human Disturbance

Peoples' disturbance of the land, such as through lumbering and plowing, has led to the elimination and curtailment of key ecological processes which has greatly altered the park's natural features. Tilling and intensive cattle grazing eliminates native plants and disturbs soil profiles, which reduces soil organic matter content and destroys essential soil microbes and the soil food web. This situation leads to a significant reduction of soil quality and makes soil vulnerable to erosion. In addition, today, a lack of *natural* native plant community disturbance, particularly a lack of fire and native ungulate grazing, has prohibited recruitment of species and, altered species interactions, truncated nutrient cycling, and stunted typical regeneration patterns of biotic communities. The fire-dependent plant communities of the park that are currently not intentionally managed by fire and grazing (or other means such as haying and mowing), have diminished to mere vestiges of native forest, woodland, and savanna, while populations of invasive plant species have become established and continue to rise.



Ranelius Turkey Farm, date unknown. Source: Guelcher, The History of Nininger

Opportunities/Recommendations:

- Continue restoring native plant communities, especially oak savanna and forests. by:
    - Allocating funds for restoration projects.
    - Using fire as a management tool in fire-dependent communities.
    - Introducing native grazing animals, such as bison, where appropriate.
    - Mimicking fire and/or grazing with mowing, haying, or other techniques, when fire and/or grazing cannot be used in fire-dependent communities.
    - Controlling exotic species, such as European buckthorn and Tartarian honeysuckle.
    - Re-introducing a diversity of native plants.
    - Educating park users about past and current impacts to the native ecosystem and the efforts Dakota Parks are taking to reverse degradation.
- Control invasive species, using best practices and the latest science. Diligently watch for new invasive species to avoid their encroachment.
- Minimize ecological disturbance when constructing new trails and other park development through the thoughtful placing and alignment of these elements within the landscape setting.

4.2 Habitat Fragmentation and Loss in Variation within the Ecosystem of the Park

Habitat fragmentation is that process that cuts habitats into smaller pieces of land that get isolated from each other. Each of these pieces constitutes a habitat by itself, but they no longer interact with each other like they did when they were all part of the same ecosystem. Within SLPR, the elimination of development within private inholdings (e.g., housing, roads) in the park in recent years has greatly contributed to joining separate pieces of habitat. Purchasing inholdings has made great strides in allowing park habitats to merge within park borders.

The construction of the Mississippi River Green Way (MRG) through the middle of the park has resulted in the separation of habitats above and below the trail. Given the long, linear shape of the park, this disturbance in the middle of the site is even more impactful because it interrupts interior forest and creates more edge in an already edge-heavy site. Although ecologically very disruptive, recreationally, the trail is an essential connection within this regional trail. Based on the due diligence, the multi-purpose trail is consistent with an approved master plan and an informed County Board-selected alignment, accommodates park access to people of all abilities, and serves diverse and year-round recreation

opportunities. As with any trail of such size, plant and animal species, especially very small ones, can have difficulty and sometimes even be unable to traverse this pavement, resulting in their inability to expand territories or colonize new ground.

Habitat fragmentation in the park is also occurring due to large colonies of invasive species such as common buckthorn and Tartarian honeysuckle. An example is the very western corner of the park along the river where buckthorn dominates and displaces native plant habitat.

Mississippi River Green Way with restoration of sides slopes in-process.

Opportunities/Recommendations:

- Recognize that cultural and natural resources are inseparably intertwined and intentional changes to either one affects both.
- Continue purchasing inholdings and expand park boundaries as feasible (described in the SLPR Master Plan).
- Continue restoring habitats that were impacted by farming or development, until all are restored.
- Carefully design new park development to retain and maximize biotic community connectedness.
- Continue the restoration and management of disturbed land along the MRGW. Be especially vigilant of invasive plant species control as the trail corridor is a primary entry point for many invasive species.

4.3 Loss or Curtailment of Ecological Services in the Region

The ecological functioning of the park occurs within a greater ecological context and ecosystem of the county and beyond. Its wildlife, plant communities, air and water quality, and climate all influence and are highly influenced by the greater system. The influence of immediate agricultural and industrial neighbors, as well as influences from regional habitat destruction, air pollution, and urbanization even from distant locales, limits the ecological possibilities of the park. Examples include the heavy sediment loads flowing down the Mississippi River that cloud the water in Spring Lake which prevents much aquatic vegetation growth and diminishes fish and waterfowl habitat. The degradation and elimination of many forests and savannas throughout the Mississippi flyway has negatively impacted feeding habitat for migrating songbirds, thus reducing the number and species of birds reaching the park. Farming adjacent to the park has eliminated a significant local native plant propagule source for the park, as well as reduced the greater area of wildlife habitat. Furthermore, there is the great threat of climate change, discussed below.

Opportunities/Recommendations:

- Investigate working with the US Army Corps of Engineers, MN DNR, and other agencies to improve the water quality of Spring Lake and to restore its aquatic vegetation.
- Continue working with adjacent landowners to help them improve their lands in ways that improve the ecological quality of the park, such as by controlling erosion and restoring native plant communities. Consider working with adjacent landowners who grow row crops to determine if they are interested in selling an agricultural (buffer) easement on their property to prevent erosion of

and next to the park or to perhaps restore the easement area to native vegetation if row crop agriculture is no longer of interest to the landowner (Land Conservation Plan of Dakota County).

- Continue restoring native plant communities and improving ecological conditions in the park so that the park is a positive example for neighbors and park visitors, which can benefit its local ecosystem's ecological context through leading by example.
- Reintroduce extirpated wildlife species when appropriate.
- Reach out to neighboring landowners to establish good relations; encourage them to restore native habitat on their property.
- Continue educating park visitors about the ecology of the park and teaching them the value of their own actions outside the park borders to positively influence the ecology of Dakota County and beyond.

4.4 Loss of key park ecological processes

Through the altering of the land to meet human needs, key ecological processes and elements have been eliminated with unintentional consequences. One is the elimination of wildfire, which is a key component of nutrient cycling and plant life cycles, that has resulted in the near elimination of oak savanna in the park and the extirpation of many plant and animal species. Also, past overhunting of large grazing animals, such as elk and bison, as well as habitat destruction throughout the region have resulted in the elimination of animal-mediated disturbances, such as seed movement and nutrient transport by these animals that has altered the composition and trajectory of native plant communities.

Controlled burns are a valuable tool in woodland and savanna management.

Opportunities/Recommendations:

- Reintroduce bison or other large grazing animals to the park.
- Increase the use of fire as a management tool especially in woodlands and savannas.
- Mow and hay prairie vegetation if fire is not an option.
- Determine what plants have been eliminated from the park and reintroduce them as habitats are developed.
- Stabilize ravines to prevent erosion of valuable topsoil.
- Investigate working with US Army Corps to perform periodic drawdowns of Spring Lake to help regenerate native wetland seedbanks and improve waterfowl habitat.
- Work with US Army Corps to build habitat islands in Spring Lake to help improve wildlife habitat.

4.5 Reduced Native Plant Diversity

For a large variety of reasons as described above, plant diversity in the park is diminished from historic levels and is on a trajectory to continue to diminish. Additional reasons include invasive species encroachment, ravine erosion, deer predation, lack of past natural resource management, nitrogen deposition, and climate change (described below).

Of particular note in SLPR is the lack of native oak tree regeneration and lack of herbaceous plant diversity in all forests of the park. Oaks were the dominant tree prior to European settlement and should have persisted. However, recent plant surveys have revealed that throughout the largest blocks of forest in the central and eastern park, red, white, and bur oaks have been nearly eliminated. Logging may have been the primary reason for their scarcity today, but an inability to regenerate in the absence of fire is another. Oak seedlings need light to survive, and thus oak forests rely on windstorms, disease, and occasional burning to open up the canopy to promote seedling germination and forest regeneration. Also, periodic fires would keep shrub growth in check, which would in turn allow much more light to reach the ground.

The forest floor of the park was once covered with a proliferation of beautiful wildflowers, ferns, and sedges. Today, much of the herbaceous cover and composition is limited. The synergy of four factors has contributed to this degradation and set the stage for invasion by exotic plant species : 1) introduction and establishment of exotic earthworms that voraciously eat the duff layer and change soil chemistry, structure, and mycorrhizal associations that most forest plants are dependent upon, 2) overabundant deer populations that browse relentlessly on native forbs and shrubs, 3) recent over-grazing by cattle, and 4) fire suppression in a fire-dependent plant community. Interestingly, in some areas, large monotypic stands of wood nettle are present, notably without the presence of Tartarian honeysuckle and buckthorn. Diverse herbaceous stands do occur in the park today, but they are located primarily on very steep slopes that would have been inaccessible to grazing cattle.

Land dominated by invasive plant species lose native plant diversity, such as in this dense stand of common buckthorn.

Opportunities/Recommendations:

- Minimize soil disturbance when developing the park and designing and installing trails. Soil protection and restoration should be part of any project that involves soil disturbance.
- Restore a variety of native habitats and shifting patchwork of refugia. Oak savanna was the dominant pre-settlement habitat of the park, yet today only a few acres exist. This and other habitats should be restored to increase landscape heterogeneity and ecosystem complexity.
- Continue to work with Agency partners and park neighbors to achieve the natural resources goals of the park and to support efforts in the surrounding ecoregion.
- Promote increased support of natural resources management in the park.
- Continue working with Dakota County Land Conservation group to purchase inholdings and any other adjacent properties from willing sellers or as identified in the approved master plan.
- Fund park natural resources management at a greater extent than currently funded to build on past prairie restoration successes.
- Reintroduce bison to the park.

- Use fire, according to the appropriate burn rotation, as a management tool, especially in woodlands and savannas.
- Monitor and aggressively control new invasive species. For example, oriental bittersweet is just establishing in the park; now is the time to get ahead of this newly introduced invasive species.
- Continue to and more aggressively manage long-established invasive species such as garlic mustard, common buckthorn, and Tartarian honeysuckle.
- Identify extirpated native plants and re-introduce them to increase species diversity and species interactions.
- Work with adjacent landowners to reduce stormwater runoff volumes coming off of their properties and entering the park.
- Stabilize eroding ravines.
- Continue managing whitetail deer populations to protect plant communities from over-browsing.
- Place a greater emphasis on research as part of the restoration process. Since the park has large areas to restore, it would be very valuable to compare different restoration methods and strategies in different areas, helping to inform the science for the County and for other practitioners.
- As much as practicable within the context of this being a park, avoid creating new turfgrass lawn areas and impermeable paved surfaces.

4.6 Invasive Species

An invasive species is a plant or animal that is not native to a region and has negative effects on its economy, environment, or human health. They are typically those aggressive, exotic plant species that grow and reproduce rapidly, often displacing native plants or animals. Invasive plants typically reduce wildlife habitat value significantly by eliminating or displacing native cover and food sources. When filling in previously disrupted areas, invasive plants often form single-species (monotypic) stands that can create barriers to peoples' movement, such as through dense or thorny growth. Many invasive plant species have colonized SLPR (see list below). Besides degrading wildlife habitat, invasive species can result in the erosion of topsoil that leads to the degradation of water quality.

Park staff have been working to control invasive plant species, especially common buckthorn, Tartarian honeysuckle, garlic mustard, and Japanese hedge parsley. These efforts would best be amplified since there is much more infested area than is currently being addressed.

Invasive plant species in the park include:

Upland: garlic mustard, black locust, Siberian elm, common buckthorn, Tartarian honeysuckle, oriental bittersweet, Amur maple, Norway maple, yellow and white sweet clover, Japanese hedge parsley, common burdock, wild parsnip, leafy spurge, spotted knapweed, Canada thistle, creeping Charlie, Japanese barberry, crown vetch, alfalfa, yellow rocket, orange hawkweed, and smooth brome.

Lowland and Lakeshore: narrowleaf cattail and reed canary grass.

Park managers should also be on the watch for invasive species on the MN DNR Early Detection Watch List. Early detection target species are non-native, invasive species with limited distribution in Minnesota that are assessed as high risk. These include black swallow-wort, British yellowhead, Dalmatian toadflax, giant hogweed, Grecian foxglove, tree of heaven, teasel, *Phragmites australis*, Japanese knotweed, Japanese hops, and multiflora rose—and this list is dynamic. As of summer 2019 these species were not observed in the park.

- **Opportunities/Recommendations:**
    - Further develop and follow through with a comprehensive invasive species management program.
    - Continue restoring native plant communities to restore native plant diversity and potentially out-compete some invasive plants.
    - Teach park users about the impacts of invasive plant species and show them how they can be identified and controlled such as by:
        - Cleaning shoes before walking through the park.
        - Cleaning watercraft before and after entering the lake.
        - Watching for invasive species in the park and notifying park staff of their appearance.
        - Reporting sightings via EdMaps

4.7 Ravine Erosion

The ravines of the park are in their essence evidence of past and present erosion. Their formation is the result of water moving from upland areas washing soil away to incise the ravines. There is a continual, natural rate of erosion inherent to all ravines. In SLPR, however, altered land use within the watershed and increased precipitation due to climate change is amplifying the volumes of water moving through the ravines, compared to historic levels. The most significant erosion is occurring along Hilary Path where construction of the road and elimination of natural vegetation has exacerbated the situation. There are also several points along the Mississippi River Greenway (MRG) that are significantly eroding.

Ravine erosion in SLPR

Opportunities/Recommendations:

- Implement existing plans developed to improve Hilary Path and to stabilize the erosion.
- Develop plans to stabilize all points of erosion along the MRG.
- Work with landowners within the watershed, especially those adjacent to the park, to reduce stormwater runoff.
- Restore vegetation within ravines after runoff reduction practices have been implemented within the watersheds above the park ravines.
- Monitor regularly to look for evidence of new or exacerbated erosion so that any new issues can be promptly addressed.

4.8 Deer Abundance

Deer overabundance is an issue throughout the region. Deer do significant damage by browsing newly establishing trees and wildflowers. They prevent forest trees from regenerating, the beauty of woodland wildflowers is lost. Deer impact is compounded by earthworm activity that limits vegetation regeneration in the park. Unfortunately, earthworm control methods do not exist, so it is important to keep deer populations low to prevent them from taxing an already weakened forest regeneration capacity. Park staff currently monitor deer populations and have implemented a bow hunt season to manage deer populations.

Other methods of deer control should also be considered, such as protecting seedlings with tree protectors, placing paper caps on the buds of desirable trees, applying chemical deterrents to new plantings, and installing exclusion fencing around protection zones. Some of these methods

will also help reduce herbivory by other animals such as rabbits and mice. Since deer prefer landscapes that have an abundance of "edge", sharp boundaries between vegetation cover types (e.g., between forest and meadow/grassland), "softening" edges, by removing trees and shrubs on the forest-sides of sharp boundaries and by planting a few trees and shrubs on the grassland/meadow-sides of sharp boundaries, will help to reduce edge effects and thus lower the habitat's attractiveness to deer. In addition, increasing the size and amount of core habitat, such as interior forest or prairie/savanna, should also help to deter deer.

Opportunities/Recommendations:

- Continue the existing deer monitoring and management program. Reduce deer population to no greater than 10 deer per square mile.
- Consider all options to control deer populations and impacts.
- Educate park users as to the natural role of this beautiful animal and how people can best nurture balanced populations of plants and animals.

4.9 Earthworms

Earthworms are an invasive species not native to the Midwest. They are degrading many forests in Minnesota including those in Spring Lake Park Reserve. Minnesota forests did not evolve in the presence of earthworms who rapidly consume the duff on the forest floor leaving it bare by mid-summer. This results in soil moisture and nutrient loss and prevents the reproduction of native tree and wildflower species that requires the protection of the duff to regenerate. Forests that have been taken over by earthworms lack wildflowers, ferns, and young native trees. Unfortunately, there are no effective earthworm management techniques.

Opportunities/Recommendations:

- Plant native forest species that are able to tolerate the presence of earthworms including Pennsylvania sedge, zig-zag goldenrod, columbine, and jack-in-the-pulpit.
- Plant native and near-native trees that are not reproducing naturally in the park.
- Educate park users about the impact of earthworms and how they affect Minnesota forests.
- Try to control deer populations to 10 deer per square mile.

4.10 Past Natural Resource Management

In the past twenty years, an exceptional effort has been put forth by the County to establish and maintain prairies in SLPR, which has resulted in most of the former farm fields re-establishing exceptional biodiversity and providing improved habitat for a wide variety of species. However, natural resources management has not been sufficiently funded in past decades for the remaining natural areas of the park, resulting in diminished biodiversity, increased erosion, and lost oak savannas. Forests, too, have received little attention, except for some limited buckthorn and honeysuckle removal efforts and, as a result, are experiencing significant encroachment of invasive species.

Opportunities/Recommendations:

- Sufficiently fund and implement this natural resources management plan.
- Partner with landowners of park inholding properties in a cooperative manner to achieve common natural resources goals.
- Recognize the need for large-scale ecosystem management to achieve site-specific goals.
- Educate park users, including the YMCA at the Youth Lodge, on the importance of natural resources management.
- Continue to organize volunteer events such as harvesting seed or removing invasive plants.

4.11 Climate Change

Climate change is impacting SLPR and will increasingly impact the area in the near future. In Minnesota, climate change is manifesting with warmer winters (especially increasing night-time lows), increasing precipitation and storm intensity (more heavy rains and fewer slow soaking events), and greater snow events. According to DNR State Climatologist Kenny Blumenfeld, increased summer day-time temperatures and increased occurrence of drought have not yet been experienced in Minnesota (although night-time lows have been increasing). These changes are, however, predicted to increase within the next 10– 20 years. Park users and managers can expect more heat and drought in the near future.

Climate change exacerbates the ecological issues discussed above in this section. As the region and the park experience greater swings in temperature and precipitation, insects, birds, trees, wildflowers, and soil microorganisms are forced to tolerate conditions beyond those through which they have evolved. As disease more readily occurs in stressed plants and animals, native plant species die out with invasive species taking their place, we lose our rich natural heritage. In addition, downed trees and erosion from severe storms increasingly is a concern.

The stewardship section of this plan puts forth a strategy and methods for protecting the natural resources of SLPR. As park users and managers, we must be alert to the changes occurring in this and all of Dakota County's natural areas.

Opportunities/Recommendations:

- Continue the monitoring program for plants and animals to track changes in populations and shifts in species. Appropriate measures can be taken as changes occur. Evaluate the monitoring program periodically for fit and efficiency along with staffing capacity.
- Increase plant and habitat diversity today. Increasing diversity establishes resilient plant communities because species are adapted to differing niches and will tolerate different stresses. For example, some prairie species can handle cool, wet conditions better

than hot, dry, whereas other species are the opposite. In a diverse ecosystem, they can alternate in dominance as environmental conditions shift. They go dormant when the conditions they prefer are not present.

- Revert select forests to savanna. Oak savannas are more resilient to heat, drought, and wind. Since oak savannas were the dominant plant community at SLPR prior to European settlement, it makes sense to prefer them at this site.
- Address ravines, since they will be experiencing larger, more intense storm events. Perhaps design systems that will store more water at the tops of ravines in order to reduce erosion.
- Teach park visitors about the impacts of climate change and instruct them on how they might be able to help through volunteer activities.

Oak savannas are resilient plant communities that can withstand extremes in wet and dry conditions. They must be burned regularly.

5 Vision & Goals

The **purpose** of protecting and restoring natural resources at Spring Lake Park Reserve is to:

- Allow people to experience the natural heritage of the area and improve their experience in the park
- Provide habitat for native plants, birds, insects, mammals, amphibians, and reptiles
- Demonstrate the native ecosystem regeneration process
- Foster and build a resilient, mature, and high-functioning ecosystem
- Collaborate and partner with adjacent landowners to achieve the best joint management of natural resources for the area
- Conserve wildlife species of Conservation Need (MNDNR designation)
- Mitigate impacts of climate change
- Achieve regionally outstanding ecological quality

This Spring Lake Park Reserve NRMP builds from:

Dakota County's Natural Resources Management Vision for the Park System

The water, vegetation, and wildlife of Dakota County parks, greenways, and easements will be managed to conserve biodiversity, restore native habitats, improve public benefits, and achieve resilience and regionally outstanding quality, now and for future generations.

5.1 Overall Park Natural Resources Management Goals

- Regenerate a landscape that contains a mosaic of upland plant communities across a continuum from oak forest to oak savanna to prairie
- Increase native plant diversity and reintroduce extirpated animal species
- Minimize the invasive species cover
- Prevent new non-native species encroachment

- Reduce the impact of people, for example, by maintaining and establishing new trails that allow them to explore the park without adverse impacts
- Reduce erosion and stabilize ravines
- Protect lake water and groundwater quality; establish a measure of success since the bulk of issues in the lake originate from upstream in the Mississippi River and Minnesota River basins
- Adapt to climate change by facilitating the introduction of appropriate species native to northern Iowa, southwestern Wisconsin, and Southern Minnesota

5.2 Goals and Recommendations for Priority Features

Forests and Woodlands

Goal: To manage forest and woodlands to:

- Regenerate native tree species, especially sugar maple and oaks.
- Preserve existing sugar maples and oaks.
- Facilitate the introduction of certain/select southerly (northern Iowa) forest species adaptive to a warming climate.
- Preserve and enhance a diverse native plant community in the mid- and understories.
- Achieve mixed age woodland and forest canopies.
- Manage for habitat as opposed to timber production.

Recommendations:

- Control invasive plant species to an average maximum cover of five percent.
- Aggressively manage invasive species that are new to the area, striving to eradicate them from the park.
- Introduce and/or continue to use fire as a management tool.
- Utilize the National Park Services inventory to help manage forests and woodlands on the site.
- Manage deer to minimal numbers (approximately 10 deer per square mile). This is the least expensive undertaking park staff can conduct with the greatest impact to protect habitat and increase native plant diversity and improve overall wildlife habitat in the park. Recommended deer management includes:
    - Conducting aerial deer surveys (from a helicopter) in the winter to assess deer populations.

    - Holding controlled hunts in the fall.
    - Working with neighboring municipalities to coordinate deer management programs.
    - Conducting a sharpshooting program if hunting is not possible or is not enough to control the deer population.
- Protect oak and sugar maple seedlings from predation by deer, rabbits, or mice by fencing or other methods.
- Follow the Dakota County Emerald Ash Borer management plan. Remove dead trees in areas where they are a danger to people and in areas of plant community restoration.
- Remove invasive canopy trees. Phase out the pine plantations in the park over time through thinning and replacing with locally appropriate species.
- Consider introducing climate-adaptive plant species within 250 miles of Dakota County, such as those native to northern Iowa, southwestern Wisconsin, and Southeastern Minnesota (south of Dakota County) but that are not found in Dakota County.
- Introduce native ground layer species that have been lost. The method is to plant or seed into canopy gaps, thus ensuring adequate sunlight. This will serve to increase overall diversity of the community as well as provide pollen and food for native pollinators and other wildlife.
- Monitor vegetation and wildlife.

Oak Savanna

Goal: To establish and maintain oak savanna plant community similar to what would have existed in the park prior to European settlement. To establish a diversity of native plants that thrive under a burning management regime typical for oak savanna.

Recommendations:

- Thin canopy trees to occupy 10–40 percent aerial coverage (herbaceous vegetation should dominate this community type).
- Use fire as a primary management tool. Burn often enough to achieve the desired species composition, distribution, and structure. Burning units on a staggered rotation every one to five years is typical. Never burn more than a third of the entire savanna plant community in one year.
- Plant or protect from predation as saplings those trees native to the Minnesota oak savanna, primarily bur oak, to naturally establish trees in the park.
- Establish a diversity of native herbaceous plants appropriate to savannas. See DNR's *Field Guide to the Native Plant Communities of Minnesota: The Eastern Boreal Forest Province* (2005).
- Minimize the extent of shrub establishment to develop an open landscape safe for park users and easy to burn.

- Consider introducing climate-adaptive plant species within 250 miles of Dakota County, for example those native to northern Iowa, southwestern Wisconsin, and Southeastern Minnesota (south of Dakota County) but that are not found in Dakota County.
- Control invasive plant species to an average maximum cover of five percent.
- Aggressively manage invasive species new to the area to extirpate them from the park.
- Introduce grazing/browsing as a management tool (e.g., bison or goats).
- Manage deer to minimal numbers.
- Continue working with adjacent landowners and owners of park inholdings to explore opportunities for natural resources regeneration and protection both in and adjacent to the park.

Prairies

Goal: To nurture, establish, and regenerate diverse prairie habitats.

Recommendations:

- Establish a diversity of native herbaceous plants appropriate to prairies of southern Minnesota. See DNR's *Field Guide to the Native Plant Communities of Minnesota: The Eastern Boreal Forest Province* (2005).
- Remove newly establishing trees and shrubs in prairies and control colonies that have established (primarily using fire as a management tool).
- Control invasive plant species to an average maximum cover of five percent.
- Aggressively manage invasive species new to the area to extirpate them from the park.
- Consider introducing climate-adaptive plant species within 250 miles of Dakota County, for example those native to northern Iowa, southwestern Wisconsin, and Southeastern Minnesota (south of Dakota County) but that are not found in Dakota County.
- Use fire as a primary management tool. Burn often enough to achieve the desired species composition, distribution, and structure. Burning units on a staggered rotation every one to three years is typical. Never burn more than a third of the entire prairie plant community in one year.
- Introduce grazing and browsing as a management tool (e.g., bison, goats).

Ravines

Goal: To stabilize ravine slopes and to eliminate the accumulation of sediment in the bottom of ravines.

Recommendations:

- Protect and enhance vegetation in the contributing watersheds of the ravines. Do this through establishing and managing native plant communities as described above.
- As watersheds contribute to destabilizing ravines, focus on the stabilizing of ravine side slopes and bottoms through planting and ecosystem management.
- Continue working with property owners within the ravine watersheds to manage stormwater runoff that flows to the park ravines. Encourage them to establish permanent vegetation and share with them information about stormwater management features that can be implemented to slow or infiltrate stormwater. Direct them to publicly available funds for project implementation.
- Work with County Facilities Management staff to change trail snow plowing practices that cause erosion near trails.
- Site and design new trails with standards such that they do not cause soil erosion, such as aligning trails with the contours of slopes and not against them. Follow International Mountain Bike Association trail design standards and MN DNR Trail Planning, Design, and Development Guidelines (2007). Apply the same standards to already-built/existing hard and soft surface trails in the Park Reserve.
- Work to purchase easements from adjacent landowners at the tops of slopes in order to construct or install practices to address stormwater runoff in the ravines and help reduce ravine erosion.

Cliffs & Bluffs

Goal: To protect these sensitive geologic features from human impacts and invasive species.

Recommendations:

- Monitor cliffs for direct and indirect damage by people, such as climbing damage or erosion caused by construction projects uphill.
- Direct trails away from fragile cliffs.
- Manage cliffs to limit the growth of invasive species and to limit the encroachment of red cedar. Red cedar is a native tree but historically was not nearly as abundant as it is today due to fires and browsing. In many places it is encroaching bluff prairies and out-competing a diversity of native herbaceous plants.
- Restore native plant diversity to bluff prairies and woodlands in areas of low ecological quality (see Figure 6-2: Target Plant Community).

- Vegetate the exposed rock face created during the development of the Mississippi River Greenway. This would require substantial soil importing at the base of the cliff to allow for the establishment of trees while also supporting the growth of vines that could potentially climb the rock face from below.

Red cedars displacing cliff plant communities in the park.

Soils

Goal: To regenerate soils by eliminating negative soil impacts and by supporting the building of soil structure.

Recommendations:

- Soils that are left undisturbed and which therefore have a diversity of vegetation slowly build soil structure through the action of roots, microbes, invertebrates, insects, and mammals. Soil regeneration (soil structure) can be enhanced by incorporating or topdressing with organic matter. Consider this as a step for restoration projects on especially degraded or compacted soils.
- Limit driving vehicles off-road and off-trail. Vehicles compact soil and destroy soil structure, greatly reducing the ability for soils to hold water and oxygen necessary for plant success.
- Prior to construction, install tree protection fencing around mature trees to protect their critical root zones.
- During construction projects, minimize the area of impact. Do not allow contractors to sprawl beyond the project limits.
- After construction, mechanically rip compacted areas to a depth of 18 inches and till eight inches of compost six inches into the ground.
- In areas of past construction, where negative soil impacts have lingered (such as the regional trail corridor), topdress with compost to boost the soil regeneration process and feed the soil food web.

Regional Trail Corridor

Goals: To restore a diversity of native plant species and regenerate soils impacted through the construction process. To diligently manage invasive species. To continue the restoration process that narrows the ecological gap the trail has created.

Recommendations:

- Establish oak savanna or forest in areas disturbed by trail construction (as per Target Communities maps, Figure 6-4 through Figure 6-6). Focus on the establishment of a diverse herbaceous layer.
- Regenerate soils through nurturing both the soil and a diversity of herbaceous plants for the foreseeable future.
- Use fire as the primary management tool.
- Site and design trails such that they do not cause soil erosion, such as by aligning trails with the contours of slopes and not against them. Follow International Mountain Bike Association trail design standards and MN DNR Trail Planning, Design, and Development Guidelines.
- Monitor and control invasive plant species to an average maximum cover of two percent. Trail corridors of this size become corridors for the distribution and establishment of invasive species because they are inadvertently brought in and spread by trail users and maintenance equipment.

Wildlife

Goal: To provide habitat for a diversity of indigenous wildlife species.

Recommendations:

- Manage for a shifting mosaic of refugia that promotes a heterogenous landscape and helps to maximize biodiversity.
- Continue, and ramp up, wildlife monitoring efforts to better understand existing and extirpated wildlife populations. Identify habitat needs for Species of Greatest Conservation Need (Table 3-2).
- Reintroduce native grazers (i.e., bison) to the middle portion of the Park Reserve. Implement the Board-approved schematic design of the bison range. Develop operational strategies and documents.
- Consider working with local colleges and universities to conduct wildlife research.
- Continue restoring native plant habitats throughout the park to expand and improve wildlife habitat. A diversity of habitat types provide life-cycle needs for a diversity of wildlife species.

- Protect and enhance habitat for Species of Greatest Conservation Need; for example:
    - Bats: protect roosting trees by limiting the removal of trees to only the winter months (November through March).
    - Bumble bees: prior to any construction, mow flowering species (before they flower) to discourage insects from the area.
- Monitor and control invasive animal species. Species of concern (MN DNR) include Emerald Ash Borer, Asian-Long horned beetle, Brown marmorated stink bug, Gypsy moth, and jumping worms. None of these have yet been detected in the park.

6 Implementation

6.1 Native Plant Community Restoration

Restoration Strategy

The restoration of native plant communities within Spring Lake Park Reserve will begin within four nodes of highest ecological potential (Figure 6-1: Restoration Priorities). Here an intense focus on invasive species removal will begin with an aim of eliminating competition, protecting native plants, and creating conditions for species diversity enhancement. The goal is to first protect the highest ecological quality areas (areas of greatest native plant diversity) through invasive species eradication and then to move restoration efforts out to lower diversity areas as indicated by the arrow in Figure 6-1: Restoration Priorities. Eventually the entire park may be restored and transition to the management phase where burning, supplemental planting, and other management activities will encourage native plant proliferation and discourage invasive plant establishment. Figure 6-2: Target Plant Community Systems depicts target plant communities for the restoration efforts. Figure 6-3: Restoration Phasing depicts recommended phasing of restoration efforts. The speed at which restoration is to be implemented will depend upon funding and Dakota County staff capacity to oversee the process.

Restoration of this oak savanna included the placement of prairie straw to carry fire through an area where buckthorn and canopy trees were removed.

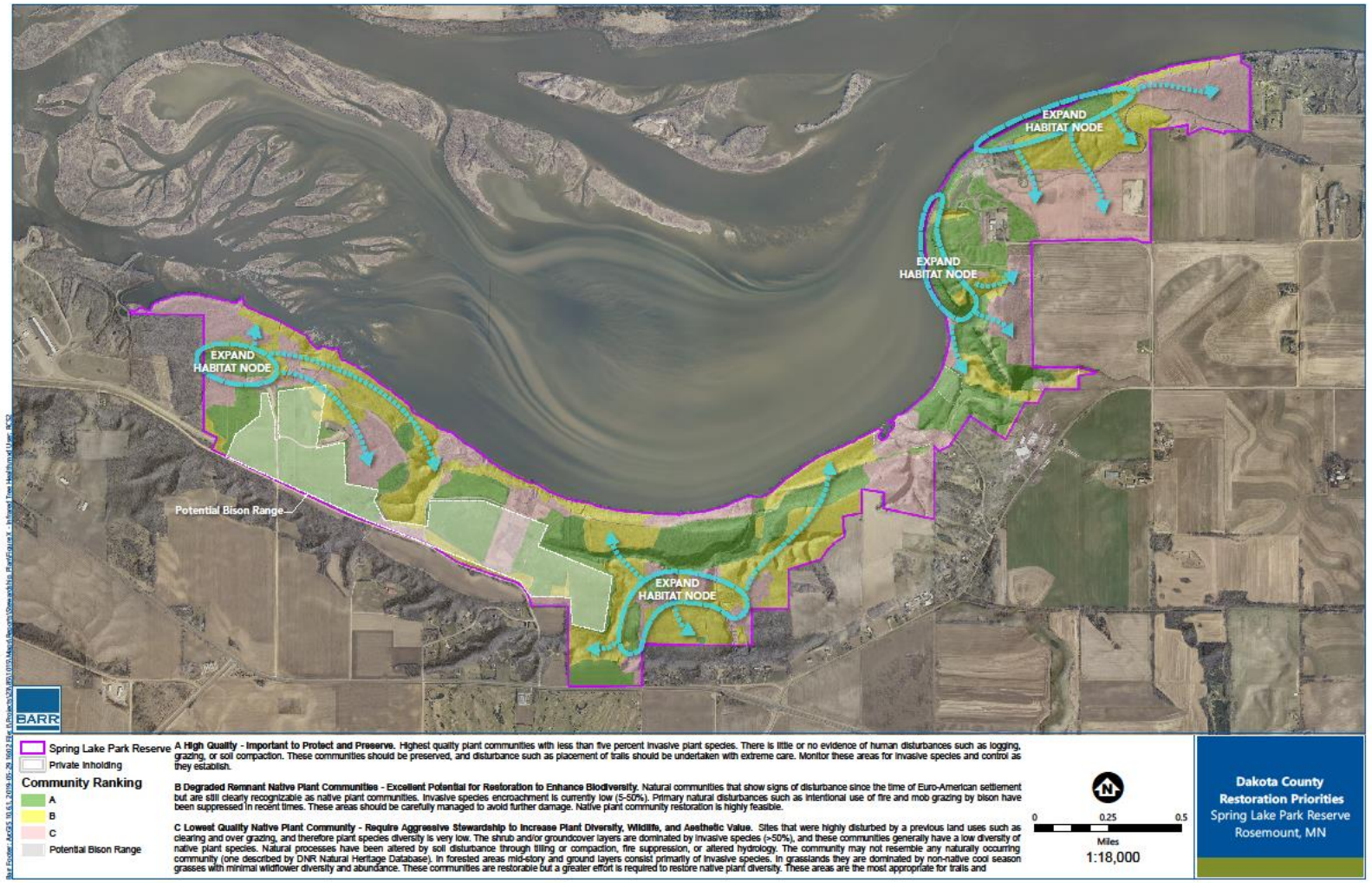


Figure 6-1 Restoration Priorities

Figure 6-2 Target Plant Community Systems

Figure 6-3 Restoration Phasing by Work Unit

Adaptive Management Approach

An adaptive management approach for ecosystem regeneration will be followed at Spring Lake Park Reserve. Adaptive management is an iterative process of decision making with an aim of reducing uncertainty over time via system monitoring. It is a systematic approach for improving resource management by learning from management outcomes including but not limited to:

- Weed control and weed eradication success
- Native plant establishment, failure, and success
- Disturbance by people and wildlife
- Climate impacts

Adaptive management is the process of testing a management technique in each unique landscape, monitoring its effectiveness, and then adjusting the technique in response. This iterative process takes time and results in long-term success.

The monitoring process involves:

1. Conducting annual spring site assessments to identify issues and determine management actions for that year. Develop a maintenance plan for the year (timing and activities involved).
2. Each year, walking the park natural areas every four to six weeks during growing season to inspect for invasive weed encroachment, dead or diseased plants, erosion problems, human impacts, and miscellaneous issues.

Target Plant Communities

Target plant communities set the goal for eventual restoration. They provide a vision for native plant community restoration in the park. The target communities were developed through analysis of the park's existing plant communities, soils, aspect, and moisture levels, as well as taking into consideration the historic plant communities of the site through historical aerial photography interpretation. Climate change, resilience, and management requirements were also taken into consideration. The plant communities of the park will exist in a continuum, with transition zones between the communities. The sharp lines on the map are not representative of actual transitions that will develop.

Figure 6-4, Figure 6-5, and Figure 6-6 show the target plant communities developed for the park. Plant communities are identified using Minnesota's Native Plant Community Classification (Version 2.0) by MnDNR. Detailed descriptions of native plant communities can be found at https://www.dnr.state.mn.us/npc/classification.html. Park managers will determine species to plant in these communities, as well as specific management processes. The restoration process is outlined in the next section below. Native plant communities identified in the plan include:

Prairie
CTs12 - Southern Dry Cliff
CTs33 - Southern Mesic Cliff
UPs23 - Southern Mesic Prairie

Forest/Woodland
FDs27b - White Pine - Oak Woodland
FDs37b - Pin Oak - Bur Oak Woodland
FFs59 - Southern Terrace Forest
FFs68a - Silver Maple - (Virginia Creeper) Floodplain Forest
MHs37 - Red Oak-White Oak Forest
MHs38b - Basswood - Bur Oak Forest
MHs38c - Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest
MHs39a - Sugar Maple - Basswood - (Bitternut Hickory) Forest
MHs39b - Sugar Maple - Basswood - Red Oak - (Blue Beech) Forest
MHs49a - Elm - Basswood - Black Ash - (Hackberry) Forest

Savanna
UPs13 - Southern Dry Prairie
UPs14 - Southern Dry Savanna
UPs14c - Dry Hill Oak Savanna (Southern)
UPs24 - Southern Mesic Savanna

Wetland
WFs57 - Southern Wet Ash Swamp
WMs83a - Southern Seepage Meadow/Carr

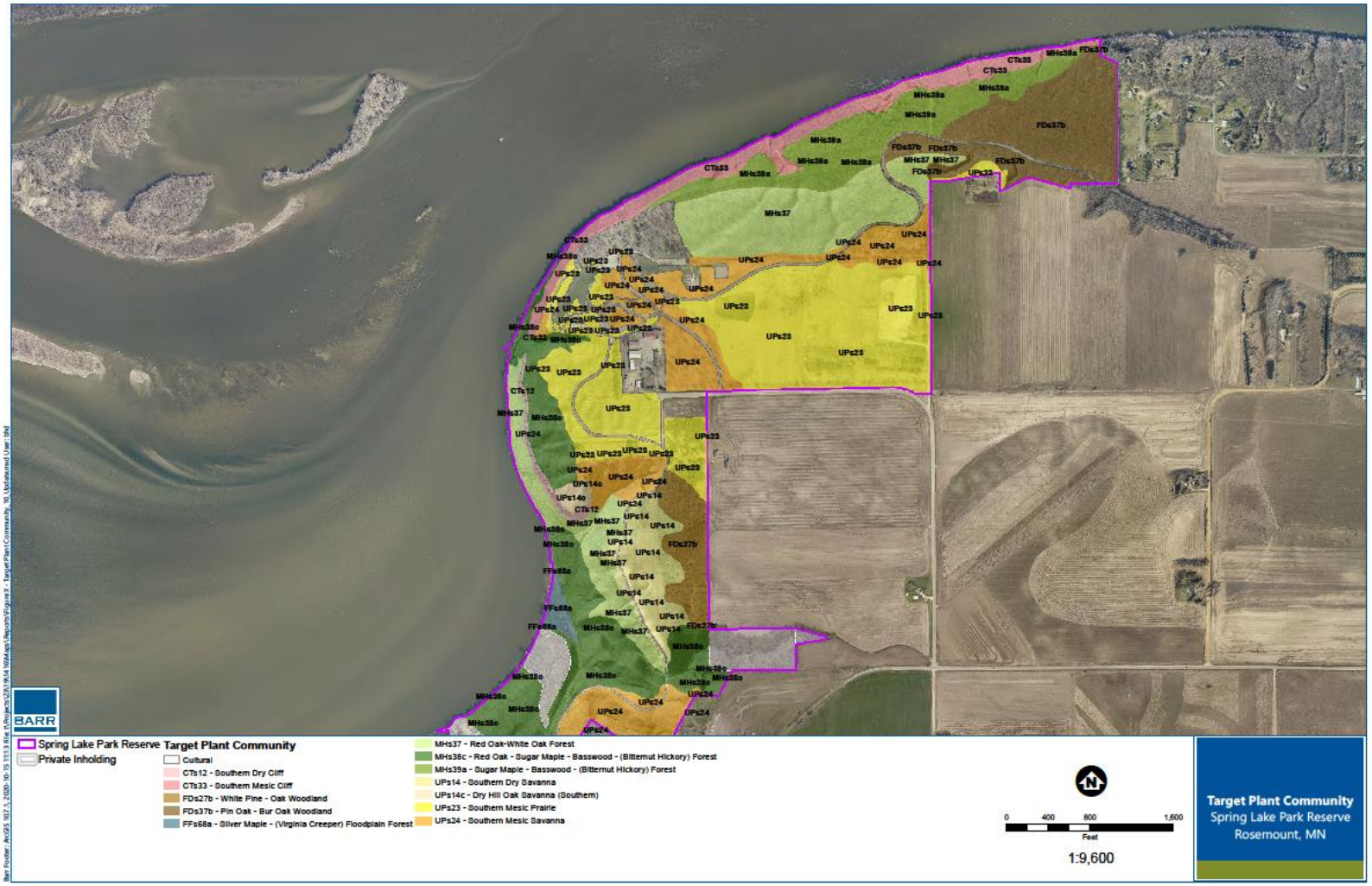


Figure 6-4 Target Plant Community Classes: East

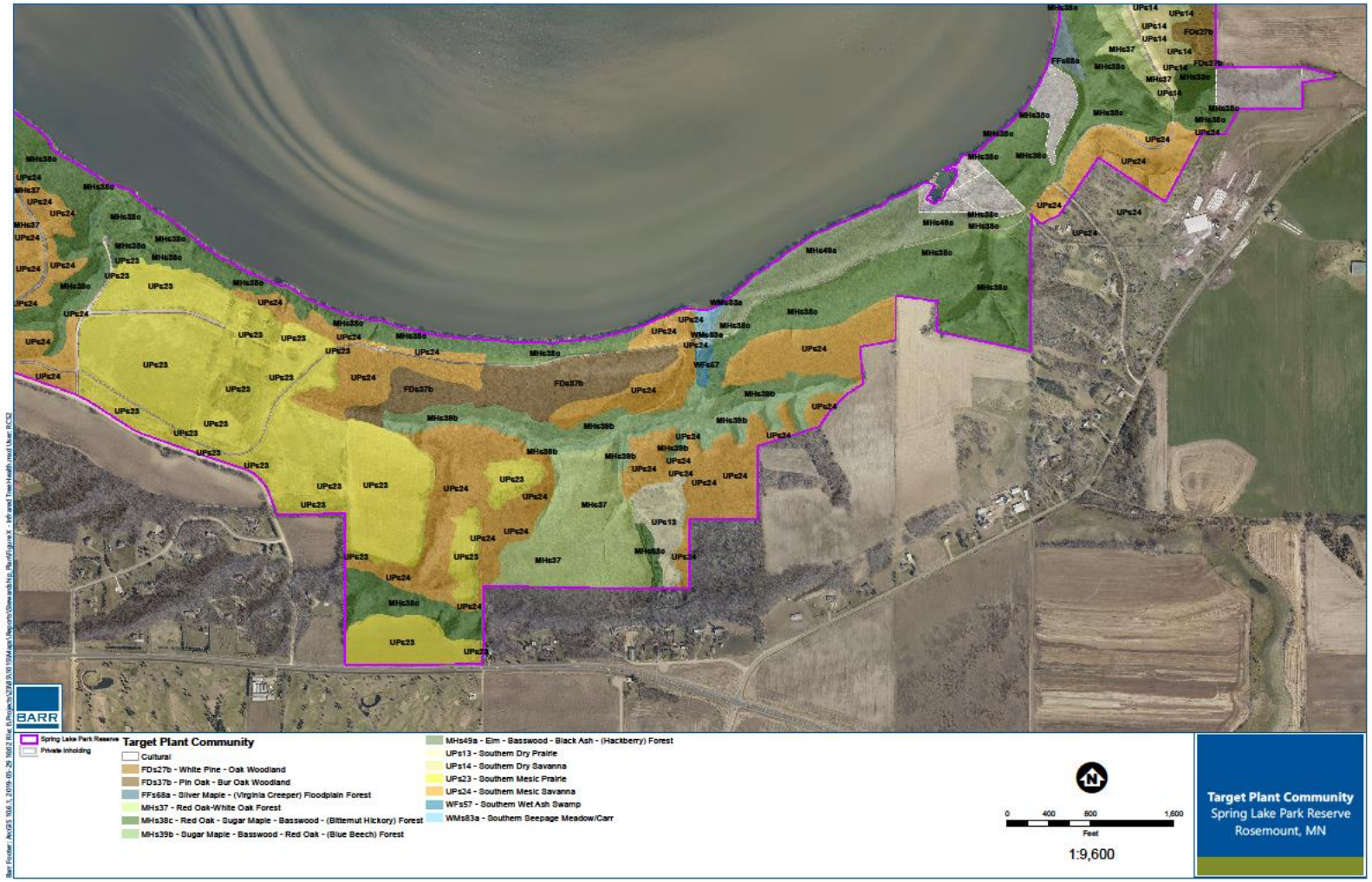


Figure 6-5 Target Plant Community Classes: Central

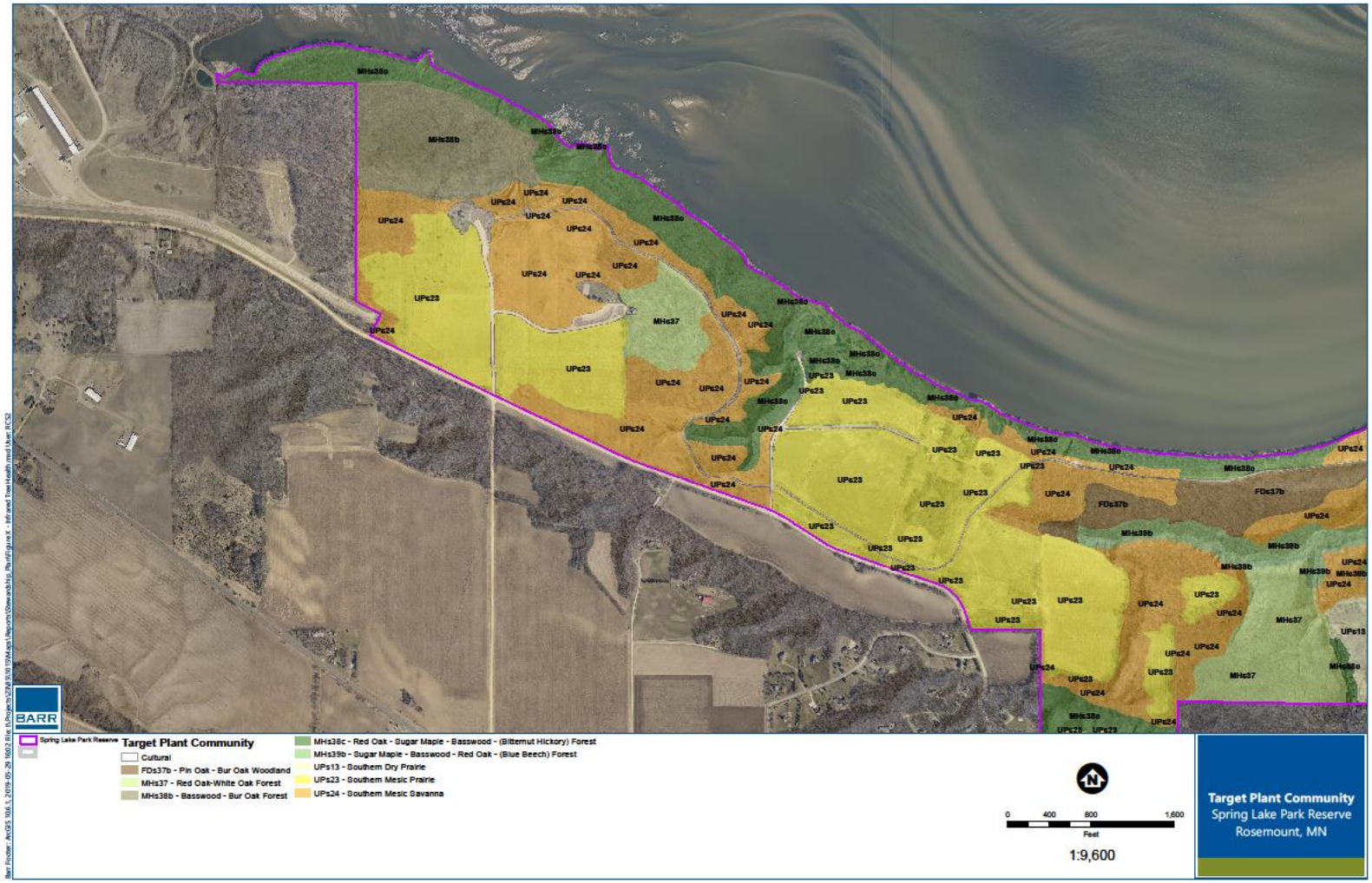


Figure 6-6 Target Plant Community Classes: West

Ecological goals for the park include habitat improvements, diversification of habitat types, and increased biodiversity. This is to be accomplished in the face of climate change, invasive species encroachment, and increased use of the park. To achieve these it will be important to restore ecological processes, such as grazing and fire, and to move ecosystem composition back towards those plant communities found on site 150 years ago (i.e., prairie, woodland, and oak savanna dominance [see Figure 2-1 and Figure 2-2]). In the future, prairie and oak savanna are expected to be more resilient to the extremes of climate change (i.e., warmer summers, warmer winters, and both wetter and drier conditions). These communities are also more economical to maintain as they can readily carry fire which provides cost-effective maintenance because fire controls cool-season exotic weeds, helps prevent the invasion of woody plants, and reduces thatch. Savannas also provide habitat for a great diversity of indigenous wildlife species.

Restoration Process and Long-Term Maintenance

The following table (Table 6-1) describes the basic steps in the process of plant community restoration:

Table 6-1 Plant Community Restoration

Target Plant Community	Restoration Process	Long-Term Maintenance
Maple-Basswood Forest, Oak Forest	• Remove woody and herbaceous invasive species (e.g., cut, mow, herbicide, burn) throughout the project area. • If deemed necessary, regenerate canopy trees by creating small clearings (canopy gaps) that allow light to stimulate growth of naturally regenerating or newly planted trees. • If deemed necessary, seed or plant native trees or herbaceous species. • If restoration is located along the regional trail, develop specific planting and management plans to focus resources on this highly degraded area within 50' of the trail. • Aggressively control deer that consume regenerating native vegetation (because earthworms cannot be controlled). Reduce deer population to no greater than 10 deer per square mile.	• Monitor restoration progress as described above in the Adaptive Management Approach. • During the first three years after initial restoration, conduct weed management through mowing or spot spraying at least four times per growing season. • After the first three years of management, spot mow, brush saw, and herbicide-treat invasive woody plant species once every three to four years. Also, treat invasive herbaceous species once per year in spring or fall. • Manage emerald ash borer per the County's Emerald Ash Borer Management Plan. • Plant trees and wildflowers as deemed appropriate every five to 10 years. • Maintain deer populations at no greater than 10 deer per square mile.

Target Plant Community	Restoration Process	Long-Term Maintenance
Oak Woodland	• Remove woody and herbaceous invasive species (e.g., cut, mow, herbicide, burn) throughout the project area. • To develop true woodland, remove 20–50 percent of trees to open the canopy and allow light to hit the ground plain. • Consider using grazing by goats to clear invasive vegetation from the woodland floor. A plan could be developed with a grazing specialist to determine where and when grazing would be most effective. • Consider planting woodland herbaceous species in the gaps created. Alternatively, allow vegetation to emerge from the seed bank. • Control deer to 10 deer per square mile. • Interseed and/or plant live plugs the third growing season for additional diversity. Experiment with seeding onto the black following a prescribed burn.	• Monitor restoration progress as described above in the Adaptive Management Approach. • During first three years after canopy gap creation, spot treat invasive plants with herbicide four times per growing season. • After the three-year establishment period, spot mow and herbicide-treat invasive woody plant species. Herbicide application during dormant season is ideal (every other year). • Conduct prescribed burns every three to four years. • Consider grazing by bison or goats to supplement burning. • Manage emerald ash borer as per the County's Emerald Ash Borer Management Plan. • Phase canopy-gap creation to maintain partially open canopy. Create additional gaps every 10–20 years until all undesirable canopy trees have been removed. • Interseed and/or plant live plugs occasionally for additional diversity. Experiment with seeding onto the black following a prescribed burn. • Maintain deer populations at no greater than 10 deer per square mile.

Target Plant Community	Restoration Process	Long-Term Maintenance
Oak Savanna	• Remove woody and herbaceous invasive species (e.g., cut, mow, herbicide, burn) throughout the project area. Reduce canopy cover to within a range of one tree per acre to 40 percent cover. • Prep soil for planting (e.g., till, harrow, smooth, rake, burn). • Install seed and/or live plants. • Prevent erosion by appropriate means such as disc anchored straw or hydromulch. • Consider planting some bur oaks, but limit tree planting to achieve a maintainable savanna landscape. • Water any live plants as necessary. • Install tree protection from deer and mice as needed.	• Monitor restoration progress as described above in the Adaptive Management Approach. • For the first two years after planting, mow herbaceous plants as appropriate (1–2 times the first year and once the second) to reduce annual weed competition. Also, spot apply herbicide to perennial weeds four times per growing season. • After the establishment period (approximately 3 years), burn sporadically to minimize woody plant establishment. • Use fire as a primary management tool for woodland, savanna, and prairie. Prescribe a burn every three to four years. • Consider grazing by bison or goats to supplement burning. • After establishment period, spot treat invasive plants with herbicide once per growing season. • Interseed or plant to increase native cover to increase native plant diversity. Experiment with seeding onto the black following a prescribed burn. • Control deer to 10 deer per square mile.

Target Plant Community	Restoration Process	Long-Term Maintenance
Mesic Prairie, **Dry Bedrock Bluff**	• Remove woody and herbaceous invasive species (e.g., cut, mow, herbicide, burn) throughout the project area. • Prep soil for planting (e.g., till, harrow, smooth, rake, burn). • Install seed and/or live plants. • Prevent erosion by appropriate means such as disc anchored straw or hydromulch. • Control deer to 10 deer per square mile.	• Monitor restoration progress as described above in the Adaptive Management Approach. • For the first two years after planting, mow herbaceous plants as appropriate (1–2 times the first year and once the second) to reduce annual weed competition. Also, spot apply herbicide to perennial weeds four times per growing season. • After the establishment period, burn sporadically to minimize woody plant establishment. • Consider grazing by bison or goats to supplement burning. • After establishment period, spot treat invasive plants with herbicide once per growing season. • Interseed or plant to increase native cover to increase native plant diversity. Experiment with seeding onto the black following a prescribed burn. • Control deer to 10 deer per square mile.
Sedge Meadow, **Seepage Meadow** **Floodplain Forest**	• Remove woody and herbaceous invasive species (e.g., cut, mow, herbicide, burn) throughout the project area. • Allow native plants to naturally regenerate. Supplementally seed if necessary. • Control deer to 10 deer per square mile.	• Monitor restoration progress as described above in the Adaptive Management Approach. • Manage emerald ash borer as per the County's Emerald Ash Borer Management Plan. • Spot treat invasive plants with herbicide twice per growing season. Depending on weed pressures, aggressive treatment of reed canary grass and cattail may be necessary.

Restoration phasing

Spring Lake Park Reserve covers approximately 1,100 acres—most of which will require restoration and management. The work will be phased to achieve reasonable annual budgets and stay within staff capacity. The phased approach is depicted in Figure 6-3.

Phase 1, Years 1–5: Starting within the highest quality ecological nodes of the park (see Figure 6-1), a significant effort will be undertaken to protect these unique, high-quality resources. Native plant community restoration begins here. Upon restoration completion within the Phase 1 area, efforts will move out from these nodes into somewhat more degraded plant communities. Before embarking upon Phase 2, restoration projects funds must be secured to maintain Phase 1 acreages. If adequate funds are not available to maintain any phase of work, restoration of the next phase should not proceed. It is recommended to focus resources on the protection and management of the highest quality areas first.

Phase 2, Years 6–10: Phase 2 adds a concentric ring of native plant community restoration around the Phase 1 central nodes. Phase 2 projects serve both to expand habitat and to create a protective buffer around the diverse ecological nodes. Phase 2 efforts are slated to occur over the course of five years as funds are available.

Phase 3, Years 11–20+: This phase comprises an effort to restore the most degraded reaches of the park. Restoration may be slow and expensive because of a lack of indigenous species on the ground and because of extensive invasive species. A strong effort (two years) is recommended to control/eliminate invasive species before planting. This will help to keep management efforts reasonable.

6.2 Wildlife Management

The primary goal for SLPR wildlife management is to enhance habitat so that a diversity of wildlife species thrives. This is a "build it and they will come" approach. Restoring a diversity of habitat types and a diversity of native plant species provides wildlife the food, shelter, and space to reproduce and thrive in the park.

Species of Greatest Conservation Need (see Table 3-2) are priority species for habitat management in Spring Lake Park Reserve. Habitat improvement will be accomplished through the native plant community regeneration efforts described in this document. Healthy woodlands, savanna, and prairies host a great diversity of these species. Park managers will determine specific habitat improvements for individual wildlife species to be implemented in the park.

Park managers will be considering reintroducing extirpated animals as opportunities arise. Bison are currently scheduled for reintroduction in 2022. Other species may include a variety of herptiles, such as bull snake and rat snake, and Lepidopterans, such as regal fritillary; but many other species may be considered.

It is important to establish a diversity of habitat types within the park because different wildlife species require different food, shelter, and nesting types. Management staff will continue to improve a variety of vegetative layers (e.g., ground, understory, mid-story, and canopy layers) for birds to carry out their life cycles. For example, to provide the appropriate habitat for forest birds, it is critical to have a diverse and well-structured forest composed of various species of large trees, medium-size trees, and small trees (structural heterogeneity). Standing dead trees (snags) and logs and treetops on the forest floor (coarse woody debris) may look rather messy, but they provide excellent habitat for birds and bats. This diversity of habitat will be achieved by implementing the native plant community regeneration plan.

Deer Management

Deer are a hindrance to ecosystem regeneration because dense populations of deer over-graze native plants. Deer have been well managed in the park, and this is recommended to be amplified to protect a significant investment in ecosystem restoration and management by reducing deer to 10 per square mile. This is especially important because of the damage to native plant communities caused by earthworms. The earthworm impacted forests of the park are further damaged by deer, so their control is critical because there are no control methods for earthworms.

Other methods of deer control should also be considered, such as protecting seedlings with tree protectors, placing paper caps on the buds of desirable trees, applying chemical deterrents to new plantings, and installing exclusion fencing around protection zones. Some of these methods will also help reduce herbivory by other animals such as rabbits and mice. Since deer prefer landscapes that have an abundance of "edge", sharp boundaries between vegetation cover types (e.g., between forest and meadow/grassland) will reduce edge effects and thus lower the habitat's attractiveness to deer. "Softening" edges, by removing trees and shrubs on the forest-sides of sharp boundaries and by planting a few trees and shrubs on the grassland/meadow-sides of sharp boundaries, will help to reduce edge effects. In addition, increasing the size and amount of core habitat, such as interior forest or prairie/savanna, should also help to deter deer.

6.3 Soil Management

Soil regenerates (develops good soil structure) through the growth of plant communities that are not repeatedly disturbed through actions such as tilling, grading, or construction. A vast majority of the soils in the park are naturally recovering from past agricultural and construction impacts through the action of roots, microbes, insects, invertebrates, and mammals that build soil structure. Soils with good structure can hold nutrients, hold additional moisture, and become resistant to erosion. The act of restoring and managing native plant communities will continue this trend of soil regeneration.

When undertaking construction projects within the park it is important that sufficient budget and planning occur to implement soil regeneration within the construction disturbance zone. This may include importing topsoil or the incorporation of soil amendments. It will also involve the

implementation and management of appropriate native plant communities. Therefore, the design of native plant communities around designed facilities will improve overall ecological quality.

Soils are eroding through the central ravine and the ravine of Hilary Path. The contributing watersheds within the park are stable, while agriculture disturbs soils within reaches of watershed beyond the park boundary. Park managers should continue to build relationships with park neighbors to work with them on soil stabilization and recommend funding sources for stabilization projects.

6.4 Stormwater & Shoreline Management

As discussed earlier in this plan, park managers should continue to work with neighboring property owners to manage stormwater running into the park from their properties. Options include seeking agricultural and natural area easements, offering to provide technical and financial assistance to manage the natural communities on their properties, and collaborating on projects that benefit the natural resources of the park reserve and possibly of the private properties too. For example, decreasing the volume and rate of stormwater runoff from surrounding properties will go a long way to stabilizing the ravines of the park.

New construction of park facilities and trails must include the construction of stormwater management facilities to infiltrate and filter stormwater running off hard surfaces. Rain gardens, bioretention swales and stormwater ponds are a few of the facilities that can be implemented to manage stormwater.

The shoreline of Spring Lake is very stable, secured with naturally occurring boulders and large trees. Erosion is not occurring, but it would be advisable to walk the shoreline every other year or so to inspect for changes. When park boating and recreational facilities are designed for the lake shore, considerable effort and resources must be invested to provide protection from the erosive power of flood waters and wave action as this is a very dynamic shoreline. It is important to consider that when the River Use Area in the vicinity of old Bud's Landing gets reconstructed that there needs to be a large enough space to accommodate the waterfowl hunters in the fall as well as other users that may be drawn there, which will potentially cause much disturbance to the vegetation and soil of this site.

6.5 Monitoring Recommendations

The monitoring of native plant communities and wildlife in Spring Lake Park Reserve can provide park managers with an understanding of populations and their condition. This information allows for informed management decisions. Monitoring procedures and recommendations are presented in detail in the 2019 Lebanon Hills Natural Resources Management Plan. Refer to pages 186–192 of this document for monitoring protocol for Spring Lake Park Reserve.

6.6 Native Plant Community Restoration & Maintenance Costs

The tables below present projected costs for the restoration and management of native plant communities within Spring Lake Park Reserve. They were developed from costs incurred from similar projects in the region, including County projects, for the years 2017–2019.

Table 6-2 Native Plant Community Restoration Cost Estimates

Cost to Restore per Phase		
Restoration Phase	**Total Acres to Restore**	**Cost Estimate**
1. Years 1–5	294	$1,024,000
2. Years 6–10	310	$1,389,000
3. Years 11–15	208	$716,000
Total	**811**	**$3,129,000**

Table 6-3 Native Plant Community Maintenance Cost Estimates

Cost to Maintain per Phase		
Restoration Phase	**Existing and Newly Restored Acres to Maintain**	**Cost Estimate**
1. Years 1–5	462	$1,005,000
2. Years 6–10	819	$1,571,000
3. Years 11–15	1037	$1,659,000
Total		**$4,235,000**

Table 6-4 Maintenance and Restoration Combined Costs Estimates

Restoration Phase	Acres to Restore and Maintain	Cost Estimate
1. Years 1–5	462	$2,029,000
2. Years 6–10	819	$2,960,000
3. Years 11–15	1037	$2,375,000
Total		**$7,364,000**

6.7 Wildlife Resources Projects and Cost Estimates

Inherently, wildlife habitat is closely intertwined with vegetation; wildlife depends on vegetation for cover, nesting, and food. Conversely, plants depend on animals for many things, such as dispersal, to scarify seed covers, and for pollination. Therefore, general improvements to native vegetation will benefit wildlife. More focused wildlife management, however, should be conducted so that a greater number of species can benefit. Each species has different habitat requirements, and these should be given consideration during vegetation management. For example, grassland birds require large tracts of land that are relatively free of trees and tall woody vegetation, since predators and cow birds can more readily prey upon them if too many perch sites are available. Certain warblers need a mix of open and shrub/Carr habitats to be successful throughout their varied life cycles. Fishers and badgers need a large territory to range in to be successful. Monarch butterflies need adequate amounts of milkweed stems to be successful. In general, many of the species that are in decline or rare need either specialized habitat elements or a type of habitat that has been lost or has become rare. For example, red-headed woodpeckers and Blanding's turtles require savanna and ovenbird need blocks of forest interior.

Managing for the community, i.e., managing for a general plant community type, is what is typically done and what is recommended here; but staff must also be mindful of the specific conservation requirements of rare and declining species, so that species diversity is maximized. To that end, the lists of species in Tables 3.1 and 3.2 contain many potential species to be considered for wildlife projects in the next five and 20 years for Spring Lake Park Reserve.

To date, the biggest potential wildlife project that is being planned for the Park Reserve is the re-introduction of bison. This project has advanced to the point of producing a draft proposal for Board review. The cost estimate for that project is approximately $1.2 million, of which approximately $160,000 will be needed for match, provided by the County.

Continuous monitoring and adjusting of management methods is required to achieve this goal. Also, some special management efforts may be required, such as 1) developing a protocol for animal species reintroductions that considers all aspects of the subject, such as the potential unintended negative consequences of introducing a particular species, and 2) developing a file for each of the target species that enables a full understanding of the species and their life cycles, gathers literature on them, and compiles data.

The NRMSP described a timeline and a cost associated with wildlife management that includes collecting baseline and trend data, working with partners outside of parks, focusing on rare and endangered wildlife, protecting other important wildlife, and controlling problem wildlife. This had a cost of $1.1 million for the entire parks system for the first five years, which means that for SLPR approximately $300,000 would be allocated in the first five years for wildlife management. The costs for specific projects will be determined when they are identified and implemented. Some grant money can be used to enhance the vegetation for specific wildlife habitat improvement needs.

6.8 Water Resources Projects and Cost Estimates

The recommended water resources projects and associated cost estimates are the following:

Table 6-5 Water Resources Projects and Associated Cost Estimates

Project Name	Timing and Years	Cost Estimate	External Funding Estimate	County Funding Estimate
Ravine 1 and 2 Stabilization Design	2020–2021	$20,000 to $30,000	None	$20,000 to $30,000
Ravine 1 and 2 Stabilization Implementation	2021–2024	Approximately $600,000 to $800,000	Approximately $450,000 to $600,000	Approximately $150,000 to $200,000
Trail Erosion Stabilization Design				
Trail Erosion Stabilization Implementation for four sites	2021–2022	Approximately $150,000	None	Approximately $150,000
Habitat Islands in Spring Lake (potential partner with USACE)	TBD	TBD	USACE Habitat Restoration Grants provide 65% cost share (up to $10M) for approved projects	35% cost share to be provided by the sponsor

Project Name	Timing and Years	Cost Estimate	External Funding Estimate	County Funding Estimate
Enhance the Black Ash Seepage Swamp	2022–2025	$50,000	$40,000	$10,000

6.9 Funding Sources

Table 6-6 lists a variety of grant funding sources that are available for natural resource improvement projects at Spring Lake Park Reserve.

Table 6-6 Grant Funding Sources

Grant Program	Category	Sponsor Agency	General Info	Eligibility	Link to Website	Contact Information
Fishers and Farmers Partnership for the Upper Mississippi River Basin	Natural Resources/ Habitat Protection	National Fish Habitat Partnership	MN CREP is a voluntary, federal-state-funded natural resource conservation program that uses a science-based approach to target environmentally sensitive land. MN CREP will focus on four main Conservation Practices: grass filter strips, wetland restoration (floodplain and non-floodplain), and wellhead protection areas. The purpose of this project is to accelerate staff capacity to deliver the MN CREP funds.	Applicants can be federal, state, county, and non-government organizations in either natural resources or agriculture with the ultimate goal of adding value to farms while restoring aquatic habitat and native fish populations.	http://www.fishhabitat.org/news/	"Heidi Keuler US Fish and Wildlife Service 555 Lester Avenue Onalaska, WI 54650 608-783-8417"
Forest Stewardship Program	Natural Resources/ Habitat Protection	MN DNR	This cost share program provides technical advice and long–range planning to interested land owners. Forest stewardship plans are the outcome of the program-plans designed to meet landowner goals while maintaining the sustainability of the land.	Financial assistance is available to woodland owners for completing projects to practice good forest stewardship on their land. A typical project is between three and 20 acres but could be smaller or larger depending on land goals.	https://www.dnr.state.mn.us/woodlands/cost-share.html	Private Forest Program Coordinator DNR Forestry 500 Lafayette Road, Box 44 St. Paul, MN 55155 (651) 259-5261

Grant Program	Category	Sponsor Agency	General Info	Eligibility	Link to Website	Contact Information
Conservation Partners Legacy Grant Program: Traditional Projects	Natural Resources/ Habitat Protection	MN DNR	This grant program is for restoring or enhancing prairies, wetlands, forests, or habitat for fish, game, or wildlife in Minnesota. Program provides competitive grants of $5,000–$400,000 with a 10 percent non-state match requirement and a total project cost cap of $575,000. Restoration and enhancement projects will only be funded on lands in public ownership or waters designated as public waters. All project sites must be open to the public for all seasons of hunting and fishing.	Eligible applicants are limited to local, regional, state, and national non-profit organizations, including government entities. Private individuals and for-profit organizations are not eligible to apply for these grants.	http://www.dnr.state.mn.us/grants/habitat/cpl/ecp-grant-cycle.html	LSCPLGrants.DNR@state.mn.us Jessica Lee, CPL Grant Program Coordinator 651-259-5233 (St. Paul) Conservation Partners Legacy Grant MN DNR 500 Lafayette Road Box #20 St. Paul, MN 55155

Grant Program	Category	Sponsor Agency	General Info	Eligibility	Link to Website	Contact Information
Conservation Partners Legacy Grant Program: Metro Projects	Natural Resources/ Habitat Protection	MN DNR	This grant program is for restoring or enhancing prairies, wetlands, forests, or habitat for fish, game, or wildlife in Minnesota. Program provides competitive grants of $5,000-–400,000 with a 10 percent non-state match requirement and a total project cost cap of $575,000. Restoration and enhancement projects will only be funded on lands in public ownership or waters designated as public waters.	Eligible applicants are limited to local, regional, state, and national non-profit organizations, including government entities. Projects must be located within the seven-county metro area or within city limits of cities with a population of 50,000 or greater (Duluth, Rochester, St. Cloud). Private individuals and for-profit organizations are not eligible to apply for these grants.	http://www.dnr.state.mn.us/grants/habitat/cpl/ecp-grant-cycle.html	LSCPLGrants.DNR@state.mn.us Jessica Lee, CPL Grant Program Coordinator 651-259-5233 (St. Paul) Conservation Partners Legacy Grant MN DNR 500 Lafayette Road Box #20 St. Paul, MN 55155

Grant Program	Category	Sponsor Agency	General Info	Eligibility	Link to Website	Contact Information
National Fish Habitat Action Plan	Natural Resources/ Habitat Protection	USFWS	The National Fish Habitat Action Plan is a national investment strategy to leverage federal and privately raised funds to protect, restore, and enhance the nation's fish and aquatic habitats through partnerships that foster fish habitat conservation. Funds appropriated to the U.S. Fish and Wildlife Service's (Service) Fish and Aquatic Conservation (FAC) Program specifically to implement the Action Plan will be utilized in collaboration with the National Fish Habitat Board and Fish Habitat Partnerships. Fish Habitat Partnerships are the primary work units of the Action Plan, formed around distinct geographic areas, "keystone" fish species, or system types (e.g. large lakes, impoundments, estuaries). Funds will support national and regional science and coordination activities to protect, restore, or enhance fish habitats.	Eligible applicants include federal, state, or local government agencies; Native American governments; interstate, intrastate, public, and private nonprofit institutions and organizations; or any other organization subject to the jurisdiction of the United States with interests that support the mission of the Service on a cost-recoverable basis and the goals of the Action Plan.	https://www.grants.gov/web/grants/search-grants.html?keywords=national%20fish%20habitat%20action%20plan	Cecilia M. Lewis, National Coordinator National Fish Habitat Partnership Fish and Aquatic Conservation Program 703-358-2102 cecilia_lewis@fws.gov

Grant Program	Category	Sponsor Agency	General Info	Eligibility	Link to Website	Contact Information
Tax Base Revitalization Account	Brownfields	Metropolitan Council	The Metropolitan Council's Tax Base Revitalization Account (TBRA) is one of the three incentive accounts created by the 1995 Livable Communities Act adopted by the Minnesota Legislature. The TBRA provides grants to investigate or clean up contaminated property for subsequent residential, commercial, or industrial development. Funded activities include Phase I and Phase II environmental site assessments, RAP development, demolition and site preparation (only if necessary, to access contamination), soil or ground water remediation, soil vapor mitigation, asbestos abatement work, lead paint removal, or stabilization.	Cities, counties, and local development authorities located in the seven-county metro area and participating in the Metropolitan Livable Communities Housing Incentives Program are eligible to apply for funds. Applications involving public-private partnerships are most competitive. Cleanup grant applicants must have an MPCA-approved RAP, but investigation grants can fund RAP development.	https://metrocouncil.org/Communities/Services/Livable-Communities-Grants/Tax-Base-Revitalization-Account-(TBRA).aspx	Marcus Martin Phone: (651) 602-1054 Email: marcus.martin@metc.state.mn.us

Grant Program	Category	Sponsor Agency	General Info	Eligibility	Link to Website	Contact Information
Conservation Corps Minnesota Clean Water Fund: Crew Labor	Water Quality	BWSR	Funds are available for Conservation Corps crew labor only for the purposes of protecting, enhancing, and restoring water quality in lakes, rivers, and streams and to protect groundwater and drinking water sources from degradation. Project proposals should demonstrate measurable outputs to achieve water quality objectives through the implementation of BMPs. Projects that focus on retaining water on the land through native plantings versus habitat restoration are preferred.	Counties, Cities, SWCDs, Watershed Districts, and Watershed Management Organizations are eligible.	http://conservationcorps.org/clean-water-funding	Brian Miller at (651) 209-9900 ext. 19 brian.miller@conservationcorps.org
Conservation Initiative Funding Program	Water Quality	Dakota County Soil & Water Conservation District	The Dakota SWCD offers funding and/or technical assistance for projects that demonstrate innovative stormwater management, low-impact development, and/or conservation design principles.	Dakota County landowners, developers, and local units of government are eligible.	http://www.dakotacountyswcd.org/cif.html	Contact Dakota County SWCD (651) 480-7777

Grant Program	Category	Sponsor Agency	General Info	Eligibility	Link to Website	Contact Information
Metro Conservation Corridor Partnership Habitat Restoration Program	Natural Resources/ Habitat Protection	MN DNR	Great River Greening is seeking partners to implement habitat restoration on protected lands and waters, with priority given to projects that 1) protect and restore water quality (projects must include monitoring), 2) protect, restore, and enhance land and habitat, and 3) reduce the spread of invasive species along streams, rivers, and land transportation routes.	Partners can be counties, watershed districts, cities, non-profits, and others within the 12-county metropolitan area. Projects must be within a mapped Metro Conservation Corridor.	http://www.dnr.state.mn.us/metroconservationcorridors/index.html	For more information, please contact: Kristina Geiger, 651-917-6295 Minnesota Land Trust, kgeiger@mnland.org Bart Richardson, 651-259-5796 MnDNR, bart.richardson@state.mn.us
Clean Water Partnership Loan Program	Water Quality	MPCA	The MPCA is accepting applications for water resource projects to be funded through the CWP Loan Program (approximately $11 million available). Applications will be accepted from local governmental units (LGUs) interested in leading a project for protection or improvement of groundwater or surface water bodies from nonpoint sources. Applicants awarded loan funds may begin project work after the loan agreement is executed and project workplan is approved. No reimbursable costs may be incurred prior to execution of the loan agreement.	Only LGUs that meet the following criteria are eligible to apply for loans. • LGU has the ability to pledge its full faith and credit to ensure repayment of a project implementation loan. • LGU has the authority to generate cash revenues for the repayment of a loan. • LGU has the authority to enter into a loan agreement with the MPCA. LGUs that meet these requirements include counties, cities, townships, tribes, watershed districts, and watershed management organizations. Joint powers organizations composed of	https://www.pca.state.mn.us/water/financial-assistance-nonpoint-source-water-pollution-projects-clean-water-partnership-and	Cindy Penny: cynthia.penny@state.mn.us or 651-757-2099

Grant Program	Category	Sponsor Agency	General Info	Eligibility	Link to Website	Contact Information
				previously mentioned entities are also eligible but must submit a resolution from at least one LGU that meets the eligible criteria stating that they will participate in the project as a loan sponsor. Local soil and water conservation districts and other LGUs that are not eligible to serve as a loan sponsor may partner as a project sponsor with another government entity, such as a county or watershed district, which will serve as the loan sponsor.		
Continuing Authorities Program	Natural Resources/ Habitat Protection	United States Army Corps of Engineers	This program authorizes the Corps of Engineers to plan, design, and implement certain water resources projects without additional project specific congressional authorization.	Requirements for application include sponsorship and cost sharing. The sponsoring agency may be a state, county, city, tribes, or other group. Cost share is 65 percent federal and 35 percent sponsor (County), and maximum federal costs can be $10,000,000. Spring Lakes represents a possible project to restore vegetation with a drawdown of Pool 2 and mitigation/use of sediment to		For more information, please contact: Tim Novak or Nathan Campbell from USACE.

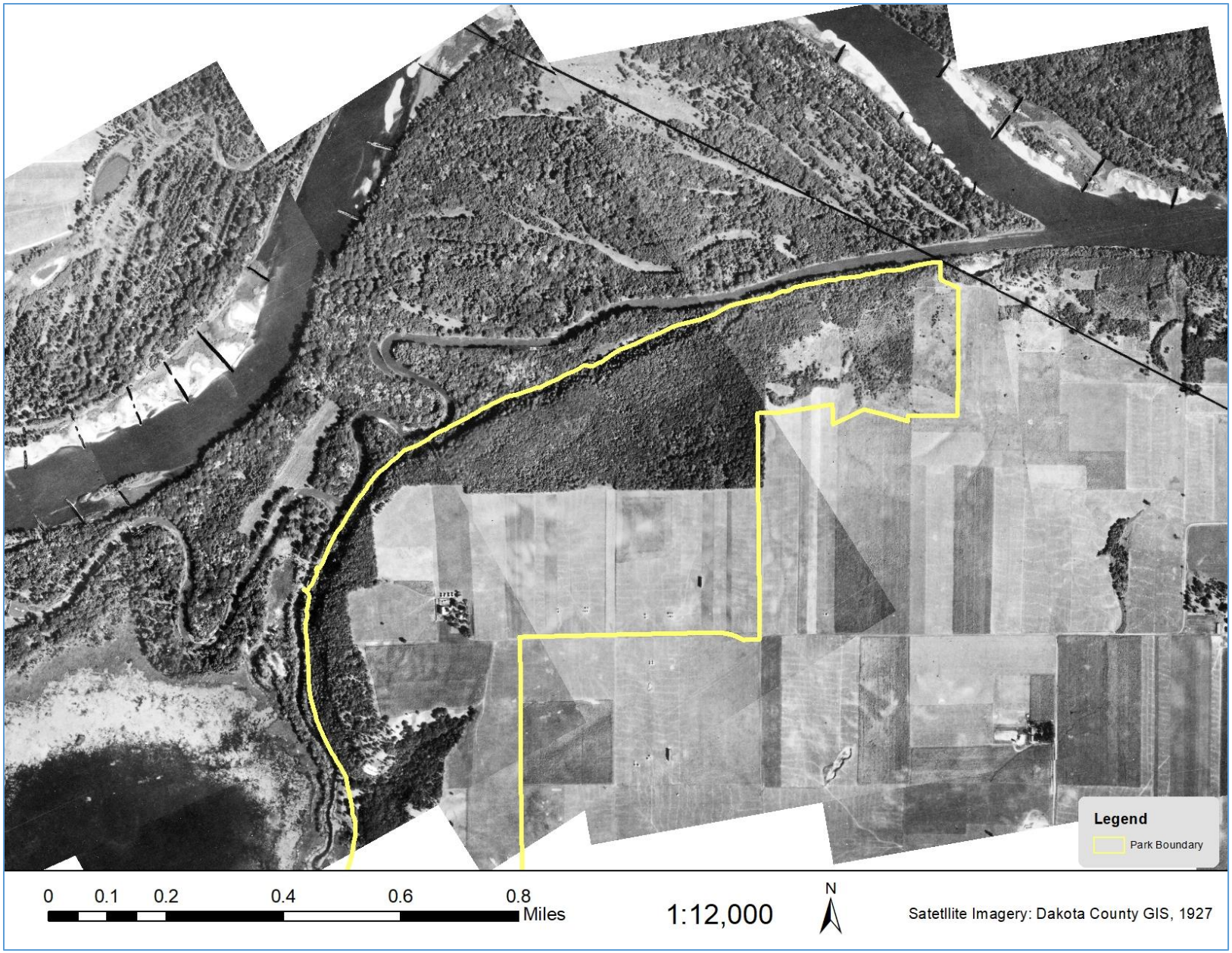
Grant Program	Category	Sponsor Agency	General Info	Eligibility	Link to Website	Contact Information
				perhaps build islands for habitat.		
VRPJPO Water Resource Improvement Financial Assistance Program	Water Quality/In-Stream Habitat Restoration	Vermillion River Watershed Joint Powers Organization	The VRWJPO offers funding and/or technical assistance for projects that provide water quality improvement or in-stream habitat restoration.	Landowners, Units of Government, and Non-Profit Organizations within the Vermillion River Watershed are eligible.	http://www.vermillionriverwatershed.org/get-involved/financial-assistance/	VRWJPO (952) 891-7000

Appendix A.

Historical Aerial Photographs from 1927

In 1927, as part of the Mississippi River lock and dam project, the river was flown for aerial photography. This is the oldest date available for aerial photos in the state. Since SLPR is adjacent to the Mississippi River, the County is fortunate to have areas of the Park Reserve that can be seen in these photos. Interesting features in these photos include the following:

- The extent of row cropping in the Upper Park Reserve in 1927
- Areas of dense forest in the Upper Park Reserve in 1927
- Areas of open canopy forest and woodland in the Upper Park Reserve in 1927
- Areas of savanna in the far eastern part of the Upper Park Reserve in 1927
- Conditions of the hydrology and cover types prior to the flooding of the river the Spring Lake Basin area: the Mississippi River floodplain, Spring Lake and its vast size, and the mosaic of marshes, wetlands, and woodlands and savannas
- The presence of a stream that meandered just south of the main channel of the river and another small stream that paralleled the bluffs on the eastern side of the Park Reserve area (this was the stream that provided power to the old Mill)


Legend
Park Boundary
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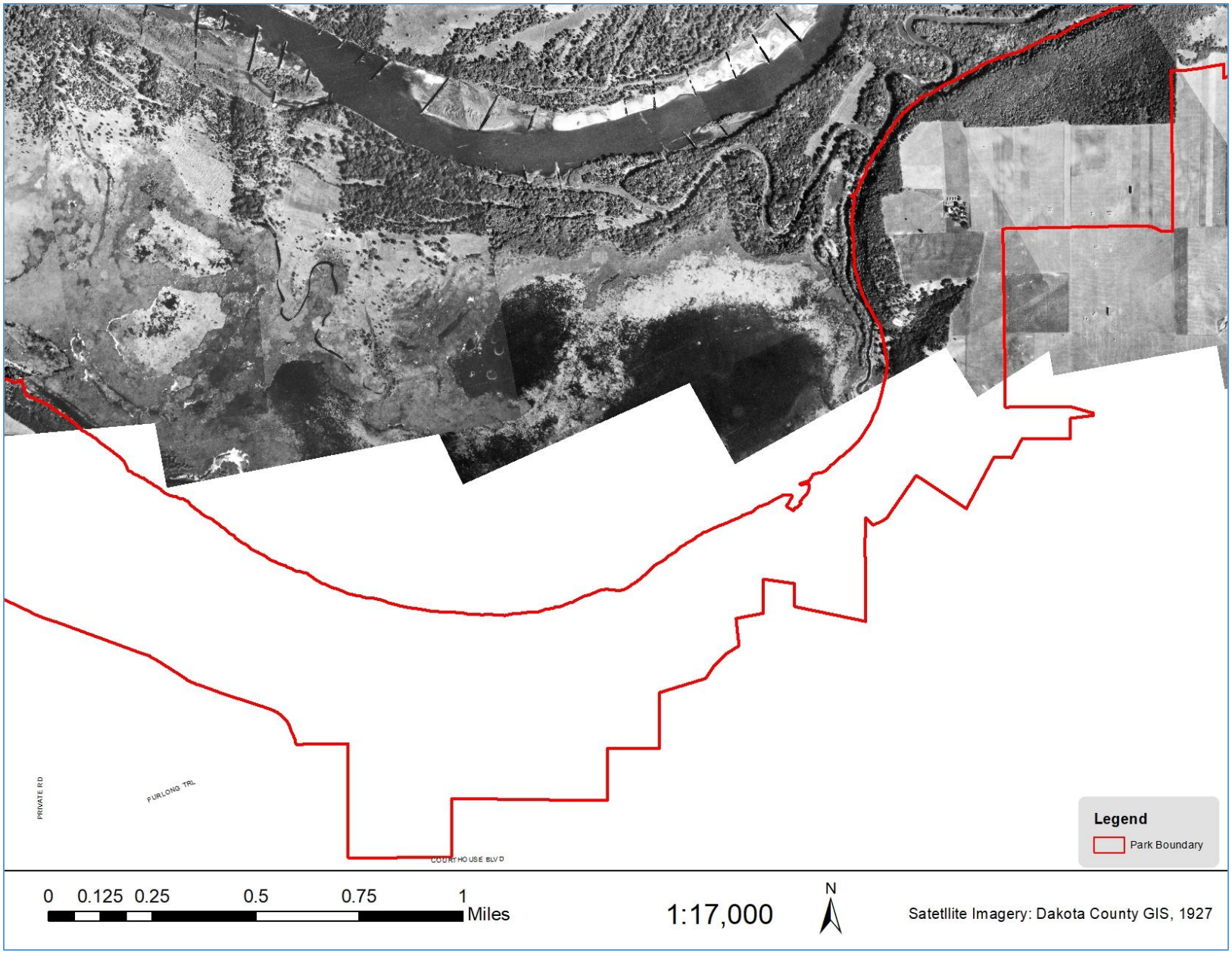
Miles
1:12,000
N
Satetllite Imagery: Dakota County GIS, 1927


PRIVATE RD
FURLONG TRL
COURTHOUSE BLVD
Legend
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Miles
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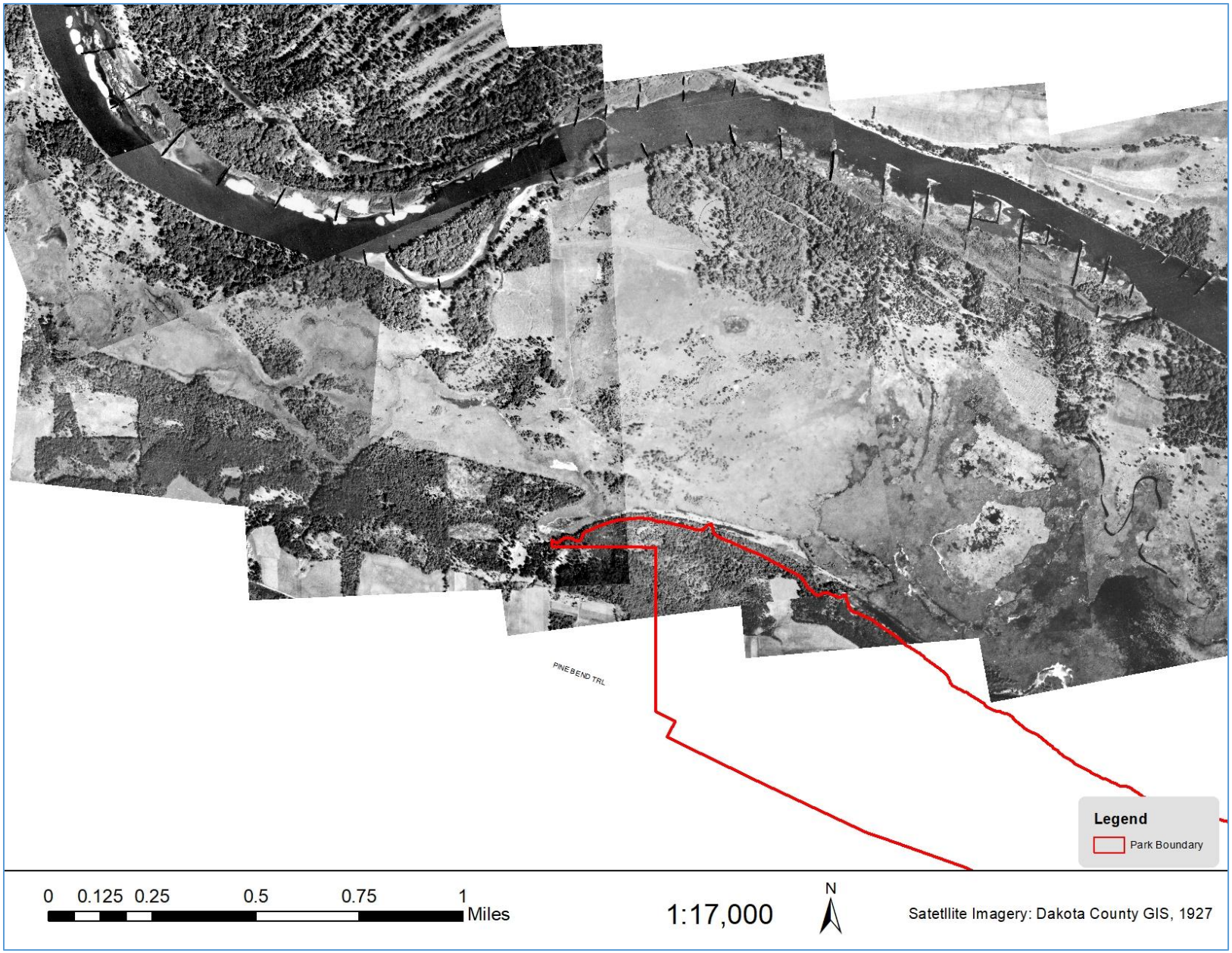
N
Satetllite Imagery: Dakota County GIS, 1927


PINE BEND TRL
Legend
Park Boundary
0 0.125 0.25 0.5 0.75 1
Miles
1:17,000
N
Satetllite Imagery: Dakota County GIS, 1927