

Dakota County
Natural Resource Management System Plan

May 2017



Dakota County Natural Resource Management System Plan

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EXECUTIVE SUMMARY



Dakota County continues to be shaped by its natural resources. For centuries its soils, plants, and animals sustained native peoples and European settlers, and these natural resources are still important to the County's 410,000 residents, many of whom farm and work in the County. The County's original plant communities are now scarce and most of the remaining natural areas and surface waters have been damaged by adjacent development and agriculture, invasive species, and suppression of surface fires—a natural disturbance that sustains many native ecosystems. The vast loss of natural areas and reduced quality of those that remain not only have environmental consequences, this also detracts from recreation, quality of life, and a sense of place.

Dakota County recognizes the importance of the natural resources represented by its vegetation, waters and wildlife. Over the decades the County first protected, and then began managing its natural resources throughout the County. This Natural Resource Management System Plan (NRMSP) represents a county-wide effort to increase the level of natural resource management in the County's parks, regional greenways, and conservation easements.

This NRMSP focuses on County-managed lands and waters (**Figure ES-1**), namely:

Parks

- Lake Byllesby Regional Park (611 acres)
- Lebanon Hills Regional Park (1,874 acres)
- Miesville Ravine Park Reserve (1,847 acres)
- Spring Lake Park Reserve (1,160 acres)
- Thompson County Park (58 acres)
- Whitetail Woods Regional Park (456 acres)
- Dakota Woods Dog Park (14 acres)

Regional Greenways

- Big Rivers (5.1 miles)
- Minnesota River (10.9 miles)
- Mississippi River (36 miles)
- River to River (8.4 miles)
- Lebanon to Mendota (approved)
- Lake Marion (approved)
- Vermillion Highlands (approved)

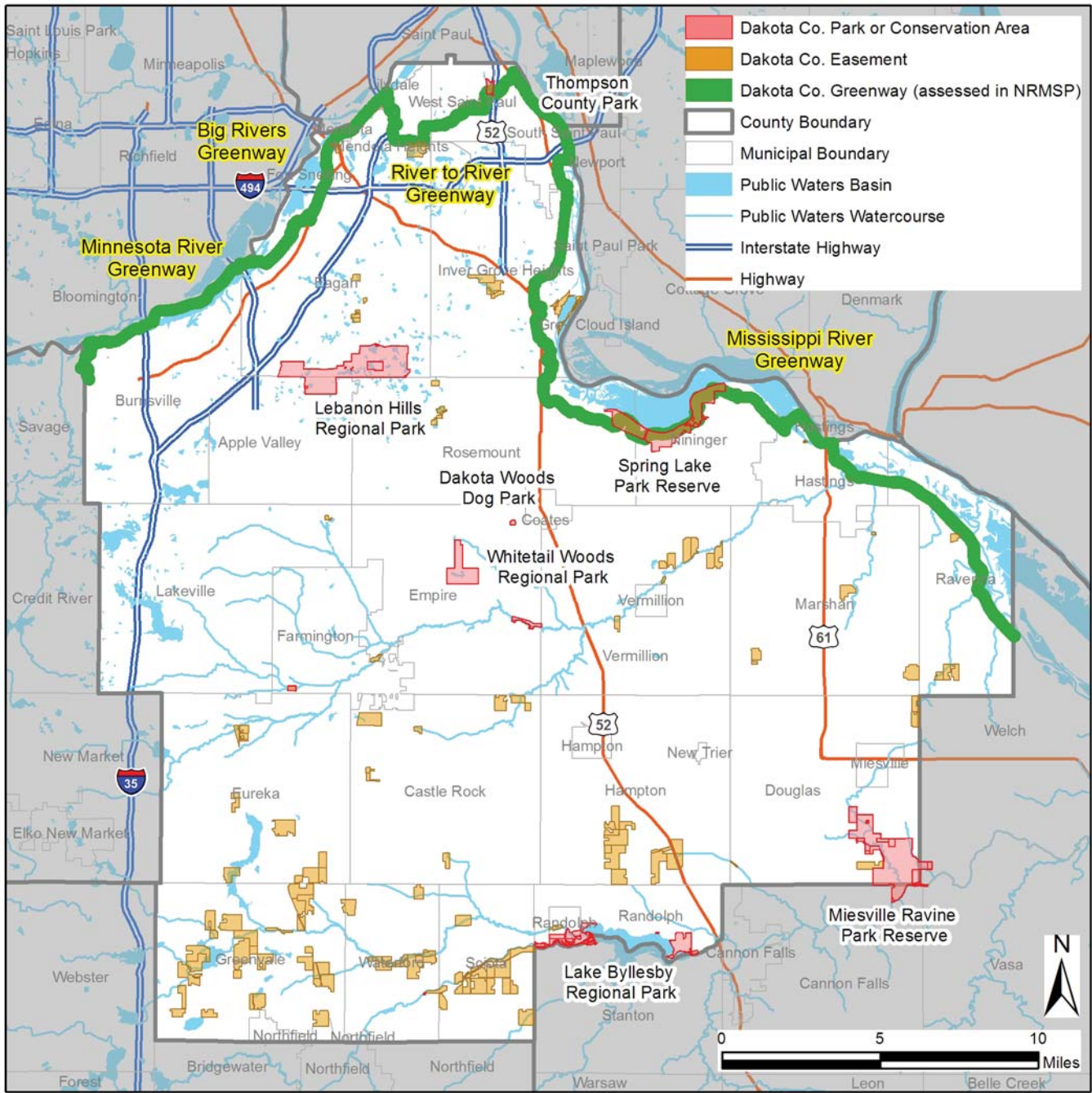
Conservation easements

- Natural area easements (41, totaling 1,621 acres)
- Agricultural easements (68, totaling 7,758 acres)

The vegetation, water, and wildlife in these areas will benefit from a strategic approach to natural resource management. This, in turn,

will produce a higher quality and more resilient environment than today, more enjoyable recreation for County residents and visitors, and greater sustainability of the County's valuable agricultural lands.

Figure ES-1. Dakota County parks, greenways and easements.



Developing this NRMSP took place in five phases, described below:

1. Scoping
2. Research
3. Vision & Concepts
4. Preferred Plan
5. Public Review and Plan Adoption

The consulting team worked closely with a large contingent of County staff, who brought a broad range of expertise and perspectives to the project. County contributions came from staff within Natural Resources, Parks, and Planning Departments, as well as the County Planning Commission, Physical Development Committee, and County Board of Commissioners. This plan also benefited from valuable input gathered from a Technical Advisory Panel of natural resource experts from across the region, and also from contributions by the public via interactive open houses and a County-wide survey designed specifically for this plan.

In the **Scoping** phase the consultant-County team refined the approach used to develop this system plan. The **Research** phase involved a compilation and review of existing natural resources data, such as land cover, water features, rare natural features; and a synthesis of County demographic data, including the status and trends in age, ethnicity, and use of park resources by Dakota County's population. In addition, the County's existing natural resource management and volunteer programs were inventoried and compared in a benchmarking study with comparable programs run by other counties and regional systems. In the **Vision & Concepts** phase, principles were described which contributed to a vision for the NRMSP:

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.

From the vision emerged goals, which were organized as follows:

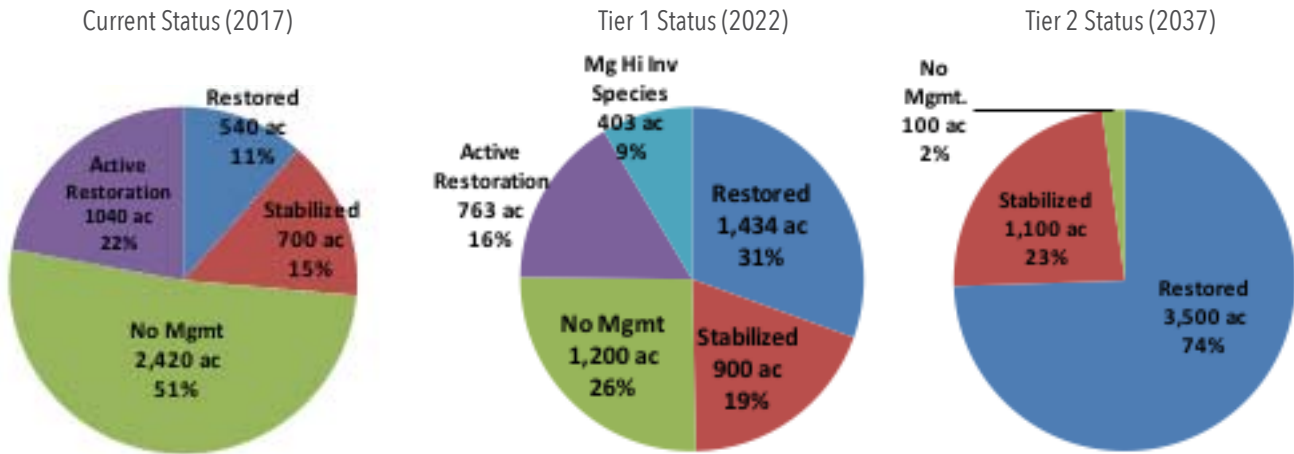
- Vegetation management in parks, with a focus on natural areas
- Water resources management in parks
- Wildlife management in parks
- Natural resource management in regional greenways
- Natural resource management in conservation easements

Through an iterative process, a suite of approaches was developed to achieve NRMSP goals, leading ultimately to a Preferred Plan. The Preferred Plan has two tiers: In the first five years of plan implementation (years 1-5), Tier 1 projects will address priority goals in park vegetation, waters, and wildlife; greenways; and easements. Tier 2 projects are also important but less critical to program success. These will be implemented over 15 years (years 6-20 of this plan) and will address all remaining goals. The Public Review and Plan Adoption phase of NRMSP development occurred in spring of 2017, with final plan adoption by the County Board.

While the County already manages its natural resources, this NRMSP is a substantial step up and expresses a high commitment to natural resources. This is clearly illustrated in **Figure ES-2**. The amount of park land being actively managed will increase from 49 percent today to 75 percent after five years of plan implementation, and reach 98 percent of all lands managed at the end of the plan, twenty years from now. Similar advances in water and wildlife resources management will occur in parks, greenways, and easements by implementing all Tier 1 and Tier 2 activities over the next twenty years.



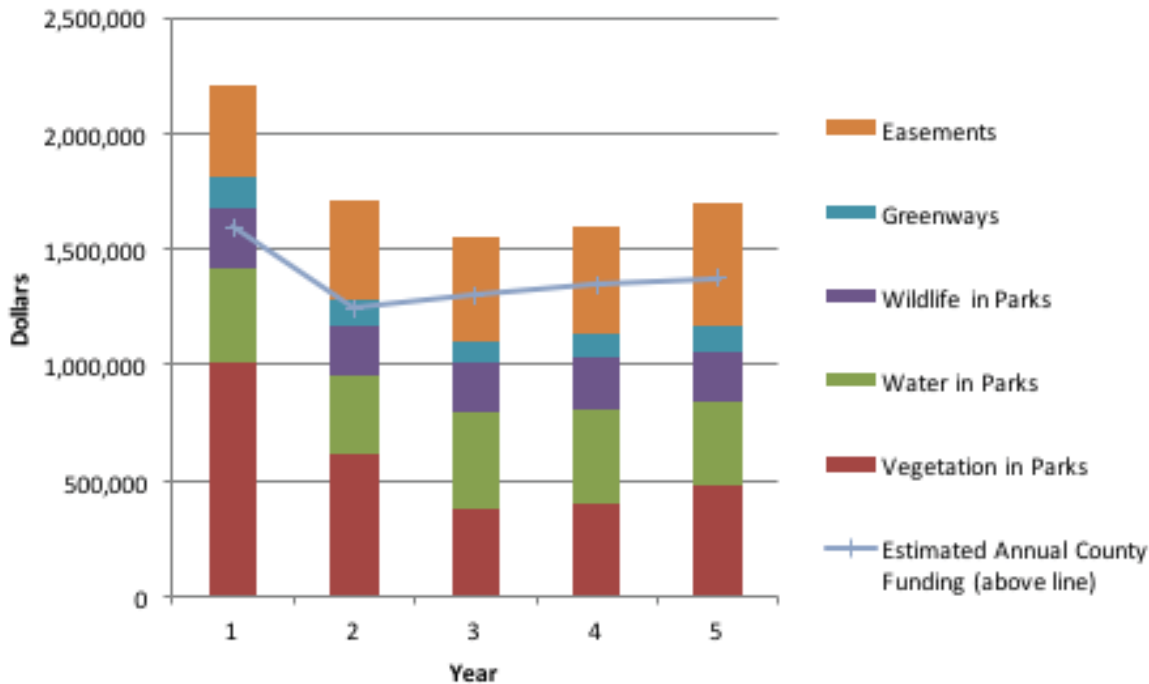
Figure ES-2. Expansion of Dakota County park and greenway vegetation management, 2017 to 2037



To implement this system-wide plan, the County recognizes it will need to continue to pursue and secure state and other grants, capitalize on partnerships, collaborate with municipalities and other entities in the County, and commit additional internal County resources for staff, volunteer coordination, equipment, and external contractor work.

Executing this plan requires an increase in funding above current levels (Figure ES-3). In the first year of Tier 1 implementation, costs are higher than in following years. Vegetation management costs decrease over time as invasive plants and declining vegetation quality are addressed. Costs in the other categories remain generally constant over the five years. The County's share of the new funding is greatest in the first year, and then declines to 20-25 percent of the total. The County's contribution is expected to leverage outside funds or equivalent labor contributions at a 3:1 ratio.

Figure ES-3. Estimated annual Tier 1 costs for years 1-5 (2018-2022). The area above the line is the estimated additional funding above current levels which the County must generate internally each year.



*Assumes same CIP funding at Year 5 (2022) as that of Year 4 (2021).

Note: These estimated costs may differ somewhat from other estimates in the NRMSP due to more refined sub-analyses.

By 2022, the outcomes and benefits of implementing Tier 1 activities will:

- Leverage an estimated \$6.5M of non-County resources, representing 78 percent of the estimated expenses in the 2017-2022 period.
- Demonstrate active and responsible stewardship, resulting in 75 percent of the natural vegetation in County parks being restored or managed within five years.
- Recognize and positively engage the public's long-stated support for natural resource management.
- Positively influence cities, agencies and private property owners in the County to increase natural resource management.
- Act consistent with County Board Goals.
- Provide strategic protection of past natural resource investments, such as past acquisitions and restoration projects.
- Integrate economic, social, ecological, and political values in the County's parks, greenways and easements.

- Increase public awareness, understanding and appreciation of the County's natural resources, the need for active natural resources management, and the management work that the County is doing.
- Expand a popular and constructive outlet for citizens to get involved.
- Foster greater levels of collaboration and partnerships.
- Provide greater proactive actions which minimize and avoid future problems and costs.

Tier 2 costs—which begin in 2023—are much harder to estimate. Assuming Tier 1 activities are completed by 2022, the combined capital and maintenance costs for the fifteen years of Tier 2 activities may range from \$13.2M to \$36M, or \$880,000 to \$2.4M per year (**Table ES-1**). Tier 2 activities include efforts outside of lands in which the County has a legal interest. This means the County will be engaged in activities that positively benefits the land it owns and has acquired an easement, but which will be accomplished on lands owned or managed by others.

Table ES-1. Tier 2 activities and estimated costs (2023-2037).

Activity	Outcomes & Costs		
	Estimated Acres/Sites Affected	Total Cost (Low)	Total Cost (High)
Park Vegetation (capital)	4,000 ac. inside + 1,000 ac. outside parks	\$5M	\$15M
Park Vegetation (maintenance)	4,600 ac	\$6M	\$12M
Water in Parks (capital)	850 ac. + watersheds outside parks	\$300K	\$2M
Water in Parks (maintenance)	350 ac	\$50K	\$1M
Wildlife in Parks (capital)	600 ac. - 4,000 ac.	\$200K	\$900K
Wildlife in Parks (maintenance)	TBD	\$50K	\$300K
Greenways (capital)	TBD	TBD	TBD
Greenways (maintenance)	TBD	TBD	TBD
Easements (capital)	1,200 ac.	\$1.2M	\$4M
Easements (maintenance)	2,000	\$100K	\$500K
Subtotal, Capital (20 years)	~5,000	\$7M	\$22M
Subtotal, Maintenance (20 years)	~6,000	\$6.2M	\$14M

To hold itself accountable to the public and to document that implementing the NRMSP is achieving its goals, the County will measure outcomes related to vegetation, waters and wildlife in parks, greenways, and easements. Monitoring progress will also enable “adaptive management”: a cycle of implementation, monitoring, evaluation, adjustment, and more implementation. Adaptive management, which will continue indefinitely, has been shown to improve results and increase efficiency. Data collected as part of this NRMSP will be recorded and archived in cumulative spreadsheets, which will be used to complete multi-year analyses of conditions and trends.

Although this NRMSP was developed with the best available data and draws firm conclusions about priorities for the County’s natural resource management program, it should not be viewed as unchangeable. Rather, it should be seen as establishing a foundation for a successful, system-wide natural resource management program, enabling Dakota County to realize the many environmental, social, and economic benefits of healthy and resilient natural resources.



1. INTRODUCTION AND BACKGROUND



Star Pond Prairie in Lebanon Hills Regional Park. Photo by AES.

Nearly entirely bounded by three large rivers, with a diverse landscape of hills, plains and bluffs, Dakota County continues to be shaped by its natural resources. The wide variety of plants and animals living here sustained the native peoples and early settlers. The fertile soils gave birth to a thriving agricultural tradition. Small communities became towns and cities. Its history is like much of the Midwest.

Most of the County's 410,000 residents live in the urbanized northern third of the County, a rolling landscape dotted with lakes, forests, and wetlands. The southern two-thirds are generally level, open and dissected by many streams and tributaries. Although row crop agriculture dominates land use here, this area harbors the County's largest remnant natural areas.

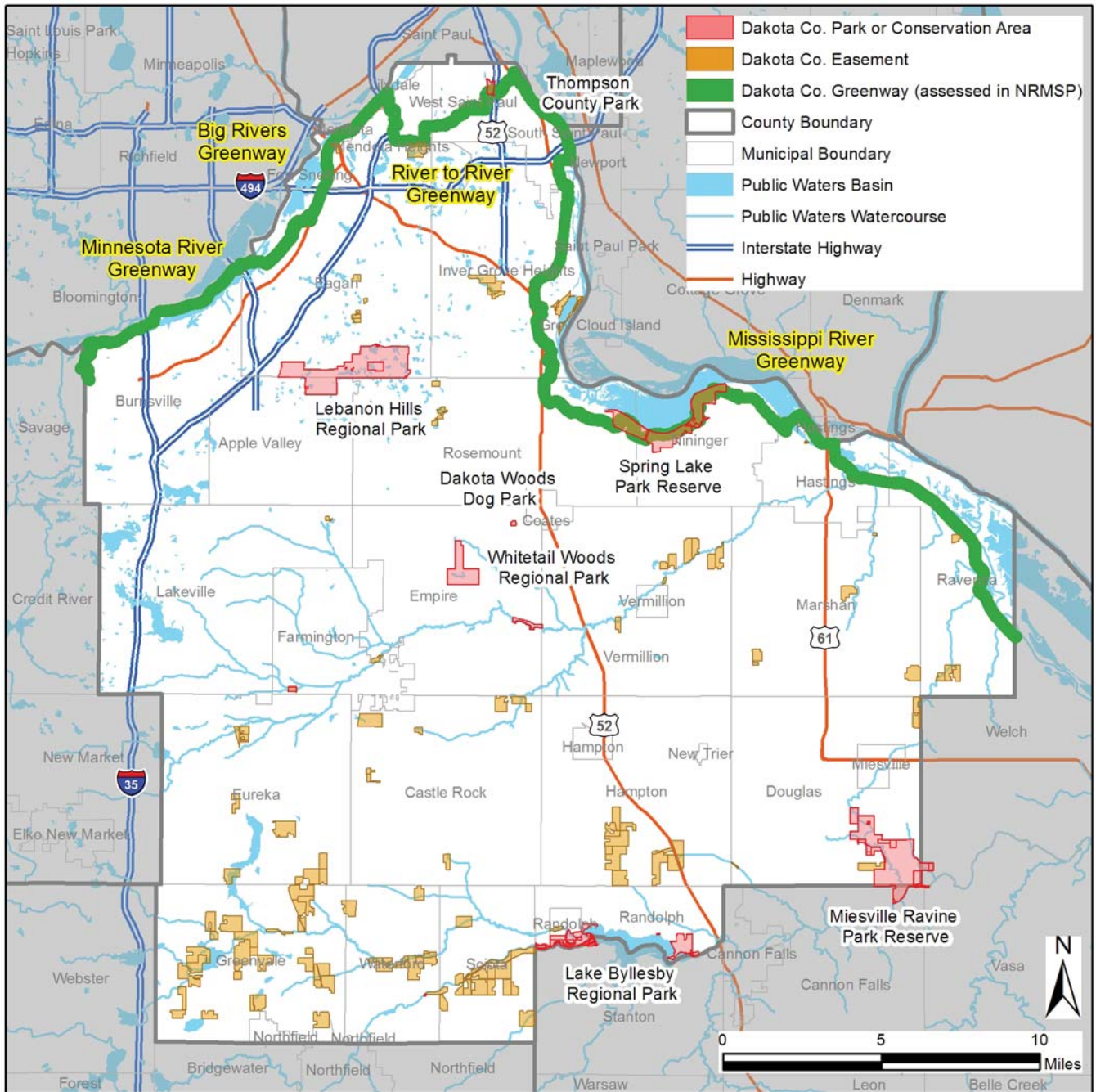
The agriculturally rich soils and easy commuting to St. Paul and Minneapolis attracted agriculture and suburban development, which has caused the loss of over ninety percent of the County's original wetlands, prairies, savannas, and upland forests. The remaining natural areas are largely degraded and fragmented, meaning they do not function as healthy natural systems. Despite their rarity and limited extent, some remnants support uncommon plants and animals and unique ecological communities.

Fortunately, many natural areas, some of high quality, are protected in the County. Federal and state government helped establish an early, large, protected area which became the Gores Pool #3 Wildlife Management Area (WMA) on the Mississippi River. Created in the 1930s when the Red Wing lock and dam was built, the WMA has

over 6,700 acres of natural habitat. The state also created Fort Snelling State Park (3,711 acres), various wildlife and aquatic management areas (12,923 acres), and scientific and natural areas (1,007 acres) in and near the County. The federal government protected 4,400 acres of the Minnesota River Valley in Dakota County as part of one of the rare urban national wildlife refuges.

The County has been protecting important natural areas for decades. Since its first park acquisition in 1967, the County has preserved many quality natural areas and scenic vistas. The "land protection era" was a first step in bringing important County lands and waters into a natural resource management program – lands which otherwise would likely have been altered and/or developed. Although the County continues to protect important lands with significant natural resources, it has since moved into a new era management with the completion of this Natural Resource Management System Plan (NRMSP). This plan brings under a management umbrella Dakota County parks, greenways, and easements (**Figure 1**). (The technical terms in this plan are explained in **Appendix A**.)

Figure 1. Dakota County parks, greenways, and easements.



1.1. REGIONAL AND COUNTY PARKS

The County has established six distinct parkland areas, which are diverse and varied in resources (Figures 2 through 4).

- Lake Byllesby Regional Park (611 acres)
- Lebanon Hills Regional Park (1,874 acres) (Figure 2)
- Miesville Ravine Park Reserve (1,847 acres) (Figure 3)
- Spring Lake Park Reserve (1,160 acres) (Figure 4)
- Thompson County Park (58 acres)
- Whitetail Woods Regional Park (456 acres)



Figure 2. A skier is traversing an area known as “Buck Pond” in Lebanon Hills Regional Park that is the site of a wetland and savanna restoration.



Figure 3. View of the Trout Brook valley from atop the largest bluff prairie remnant in Miesville Ravine Park Reserve.



Figure 4. The “nature-based” theme of the County park system is accentuated by scenic views, like this one from the bluffs of Spring Lake Park Reserve.

Park Designation Status

Parks within the system have been designated differently, according to usage, resource status, and development expectations. Using a combination of criteria from LCCMR, Metropolitan Council, and Dakota County, there are three types of parks in the County Park System: 1) Park Reserve, 2) Regional Park, and 3) County Park.

Regional Parks

According to Metropolitan Council, Regional parks (RP) “should contain diverse natural resources and the ability to provide for a wide range of natural resource related recreational opportunities. Access to water bodies suitable for recreation is particularly important. A regional park should be large enough to accommodate a variety of activities, preserve a pleasant natural aspect and buffer activity areas from each other. Regional parks are 200 to 500 acres. Occasionally, because of the quality of the resource an exception may be made and a RP may be as small as 100 acres.” Three Regional Parks exist in Dakota County: Lebanon Hills, Whitetail Woods, and Lake Byllesby Regional Parks.

Park Reserves

Park Reserves “are expected to provide a diversity of outdoor recreational activities. A reserve is also intended to provide, protect and manage representative areas of the original major landscape types in the metro area. Optimal size exceeds 2,000 acres, while the minimum size is 1,000 acres.” Two Park Reserves exist in the County: Spring Lake Park Reserve and Miesville Ravine Park Reserve

County Parks

A County Park is designated as such if it does not meet the criteria of either a Regional Park or a Park Reserve, but the County still consid-

ers it to have significant local value or resources. One County Park exists in the County: Thompson County Park in Mendota Heights.

Other park units include the 14-acre Dakota Woods Dog Park and a newly established park system unit called County Park Conservation Areas. These new park units were established to protect natural resources and provide future greenway recreational opportunities and natural resource protection.

- Vermillion River Unit in Empire Township (62 acres)
- Vermillion River South Creek Unit in the City of Farmington (24 acres)

1.2. REGIONAL GREENWAYS

Four regional greenways provide the backbone of a 200-mile multi-purpose, regional greenway system. According to the Met Council, Regional Trails “are intended to provide recreational travel along linear pathways. They are selected to pass through, or provide access to, elements in the regional park system and to intersect with local trail systems.” The County classifies greenways as urban (100 feet wide), suburban (200 feet wide), and rural (300 feet wide).

The greenway system includes many separated natural areas that could be connected and enhanced, depending on greenway width. Functioning like a linear park, greenways could be designed to improve water quality and wildlife habitat. Properly designed and managed, they can avoid problems like spread of invasive plants and small animal fatalities. However, greenway management is complex and requires close collaboration among many municipalities and landowners. Limited restoration and natural resource management has occurred within some greenways.



Existing regional greenway.

The main regional greenway framework and approved segments are:

- Big Rivers (5.1 miles)
- Minnesota River (10.9 miles)
- Mississippi River (36 miles)
- River to River (8.4 miles)
- Lebanon to Mendota (approved)
- Lake Marion (approved)
- Vermillion Highlands (approved)

1.3. CONSERVATION EASEMENTS



One of the Natural Areas Conservation Easements along the Vermillion River.

A thriving agricultural economy maintains the open, rural character of the County. Suburban growth, by contrast, shrinks natural areas and removes productive farmland. County leaders and citizens concerned about these trends that accelerated in the 1990s created the 2002 Dakota County Farmland and Natural Area Protection Plan (“Protection Plan”). This plan identified nearly 76,000 acres deserving protection; 30,000 acres of high quality natural areas and 46,000 acres of farmland and nearby natural areas within a half mile of rivers and streams. In 2003, citizens led a successful campaign to pass a \$20 million bond referendum to provide funding to begin implementing the Farmland and Natural Areas Program (FNAP) and subsequently the more comprehensive Land Conservation Program.

Forty-one natural area easements, totaling 1,621 acres, have been acquired from willing landowners to protect forests, grasslands, wetlands, and shoreland. Development is prohibited, and landown-

ers must develop Natural Resource Management Plans (NRMPs) for these easement areas. Easements remain in private ownership, and are inaccessible to the public without landowner permission. Sixty-eight agricultural easements, totaling 7,758 acres, have been acquired in the southern portion of the County. These easements protect nearly 1,300 acres of associated natural areas, prevent development, and allow cultivation and grazing. Voluntary Stewardship Plans are jointly developed and landowners must install vegetative buffers along all rivers, streams and wetlands.



Restored prairie at a Natural Area Conservation Easement in Ravenna Township.

Through the FNAP and now the Land Conservation Program, the County has worked with several cities and the Minnesota Department of Natural Resources (DNR) to protect more than 1,900 acres of new public lands. Some of these are notable cultural places such as Pilot Knob in Mendota Heights, Caponi Art Park in Eagan, Pine Bend Bluffs Scientific and Natural Area (SNA) in Inver Grove Heights, Hampton Woods Wildlife Management Area (WMA) in Hampton and Castle Rock Townships, Vermillion River WMA, and Aquatic Management Areas in Empire and Vermillion Townships.

1.3.1. Park and Buffer Easements

Easements have also been secured to buffer sensitive areas of parks. The County has acquired five easements, preventing development and ensuring screening of new development from parks. Two are located within Spring Lake Park Reserve and three are adjacent to Lebanon Hills Regional Park.

Countywide Land Protection

Cities, private institutions and corporations have also protected approximately 37,000 acres of natural areas in the County. Collectively, approximately 79,240 acres, or 21 percent of the 375,517 total acres of the County, is protected for open space and natural resource purposes.

2. NATURAL RESOURCES AND THEIR IMPORTANCE



Sandstone cliffs across from Lake Byllesby Regional Park East. Photo by Dakota County Staff.

Natural resources exist spontaneously in nature. They are divided into non-living natural resources (sunlight, air, water, metals, and minerals) and those that are alive (soil, vegetation, and animals). Some are abundant, like sunlight and air, while others are distributed unevenly (e.g., fresh water, certain animal populations), and some are local—that is, rare and scattered, such as gold and brook trout. Most natural resources are local. Although some such as air and solar radiation are thought to be inexhaustible, the vast majority is limited and can be lost if overused or poorly managed.

Industrial societies tend to value natural resources for their extrinsic value, or how useful they are to people. Timber, gravel, stone, soil for crops, groundwater for drinking and irrigation—all are important to and for people. An alternate attitude, however, is that natural resources also have intrinsic value unto themselves—that all species of animals, plants, and fungi have a basic right to exist. This attitude is really no different than what is extended to society in general—to ourselves, our pets and things we hold dear. There is a large and growing body of ethical thought which grants humans and nature equal standing. For instance, Aldo Leopold, noted conservationist, philosopher, writer, hunter, and outdoorsman (and considered by many to be the father of wildlife ecology and the United States' wilderness system), promoted the idea of a "land ethic," which calls for an ethical, caring relationship between people and nature. In A Sand County Almanac, written more than over 50 years ago, Leopold wrote:

- *A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.*
- *We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.*

So not only do people need to use nature and natural resources to survive, we also may need to strike a balance between our own interests and the interests of the ecological community at large. The "intrinsic value" attitude towards nature has been steadily gaining support in modern times, as people seek experiences in natural areas in parks, through travel, by visiting museums and zoo exhibits, or simply while watching television programs about nature.

Ethics aside, it is well known that most people want to live near parks and open space. Homeowners and businesses across the country consistently rate proximity to a park as highly desirable, which typically generates higher demand for buildings near open space. Several studies measured the effect of parks on property values and found a value increase. For example, a study by Michigan State University in Dallas, Texas, found that distance to and the size of a park resulted in a price premium of up to two to three percent. Other researchers found that homes next to greenbelts in Austin, Texas saw an increase in value of six to twelve percent. Here in the Twin Cities, researchers summarized four property value studies and found that proximity to parks increased urban and suburban property values, except in suburbs where active recreational parks decreased property values.

2.1. ECOSYSTEM SERVICES

Natural resources generate many unseen and unappreciated benefits for individuals and communities that can often be quantified and even assigned a monetary value for “services” they provide. For instance, relative to intensively developed urban and intensively farmed landscapes, natural areas are better at maintaining clean air and water and ecologically healthier plant and animal life. If we were to place a monetary value on clean air and clean water, it would run into the billions of dollars. Scientific studies continually demonstrate other, less tangible services provided by natural systems, such as a strong link between time spent in or near nature and better physical and mental health. Even simply viewing nature out a window can improve test scores in school children or raise people’s depressed moods. Of course, people love to fish, hike, bike, ski, picnic, camp, and celebrate with family. Sometimes simply sitting in stillness surrounded by nature can allow for the nourishment of the spirit, for which monetary value cannot be assigned.

The following are a few examples of hidden “ecosystem services.” An ecosystem service is a spontaneous output from nature that benefits people. Natural resources deliver, free of charge, many helpful goods (such as wild food) and services (such as purification of water), which support and enrich society and the economy. Imagine the cost of creating fertile soil from rock and manure; nature does it for free over vast areas. Without vegetation and soil to soak up rainfall, there would be little groundwater because water would simply run off the land, and growing crops would be very challenging. Another example is decomposition. If we did not have functioning decomposers, such as aerobic bacteria and most fungi, we would be wading through heaps of dead material and detritus. Keeping the

environment healthy for decomposers to function properly should be an important goal for society.

The ecosystem services generally at work in the County are:

Supporting (Natural Processes)

- Photosynthesis to grow plants
- Nutrient cycling (carbon, phosphorus, etc.)
- Carbon sequestration in plants & soil
- Soil formation
- Erosion control by vegetation and soil biota
- Air purification and oxygen production
- Water purification
- Decomposition of waste
- Detoxification of soil & water
- Groundwater recharge
- Disease and pest control
- Pollination of crops and wild plants
- Seed dispersal for regeneration
- Local shading and cooling (microclimate)
- Blocking of harmful ultraviolet radiation

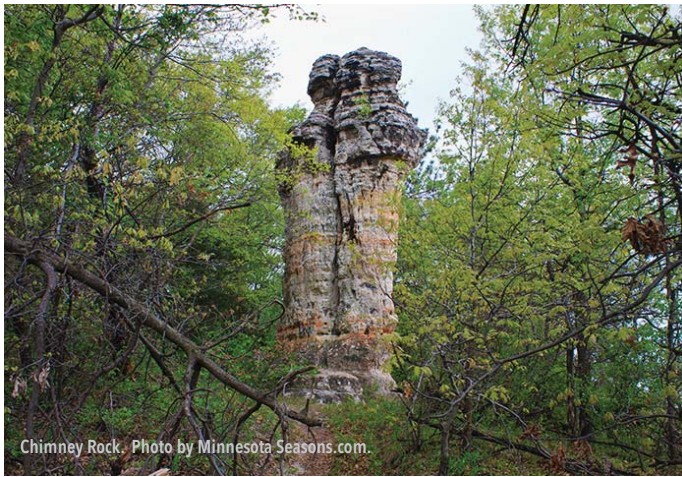
Provisioning (Goods)

- Clean air
- Fresh, clean water
- Fertile & productive soil
- Food production
- Fiber production (paper pulp, etc.)
- Fuel production (biomass for energy)
- Game & fish production
- Biodiversity & wild genetic material

Regulating

- Climate stabilization
- Water volume and flow regulation
- Flood and drought regulation
- Disease and pest regulation
- Hazard reduction

Natural resources can define how a community sees itself, with far-reaching effects on culture and the economy. They add real value, both in mere existence and also for usefulness; this in turn creates a sense of place that attracts new residents and convinces current residents to stay. They can also be the reason that people visit parks. Well-managed natural resources improve the park visitors' experience. Raising awareness of how natural resources positively affect the culture and economy of a community gives a rationale to protect and properly manage natural resources, and to treat this as a normal part of a community's daily life.



Chimney Rock. Photo by Minnesota Seasons.com.



Sandstone cliffs across from Lake Byllesby Regional Park East. Photo by Dakota County Staff.

3. DAKOTA COUNTY CONTEXT



Pine Bend SNA from the Mississippi River Regional Trail. Photo by Dakota County Staff.

The County's natural resources are described in the 2009 County Comprehensive Plan and other County reports. The following summarizes but also adds to that extensive information.

3.1. GEOLOGIC HISTORY

The Wisconsin glaciation ended about 10,000 years ago and created the region's major landforms. The glaciers left a rolling and hilly landscape with lakes and wetlands in depressions. Soils formed primarily from sandy and gravelly glacial outwash on level plains and are well drained. Other deposits called moraines appear today as mounds of mixed-up rock, gravel, sand and clay, with low spots—or "kettles"—and are common in the northern and western portions of the County.

3.2. VEGETATION AND ECOLOGICAL REGIONS

The County's natural resources are shaped by their ecoregion context—ecoregions being landscapes of similar characteristics. The DNR defined provinces, sections and subsections within a national ecoregion classification. The County is in the Eastern Broadleaf Forest and divided into two sections: Paleozoic Plateau and the Minnesota and Northeast Iowa Moraines. The presence of these ecore-

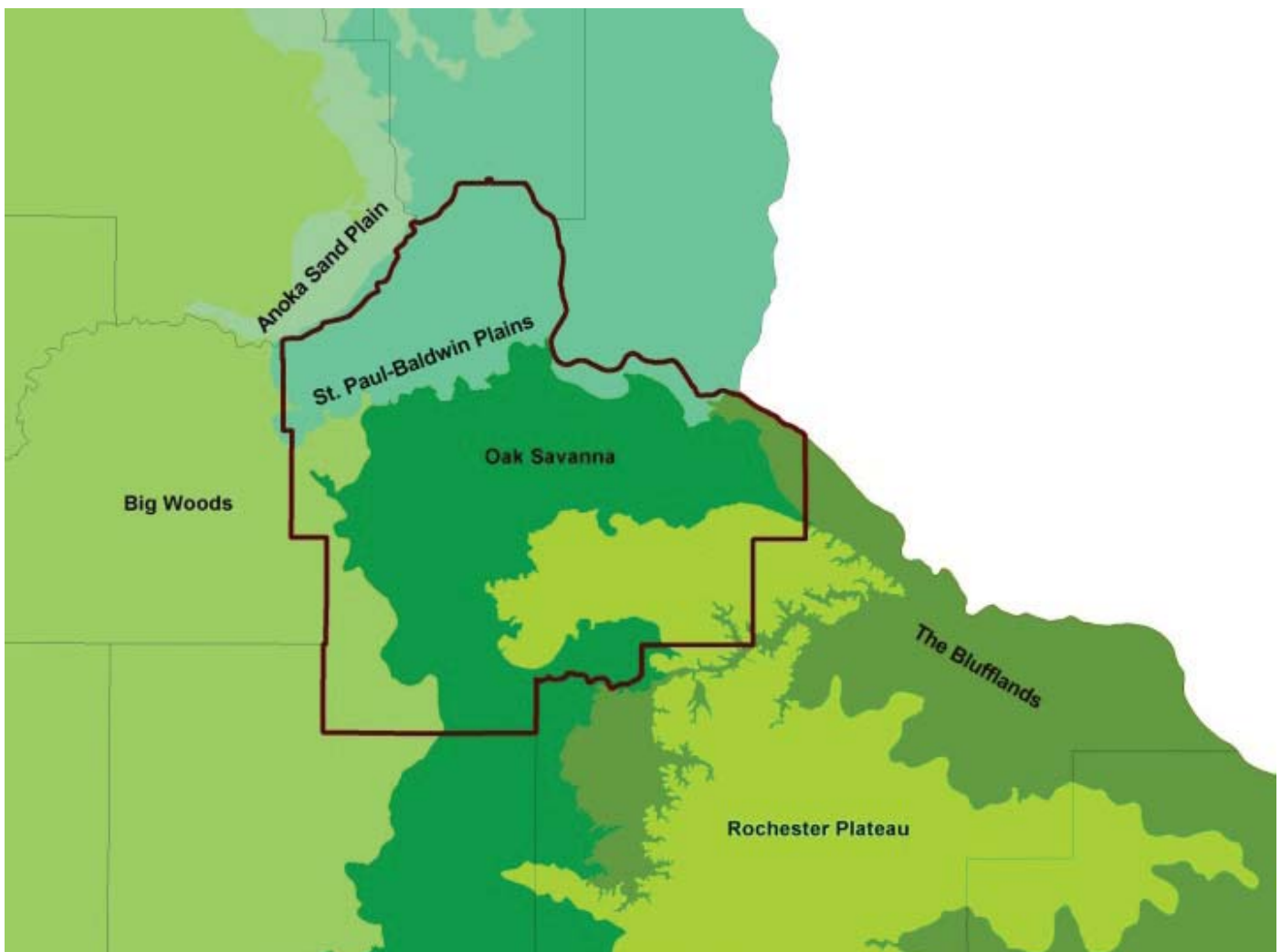
gions and the five subsections described below makes the County one of the most ecologically diverse in the state. Only Lake County, adjacent to Lake Superior, contains more subsections.

The County's five ecological subsections are described below and show in **Figure 5**.

- **St. Paul-Baldwin Plains.** Located in the northern portion of the County. Soils are clay loams, loams, sandy loams, and loamy sands and historically dominated by oak and aspen savanna with tallgrass prairie. Maple-basswood forest was common in fire-safe areas. Nevertheless, fire was an important natural disturbance. Today, the subsection mostly consists of urban and suburban land uses.
- **Big Woods.** Located in the western portion of the County. Soils are loam to clay loam, which are productive for farming. Lakes are common and maple-basswood forest and oak woodland historically prevailed. Fire was infrequent. Today, over 75 percent is cropland and pasture.

- **Oak Savanna.** Located in the central portion of the County. A variety of soil types exist, lakes are uncommon, but wetlands were once common. Historically, bur oak savanna dominated with tallgrass prairie, and fire was an important disturbance. Today, almost all of the prairie and wetlands have been lost, and land use is dominated by farming, with suburban development advancing from the north.
- **Rochester Plateau.** Located in the southeastern portion of the County where glacial deposition material becomes thin and bedrock exposures are common. Sensitivity to groundwater pollution is high to very high. Soil types are variable and lakes are uncommon. Historically, tallgrass prairie and bur oak savanna covered the area, and fire was a key disturbance. Today, it is mostly farmed.
- **The Blufflands.** A small area located in the eastern portion of the County, mostly along the Mississippi River valley. Steep slopes are characteristic, and soils vary. There are no lakes, except old oxbows in river floodplains. Historically, there were tallgrass prairie and bur oak savanna on ridges and upper slopes, and various forest types on moist slopes and in valleys. Fire was important in upland prairie and savannas. Today, about half the subsection is farmed or pastured, and much of the woodland and forest is interspersed with low-density housing. The former Mississippi River floodplain has been greatly altered by changes made to the River, which was transformed from a wild river to a series of lock and dam-created pools constructed during the 1930s and 1940s.

Figure 5. Five ecological subsections of Dakota County.



Source: Dakota County

3.3. WATER RESOURCES

As previously described, most of the County was under glacial ice until about 10,000 years ago. This created dramatically different landscapes consisting of outwash plains, hilly, lake-studded moraines, rocky outcrops in the southeast, and deep river valleys. Glaciers also bequeathed an abundance of water resources, from the Minnesota and Mississippi Rivers and lakes in the north and east (**Figure 6**), to the Vermillion River that divides the County, and the many small trout streams to the south.

In the north, the Mississippi River passes through a narrow gorge and then becomes a wide floodplain and backwaters further downstream. The wide Minnesota River Valley joins the Mississippi River at Fort Snelling, the starting point of the state's European settlement history. Together, these rivers form the largest, most continuous natural area in the Twin Cities. The floodplains and bluffs are preserved by the Mississippi National River and Recreation Area (MNRRA), the State Critical Areas Act, the Minnesota River Valley National Wildlife Refuge, Fort Snelling State Park, and Lilydale Regional Park. The Cannon River, with trout stream tributaries, has some strikingly steep and rocky valleys. The Vermillion River and its tributaries meander through the central County, dropping over Vermillion Falls in Hastings on its way to the Mississippi.



Figure 6. Portage Lake, in Lebanon Hills Regional Park, Eagan, MN.

Many small lakes are located in the northern County. Notable lakes with public access are Crystal Lake in Burnsville, Lake Marion and Orchard Lakes in Lakeville, and the nine lakes in Lebanon Hills Regional Park. Chub Lake in Eureka Township is located in the southwestern portion of the County. Lake Byllesby at the County's southern boundary is a dammed reservoir on the Cannon River. Spring Lake at the County's eastern border was a natural oxbow lake and marsh of the Mississippi River, but was submerged by the 1930 lock and dam at Hastings. Lake Byllesby and Spring Lake have public access.

3.3.1. Wetlands

Most people think of wetlands as marshy areas with ducks and cattails (**Figure 7**). While those areas are wetlands, there are many different wetland types that may even be dry for most of the year. Some wetlands support trees and shrubs, and some may be farmed.



Figure 7. Many kinds of wetlands are found in the County, supporting diverse plant and animal life.
Source: Dakota County Soil and Water Conservation District

Historically, wetlands were considered wasted space and were drained and filled for crops and development. In Minnesota, an estimated 11 million wetland acres (60 percent) were lost during the past 150 years, leaving about 7.5 million acres. In Dakota County, over 85 percent of the historical wetlands were drained, dredged or filled. Today, most of the County's wetlands are located in its northwestern third with few existing elsewhere.

The historic loss of wetlands has consequences for water resources. Wetlands have the ability to maintain stable, clean water resources by storing excess water during floods and by filtering sediments and nutrients before water enters lakes, rivers and streams. Wetlands also provide wildlife habitat and public recreation opportunities.

To preserve wetland benefits, the Minnesota Legislature enacted the Wetland Conservation Act (WCA) in 1991. The WCA gives authority to local governments to enforce the nation's wetland laws and prevent further loss and damage. For example, the Dakota County Soil and Water Conservation District (SWCD) assists cities, townships and individual landowners to determine if an area is a wetland. SWCD staff also provides technical support and act as an information clearing-house for government and citizens who have questions about wetlands and water resources. Any project that would damage or destroy a wetland requires a permit from federal, state, and/or local agencies.

Monitoring water quality to ensure that it meets the needs of Minnesota's citizens is an important function of state and local government. The County has been monitoring wetlands through the Minnesota Pollution Control Agency's (MPCA) Wetland Health Evaluation Program (WHEP). Since 1997, volunteers have monitored 181 wetlands, visiting many of them multiple times each year. As a result, the County has learned that wetland health varies greatly from wetland to wetland and in different areas of the County, with the majority of wetlands having moderate health/functionality. Some wetlands, monitored for many years, show improving wetland health while others are declining.

3.3.2. Groundwater

About 95 percent of the County's drinking water comes from groundwater, either from the 151 municipal wells or 8,000 private domestic wells. The rest of the drinking water is supplied by the St. Paul Regional Water Service.

In addition to its use by people, lakes, streams, wetlands, and fens also depend on groundwater for their existence. Wetlands and surface waters are the groundwater made visible—the surface expres-

sion of the groundwater table. Groundwater sometimes provides a stream's base flow of steady-flowing, cold water despite summer heat and drought (**Figure 8**). Trout streams and other fisheries need stable groundwater. In the County's rare calcareous fens, the build-up of peat does not occur unless a continuous flow of cold, nutrient-poor groundwater flows through them. To give just one example, a tamarack swamp in Lebanon Hills Regional Park has likely been degraded because runoff from roofs and streets is diverted into storm drains leading to detention ponds, rather than penetrating the ground to become groundwater feeding the swamp. This loss of groundwater is due to a loss of groundwater "recharge." Recharge is determined by the amount of precipitation flowing through soil to the groundwater table. It is affected by the amount of rain and snowmelt, the soil type and the land use. Experts estimate that 3 to 13 inches of precipitation recharge the groundwater in the County each year.



Figure 8. A Trout Brook tributary, a groundwater-fed stream. Note that the stream is being formed by emerging spring water.

Groundwater comes from two main sources: surface groundwater (or surface aquifers) in glacial material, and bedrock aquifers, of which there are several. People tap into these aquifers for their needs and have noticed that groundwater level fluctuates naturally during the year and from year to year, especially in response to drought. Surface aquifers are affected most by drought, but respond quickly when rain returns. Deep aquifers fall slowly, but also take more time to recharge.

In the Twin Cities Basin, groundwater use may be exceeding the capacity of some aquifers to function as usual, creating a potential issue for people and natural resources. The DNR reports that County residents and businesses use about 32.6 billion gallons of groundwater every year. Municipal wells (49 percent) and crop

irrigation (23 percent) are the two largest uses and generally draw from the Jordan aquifer. Private domestic wells use the Jordan and Prairie du Chien aquifers as well as surface aquifers. When groundwater withdrawals combine with natural fluctuations, the decline in groundwater supply is noticeable. Large drops in groundwater levels have been seen in some County aquifers due to withdrawals and the diverting of runoff in pipes directly to surface waters. Recently, the Metropolitan Council used a model to predict that, if groundwater use trends continue over the next ten to thirty years, the groundwater level in the surface aquifer and the Prairie due Chien-Jordan aquifer will fall significantly. This may require a shift to other sources of water. Implications for natural resources are unclear, but there are strong indications that the current reliance on groundwater for irrigation and drinking water may be curtailed in the future.

In addition to supply, the quality of groundwater is important. Drinking water supply is strictly regulated for people's safety, though private well owners are responsible for their own drinking water quality. Groundwater quality can be affected by agricultural chemicals, industrial spills and natural contaminants. The City of Hastings, for example, is challenged by high nitrate levels in its drinking water. One in four private wells exceed the 10 parts per million (ppm) drinking water standard; above that level, infants younger than six months are at risk of developing health issues. The main source of nitrate is crop fertilizer; nitrate easily flows with water into the soil and is flushed into the aquifer by subsequent irrigation and rainfall. High levels of breakdown products from cyanazine, an herbicide that is no longer in use, have also been found in drinking water. Industrial spills, sand dumps, and commercial

and private landfills historically contaminated groundwater in a variety of ways, but current industry standards have greatly reduced this type of contamination. Lastly, in the northern and western County the shallow aquifer in places can have higher than normal levels of manganese and arsenic.

Groundwater is a critically important natural resource and subject to change due to natural and human factors. To the extent that natural resource management on County lands and easements can safeguard groundwater recharge, that will be done. However, natural resource management carried out on County lands and easements, will have little impact on the overall quality of the County's aquifers, because the County owns only a small portion of the total area of the County and because the aquifers extend much further beyond the bounds of the County. It will take regional efforts to solve groundwater issues.

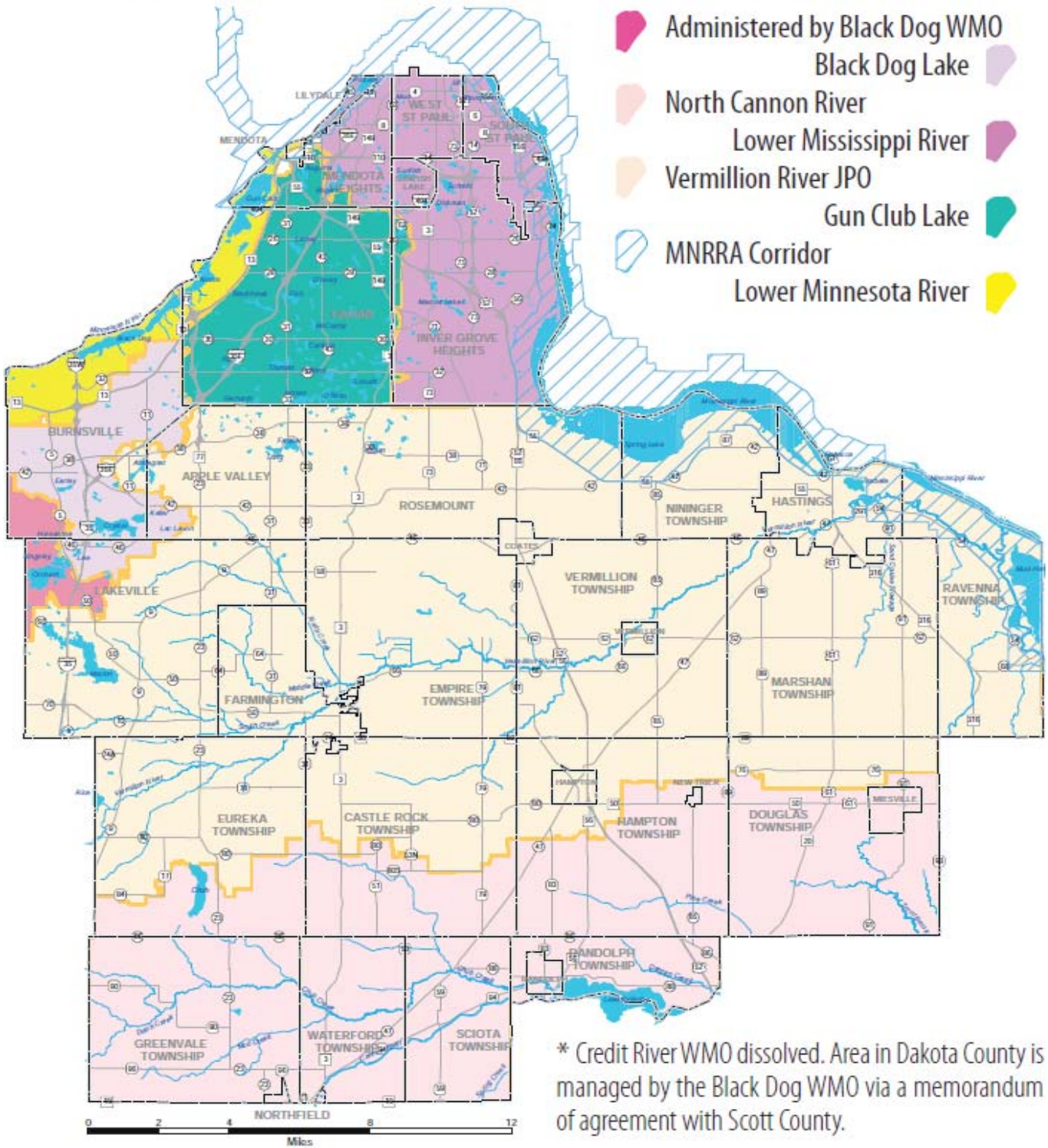
3.3.3. Watersheds

Dakota County's seven watersheds coincide generally with drainages of rivers and streams (**Figure 9**) and are managed by the following six agencies:

- Black Dog Watershed Management Organization (WMO)
- Eagan-Inver Grove Heights WMO
- Lower Mississippi WMO
- Lower Minnesota Watershed District
- North Cannon WMO
- Vermillion River Watershed Joint Powers Organization (JPO)

Figure 9. Watersheds and management organizations of Dakota County.

Watershed management organizations Figure 2.4.26A



Source: Dakota County Comprehensive Plan (2009)

Watershed organizations attend to the water resource needs and issues such as flood control, monitoring, water resource protection, and sometimes administering state laws (e.g., the Wetland Conservation Act) within their boundaries. The watershed organization may conduct monitoring or partner with cities, the County or the SWCD. Each watershed organization has a management plan that determines how it will operate. The watershed organizations, together with the SWCD, are very active in monitoring and assessing water resources and in developing and implementing plans to protect and improve them. Comparatively, the North Cannon River Watershed District operates on a far smaller budget than the other districts, and its management efforts are considerably lower.

3.3.4. Land Use Effects on Water Resources

Natural landscapes with intact native vegetation intercept and capture precipitation which reduces stormwater runoff. Water resources are generally stable and in good condition if the cumulative area of rooftops, pavement and cropland cover less than 10 percent of a watershed. When impervious cover and cropland are 10 to 25 percent or more of a watershed, water resources begin to deteriorate. Engineered curbs, gutters and sewers in urban areas, and drain tiles and ditches in rural areas effectively direct and convey stormwater away, but often carry spilled oil, heavy metals, bacteria, deicing salt, detergents, and fertilizers. Pollutants of major concern are nitrate in groundwater, phosphorus in surface water, bacteria, and suspended sediment and microscopic floating algae (phytoplankton).

For the County's designated trout streams, maintaining cold groundwater recharge is a major concern. A "temperature trading study," completed by the Vermillion River Watershed Joint Powers Organization (JPO) in 2009, demonstrated that the key to preserving the necessary below-70°F temperature in trout waters is to percolate as much precipitation as possible into the soil so that groundwater is fully charged and continuously supplies cold surface water during critical times, such as hot summer months and drought conditions.

Excess water is also a problem when it arrives in streams and lakes. It creates a quick "bounce" in water level with each small rainstorm, damaging vegetation and exposing shoreland to the erosive force of water. When there is too much water for rivers and streams to carry, streambeds can also be scoured and banks can collapse, adding to the sediment load already in streams.

The County's 2009 Comprehensive Plan set a high bar for surface waters, stating that:

-
-
- *...lakes and rivers will be clean. Water quality will be significantly improved, with County water bodies absent from the State impaired waters list. Multipurpose green corridors and open spaces will be created to reinforce green infrastructure, provide habitat, and improve water quality.*
-
-
-

By using best management practices (BMPs), impacts can be reduced. BMPs include the following: using an ecological approach to manage stormwater runoff; ensuring that rain and snowmelt infiltrate into the groundwater; and filtering runoff before it reaches surface waters. These practices can help reduce the effects of development and agriculture. Without BMPs in watersheds where impervious cover and cropland total over 25 percent, water resources are greatly altered, suffering from "urban stream syndrome." They fill with sediment, have eroded banks and shorelines, experience algae blooms, and have poor water clarity. At the present time, the majority of the County's watersheds exceed 25 percent impervious cover and cropland. Consequently, many surface waters are not in the condition envisioned by the 2009 Comprehensive Plan.

3.3.5. Water Quality Standards

Water quality standards in Minnesota are established by ecoregion. An ecoregion's conditions influence water quality in lakes and streams. The U.S. Environmental Protection Agency's national ecoregion system includes the County in the North Central Hardwood Forest, the Driftless Area, and the majority of the County, the Western Corn Belt Plains. Lakes and streams in the Corn Belt typically have higher nutrients levels and suspended solids than those in the Hardwood Forest or Driftless Area. Corn Belt streams tend to have higher bacteria counts. These differences appear related to extensive agricultural land use.

The Minnesota Pollution Control Agency (MPCA) recognizes these regional differences when setting pollutant standards for lakes and streams. Lake standards use relatively undisturbed situations, called reference lakes, for each ecoregion. Rivers and streams are classified as north, central or south and evaluated by those regions. The Corn Belt and Driftless Area are in the south region and the Hardwood Forest in the central region. Water standards for each region determine whether a water body or watercourse meets the standard, or its "intended, designated use."

Most lakes and streams in or near the County's protected lands are designated by state statute as cool and warm-water fisheries (2b) or having limited resource value (3C), which must be protected for aquatic life, recreation and industrial consumption. Some stream reaches are designated as cold water fishery (1B, 2A), which are protected for household domestic uses and as trout streams. The MPCA also has standards for shallow and deep lakes. Shallow lakes are ecologically different than deep lakes and, in general, have higher nutrient concentrations and lower water clarity. When a number of water samples over a period of time falls short of the MPCA standard, a lake or stream is listed as "impaired" by the MPCA.

Data to assess the County water resources have been collected for several years by various entities and have been included in other plans and on the MPCA and DNR web sites. These waters were monitored and assessed to determine if they met standards. Lake and stream testing has revealed that 23 of Dakota County's lakes and 29 stream or river reaches have impairments. For impaired waters, a study must be completed that identifies pollutant sources and develops of a Total Maximum Daily Load (TMDL) plan for reducing the pollutant levels to state standards. Some impairment reduction projects are currently underway in the County.

Trophic state indicates how much plant and animal life (or biological productivity) is occurring in a water body. Carlson's Trophic State Index is an indicator that is calculated using phosphorus and chlorophyll-a (a measure of the green pigments found in algae) concentrations and Secchi disk transparency measurements, which indicate water clarity. Trophic state is not commonly used in flowing waters, so trophic ratings are not included for rivers and streams.

3.3.6. Aquatic Invasive Species

Aquatic invasive species (AIS) pose a significant threat to the County's waters. These invasive plants and animals can cause environmental and economic harm including smothering other desirable aquatic species, creating nuisance conditions for recreational boaters and swimmers, and damaging/clogging underwater equipment (e.g., water intakes). The most highly invasive AIS in waters associated with County parks, greenways, and easements are Eurasian watermilfoil and curly-leaf pondweed. Of twenty lakes sampled by Blue Water Science in 2016, eight have light to moderate infestations of curly-leaf pondweed and seven have infestations of Eurasian watermilfoil. While these invasive species present significant challenges, there are control techniques that reduce their negative effects. AIS control techniques are discussed in Section 11.3.2.5.



Eurasian watermilfoil photo: US Fish and Wildlife Service



Curly-leaf pondweed photo: Minnesota DNR

3.4. WILDLIFE

Historically, a wide variety of wildlife was found in the County due to its diverse landscape, associated plant communities and abundance of water. There were prairies, savannas and hardwood forests, creating an entire range of tree canopy conditions. River floodplains and abundant depressions supported extensive lakes and wetlands. Most wildlife species have a preferred habitat, but many use several different habitats and at different times of the day and year. The combination and proximity of habitats allowed animals of the deep forest, open prairie, and unusual wetland habitats to co-exist near each other, expanding the number of animal species that historically lived in the County.

Big game species in the County once included bison and elk. Explorers and settlers in the 1800s saw bison grazing the prairie terraces near Fort Snelling. Nearly all early explorers from Radisson to Hennepin talked about their abundance. During the 1930s drought, numerous elk antlers were dug from shallow lakes in southern Minnesota. Hunting eliminated most large game, but ag-

riculture also displaced bison and elk. White-tailed deer were also nearly extirpated, but institution of hunting regulations have since allowed them to thrive in the fragmented, agricultural landscape. Mountain lions were always rare, but black bears were very common in the 1800s. Occasionally bear and mountain lion are seen in the Twin Cities region, including Dakota County.

Fur-bearers existed in good numbers in Dakota County. Fort Snelling was built, in part, to regulate the fur trade. Over-harvest decimated beaver populations in the 1800s, and land use changes further contributed to their decline. Fur traders' records in the 1930s show that beaver, muskrat, and mink were harvested, with St. Paul being a regional hub for buying and selling pelts. Recent conservation efforts have allowed beaver numbers to rebound. Minnesota populations of opossum, striped skunk, and grey fox also have increased as trapping has decreased and habitat becomes more suited to generalist species—ones that can live in many kinds of places. In 2016, a fisher, which was formerly a rare northern carnivore, was spotted in the County.

Currently, over 250 species of birds can be seen in the County, including bald eagles and peregrine falcons. At least fifty species of mammals and thirty species of reptiles and amphibians also make the County home. Animals that require special habitat or habitats damaged by development, agriculture, and pollution have been most affected by human activities—these include aquatic species that need clean water.

Pollution has altered populations of amphibians, fish and mollusks. As discussed above, agricultural and residential development upstream and adjacent to waterways has polluted and increased the amount of water in streams. Poor water clarity prevents predators

from spotting aquatic prey. Point source pollution—from industry and wastewater treatment plants—is largely under control thanks to the federal Clean Water Act, and water quality has improved since the early 1970s. Reducing non-point pollution caused by runoff from the land is more challenging, requiring shifts in land use and the application of stormwater BMPs. These efforts can, over time, greatly benefit wildlife that depend on clean water.

3.5. HISTORY AND HERITAGE

For centuries, the n Dakota (Sioux) people lived in what is now Dakota County and the surrounding area. They used fire to manage the landscape: to clear brush and tangled vegetation, to stimulate fresh grass growth that attracted game, and to open views through otherwise concealing vegetation. In the early to mid-1800s, New Englanders and Europeans arrived in large numbers, finding the gently rolling outwash landscape and rich soils very suitable for agriculture. After World War II, the County developed rapidly forming tiers of suburbs around the Twin Cities urban core. Today, the southeastern edge of the developing Twin Cities region includes the cities of Rosemount, Lakeville and Farmington.

Fortunately, many public and private landowners and groups value natural resources and have protected significant portions the County's natural heritage. While the County has a significant role in managing its own lands, these lands impact and are impacted by adjacent and nearby properties. The County has a keen interest in how natural resources are managed on those other lands.

4. PURPOSE OF A NATURAL RESOURCE MANAGEMENT SYSTEM PLAN



Prescribed burn at Lebanon Hills Regional Park. Photo by Dakota County Staff.

A story of loss is also a story of hope. It begins with recognizing that the County's natural resources have been lost, fragmented and degraded over the past 150 years. Natural processes such as fire, which shaped vegetation and wildlife for thousands of years, have been disrupted even in protected areas. Invasive species have further challenged the goal of maintaining and improving natural resources.

Nature has an amazing ability to recover from past injury and take care of itself in the long term, but private and public landowners have long known that some management is needed to ensure that the quality of natural resources is not unduly diminished now or irretrievably harmed for future generations. Natural resource management is inherently complex, involving ecological and hydrological systems and cycles, a changing climate, plants and animals, and other factors. The dynamic and inter-related factors that need to be considered in order to successfully manage natural resources include:

- Primary purposes for protecting and using the land
- Current natural resource conditions
- Issues and concerns
- Adjacent land use
- Governmental policies
- Demographic changes
- Existing and future financial resources

Recognizing these factors and making a commitment to improve natural resource management on County-owned lands and easements, the Dakota County Board of Commissioners approved the development of this comprehensive and integrated NRMSP covering all County parks, regional greenways, and conservation easements in 2015. This NRMSP is a high-level plan that broadly describes the County-affiliated natural resource lands and waters, identifies principles, a vision and goals, and specifies approaches to prioritize and execute system-wide management and restoration. The NRMSP will also be the foundation for developing individual Natural Resource Management Plans (NRMPs) for parks, greenways, and easements. NRMPs will use information from this system plan as a framework to complete inventories and assessments, develop detailed and prioritized management recommendations, and estimate associated costs for restoring and managing County-affiliated open space.

The County has adopted many documents related to the protection and management of natural resources. Its 2009 Comprehensive Plan Vision for Natural Systems includes the following: s

Open space will be protected and interconnected by green corridors to maximize healthy functioning of natural systems that benefit all County residents. This green infrastructure will be well organized to provide enjoyment to the greatest number of people and shape future growth. Infill, redevelopment, and increased density will be emphasized in urban areas so as to protect large tracts of open space and agricultural lands. Recreation parks and trails will be easily accessible to residents. Interconnected greenways, trails, active parks, and passive parks will promote healthful outdoor activity with a variety of convenient recreation choices for residents.

The Comprehensive Plan outlined natural system goals to help realize the vision:

- **Preserve vital functions of natural systems** by strategically and collaboratively improving the County's green infrastructure: Protect, connect, and manage natural areas, wetlands, stream corridors, open space, agricultural working lands, parks, and greenways.
- **Preserve agricultural land** use in the County.
- Ensure sufficient and sustainable **high quality water resources**.
- Conserve and **protect natural resources** in the County, including air quality, water, soil, productive farmland, minerals, vegetation, and wildlife.
- Protect, restore, and connect the County's **urban natural areas** and open space (green infrastructure) using recreational greenways as a building block.
- Create a **Greenway Collaborative** to achieve mutual objectives for greenways and trails.
- Develop a comprehensive, **strategic park natural resource management** approach to preserve the highest quality resources, restore targeted areas that bring economic and ecological value, and enhance visitor experiences.
- Enter all parkland into appropriate and **sustainable management** regimes.
- Identify **system-wide operating needs** to provide public services at the desired levels: staffing, roles, skills, budget, and additional resources.

- Refine **operating structure and processes** to build capacity and move forward.
- Increase County **investment** to advance the Parks and Open Space System.
- Protect and preserve unique and valuable state and regional resources in the **Mississippi River Critical Area** corridor.

Despite broad recognition that natural resource management is important and necessary, the County, like most other public landowners, has only adequately managed a portion of its natural lands. Increasing natural resource management has been challenging because the County has been, and continues to be, focused on land protection in parks and greenways and providing basic facilities for recreational use. Moreover, the County's ambitious private land protection program outside parks and greenways has its own challenges, most notably attempting to balance management responsibilities between private landowners and public entities.

In 2014, the County began to greatly increase its dedicated natural resource staff and as of publication, it is actively managing about 1,240 acres or 25 percent of its park acres. Greenways are currently not being managed by the County. Approximately 50 percent of the natural area easements have some level of management by private landowners.

4.1. NATURAL RESOURCE MANAGEMENT

Natural resource management emphasizes land, water, soil, plants, and animals, with a particular focus on how management affects the quality of life for present and future human generations. Natural resources often are managed as ecosystems. An ecosystem is the living and the non-living parts of an environment, interacting and functioning together. Ecosystems are always in flux, always responding to environmental change and evolving or "succeeding" over time. Organisms and the environment become bound together. Natural and human-caused disturbances often reset ecosystems to earlier stages. The changing climate and the introduction of new plants and animals can create both subtle and dramatic changes. Energy and materials such as nutrients and carbon move in different cycles. Natural resource management and ecological restoration strive to understand how to help ecosystems recover after damaging uses or lack of proper disturbances, and to understand the changes due to a changing environment. With that knowledge, natural resource managers apply various practices to improve the ecological health and long-term resilience of ecosystems.



A restored prairie in Miesville Ravine Park Reserve.

The County is dedicated to being a good steward of its lands and waters. Natural resource stewardship means taking care of the land and water despite past damage and future changes. Good stewardship includes maintaining, enhancing and restoring ecosystems to be well-suited to local conditions to ensure that plants and animals have the greatest chance of surviving. The County has been and will continue to promote ecological restoration to ensure natural resources are managed well.

Ecological restoration is the art and science of improving the natural environment by deliberately making the diversity, resilience, and natural functions of ecosystems more permanent. Scientific research has defined what these ecosystems should be like to be suited to local conditions and persist. Such ecosystems have a wide array and good abundance of native plant species; there are few, if any, aggressive non-native plants; wildlife is diverse and visible with important species reproducing; and abundant ecosystem services are being generated. Restored aquatic ecosystems have high water in spring and summer, lower water in fall and winter, and

slowly rising waters after storms. It is uncommon to find situations where eutrophic conditions prevail; that is, where surfaces are algae-covered, water is murky, there are few aquatic plants, and nutrients are over-rich.

4.1.1. Invasive Species

Managing invasive plant species is a priority challenge. These harmful species often establish and thrive in disturbed habitats, usually crowding out native plants and animals. They typically have the following characteristics:

- Tolerant of a variety of habitat/environmental conditions
- Grow and reproduce rapidly, with good seed dispersion
- Compete aggressively for resources, such as nutrients, water, and (for plants) sunlight
- Lack natural enemies or effective competitors

Invasive plants can induce low plant diversity, poor wildlife habitat and lessened resilience in the face of disturbances and environmental change. Controlling invasive plants is often the foundation of most ecological restoration and management efforts. Invasive animals (e.g., non-native earthworms) also have adverse effects. Some invasive species cannot be removed or cost-effectively controlled. In these cases, it is advisable to manage the effects of an invasive species, rather than try to eradicate it. Invasive species warranting control during ecological restoration and management are included in **Appendix B**.

4.1.2. Pests and Diseases

Natural resources, such as forests, can also be affected by a variety of pests and diseases. Some of these occur as natural components of an ecosystem, but others have migrated into the region by accident or by intentional human transport. The main pests and diseases that may affect the County's natural resources include:

- **Emerald ash borer (EAB)**. Present on County lands and anticipated to have a devastating effect on the many mature ash trees growing throughout the region. Some Twin Cities communities have initiated pre-emptive removal of ash trees. Removed ash trees warrant special handling to prevent spread of the borer.
- **Oak wilt**. Present in the County, warranting special management of oak trees especially red oak species.
- **Gypsy moth**. Present in the County, warranting special handling of cut wood and other surfaces where eggs may be found.

4.2. MANAGEMENT AND RESTORATION APPROACHES

Natural resource management is focused on approaches that promote and maintain healthy and long-lived ecosystems across large areas or “landscapes.” The composition, structure and function of these ecosystems may be similar to conditions of earlier ecosystems, but they often cannot be re-created because conditions have changed too much. Natural areas and vital habitats have been greatly reduced and largely fragmented. Key plant and animal species may be missing or not regionally viable. Natural processes such as fire and seasonal flooding cannot occur or may be limited or suppressed. Rainfall patterns are different and changing. Exotic species have invaded (**Figure 10**).

In the past, managers often based their goals on conditions existing before the dramatic ecological changes that began occurring during the 1800s and early 1900s. The thinking was that those ecosystems, primarily due to the fact that they were largely intact, were resilient despite environmental change, had many different plants and animals (high biodiversity), and produced a variety of ecosystem services. Recognizing that those historical conditions were a moment in time, and conditions have greatly changed, managers today use that information to provide insights into what is possible, but may not be feasible given other considerations. The large shifts that have occurred, together with changing site-specific conditions, often demote re-creation of historical ecosystems. Management and restoration goals and activities must be grounded in realistic expectations for the restoration and improvement of vegetation, water and wildlife.

The first step in comprehensive natural resource management is to develop a Natural Resource Management Plan (NRMP). As discussed above, NRMPs focus on individual parks and specific places, describing the ecological surroundings of lands and waters, their current conditions, and proposed conditions. When implemented, the condition of land and water is shifted towards long-term ecological resilience or health, with a greater variety of native plants and animals, and potentially greater enjoyment by people. NRMPs are discussed in detail in Section 6.3.

An important outcome of an NRMP is the identification of a site's most important natural areas. Importance can be measured in terms of an area's quality, its rarity, its size and capacity to support specialist wildlife, and its value to people for unique experiences. The NRMP identifies these priority natural areas and provides recommendations for protection and improvement. Through identifi-

cation, designation and management, the County can help assure that these special places will remain for future generations.



Photos by Pleasant Valley Conservancy, Wisconsin State National Area

Figure 10. Before and after photos of typical tallgrass oak restoration. Note the buckthorn in the woodland in the upper photo before restoration, versus the more open recent savanna condition in the lower photo.

4.3. RESTORATION AND SHORT-TERM MANAGEMENT

Ecological restoration has short- and long-term management phases. The initial short-term, or “establishment” or “restoration” phase is the most time-consuming and costly (**Figures 11 through 14**). Usually lasting three to five years, a significant effort is needed to prepare and begin establishing the proposed native plant diversity types and ages for different management units. Tasks often include selective woody plant removal, controlling invasive species with herbicide, soil preparation, seeding and planting native species, re-establishing natural hydrological cycles in aquatic systems, re-introducing fire regimes in fire-dependent systems, and using bio-control techniques for invasive species management when available. The length of time before moving from short-term to long-term management depends on many factors including the

site's initial quality and other issues, weather conditions, how the site responds, size, and other complexities of the area.

“Enhancement” is a management term used to describe activities where minimal-to-moderate effort and cost is required to improve the resource. Adding more native flower species into a reconstructed prairie (Figure 15), or removing box elder from an oak forest, or planting native shrubs are examples of enhancements.



Figure 11. Contractors cutting exotic brush (buckthorn) at a woodland at Whitetail Woods Regional Park.

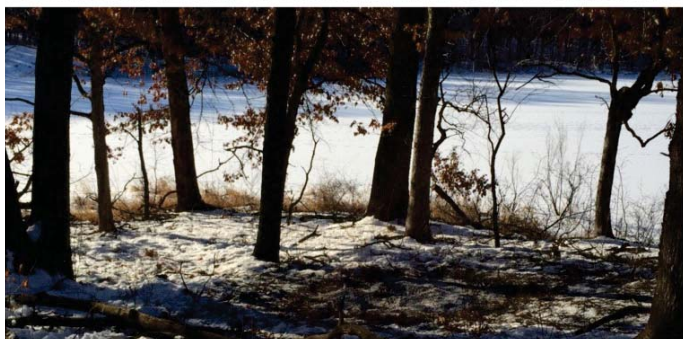


Figure 12. Before and after photo of a woodland at Lebanon Hills Regional Park in which exotic buckthorn was removed.



Figure 13. Volunteers controlling exotic herbaceous plants (hand-pulling garlic mustard) from woodlands at Lebanon Hills Regional Park.

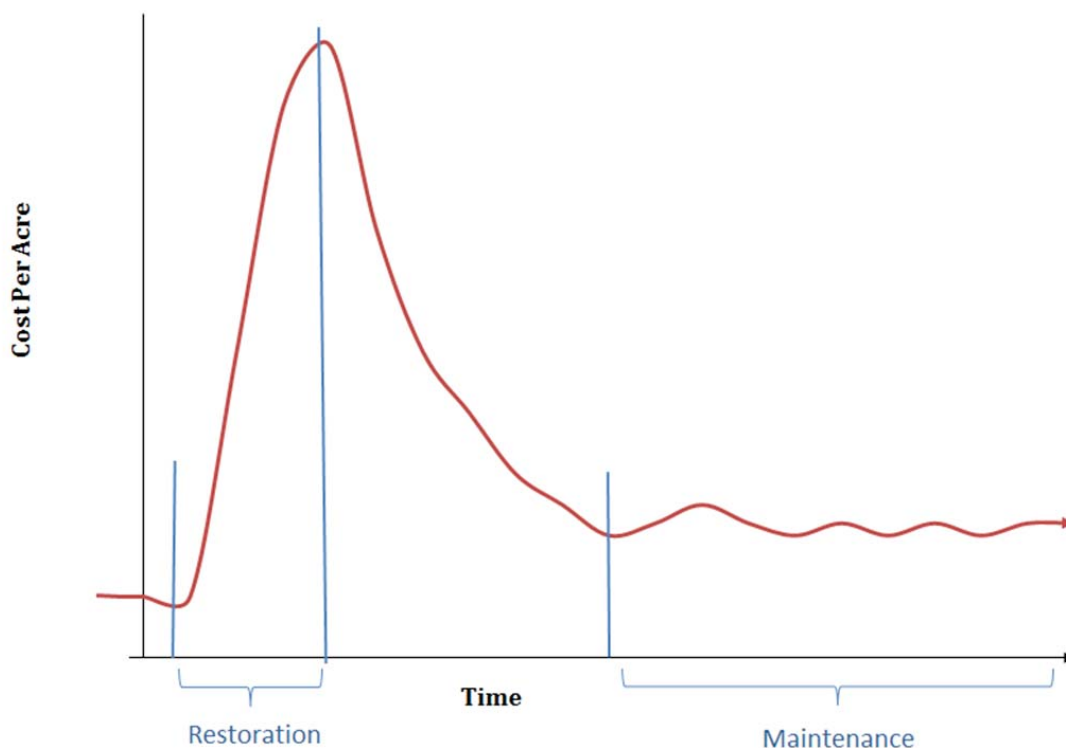


Figure 14. Conducting a prescribed burn at a restored prairie in Miesville Ravine Park Reserve.



Figure 15. Volunteers collecting seed from a remnant prairie at Lebanon Hills Regional Park to add to a reconstructed one elsewhere in the park.

Figure 16. Initial high cost per acre for restoration and short-term management.



Source: Dakota County

4.4. LONG-TERM MANAGEMENT

After short-term restoration and management goals are achieved in a management unit, the process shifts to a lower-cost, but equally important, long-term (or perpetual) “maintenance regime” (Figure 16). Without a commitment to long-term management, it is likely that short-term restoration investments will be wasted. Scheduling and budgeting for long-term management each year will protect the investment already made, and ensure that the plant community and wildlife continue on a trajectory toward greater ecological health. Typical long-term management tasks include spot-herbicide of invasive plants, re-seeding disturbed or poorly developing areas, re-planting woody plants that have died, and maintaining appropriate ecosystem disturbances to perpetuate a diverse and resilient plant community. Most ecosystems need some type of disturbance that removes dead plant material, regenerates many plant species, and opens up new habitats for plants and animals to perpetuate themselves or to maintain diversity. Controlled burns in fire-dependent communities (prairies, savannas, wetlands, and some woodlands), which mimic wildfire, are a common tool to achieve this objective. Harvesting hay from prairies, which mimics

grazing, can also be effective. The vast majority of the County 150 years ago was frequented by fires, and the plants and animals were adapted to those conditions.

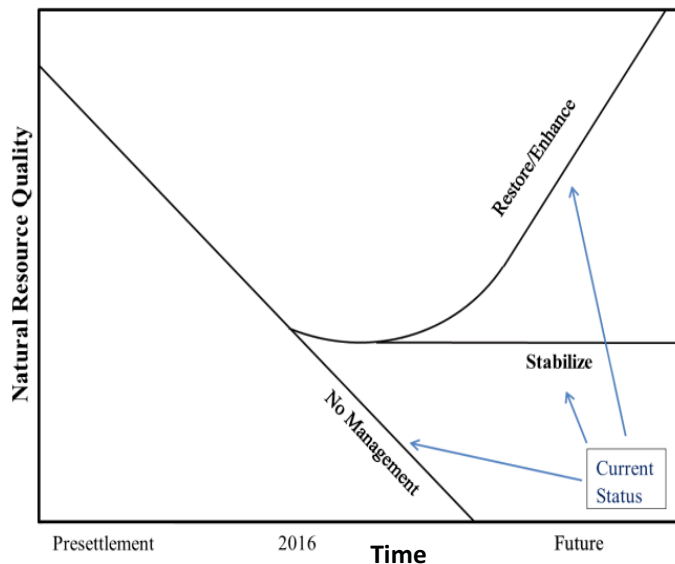
4.5. WHAT HAPPENS WHEN NATURAL RESOURCES ARE NOT MANAGED?

Philosophically, some people do not believe that natural resources need to be managed. After all, nature has been around for a very long time and there is a perception that nature can fully take care of itself. Others believe that there are more important issues and problems, and managing natural resources does not merit the use of limited staff and financial resources. While these are valid perspectives, they are not the whole story.

Studies over the last half century clearly demonstrate that, without management, natural resources change in ways that are not always beneficial to people or supportive of ecosystem services. A common problem in many unmanaged woodlands and forests in the County is invasion by exotic earthworms, common buckthorn and non-native honeysuckles. These non-native species invade natural areas, initiating a cascade of negative effects. Oak regeneration is

suppressed, native shrubs decline, ground vegetation is shaded which leads to the loss of soil-anchoring plants and increasing erosion, and flower resources for pollinators are eliminated, reducing the amount and variety of food for other wildlife and depressing wildlife populations. Although very large and ecologically complex regions may resist this trend, natural resources generally decline in quality over time without proper management (Figure 17). This is especially true in small and scattered natural areas, which are common in Dakota County. With some level of management or with a greater level management, the situation can be stabilized and even improved. Details regarding the effects of not managing natural resources are provided in Appendix C.

Figure 17. Natural resource quality over time, as determined by management action. (Note: current status, that in 2016, contains a mix of all three major management actions.)



Source: Dakota County

4.6. CORE HABITAT, EDGE EFFECTS AND CONNECTIONS

Generalist wildlife species (crows, starlings, raccoons, etc.) are animals that are common and can tolerate and even thrive in altered and developed lands and waters. These species are typically not a focus of conservation since their populations are usually stable or increasing. In contrast, specialist wildlife species are often rare or have declining populations due to special habitat needs. Many specialist wildlife species require large, diverse and high quality habitat blocks to sustain their numbers. These areas are called interior or core habitats. Protecting and managing core habitats in the County

will improve the likelihood that uncommon and declining animal species will persist. The DNR's Wildlife Action Plan (revised in 2016) identifies many of these at-risk species, which are called Species of Greatest Conservation Need (SGCN) for the ecoregions of the County (Figures 18 through 21).

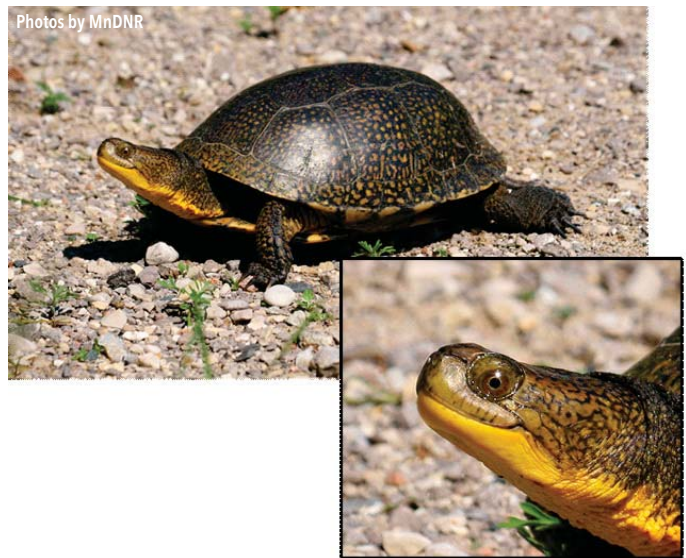


Figure 18. Blanding's turtle; a threatened species of reptile found within County parks.



Figure 19. Ovenbird; a ground-nesting bird species found in woodlands, is a species of local conservation interest and monitored by the MN DNR. Source: http://animalia-life.com/data_images/ovenbird/ovenbird1.jpg.



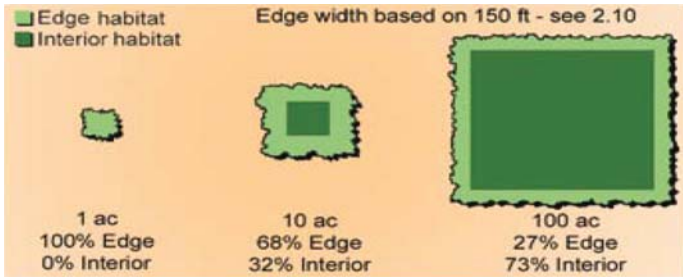
Figure 20. Red-headed woodpecker; a threatened savanna bird species.



Figure 21. Leonard's skipper; an endangered grassland butterfly species. Many species of skippers were once very common in Minnesota, now they are mostly in decline.

The effect of converting natural areas to cropland and residential developments, with its resulting habitat loss, has been well documented. Less obvious are long-term effects from increasing the amount of habitat edge. Smaller and narrower habitats have more edge than larger, rounder ones (**Figure 22**).

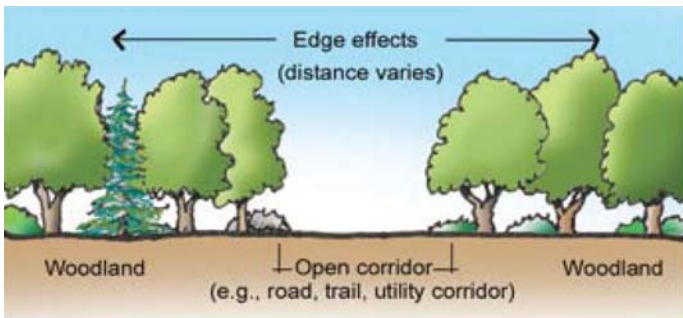
Figure 22. Core (interior) habitats and edge habitats.



Source: Conservation Buffers (Bentrup 2008)

More edge and less interior habitat pose significant threats to wildlife that need interior habitat. A variety of scientific papers and other sources have documented how edge effects penetrate into adjacent natural habitat. For instance, birds and other wildlife can be flushed by people walking on trails up to a distance of 150 feet away. Mid-sized predators (raccoon and feral house cats) will travel several hundred feet into forests and grasslands to prey on birds, small mammals and other wildlife. Invasive plants move from edges where they grow into interior areas. Traffic noise, warm and dry air, dust from gravel roads, pesticide drift, and many other damaging influences enter wildlife habitat from their edges (**Figure 23**). Management can reduce edge effects. Enlarging existing habitats, eliminating encroachments, and installing and maintaining native vegetative screens and buffers all help.

Figure 23. Edge effects from development and disturbance.

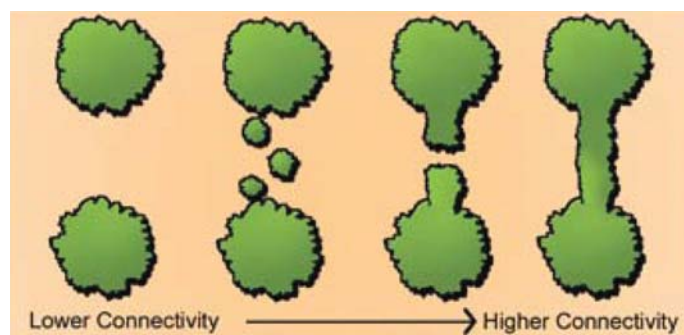


Source: Conservation Buffers (Bentrup 2008)

Connecting core habitats (**Figure 24**) allows wildlife to retreat to different, more favorable areas, without being exposed to the hazards of travel. Generally speaking, only the largest parks and tracts of public lands will support the County's most sensitive vertebrate species. Some of these require corridors of several hundred to thousands of feet in width to move among large habitat cores. These ideal conditions are possible in only a few places like the Minnesota

and Mississippi River Valleys. It is more practical to consider core habitats of 200 to 2,000 acres, with 200-foot to 2,000-foot wide corridors connecting the large cores. Larger habitat areas and connections also benefit many types of smaller animals. On the other hand, small habitat areas can sustain many invertebrate species which have small home ranges. Native vegetation can also benefit from connectivity as seed dispersal can be facilitated; however, this becomes a problem when invasive plants take advantage of these connections. Due to all of these variables, greenways (an important method of increasing connectivity) should be designed and managed thoughtfully to maximize ecological benefits and minimize adverse effects.

Figure 24. Gradients of ecological connectivity.



Source: Conservation Buffers (Bentrup 2008)

The concepts of core habitats, edge effects and connectivity can be used to help conserve the County's full spectrum of biodiversity. Protecting, connecting and restoring large areas of natural vegetation to minimize fragmentation and edge effects are critical to many SGCN surviving and thriving in the County.

4.7. CLIMATE CHANGE IMPLICATIONS FOR THE COUNTY'S NATURAL RESOURCES

People have seen the beginning effects of climate change in Minnesota. A recent study of Midwest climate trends showed that the average annual temperature has increased by over 1.5°F since 1900, and winter temperatures have risen twice as fast. Extreme weather such as heavy rainfall of three or more inches is occurring more often in Minnesota. Rising temperature and more precipitation has lengthened western Minnesota's growing season by two weeks compared to a century ago. The Third National Climate Assessment reports that, given current trends, spring and winter precipitation in the Midwest is expected to increase 10 to 20 percent over the next century, while temperature will increase approximately 3.8 to 4.9°F

by 2065. Despite more rainfall, one climate model suggests that higher air temperatures may increase the frequency of drought in the Midwest over the next century. These climate projections could alter the County's natural resources and require adjustments in their management.

The County's forests will likely change in composition, productivity, diseases, and pest infestations. Many current forests are dominated by oak, basswood, and black cherry species that are expected to thrive in the future climate scenario for Minnesota. Ranges of shrubs like buttonbush, American bladdernut and eastern wahoo, and trees like Kentucky coffeetree, honey locust, swamp white oak, black oak, and chinquapin oak may expand northwards. On the other hand, species at the southern edge of their range (paper birch, tamarack, black ash, white spruce, jack and red pines, nannyberry, and speckled alder) will diminish.

Annual forest growth is expected to increase due to increases in carbon dioxide, precipitation and temperature. However, such conditions will also tend to favor exotic weeds, pests and diseases that thrive in warmer climates. Pests such as emerald ash borer and gypsy moth, and aggressive invasive plants such as kudzu and other honeysuckles, will most likely range northward. Drought episodes may become more frequent and severe, promoting a shift from mesic and wet prairie species to those adapted to drier conditions. Planting more native prairie and savanna would be a beneficial strategy to capitalize on this trend.

Natural resource management will need to adapt to climate change in the following ways:

- Change the timing and frequency of prescribed fire and invasive plant management;
- Increase efforts to respond to greater invasive species pressure;
- Change the timing of seeding and planting;
- Use species and genetic plant material from southern Minnesota and Wisconsin, and northern Iowa and Illinois;
- Address the implications of changing community and species ranges and composition; and
- Respond to the range of options related to persistence versus change.

Surface waters also will be affected. The County's water resources already are exposed to excessive runoff and high nutrient loading. Evidence of accelerating erosion is evident in ravines, especially in areas of older glacial drift in the eastern and southern portions of the County. Precipitation trends are likely to accelerate this erosion

and increase nutrient loading to lakes and rivers. This, in combination with warmer water temperatures, can stimulate potentially toxic blue-green algae blooms. Shoreline erosion is likely to increase as well. With added sediment comes reduction in lake storage volume, which already occurs in the County's shallow lakes. Sediment can also bury or damage aquatic vegetation and gravel stream beds that are important in the life cycle of many fish and macroinvertebrates.

The County's trout streams are at risk from warming air temperatures because young trout cannot long tolerate water temperatures higher than 65-70°F. More frequent droughts are also expected to lower stream baseflow and lake levels. Discharge of cold groundwater (currently around 50°F) to trout streams may be reduced, raising stream temperature. To the extent that more rainfall is falling in these intense storms, and it is directed away in ditches and storm sewers, groundwater recharge will decrease. This shrinks the buffering effect of cold groundwater on the County's trout streams.

Water management strategies that can compensate for climate change are:

- Design stormwater best practices to reduce the erosive effect of intense precipitation events
- Reduce runoff volume by spreading many strategies across the landscape (e.g., cisterns, rain barrels, rain gardens, bioswales, infiltration basins)
- Infiltrate as much clean runoff as possible to recharge aquifers
- Increase shading of stormwater basins and cold-water streams
- Plan holistically at the watershed level.



Photos by Dakota County Staff

5. SOCIAL CONTEXT



Most people like being in natural settings, but how and how often they use them depends on their age, race, ethnicity, and health. This means that connecting people to the natural world, fostering a spirit of stewardship, and building political and financial support for natural resource management is affected by the social context. The social context of the County is changing in ways that will redefine the way people use public spaces, parks and open space. These changes mirror those seen across the metropolitan region and state. These factors may draw more visitors to natural resource-based recreation areas, such as the County's regional parks, where users will find trails, group facilities and places of quiet enjoyment.

5.1. DEMOGRAPHICS

5.1.1. Population Size

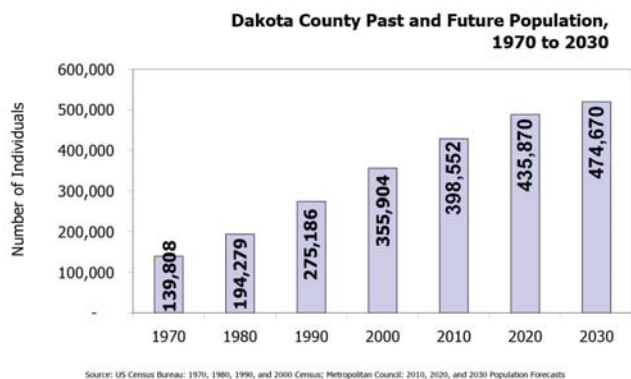
The population of the County grew from 139,808 in 1970 to 415,000 in 2015. This period of rapid growth had significant consequences on natural resources in the County, increasing the spread of invasive plants, contributing to water pollution from runoff, and shrinking wildlife habitat. By 2030, the population is anticipated to grow to 475,000 (**Figure 25**; U.S. Census Bureau 2017).

By 2040, the Twin Cities metropolitan region is projected to grow by 467,000 residents to almost 3.65 million people (Metropolitan Council 2017). The pressure of a growing population on public services and open space will increase, making preservation of existing open space and expanding the parks and trail system a high priority to accommodate the potentially greater use.

5.1.2. Age Distribution

The average age of the County's population is rising, a significant change that will affect how the County provides social services and others such as transit, recreation, and parks and open space. The Metropolitan Council predicts that by 2040, one in five residents in the metro region will be 65 and older, compared to one in seven in 2015. Citizens of an older demographic are interested in parks and open spaces, but declining physical capabilities limit their opportunities to experience the less accessible locations and habitats. More accessible elements of parks and open spaces such as trails and nature centers will provide opportunities for older citizens to experience and enjoy natural resources. Many older park users have a profound interest in natural resources and care that open space is protected and maintained. The interest and capacity to financially support all levels of governmental services, including natural resource management may be strained.

Figure 25. Dakota County - past and future population (1970-2030).



In contrast, the Millennial Generation is less connected to nature, in part because they have not embraced the traditions of camping, boating, hunting or hiking as older generations did. However, adrenaline sports such as trail running and newer forms of traditional activities such as fat-tire bicycling are becoming more enticing to millennial park users. Connectivity in parks and open space is also an important component of outdoor recreation for young park users because they seek ways to share their experiences on social media. Incorporating hotspots or Wi-Fi networks in parks and across open space areas is occurring as older parks are redeveloped and new parks are created.

5.1.3. Racial and Ethnic Diversity

The County is becoming more racially and ethnically diverse. In 2015, almost 16 percent of the County's residents were members of racial or ethnic groups other than "white," and this population grew 92 percent from 2000-2010 (Table 1). The Minnesota Demographic Center forecasts that populations of color in Dakota County will grow by nearly 176 percent between 2000 and 2030. By 2040, the Metropolitan Council estimates that the regional population of color will increase to 40 percent from 24 percent in 2010.

Table 1. Dakota County population by race or ethnicity.

	2000	2010	2013	% Change 2000 to 2010	% Change 2010 to 2013
White	325,166	339,499	347,766	4.4%	2.4%
Non-White	30,738	59,053	60,743	92.1%	2.9%
African American	8,091	18,709	22,593	131.2%	20.8%
Asian	10,285	17,451	19,616	69.7%	12.4%
Other	6,118	11,419	8,666	86.6%	-24.1%
Two or More Races	6,244	11,474	9,868	83.8%	-14.0%
Total	355,904	398,552	408,509	12.0%	2.5%

Source: U.S. Census Bureau and American Community Survey

Source: U.S. Census Bureau and American Community Survey

Based on surveys, populations of color have lower visitation rates at natural resource-based parks. Outreach programs in parks, schools, and through nature centers can provide new opportunities for people of color to experience outdoor recreation in natural resource-based parks.

5.1.4. Health and Demographics

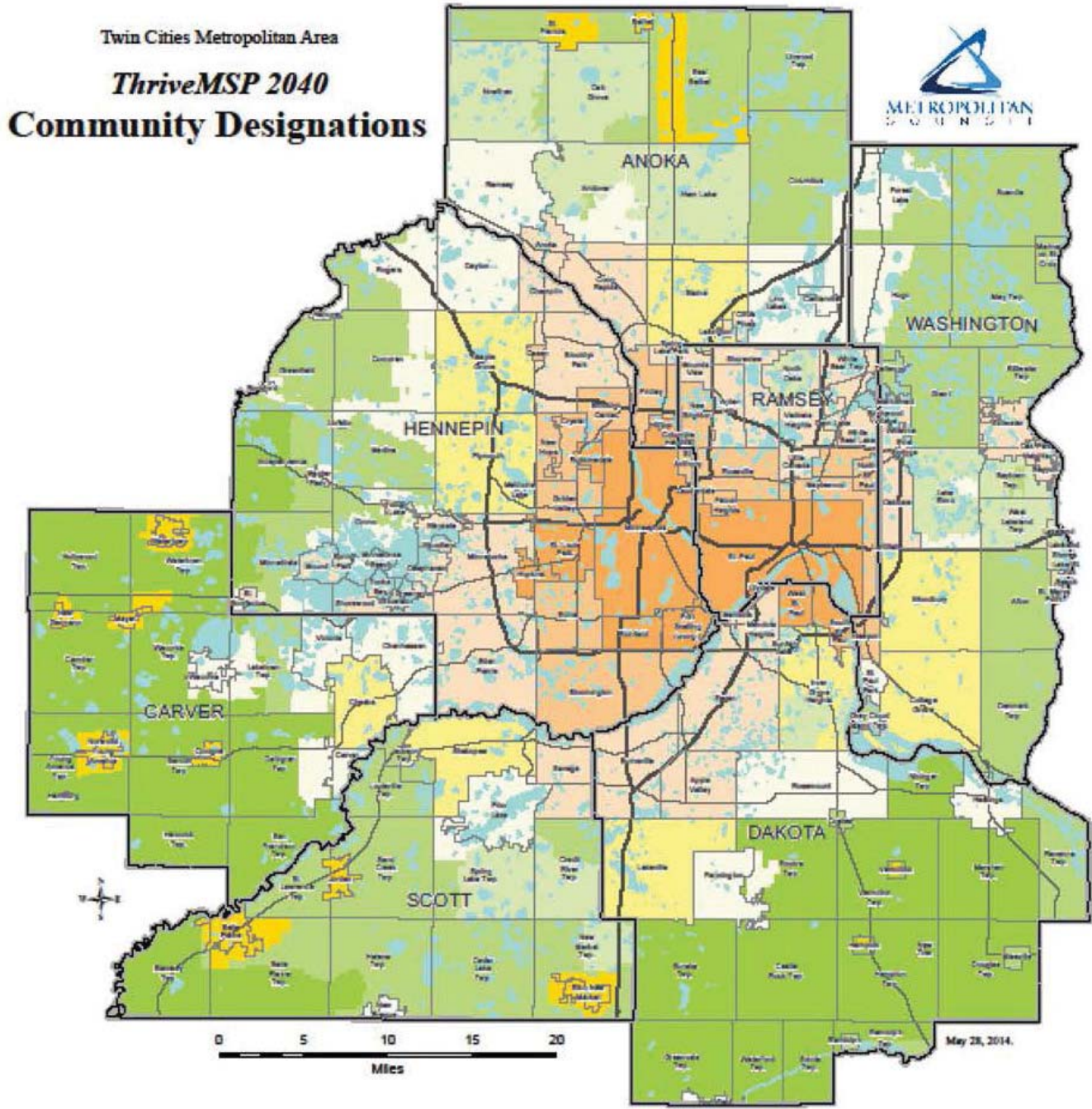
Aging citizens, more sedentary lifestyles, and dependence on automobiles due to separation of residences from shopping districts and work places is affecting the health of Dakota County's population. These changes contribute to greater obesity rates among County residents. In 2006, about 60 percent of residents were either overweight or obese (Dakota County 2009 Comprehensive Plan), mirrored in the state's population in a recent study by the Minnesota Department of Health. Land use and transportation systems play a big role in rising obesity rates. Maintaining a variety of parks, trails, and open space provides opportunities for County residents to be active and healthier. Well-managed open spaces and parks are often more visually attractive to the public, which could motivate people to visit parks and improve health.

The County has several goals, policies, and strategies in its comprehensive plan to increase active living by changing how transportation, green infrastructure, and land use are planned and carried out. Examples exist in the County that point the way toward more non-motorized transportation.

5.1.5. Changes in Land Use in the Twin Cities Region

Communities in the seven-county metro area range from rural, agricultural townships to densely populated downtown neighborhoods. The Metropolitan Council designates communities as either in the Metropolitan Urban Service Area (MUSA) or the Rural Service Area (RSA). The northwest half of the County is in the MUSA, with suburban and urban edge land uses, while the southeast half is in the RSA where agricultural land uses prevail (Figure 26). This pattern of communities and land use generally means that the size and quality of natural areas tends to be lower within the MUSA compared with areas in the RSA. However, ecologically-designed stormwater management systems within the MUSA can actually improve water quality and aquatic habitats compared to RSA runoff, which is generally managed to a lesser degree.

Figure 26: Thrive MSP 2040 Community Designations.



Community Designations

Urban Service Areas

- Urban Center
- Urban
- Suburban
- Suburban Edge
- Emerging Suburban Edge

Rural Service Areas

- Rural Center
- Diversified Rural
- Rural Residential
- Agricultural

Highways

- Interstate Highways
- State, US Highways and County Roads
- County Boundaries
- City and Township Boundaries
- Lakes and Rivers

Hanover, New Prague, Northfield, and Rockford are outside the Council's planning authority.

Development in the County will continue, with the greatest change occurring in the RSA. It is expected that rural centers and rural residential communities in the RSA will expand as the population and transportation network expands. The urban growth from the MUSA outward will reduce the amount of land used for agriculture because farming will be more difficult in terms of logistics and neighbor acceptance. As the urban area expands, existing natural areas can be identified, protected, and managed to withstand the impending changes due to development.

The Minnesota State Comprehensive Outdoor Recreation Plan 2014-2018 (SCORP) notes that with great population growth areas in the Twin Cities region comes greater demands for recreation near where people live. Less densely settled regions and associated recreational facilities will see reduced growth, if not shrinkage in some areas of the state. This suggests that over the next few decades there will be shifts in spending for recreational facilities to where the growth is.

5.2. REVIEW OF SURVEY AND POLLING MATERIAL

Since 2004, the County has conducted multiple surveys that directly address or reference natural resource management and outdoor recreation. Survey material includes summary data and raw data from mail and telephone polling and on-line surveys for the NRMSP and older surveys. Most responses pertain to outdoor recreation and not directly to natural resources or management due to the type of questionnaire used.

Previous surveys reviewed for this NRMSP include:

- County Residential Survey (2016)
- County Recycling, Parks and Transit Survey (2015)
- County Residential Survey (2013)
- County Residential Survey (2011)
- County New Regional Park Survey (2010)
- County Residential Survey (2008)
- County Comprehensive Plan Survey (2008)
- County Household Survey (2006)
- County Parks Public Opinion Survey (2004)

5.2.1. Public Awareness about Natural Resource Management

Although data from public surveys provided insights from a sample of residents, it is challenging to draw conclusions about the public's awareness of natural resource management because of lack of

knowledge, objections to the proximity of open space to residential areas, and a general sense that parks and open space exist primarily for recreation. However, the data suggest that respondents see a strong correlation between the recreational experience and the natural resources context. Many respondents stated an interest in seeing active and passive recreation take place in parks and open space, but this may be due to the context of the questions rather than a strong opinion about the natural resources themselves.

In general, the County's extensive network of parks, greenways and open space was greatly appreciated by respondents. At the same time, respondents' lack of a deeper understanding about managing landscapes is related to: a) actual or perceived limits on use and accessibility, b) limited knowledge of what and where the natural resources are, and c) limited understanding of how natural areas benefit citizens of the County beyond recreation.

5.2.2. Summary of Previous Natural Resource-Related Survey Responses

The trove of information collected over the past thirteen years provides insight into what County residents say is important about natural resources, how they use parks and open space, and what they would like natural resource management to be in the future.

How Did Respondents View Natural Resources?

Respondents largely viewed natural resources as important for active and passive recreation. The top three responses were:

1. A place for recreation
2. A place to view and experience nature
3. A place to relax and be peaceful

When asked how they interacted with natural resources, the majority of respondents said they spent a lot of leisure time outdoors. In one survey, half of respondents indicated that they look to County parks to provide both solitude and a place for active recreation.

What Did Respondents Feel was Important about Natural Resources?

Respondents generally felt that both recreation and natural resource protection were important. Respondents stated that their top activities were hiking and walking on paved and non-paved trails, bicycling on paved trails, and enjoying nature and scenery. Also notable were fishing, canoeing and kayaking, swimming, bird watching, and cross-country skiing. One survey directed at young people revealed mountain biking, geocaching, and disc golf as important. Native habitats were mentioned several times as being important components of the County's natural resources. Survey

responses also rated as important: the protection from pollution of lakes, streams, and wetlands; protection of open space, high-quality, or remote natural areas resembling pre-settlement conditions; and restoration of native plant communities. Controlling invasive species, improving habitat for native animals, and expanding and connecting natural areas were also very important to respondents.

What Did Respondents Want to See in the Future?

Natural resources were important to respondents, who want the County to promote conservation. They specifically would like the County to protect lakes, streams, wetlands, farmland, and remaining natural areas. Respondents also indicated that they would like the County to work with cities to connect parks and key destinations with greenways and trails. When asked if it was important for the County to help landowners manage natural resources on private conservation easements, the majority felt it was very important. Respondents also wanted to see paved trails, loop trails around lakes, hiking trails, ski trails, boat rentals, swimming beaches, and group picnic shelters across the County park and open space system.

Below are the salient responses to key questions from previous surveys.

County Residential Survey (2016)

County-wide mail survey that provides residents with an opportunity to rate the quality of life in the County, service delivery, and satisfaction with local government.

- Highest importance to respondents was protecting lakes, streams, and wetlands from pollution, followed by trail networks for hiking, biking or skiing.

County Recycling, Parks and Transit Survey (2015)

County-wide random mail survey asking about parks, transit and recycling. The following are on a ranking from 1-100:

- Indicate how important these activities are: enjoying nature or scenic views (essential 36, very important 33), hiking or running on non-paved trails (18 essential, 21 very important), hiking or running on paved trails (18 essential, 26 very important), biking on paved trails (19 essential, 24 very important)

County Residential Survey (2013)

County-wide mail survey that provides residents with an opportunity to rate the quality of life in the county, service delivery and satisfaction with local government. The following are on a ranking from 1-100:

- Highest importance to respondents was protecting lakes, streams, and wetlands from pollution (71), followed by trail networks for hiking, biking or skiing (66)

County Residential Survey (2011)

County-wide mail survey that provides residents with an opportunity to rate the quality of life in the County, service delivery and satisfaction with local government. The following are on a ranking from 1-100:

- Highest importance to respondents was protecting lakes, streams, and wetlands from pollution (77 essential or very important), followed by protecting remaining natural areas (67), and protecting farmland from future development (49)

County New Regional Park Survey (2010)

County-wide on-line questionnaire about Whitetail Woods Regional Park as part of master plan process. The following are on a ranking from 1-100:

- Half said they look to a County park to provide both solitude and an active experience
- Top reasons for visiting the new County regional park: outdoor recreation (67), appreciate natural world (65), relax and find serenity (47)
- Activities that would most entice residents to visit new park: non-motorized recreation (59), nature appreciation (52)
- Amenities that attract young people: mountain biking trails, geocaching/GPS rental, disc golf course
- Top three things people want to see at the park: hiking/walking trails, bike trails, ski trails

County Residential Survey (2008)

County-wide telephone survey that provided residents with an opportunity to rate the quality of life in the county, service delivery and satisfaction with local government.

- Nine in 10 respondents felt that it was at least "somewhat" important for government to promote conservation, with more than one-third reporting it as "essential"

County Comprehensive Plan Survey (2008)

County-wide telephone survey of residents that asked about a variety of issues facing the County.

- Protecting open space, historic places and water quality: 8.7 out of 10

- Should the County pursue an active role in protecting lakes, streams, and wetlands: 9.0 out of 10
- Work with cities to connect parks and destinations with greenways that include trails: 8.2 out of 10
- Should pursue an active role in protecting farmland from development: 8.1 out of 10
- Pursue an active role in protecting remaining natural areas: 8.5 out of 10
- Protecting the highest quality and more remote natural areas that are ecologically intact, resemble pre-settlement conditions and are relatively undisturbed: very important (62%)
- Expanding and connecting natural areas: very important (39%)

5.2.3. County NRMSP Survey (2016)

As part of this NRMSP, the County developed a questionnaire for on-line and intercept surveys to gather opinions about natural resources and natural resource management. The questionnaire was placed at all nine County libraries (intercept method) and provided on-line at Dakota County's website for three months. There were 362 responses, summarized below.

- Best describes how you interact with natural resources: I spend a lot of my leisure time outdoors in parks and other settings (46%)
- How important do you think it is to protect natural resources within County parks and greenways?: very important (87%)
- How important is it for them to help landowners care for natural resources on their private property that is now legally protected by the County through a conservation easement?: very important (65%)
- What do you value most about natural resources?: Water that is clean enough for fishing and swimming (62%), scenic views and beauty (57%), natural places to be physically active (55%)
- Controlling invasive non-native plant and animal species: very important (64%)
- Improving habitat size and quality for native animal species in decline: very important (70%)
- Restoring native plant communities: very important (49%)
- Improving the quality of water bodies: very important (76%)
- Maintaining and protecting natural scenic qualities: very important (48%)
- Maintaining and protecting minimally developed areas that provide a sense of seclusion or wildness in the midst of an urban area: very important (66%)

5.3. SUMMARY OF SOCIAL CONTEXT AND IMPLICATIONS FOR NATURAL RESOURCES

The County's population is growing, aging, and becoming more racially and ethnically diverse. Today, with a recovering economy, the growing population and demand for new homes and businesses will fill currently undeveloped urban and suburban spaces, and expand existing towns and developments in the County's rural southeastern half. The types of open space and the use residents make of the County's natural resources varies by location and the desires of the person using the open space. At the same time, people's natural affinity for the natural world will always draw them to parks and greenways for recreation, but also simply to get away and renew their spirit. Public opinion surveys strongly support the idea that most County residents want large natural parks and connecting greenways. They also value a high quality natural environment. Considering the weight of evidence from all surveys, it can be said that citizens of the County strongly support the conservation and management of natural resources on County lands, along regional greenways, and on the County's privately-owned easements.

The County has spent considerable time and financial resources planning for and protecting important natural resources over recent decades with the support and encouragement of County residents. Whether through direct purchase or conservation easements, the public has supported the protection of natural resources. Public opinion surveys also indicate that the public supports the active management of the County's natural resources to maintain or improve these resources as healthy habitat for animals, for recreation opportunities, and to maintain the sense of character that these places provide. This support may continue in the future, although demographic changes may shift the attention toward more visible areas until the public's understanding catches up to the scientific basis for natural resources management. Moreover, it is uncertain whether the broader public understands that to create and maintain a high quality natural environment requires a major and perpetual investment in management. To achieve the current ideal that residents hold out for natural resources, however, it will be necessary for the County to make a greater commitment and investment in natural resource management.

6. COUNTY ROLE AND RESPONSIBILITIES IN NATURAL RESOURCE MANAGEMENT



Volunteer seed collection event at "Rattlebox Prairie". Photo by Dakota County Staff.

The County wants to be a good steward of natural resources on lands and waters it owns or has a legal interest in (i.e., conservation easements). Additionally, as a significant landowner, regulator, and coordinator among governments in the County, the County is in a position to influence, lead and facilitate better natural resource management across ownerships. This is a reasonable view because natural resources and greenway corridors cross political and ownership boundaries and problems of adjacent properties spill over to the County's properties. The County's efforts on its own lands could be magnified through collaboration and coordination with other landowners. Implementation of the NRMSP will lead to consistency and continuity in the approach to natural resource management among governments and adjacent landowners.

For many years, the County has been engaged in natural resource restoration and management in some of its parks, greenways, and easements (**Figure 2**). The state of the County's natural resource management activities is discussed below.

6.1. MANAGEMENT IN DAKOTA COUNTY PARKS AND GREENWAYS

As discussed, protection was the first step in bringing some of the lands and waters of the County under natural resource man-

agement. The County's park system is relatively young by regional standards. The first acquisition occurred in 1967 for Lebanon Hills Regional Park. Acquisition within established park boundaries is on-going, with nearly 730 acres remaining to be acquired from willing sellers throughout the system, as of 2017. As parkland was acquired, development occurred to give the public access to use these areas. Entrance roads, parking lots, restrooms, unpaved and paved trails, multi-purpose buildings and other facilities were planned and built.

Meanwhile, other parks and natural areas were protected across the County. The 2008 Dakota County Park System Plan states:

Dakota County's large regional parks already have preserved some of the best land in the County with high quality ecosystems and scenic vistas. Rapid development has yielded parks dedication funds for cities, whose well-developed park systems provide a strong complement to County parks. Adjacent regional and state parks (Lilydale-Harriet Island, Fort Snelling State Park) serve northern Dakota County where there are few County facilities. Opportunities for large parks may still exist in rural Dakota County, where there has been relatively little large-lot rural residential development.

With the passage of the 2008 Constitutional Legacy amendment, significant funding has allowed the County, cities and the state to protect additional land. With more protected lands, natural resource management needs have also increased.

By contrast, the County's greenways span various land ownerships that will shift over time. This complex ownership pattern raises challenges for maintenance and natural resource management. This is discussed in detail in the 2010 Dakota County Greenway Collaborative's Greenway Guidebook.

As of 2017, County parks and greenways contain approximately 4,700 acres of natural/undeveloped land (83% of total acreage). For years, the County has generally approached natural resource management on a project-by-project basis, depending on a very small dedicated staff, a limited amount of general operating funds, and a few grants. Despite the inclusion of natural resource management as an important part of each park master plan, the 2008 recession

severely slowed implementation of natural resource management on County lands, when providing other urgent County services became a higher priority. Municipalities across the County also cut back on natural resource spending at this time. Despite setbacks, the County increased investment in natural resource management in 2013 by tripling the dedicated management staff. Between 2013 and 2016, the base operating budget increased, and the County received \$2.5 million of state grants to conduct natural resource management on 1,581 acres in four parks.

In 2016, the County's base annual budget for natural resources staff and capital improvement projects totaled \$944,000. This supported five full-time staff and two temporary staff, and also fielded an Institution/Community Work Crew (ICWC) and a Sentence to Serve (STS) crew.

By the end of 2016, ecological restoration and some sort of management was occurring on nearly 2,300 acres of County Parks and Greenways. Much work was accomplished, such as prairie restoration, prescribed burning, removal of common buckthorn and other invasive species, and construction of rain gardens and other stormwater BMPs. Dakota County also has brought over half of the natural and semi-natural vegetation in its parks into a natural resource management regime, ranging from simply removing large buckthorn at Lebanon Hills (to prevent seed dispersal), to planting large acreages of Whitetail Woods. About 1,245 acres at multiple sites are being managed with dedicated funds. Another 1,052 acres are managed through a combination of County and state grant funds. All told, an estimated 2,297 park acres are currently under management, which represents a little over half of the 4,486 acres of natural and semi-natural parklands warranting natural resources management. **Table 2** summarizes natural resource management occurring currently in County parks at the end of 2016.

Table 2. Extent of natural resource management in County parks.

Project Name	Location	Grant/Funding Source	Acres	Begin Date	End Date	Description
Non-Grant Projects						
System-wide prairie maintenance	Scattered throughout County parks and also around buildings.	Parks' annual CIP budget	540	2014	2016	Burn, mow, spot treat, 540 ac. of restored prairie; much was restored by County without grant funds
Buckthorn removal project	Lebanon Hills Regional Park	Parks' annual CIP budget	700	2014	ongoing	In Phase 1 of forest/woodland restoration (2014-2015), prison crews cut large stems (> 1.25 in diameter), treated stumps, and chipped wood. Cover about 350 ac. each year until park is completed in 2018-2019. In Phase 2 (2016-2022), seedlings and re-sprouting stumps will be controlled on 700 acres.
Rain garden maintenance (currently 20 rain gardens)	Scattered in parks and around buildings outside parks.	Parks' annual CIP budget	5	2014	ongoing	Raingardens are constructed each year.
Non-Grant Funded Restored Acres			1,245			
Grant Projects						
Mississippi River Flyway Restoration	Spring Lake Park Reserve	Outdoor Heritage (CPL)	88	4/1/2014	6/30/2017	Prairie and savanna restoration
Archery Range Prairie Restoration	Spring Lake Park Reserve	Outdoor Heritage (Friends of Miss. River)	41	2/5/2016	6/30/2018	Prairie and savanna restoration
Whitetail Woods Regional Park Restoration and Enhancement	Whitetail Woods Regional Park	Outdoor Heritage	325	11/1/2014	6/30/2019	Prairie, savanna, forest, wetland restoration
Buck Pond Restoration	Lebanon Hills Regional Park	Outdoor Heritage (CPL)	175	7/1/2015	6/30/2018	39 ac. wetland and prairie around Buck Pond; 136 ac. forest around Jensen Lake
Plateau Prairie Restoration	Spring Lake Park Reserve	Outdoor Heritage (CPL)	99	7/1/2015	6/30/2018	Prairie and forest/woodland restoration; 49 acres from CPL grant, plus 50 acres paid from excess money from the Miss. River Flyway grant/project
Tamarack Swamp	Lebanon Hills Regional Park (west of Jensen Lake)	Outdoor Heritage (CPL)	24	2016	6/30/2019	Restore tamarack swamp and surrounding wetlands, woodlands, savanna. Southern Rich Conifer Swamp is regionally rare and high priority
Miesville Bluff Prairie--Phase I	Miesville Ravine Park Reserve (east side of Trout Brook)	Outdoor Heritage (CPL)	94	2016	6/30/2019	Bluff prairie, savanna, woodland restoration; prairie restoration of cropland and enhance of bedrock bluff prairie
Star Pond Restoration	Lebanon Hills Regional Park (east & south sides)	LSOHC via Great River Greening	75	12/19/2016	6/30/2021	Woodland and savanna restoration, forb enhancement
Grant-Funded Restored Acres			1,052			
Total Restored Acres			2,297			
Percent Natural Park Lands Managed			51			

The County monitors some wildlife species and water bodies. Monitoring is essential to understand whether a natural resource management program is working or not. Information is used to identify problems, track trends, and document achievement of management goals. Species such as Blanding's turtle, snakes, native bees, song birds, and salamanders have all been monitored by the County. Motion-sensitive trail cameras were installed at some County Parks to detect wildlife, and small mammal monitoring is planned for 2017. In Lebanon Hills Regional Park, sediment sampling was conducted on Schulze Lake in November 2010, and water clarity monitoring has been conducted on Jensen Lake for many years. As mentioned above, aquatic invasive species surveys were conducted on 20 lakes in County parks in 2016. Other water quality monitoring is conducted on County water bodies by the DNR, Dakota County SWCD, and the Vermillion River Watershed JPO.

Some wildlife species cause problems, raising challenges for natural resource management and the larger community. Persistent white-tailed deer densities greater than fifteen individuals per square mile can lead to excessive browsing and loss of native trees, shrubs, and herbs, and also damage to new restoration plantings. Deer populations in Lebanon Hills, Spring Lake, and Miesville Ravine have been managed by using controlled hunts.

6.2. MANAGEMENT OF DAKOTA COUNTY EASEMENTS

All natural conservation easements have an NRMP, jointly developed with the landowner and updated every five years. The agricultural easements, which often include natural and restored natural areas, require voluntary Stewardship Plans involving required vegetative buffers along rivers, streams, wetlands and other BMPs. Landowners are required to maintain the buffers.

Initially, private landowners were not required to implement any management practices; however, many chose to do so with additional County financial assistance. More recently, landowners with a newly acquired County easement are required to begin implementing the NRMP with County financial assistance according to a five-year Natural Resource Management Agreement.

6.3. NATURAL RESOURCE MANAGEMENT PLANS

Natural Resource Management Plans (NRMPs) are a proven method to guide ecological restoration and management of a particular site. Like periodically-updated comprehensive and park master plans, NRMPs establish a starting point in a process to restore and manage sites towards improved ecological health. These plans aim to restore healthy plant communities. Their implementation helps

protect the ecological integrity of natural areas, improve native plant diversity, enhance wildlife habitat, address erosion, improve stormwater management, enhance people's enjoyment of the site, and control long-term management costs. Long-term costs are reduced because the site is set on an ecological trajectory that will allow it to be self-healing and self-correcting in the future.

NRMPs typically describe:

- Goals for the site
- Information and methods used to develop the plan
- Existing ecological conditions (inventory and assessment)
- Desired outcomes (vision and goals)
- Prioritized restoration and management actions
- Management units
- Recommended schedule
- Performance standards
- Estimated costs

The best NRMPs are flexible. Ecosystems may not respond as expected. Weather is unpredictable. Funds may be delayed, reduced or lost. Staff time may be reprioritized. New technology and scientific understanding may be gained. For these and other reasons, NRMPs must adapt and should be updated every five to ten years.

Successful natural resource management programs also regularly monitor and report on progress, and then change if necessary. This feedback loop, called "adaptive management," (**Figure 27**) generates new information that can improve management. It consists of a cycle of implementation, monitoring, evaluation, adjustment, and more implementation, and should continue indefinitely. With expert guidance and supervision, County residents can help gather the data needed for adaptive management. School children, citizens and college researchers can get involved which can increase understanding of and support for natural resource management.

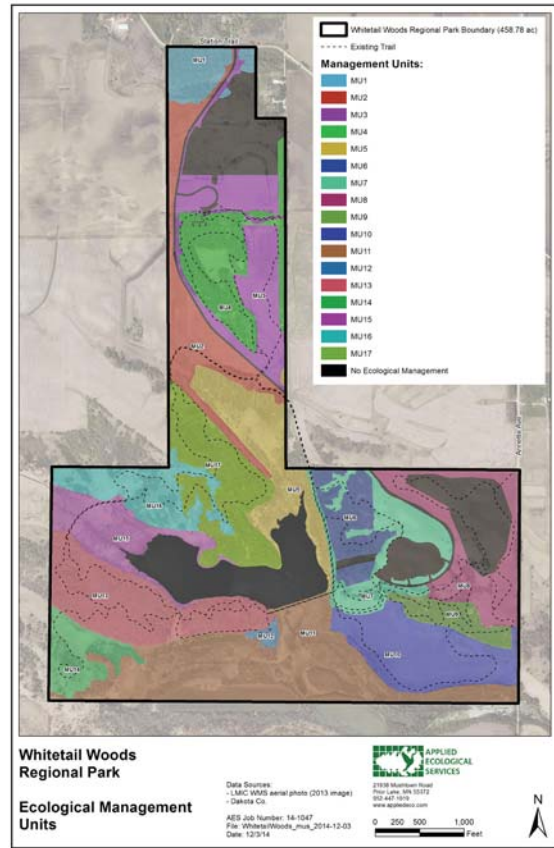
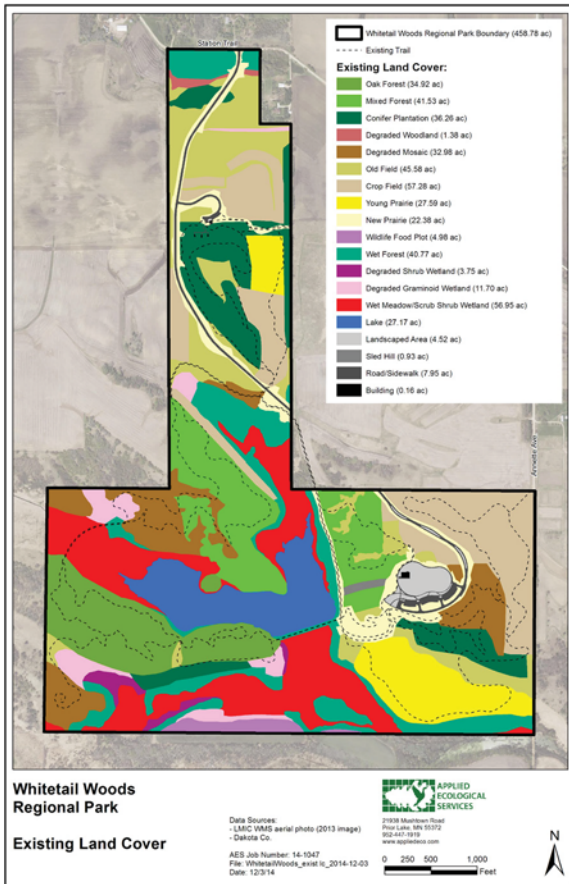
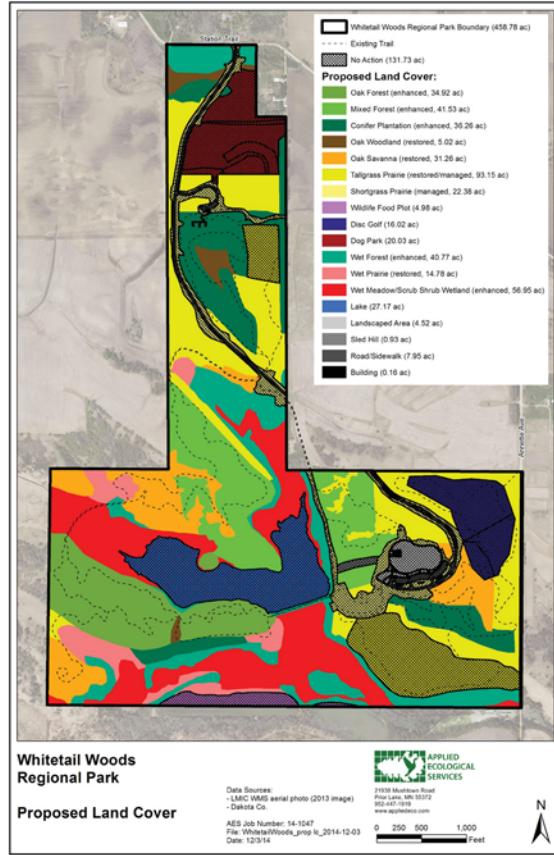
In 2016, a preliminary NRMP was completed for Whitetail Woods Regional Park and implementation is well underway. Critical elements of an NRMP are a description of the current vegetation, the proposed future vegetation, and the site's management units. **Figure 28** presents these elements as developed for the Whitetail Woods NRMP.

Adaptive Natural Resource Management



Figure 27. The concept of adaptive management sets up a cycle of constant learning and improvement.

Figure 28. Whitetail Woods Regional Park NRMP figures. Map 1 = Existing Landcover, Map 2 = Proposed Landcover, and Map 3 = Proposed Management Units.



Different types of land warrant different NRMPs. County parks, with some of the County's most valued natural resources, require park master plans and updates to provide for park users. In the future, all park master plans and updates will be accompanied by a detailed NRMP, according to the following schedule (**Table 3**).

Table 3. Schedule for Dakota County park NRMPs and related studies.

Park Name	Year of Completion
Lake Byllesby Master Plan Update	2017
Lake Byllesby NRMP	2017
Lebanon Hills Regional Park NRMP	2017
Lebanon Hills Ponds, Lake and Wetlands Study	2017
Whitetail Woods Regional Park NRMP	2018
Thompson County Park Master Plan Update	2018
Thompson County Park NRMP	2018
Miesville Ravine Park Reserve Master Plan Update	2018
Miesville Ravine Park Reserve NRMP	2018
Spring Lake Park Reserve Master Plan Update	2019
Spring Lake Park Reserve NRMP	2019
Lebanon Hills Connector Trail Study	2019

Due to complicated land ownership and shared management responsibilities, regional greenways require a different NRMP template. Likewise, since private easements are not owned by the County, natural resource restoration and management will be different than that in parks and greenways. Templates for County NRMPs are found in Appendices D (parks), E (regional greenways), and F (private easements). The County provides planning assistance to private landowners with easements by collaborating on the preparation of NRMPs.

6.4. USE OF VOLUNTEERS FOR MANAGEMENT

6.4.1. Volunteer Program

A successful volunteer program can provide multiple benefits to the County, including:

- Increasing public interest and support for parks and open space
- Collecting valuable data about the flora and fauna
- Building community
- Reducing labor costs

Leveraging in-kind volunteer match for grants

- Developing a more well-informed community
- Integrating education and natural resources

Simultaneously, volunteers (including students, teachers and other citizens) find emotional and intellectual rewards when engaging in restoration and management of natural resources. Benefits to volunteers include:

- Learning about the value natural resources
- Gaining a better understanding of the importance of stewardship
- Getting outdoor exercise
- Building teamwork with their organization or family

Volunteer efforts may involve physical labor (e.g., planting trees, removing invasive species) or monitoring/research (e.g., field observations, data collection, and data analysis). Many volunteer activities require oversight by trained volunteers, County staff or outside experts. Volunteer monitoring/research advances knowledge and builds public support for natural resource programs. One form of citizen engagement that has benefited many communities is organizing and conducting a "bioblitz." A bioblitz is a 24-hour period when volunteers, supported by experts, document all living species in a given area (e.g., a park). Bioblitzes help gather baseline data on plants and animals, while letting people discover the natural world around them. It also gives participants an opportunity to participate in scientific research. Bioblitzes also bolster more systematic monitoring of vegetation, water and wildlife resources.

Volunteer projects can typically be divided into two broad categories: one-time and ongoing. **Table 4** describes the characteristics of these two categories.

Table 4. Categories and characteristics of volunteer projects.

Characteristics	Project Category	
	One-time	Ongoing
<p>Tasks</p> <p>All tasks and methods should be reasonable and safe, and all necessary personal protection equipment (work gloves, etc.) should be provided by the County.</p>	<p>Generally requiring a training period or learning curve of ten minutes or less.</p> <p>Examples: hauling brush; planting plugs, trees, etc.; pulling invasive species, focusing on a single species within a defined area</p>	<p>Generally requiring a longer training period or learning curve.</p> <p>Examples: plant or wildlife inventory; invasive species mapping; supervising other volunteers; pulling invasive species, focusing on multiple species or working over a broad area</p>
<p>Scope</p> <p>All volunteers should be aware of how their efforts fit into the bigger picture</p>	<p>Narrow, simple and attainable</p> <p>While the broader project scope can be very large, one-time events must have a definitive goal/boundary, and volunteers must be able to accomplish the work within the set time period of the event.</p>	<p>Complex and progressive</p> <p>While these efforts may have a clear objective, it may be impossible to attain an 'end goal' (e.g., invasive species mapping). Volunteer expectations must be managed so that they understand that their work is resulting in meaningful progress; the project will be ongoing.</p>
<p>Volunteer Commitment</p>	<p>Low - Volunteers commit to two to three hour time blocks. They may not be interested in learning and applying multiple new skills within this time period (i.e. "pull the plant with the white flowers" instead of "pull the plants with pink and small white flowers, but not the large white purplish-pink flowers.")</p>	<p>Medium to High - In exchange for additional training involved, volunteers are expected to commit more time to these projects. They may also be more receptive to learning and assimilating complex or nuanced information.</p>
<p>Staff Commitment</p>	<p>Moderate - Much of the staff effort is dedicated to volunteer recruitment and event logistics.</p>	<p>High - In addition to recruitment and logistics (which may be more challenging for these higher-level tasks), staff must also put effort toward volunteer training, retention, and appreciation.</p>
<p>Performance Metrics</p>	<p>Successfully completed projects often result in very tangible results, such as cubic feet of brush hauled, number of plants installed, etc. Volunteers can get a lot of work done in a short period of time.</p>	<p>Due to the nature of these projects, results may be more difficult to quantify. However, these volunteers are often required to perform their task at levels equivalent to County staff.</p>

Volunteers can assist in a variety of tasks, and with additional training and oversight they can accomplish even more. **Table 5** summarizes natural resource management tasks for which volunteers can provide assistance.

Table 5. Use of volunteers for different management tasks.

Management Task	Volunteer Role		
	Generally Appropriate	Appropriate with Training & Oversight	Generally Not Appropriate
Native seed collection & sowing	X		
Installation of live trees, shrubs, herbaceous plugs	X		
Hand-pulling invasive plants	X		
Dragging buckthorn/brush	X		
Cutting buckthorn/brush		X	
Simple ecological monitoring		X	
Mowing			X
Herbicide application			X
Prescribed burning			X
Slope stabilization			X
Construction of water projects and best practices			X
Technical ecological monitoring			X

Although assistance by volunteers has no direct cost, the staff time for organizing, training, equipping, and supervising volunteer events is a cost, as are materials (e.g., tools, safety equipment, food and beverage). For instance, Dakota County staff estimated that one hour of staff time is needed for each five to ten hours of volunteer time expended.

Likewise, it is important to recognize that a successful natural resources program engages volunteers only when it is efficient and effective, and when activities are of an appropriate type and scope. Most volunteers will quickly recognize when their efforts are inefficient or ineffective, or when they're faced with a seemingly impossible task. After such an experience, they are unlikely to return.

6.4.2. Volunteer Goals and Metrics

While the number of volunteers engaged or number of hours contributed are useful measures of program success, they should not be over-emphasized. Factors of weather, the availability of appropriate work, and staff resources for coordination all influence these metrics from year to year.

Volunteer retention is another important metric in measuring program success. High retention rates can indicate that the program provides a consistently high quality volunteer experience. As one-time volunteers develop a relationship with the County, they may become more interested in taking on additional responsibilities

and move towards high value, "steady" volunteer positions. Volunteers who have several high quality experiences are also more likely to tell friends and family about the program. Word of mouth recruitment can greatly increase the County's overall volunteer pool.

Finally, when considering volunteer engagement goals, it is important to recognize that volunteer availability is finite and that there are multiple competitors in the local volunteer engagement market. Within this competitive market, a sustainable volunteer program must be responsive to the interests of participants. Volunteers may assist with a particularly monotonous activity on an occasional basis, but they are less likely to remain engaged if that particular activity is all that is offered. For example, while there appears to be an endless supply of buckthorn seedlings for volunteers to pull, it is unlikely that the County can engage a volunteer workforce capable of completing this entire task. To maintain volunteer morale and engagement and to ensure that natural resource goals are met on such projects, it is essential that contractors or other labor sources are available to supplement volunteer efforts.

6.4.3. County's Volunteer Program

The County's volunteer program seeks to foster an engaged, invested, and well-informed community while efficiently and effectively protecting and restoring the natural resources of the County. The County's Natural Resources program began to engage volunteers in earnest at Lebanon Hills Regional Park (LHRP) in late 2014. In

collaborating with local non-profit organization “Wilderness in the City,” the County was able to utilize highly engaged and motivated community members, which accelerated the growth of the volunteer program. Volunteers are identified and informed of events through the County website and by monthly listserv e-mail.

The County is well positioned to continue to develop a successful natural resource volunteer program. Minnesota ranks second in the nation for volunteerism, with 35 percent of residents participating in volunteer activities. Minnesotans also tend to have a high level of interest and engagement in natural resources issues. The Coun-

ty’s location in a major metropolitan area provides a large pool of potential volunteers. Due to its popularity, the volunteer program at LHRP may also serve as an excellent testing ground for new volunteer initiatives. Also, with the significant grant funding and County resources being directed towards Whitetail Woods Regional Park and Miesville Ravine Park Reserve, these investments could be leveraged to develop volunteer initiatives in these parks. A greenways volunteer program could also be developed. Use of volunteers for implementing this NRMSP is discussed further in Section 11.1.2.



Volunteer wetland vegetation planting event at “Buck Pond” in Lebanon Hills Regional Park. Photo by Dakota County Staff.

7. NATURAL RESOURCES INVENTORY AND ASSESSMENT



Spangled fritillary at Whitetail Woods Regional Park. Photo by Dakota County Staff.

The important characteristics of natural resources in the County’s parks, greenways and easements were investigated in several ways. This information helped identify the important natural resource management topics to address in this NRMSP. The issues in turn shaped the principles and vision of the NRMSP and the contents of NRMP’s for individual parks, greenways, and easements.

7.1. METHODS OF INVENTORY AND ASSESSMENT

7.1.1. Review of Existing Data

The consulting team, with assistance from County staff, compiled existing plans, reports, and data files about the County’s history, demographics, natural resources, land holdings, and management activities. Documents and data reviewed include:

Plans and Reports Published by the County

- Farmland and Natural Area Protection Plan (2002)
- Lake Byllesby Regional Park Master Plan (2005)
- 2030 Park System Plan: Great Places – Connected Places – Protected Places (2008)
- Comprehensive Plan – DC2030 (2009)
- Greenway Guidebook (2010)
- Vermillion River Corridor Plan (2010)
- Comprehensive Land Conservation Vision (2011)

- Benchmarking Study – Revised Final Report 1/11/2012 (2011)
- Vermillion Highlands Greenway Master Plan (2012)
- River to River Greenway Master Plan - Draft (2015)

Spatial Data Provided by the County

- Parks
- Regional Greenways
- Easements
- Land Cover (Minnesota Land Cover Classification System, MLCCS)¹
- Aerial Photography (from Land Management Information Center, LMIC)
- Prairie Restoration Areas
- Other Restoration Areas

¹ MLCCS data were used for most spatial analyses in this report; however, more current land cover acreages were provided by Dakota County and used in some tables and statistics.

Data Acquired from Minnesota Department of Natural Resources

- Public Waters (lakes, larger wetlands, rivers, and larger streams)
- Sites of Biological Significance
- Native Plant Communities
- Minnesota Trout Streams
- Natural Heritage Database (rare natural features)

Data Acquired from Minnesota Pollution Control Agency

- Impaired Waters 2012

7.1.2. Resource-Specific Analysis

The consulting team completed a spatial analysis of the County's parks, greenways, and easements in a geographic information system (GIS).

Vegetation and land cover acres were calculated for County parks and qualitatively assessed for County greenways and easements. Land cover acres using the Minnesota Land Cover Classification System (MLCCS) were summed for each County park (**Appendix G**). To simplify reporting and decision-making, MLCCS land cover classes were sometimes combined into "general" land cover classes (**Table 6**). Original MLCCS data were developed in the late 1990's and early 2000's. County staff has updated and refined land cover information for County parks which is incorporated in the analyses.

Table 6. General land cover categories and classes.

Land Cover Category	General Land Cover Class
Natural and Semi-Natural Vegetation	Native Mesic Forest, non-Oak (ac)
	Oak Forest (ac)
	Savanna and Shrubland (ac)
	Prairie (ac)
	Non-Prairie Grassland (ac)
	Altered Forest (ac)
	Lowland Forest (ac)
	Wet Meadow and Shrub Swamp (ac)
	Marsh/Pond (ac)
Altered Wetland (ac)	
Aquatic	Lake (ac)
	River (ac)
Cultural	Cultivated Land (ac)
	Developed Land (ac)

Land cover for County parks, greenways and easements is always in flux due to the timing of acquisitions and management implementation. Final acreages for this Plan were developed using additional data that were unavailable at the time of the initial analysis, but which informed the final analysis. MLCCS data will be updated in the future by the County so that future land cover analysis will be as up-to-date as possible.

Parks were assessed not only in terms of land cover, but also in terms of other park characteristics. Park classification, surrounding land use character, public acres, unique attributes, rare natural features (native plant communities and rare species), core habitats and biodiversity areas, and major natural resource issues are summarized in **Appendix H**.

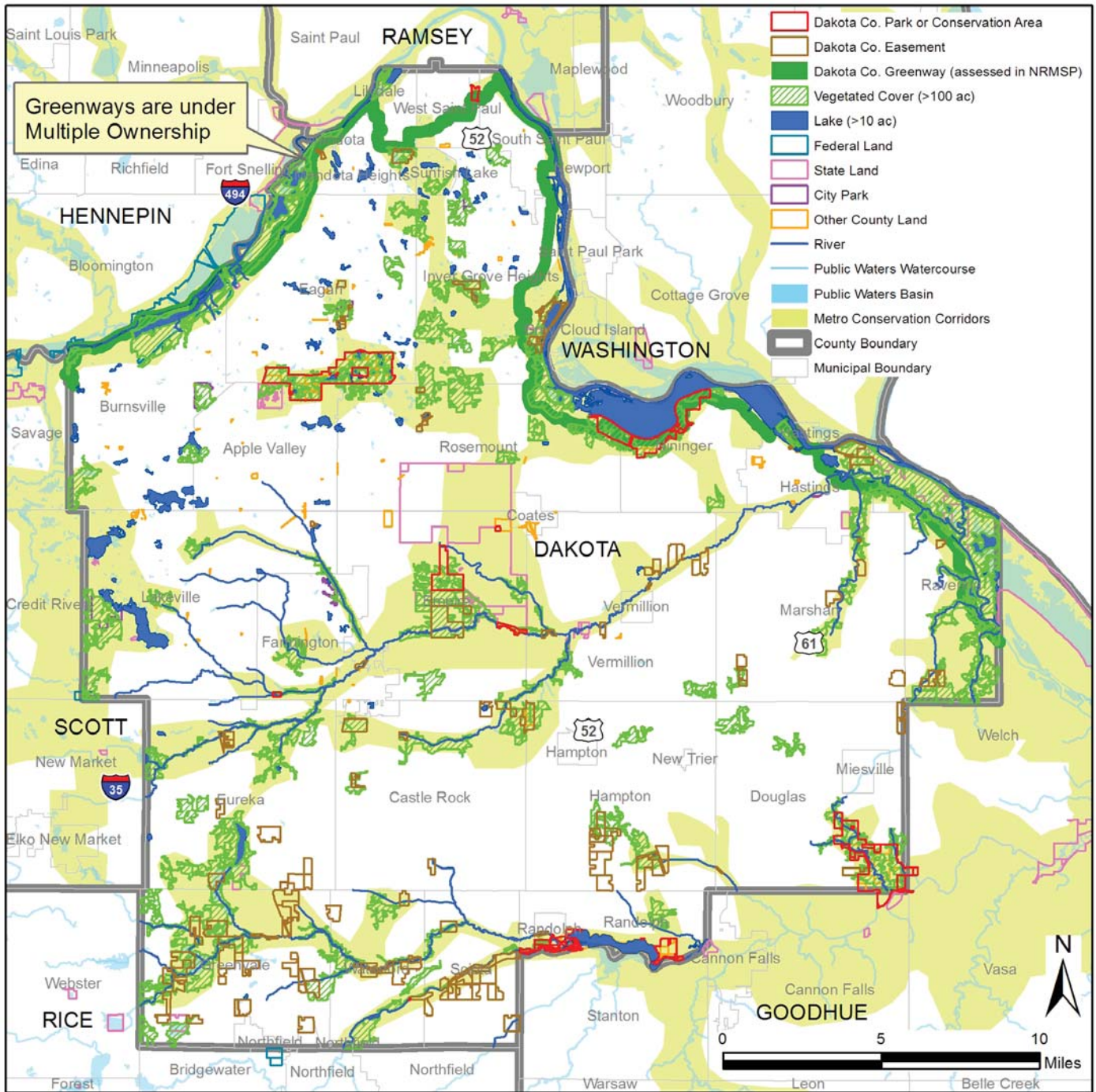
Greenways were analyzed visually and with GIS. Greenway length (including a breakdown of urban, suburban, and rural sections), acres and percentages of greenway in different landscape settings (using conceptual greenway widths, which vary depending on setting), and connected features (e.g., parks) are summarized in **Appendix I**.

Easements were analyzed visually and with GIS. Analyses included tallying easements by type (e.g., natural area, corridor, greenway, and agriculture) and assessing relative size of easements (large, medium, or small). Easement acreages, sizes, and count by type are summarized in **Appendix J**.

Water resources in County park, greenway, and easement lands were analyzed visually and with GIS. **Appendix K** summarizes the geographic location of water resources associated with County parks, greenways and easements. The appendix also summarizes the County land feature(s) intersected by the water resource, water resource name and identification numbers, classification, size and depth of lakes and larger wetland basins, length of waterway overlap with County lands, major watersheds, tributaries, trophic state, impairments, known invasive species, management efforts, health of wetland basins, and additional notes.

Wildlife core habitat was analyzed by reviewing MLCCS land cover data. Relatively large tracts of natural and semi-natural land (>100 acres) were identified (**Figure 29**). These are the portions of the County most likely to contain and sustain uncommon or declining animal species, such as SGCN and specialist species. Most of the County's smaller remaining natural and semi-natural lands provide habitat for generalist species.

Figure 29. Core habitats, connections and land ownership.



Wildlife connections between core habitats and other natural areas were assessed by reviewing the DNR’s Metro Conservation Corridors (DNR 2008). This metrowide study used land cover and other habitat-related data to broadly identify conceptual wildlife corridors between natural lands and waters. **Figure 29** illustrates conservation corridors identified in the County.

7.2. VEGETATION AND RARE SPECIES COUNTYWIDE

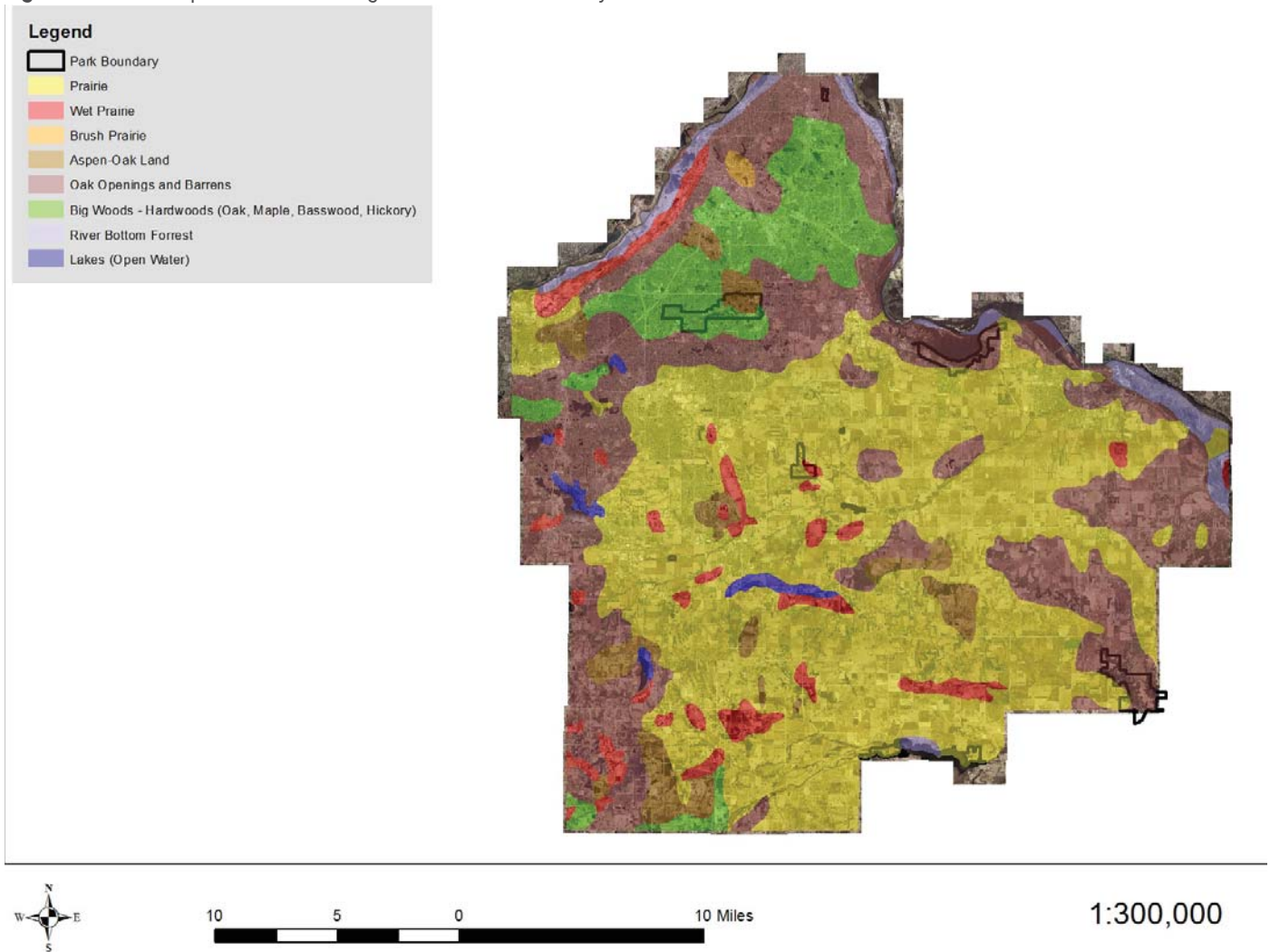
The pattern of vegetation and land cover makes it clear that there is no simple prescription for managing natural resources in the County’s 5,053 park acres, 60 miles of greenways, and 9,379 acres of easements. Each park unit, greenway and easement has a different landscape setting, different internal conditions and different potential for restoring ecosystems and ecosystem services. At the

same time, certain common issues emerged for all these lands—some more urgent than others. Given the lag between the historic damage done to the County's natural resources and contemporary conditions, it is not surprising that there is a lot of work to do. At the same time, the County's recent expansion of natural resource management has brought almost half the parkland's natural and semi-natural vegetation and 30 percent of natural areas on easements under some form of management.

The majority of Dakota County's native vegetation (**Figure 30**) has been lost to cultivation and development (**Figure 31**). About two percent (9,400 acres) of the County still supports the historical landscape from 150 years ago. While 150 years is a brief moment

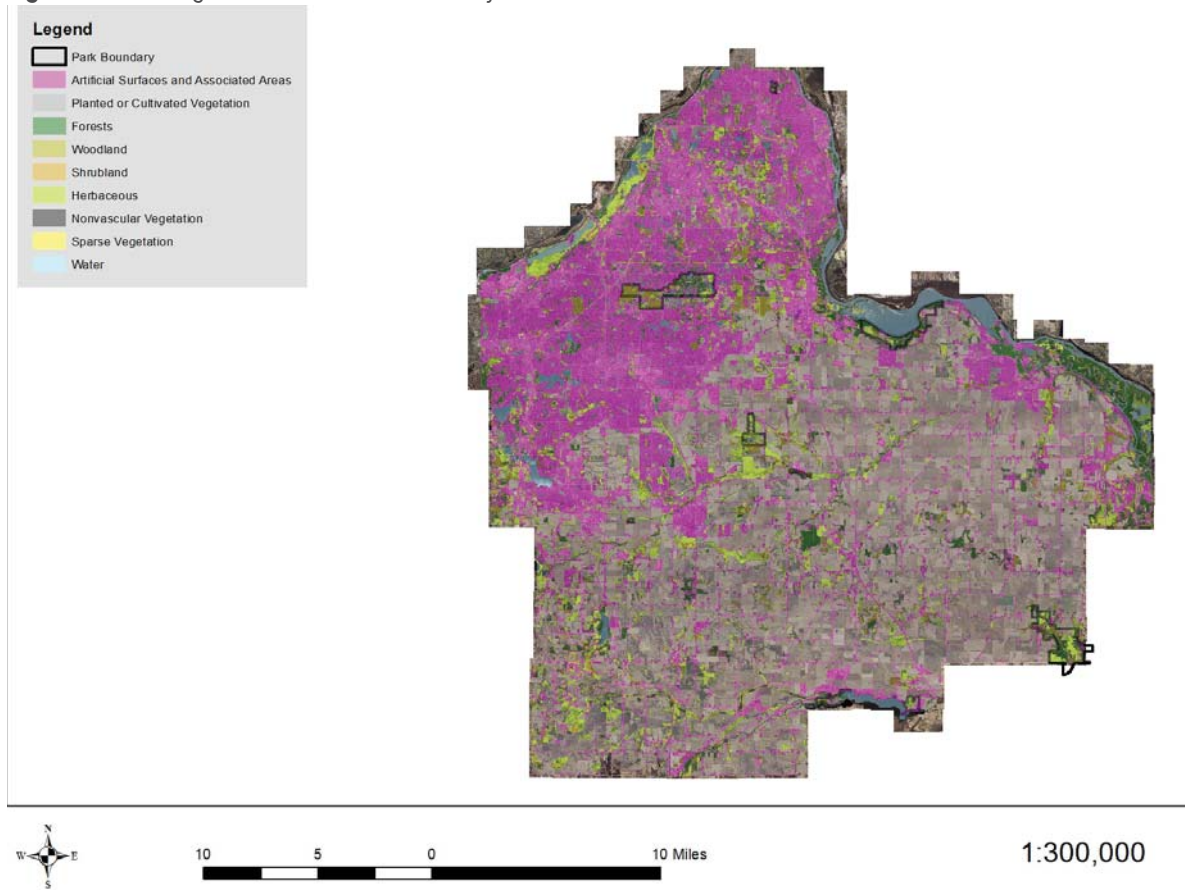
in the natural history of the County, its effects are large and span over four generations engaged in more intensive land use than was present for several thousand years prior. Each generation was aware of changes that occurred only while it was alive. The first generation saw the disappearance of bison, prairie chickens and passenger pigeons. Subsequent generations were focused on building villages and cities and converting the prairie and wetlands to productive cropland, which decreased biodiversity and started the deterioration of water quality. The current generation is experiencing more changes due to development, with the complicating factor of climate change (discussed in Section 4.7). As a result, few areas of high-quality native vegetation remain in the County (**Figures 32 and 33**).

Figure 30. Pre-European settlement vegetation of Dakota County.



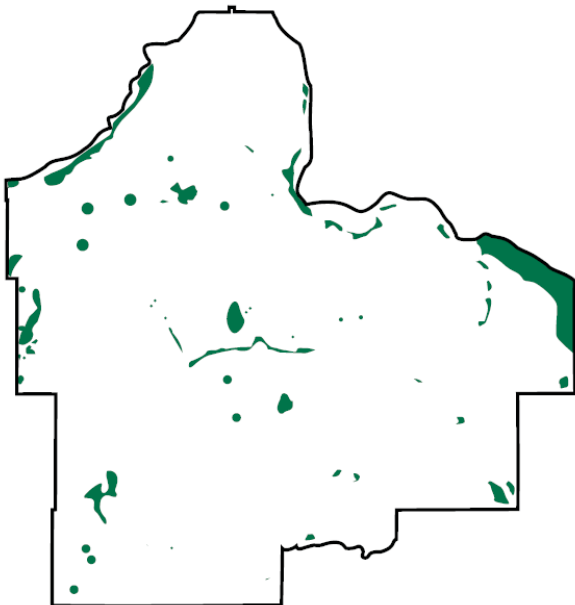
Source: Dakota County

Figure 31. Existing land cover of Dakota County.



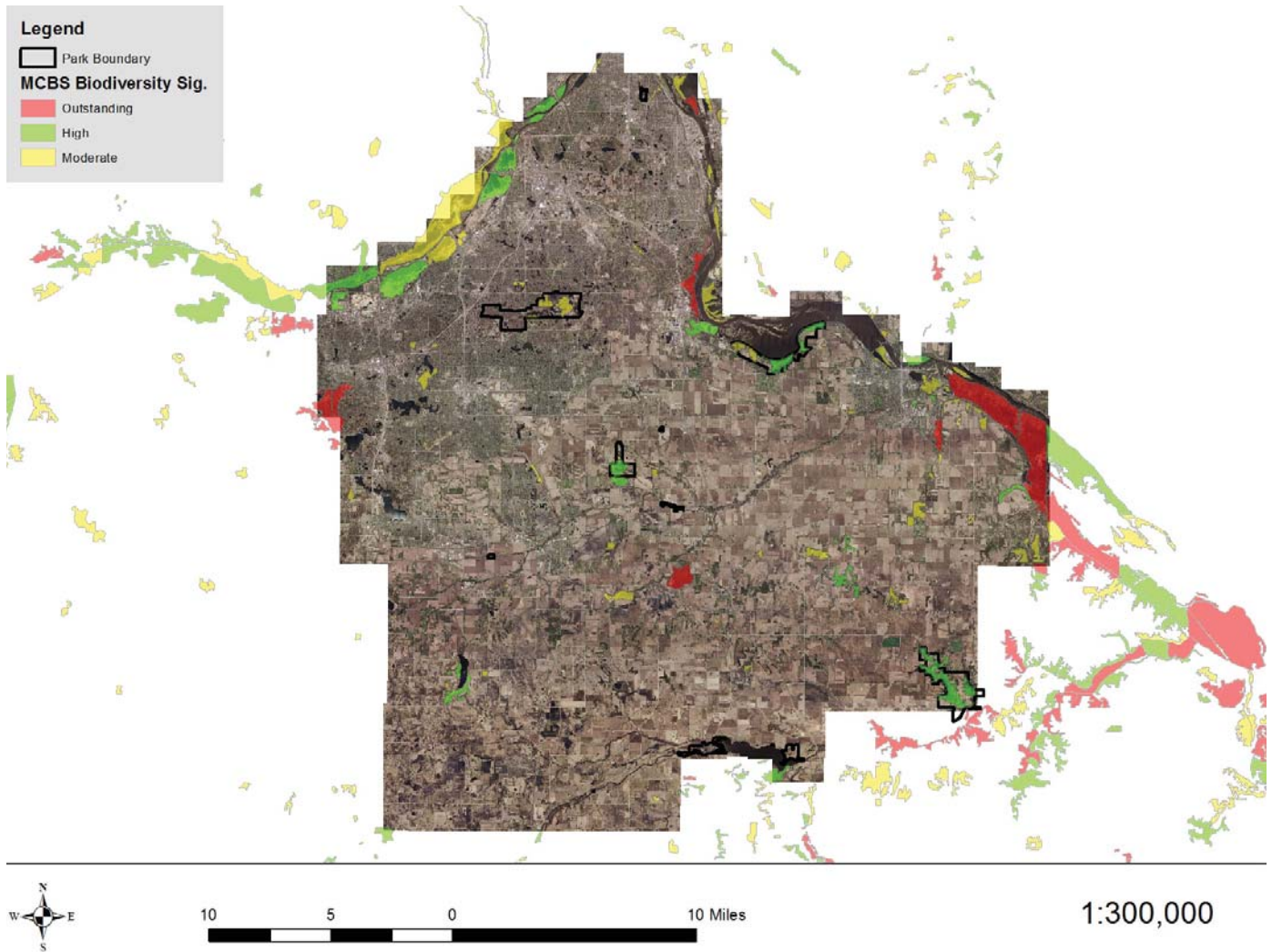
Source: Dakota County

Figure 32. Remaining high-quality natural areas in Dakota County.



Source: Dakota County Comprehensive Plan (2009)

Figure 33. Areas of biodiversity significance in Dakota County.



Source: Dakota County; DNR, MCBS data 1990-93

The County's remnant high-quality ecosystems and some other lands harbor the rarest plants and animals of the County: 29 plant species and 61 bird, amphibian, reptile, insect, fish, and mollusk species which are endangered, threatened, or special concern at the state level. At the federal level, prairie bush clover is threatened, the northern long-eared bat is threatened, and the Higgins eye pearlymussel is endangered. The rusty patched bumble bee has been recently added to the endangered species list, and part of its native range occurs in Dakota County (part of Lebanon Hills Regional Park and surrounding areas including a piece of the Minnesota Zoo). In its recent (2016) update of the State Wildlife Action Plan, the DNR identified 179 SGCN (**Appendix L**). These include the 61 endangered, threatened and special concern species, but most

are formerly common species driven to rarity by land use changes during the past 150 years.

7.3. COUNTY PARKS

Natural resource management will be tied directly to the types, amount and quality of land cover in County parks. Land cover types have characteristic plant and animal life, soil and water relations, and natural resource issues. Across the seven parks studied (**Figure 2**), 89 percent of the land is natural and semi-natural vegetation, 2.4 percent is cultivated, and 5.7 percent developed (**Appendix G**).

Forests comprise 51 percent of all the combined County park land. About 37 percent of the forested land (or 1,720 acres) is oak forest or native mesic forest and provides a good foundation for res-

toration and management. The remaining forest (19 percent of park acres) is young or consists of lowland forest trees that have colonized abandoned cropland and pasture. These forests can be improved by planting trees of the original upland forest such as oaks, walnuts and hickories.

While grasslands constitute 22 percent of parkland acres, only 0.3 percent is original native prairie. Native prairie, once dominant in the County, is among the rarest of plant communities today. Non-prairie grassland covers seven percent of the parks and consists of non-native species and has low plant diversity. Restored prairies make up the rest of the grassland acres, at about 13 percent of the total land cover, which speaks well of the County for restoring prairie.

Lakes, ponds, wetlands, and rivers total 11 percent of park area. Only 3.2 percent of park acres are lakes and rivers; small streams are not included as they would add little to this total. Furthermore, only about three percent of land cover is wetlands, which testifies to the fact that nearly all of the wetlands in the County have been lost or altered. Keep in mind that the small area of surface waters belies their large watersheds outside park boundaries, where much of the water originates. For instance, Jensen Lake in Lebanon Hills receives water from nearby roads and neighborhoods as far as two miles away.

Although similar ecosystems and management issues are found county-wide, each park has a unique character. (Some of each park's unique characteristics are presented in **Appendix H**.) All parks except Lake Byllesby have 70 to 90 percent of the land in natural and semi-natural vegetation. Lake Byllesby has less due to the east unit's scant natural vegetation. Measured by natural vegetation, Miesville Ravine, Spring Lake, and Whitetail Woods are the most natural parks in the system. A third to one-half of the vegetation in those parks is oak forest, reflecting the region's past history as a fire-influenced landscape. More native mesic forest is in Miesville Ravine than anywhere else, due to the fire-protection afforded by the steep slopes, shaded ravine, and floodplain setting. Farming, a transitional land use, exists on three percent of park acres, but is absent at Thompson County Park and Lebanon Hills. Although

greatly altered from historical conditions, savanna and shrubland are important ecosystems, found on nearly 100 acres at Lebanon Hills, Miesville, and Spring Lake.

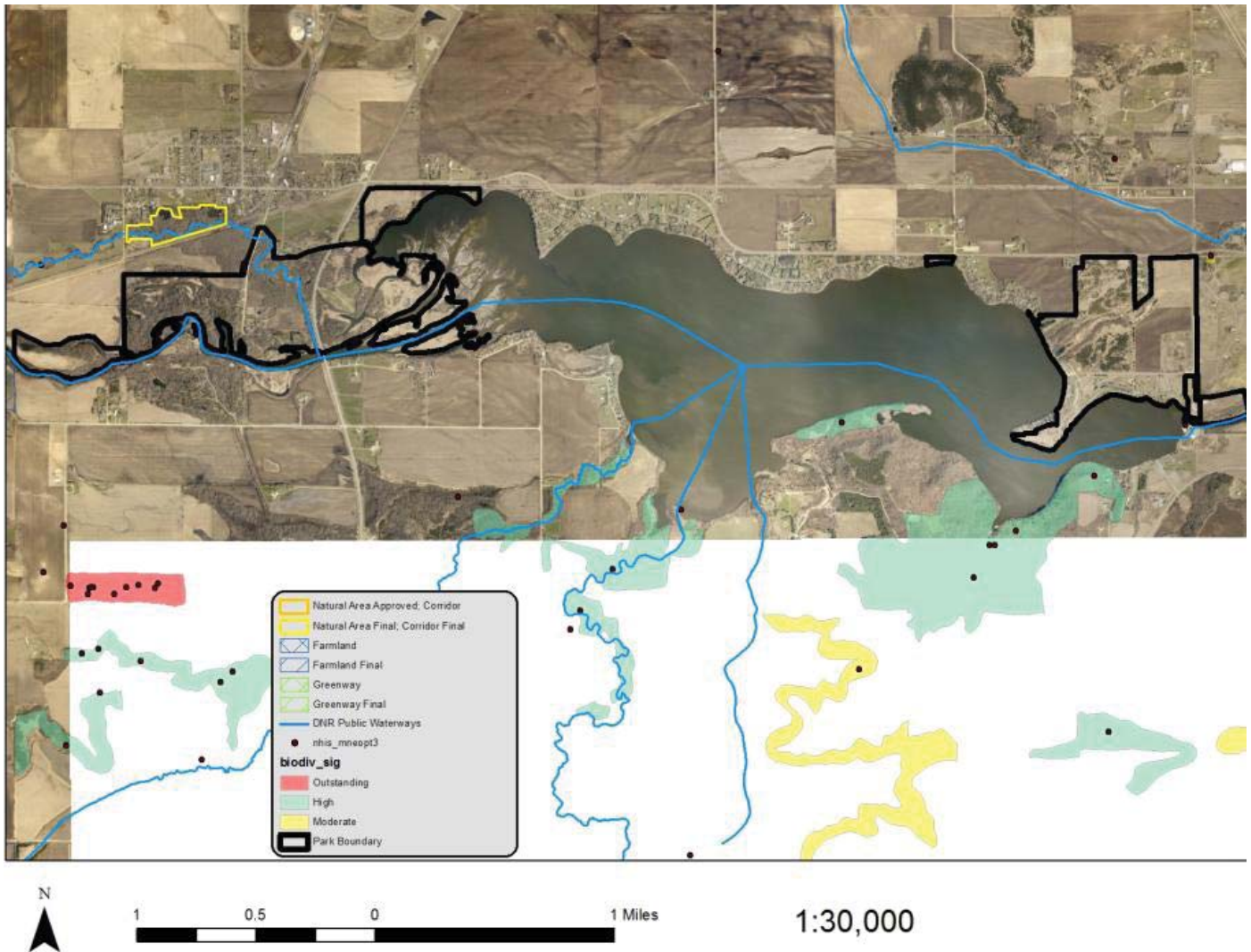
The unique character of each park is summarized below.

Lake Byllesby Regional Park

Located on the County's southern border in Randolph Township, the park has 436 land acres, with an additional 123 acres yet to acquire. The primary natural features of the park are Lake Byllesby, the largest water body in the south metro region, and the Cannon River. The reservoir has been used for recreation since 1910 when the dam, which continues to produce power, was built. The park consists of an east and west unit, located at both ends of the lake. The east unit near Cannon Falls is more developed and more intensively used for recreation. This portion of the park is flat except for the river gorge below the dam and small, irregular areas created by mining in the early 1900s. It contains wetlands, floodplain forests, and small areas of native prairie. The west unit is south of the City of Randolph and is not developed. It contains mill ruins from the 1800s where the proposed City of Cascade was platted, but never developed. The primary natural features include the Cannon River, a channelized portion of Chub Creek as it flows into the Cannon River, and the broad, expanding sediment delta formed as the river enters the reservoir.

Lake Byllesby has the second highest amount of impervious cover among all parks, slightly less than the much larger Lebanon Hills Regional Park. At the same time, it has the least natural and semi-natural vegetation of all parks. Very little of the park resembles pre-settlement conditions. Although some areas to the south in Goodhue County have biological significance, no part of Lake Byllesby park was mapped by the Minnesota County Biological Survey (MCBS) as having biodiversity significance (**Figure 34**). Most of the savanna and brushland are structural only. The vegetation is not characteristic of pre-settlement vegetation, but mostly consists of agricultural weeds, highly-competitive native plants and invasive plant species.

Figure 34. Natural areas and areas of significant biodiversity at Lake Byllesby Park.



Restoration:

Previous and current restoration projects include:

Byllesby East

- Felton Field. 20 acres restored to native prairie in 2009.
- Cannon River downstream from the dam. Three acres of woody brush cleared around oaks during winters of 2010-2013. Three acres of relatively flat area on the top of the river bank, east of the dam, was reconstructed to native prairie.
- Red Cedar Area (38 acres) and Tree Plantation Area (14 acres). Twenty acres were cleared of cedar, buckthorn, and Siberian elm from 2009 to 2011. The areas were never planted or seeded; however, several prairie remnants occur in the Red Cedar Area.
- Echo Point. 20 acres cleared of buckthorn.

Byllesby West

- Knox Farm. Restored from a former apple orchard and gravel pit to a native prairie. 12 acres of woody brush was cleared and then burned; then the site was seeded with prairie seed that was collected from other County park sites in 2004-2005.
- Byllesby Marsh. 15 acres was cleared of woody invasive species and replaced with bird-friendly shrubs and plants since this is a popular birding area.
- Old Mill in Cascades. 45 acres of woody brush was cleared to release young oak trees in 2010-2012.
- The Lake Byllesby Regional Park Master Plan, including a NRMP, is being updated in 2017 and will determine future restoration projects.

Recreation:

116,400 visitors in 2015. Facilities and activities include:

- Boat launch
- Cross-country skiing and ski skating
- Fishing and ice fishing
- Hiking and nature trails
- Picnic areas with water and bathrooms
- Playground
- Swimming beach and beach house
- Tent and RV campground.

2005 Master Plan Theme and Future Facilities.

With the new Cannon River bridge connection between Lake Byllesby Regional Park and the Goodhue County Park, and planned connections between the State Mill Towns Trail and the Cannon Valley Trail, Lake Byllesby Park could become a recreational base for the Cannon River Valley. The master plan emphasizes the east park, with lake and lakeside activities, group recreation, and diverse activities to appeal to overnight campers. Camping is popular in the park, and it will remain a predominant and visible use. Activity centers planned for the east park include an inland swimming lagoon and/or splash pad, more picnicking on Echo Point (pavilion, small shelters), boat launch area near the dam, campground, day activities (disc golf, mini golf), and a future Visitor Center. The west park is the “quiet side,” with opportunities for nature immersion, exploration, and interpretation. A Mill Towns trailhead, picnic grounds, canoe takeout, and residential learning center are planned activity centers for the west park. Master Plan revision is due in 2017, along with a new NRMP.

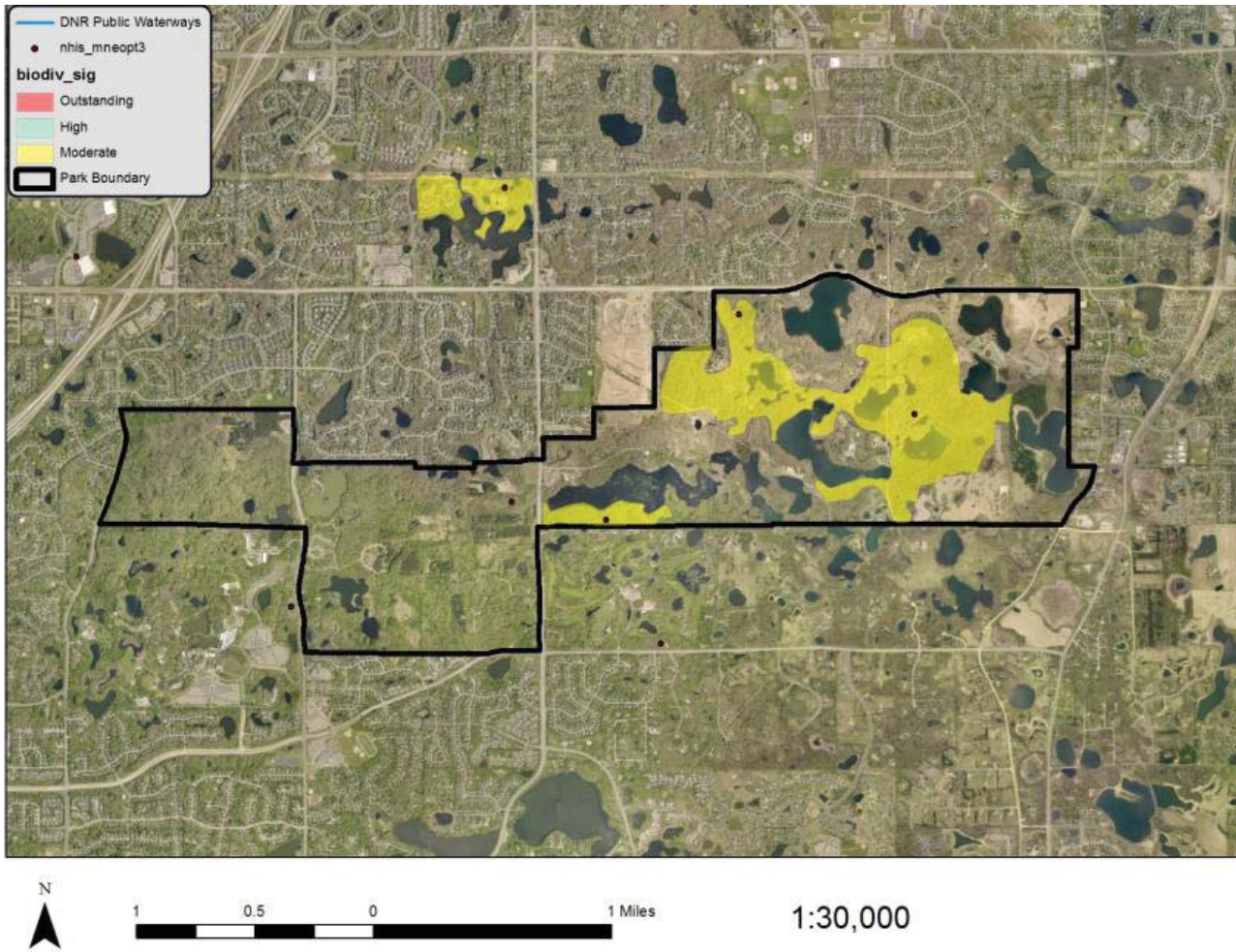
Lebanon Hills Regional Park

Located in Egan and Apple Valley next to the Minnesota Zoo, this park consists of 1,785 acres with 90 additional acres yet to acquire. The park is quite hilly because it was a terminal moraine at the melting edge of the last glacier. Ten lakes (primarily of shallow depth) of over ten acres each and dozens of small ponds dot the park landscape. Many of the Park’s lakes receive runoff from the surrounding, largely suburban watersheds. This stormwater exerts significant stress on the Park’s water resources, both in terms of the volume of water flowing through them as well as degraded water quality.

Most of the park’s land was converted to agricultural uses during the last century and a half, prior to becoming park land. The park is comprised predominantly of oak woodland, but also contains open prairie, shrubland, floodplain forest, upland hardwoods, and a tamarack bog. Wildlife, including sensitive species like barred owl, broad-winged hawk, and eastern towhee, are common in the park.

Lebanon Hills is the largest park in the system, has the greatest acreage of natural and semi-natural vegetation, and the highest acreage of forest, dominated principally by white, bur, and red oak. The large habitat cores attract and retain species that are uncommon in the region. The savanna, brushland and prairie expanses are the greatest in the park system and they harbor species that are uncommon in the County. Nearly all the lake acreage and over half the acreage of marsh and pond in the County park system occurs here, too. MCBS, conducted by the DNR starting in the 1980s, mapped large portions of land in the middle and eastern portions of the park as having “moderate biological diversity significance” (**Figure 35**). The park is surrounded by urban, residential development, and is bisected by two large roads (Pilot Knob Road and Johnny Cake Ridge Road), which offer challenges to managing natural resources.

Figure 35. Natural areas and areas of significant biodiversity at Lebanon Hills Regional Park.



Restoration:

Recent and on-going restoration projects include:

- Buck Pond Restoration. 175 total acres; 38.5 ac prairie and wetland, 136.5 ac woodland; project completion in 2018
- Tamarack Swamp and Adjacent Woodland Restoration. 24 acres; project completion in 2019
- Star Pond Savanna and Woodland Restoration. 75 ac; project completion in 2021
- Phase I Buckthorn Removal (stems >1.5"). 715 ac; completed
- Prairie restoration. 63 acres restored prior to 2015; now on a regular maintenance schedule (burn, spot spray, biannually; inter- or over-seed as required)

Recreation:

576,400 visitors in 2015. Facilities and activities include:

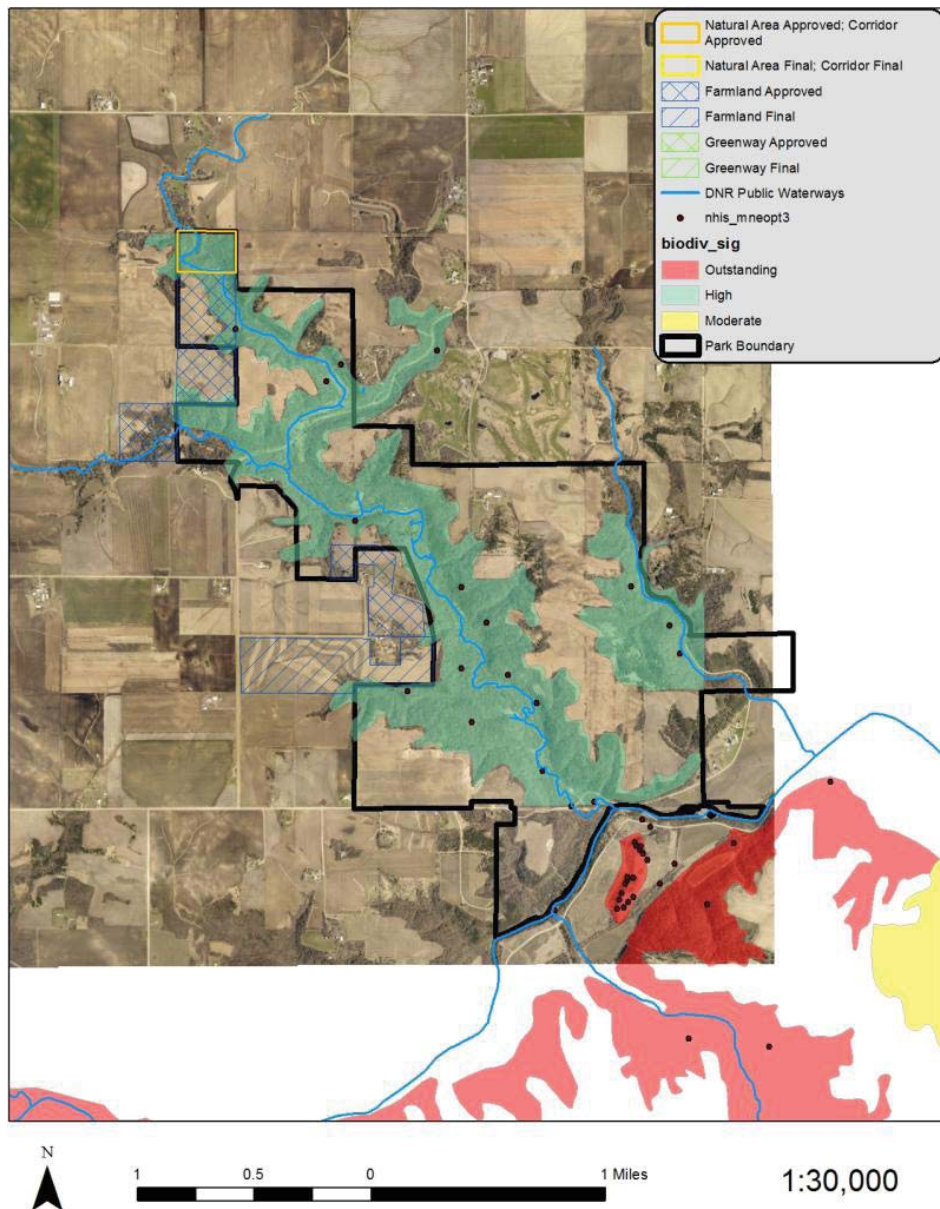
- Canoe trail and non-motorized boating
- Cross-country skiing and ski skating
- Discovery interpretive trail
- Fishing and ice fishing
- Hiking and nature trails
- Horseback trails
- Mountain biking trail
- Picnic areas and playground
- Retreat lodge with camping and ropes course
- Sustainably designed Visitor Center
- Swimming beach
- Tent and RV campground

Miesville Ravine Park Reserve

Located in Douglas Township in far southeastern corner of the County, this park reserve is named for a 200-foot deep ravine through which Trout Brook flows to the Cannon River. Several bluffs, side ravines, and Cannon River frontage are the park's chief natural features that are found within the 1,405-acre park; 262 acres in several different areas are left to acquire. The park's proximity to the rugged Driftless Area means that glaciers did not fully cover the park during the last glacial period, making the park unique among those in the metro region. Because of the diversity of landforms, this park har-

bors a wide variety of natural communities, including oak forests, grasslands, dry rocky hillsides, ravines, floodplains, small spring-fed creeks, and a navigable river, which contains a large number of plant and animal species. A natural stand of white pine near the park's center adds a touch of the north woods, since pines are not native to most of southern Minnesota. The Trout Brook watershed includes extensive agricultural areas outside of the park which makes the brook highly susceptible to nitrate contamination and erosion/ sedimentation issues after large rainfall events. The lower portion of the brook supports a wild population of native, naturally reproducing brook trout.

Figure 36. Natural areas and areas of significant biodiversity at Miesville Ravine Park Reserve.



Miesville Ravine is the second largest park in the system, with the greatest amount of cultivated land, about 66 acres. It has the second greatest acreage of forest among the parks, and by far the most native mesic forest, a rich forest with moist soils and deep shade. Nearly as many acres of savanna, shrubland and prairie occur here as at Lebanon Hills, but not quite as much non-prairie grassland. The sun-demanding plant communities—prairies and savannas—speak to the historical conditions of the park—prairie on the flat upland surrounding landscape with a transitional savanna zone to the oak and mesic forests on ravine slopes and bottoms. The MCBS mapped nearly the entire area of this park, excepting agricultural fields, as having “high biodiversity significance” (Figure 36). Nearby areas in Goodhue County were ranked as having “outstanding biodiversity significance,” including a State Scientific and Natural Area there today.

Restoration:

Current restoration projects include:

- Bluff Prairies of Miesville Restoration (Phase I). This is a Conservation Partners Legacy (CPL) 2016 grant-funded project which is being restored by traditional methods for the flat surfaces and by using goats on the steep slopes. The traditional restoration includes 34 acres of bluff prairie, savanna and woodland enhancement and restoring 32 acres of old field and crop field to native prairie. The steep slopes include 39 acres of bluff prairie, savanna and woodland enhancement using goats to browse the invasive woody vegetation.
- Bluff Prairies of Miesville Restoration (Phase II). This is a CPL 2017 grant-funded project similar to Phase I. It includes restoring 68 acres of crop fields to native prairie and 57 ac of degraded mosaic to oak savanna and enhancing 20 acres of forest and 15 acres of bluff prairie by removing invasive vegetation and expanding scattered remnant vegetation.
- Trout Brook Streambank Restoration. Trout Unlimited has secured funding for restoring and stabilizing 3,000 feet of Trout Brook stream bank.

Past restoration projects include:

- Restored 16 acres of prairie in 1998 east of the church on the south end of the park
- Restored 16 acres of shortgrass prairie in 1999 north of 280th St on the south end of the park

- Restored 95 acres of prairie in 2006 north of the church on the south end of the park
- Restored 161 acres of prairie between 2008 and 2010 on the former Banks property northeast of Trout Brook
- Restored 36 acres of prairie between 2008 and 2010 on the former Bauer property in the northwest end of the park
- Restored 42 acres of prairie between 2008 and 2010 on the former Weber property in the northwest end of the park
- Various streambank stabilization projects have taken place on Trout Brook

Recreation:

25,400 visitors in 2015. Facilities and activities include:

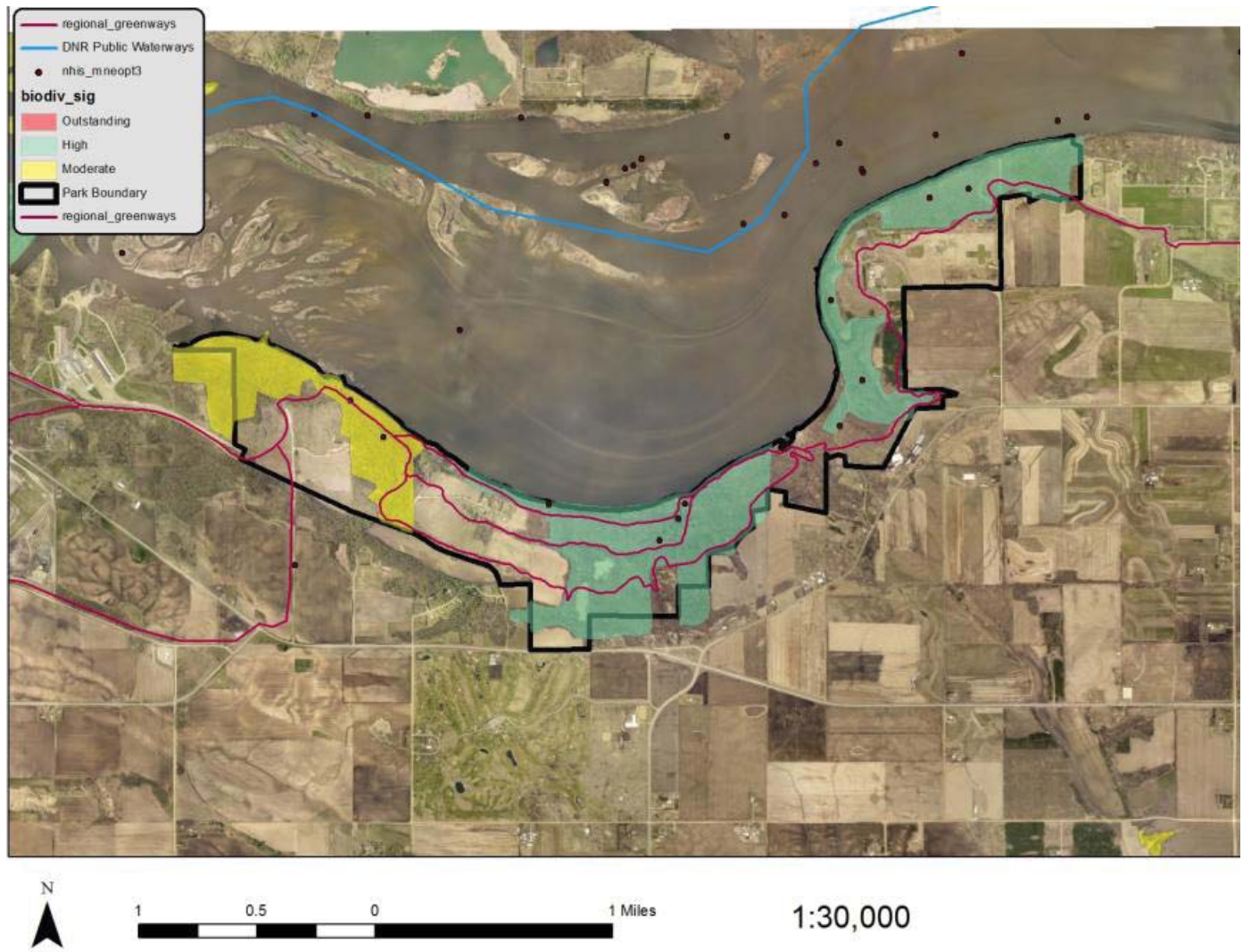
- Picnic area with rustic shelters, bathrooms
- Canoe launch
- Hiking trails (unpaved)
- Fishing

Spring Lake Park Reserve

This 1,097-acre park reserve in Nininger Township, west of the City of Hastings, is located along Spring Lake which was formerly Mississippi River floodplain, marsh, and slough with scattered oak savanna areas that were inundated when Lock and Dam No. 2 in Hastings was built in the 1930s. The resulting shallow lake, which is outside of the official park reserve boundary, is the most prominent natural feature. A significant portion of the park reserve includes steep, north-facing limestone bluffs, steep slopes, and ravines that support ecosystems and species that are rare in the region. There are also bottomland and upland terraces. Archaeological discoveries by the Science Museum of Minnesota during the 1950s demonstrated that people have used the area for 8,000 years.

This park reserve contains approximately 94 percent natural and semi-natural vegetation as a percent of total area with large areas mapped by MCBS as having “high biodiversity significance” (Figure 37). Oak forest is the dominant plant community and resembles that of historical conditions. A large percentage of the park supports savanna, shrubland, prairie, and non-prairie grassland, suggesting the historical prairie and savanna which prevailed across the southern two-thirds of the County prior to 1850. Few water resources or wetlands occur here.

Figure 37. Natural areas and areas of significant biodiversity at Spring Lake Park Reserve.



Restoration:

Current restoration projects include:

- Mississippi River Flyway Restoration. This is a 2014 CPL grant-funded project, which includes restoring 63 acres of old field to native prairie and 18 acres of degraded mesic 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.
- Plateau Prairie and Woodland Restoration. This is a 2015 CPL grant-funded project which includes restoring a ten-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.

- Archery Range Restoration. This is an Outdoor Heritage grant-funded project being completed by Friends of the Mississippi River, which includes restoring 33 acres of prairie, two acres of woodland, and six acres of forest.

Past restoration projects include:

- Restored 11 acres of prairie by the Youth Lodge in 1995
- Restored 20 acres of prairie east of the Youth Lodge off of Pine Bend Trail in 2003
- Restored four acres of prairie around the Gathering Center in 2009-2010
- Restored eight acres of prairie south of the previously planted Youth Lodge prairie in 2010
- Restored 24 acres of prairie close to the Maintenance Shop in 2012

Recreation:

119,500 visitors in 2015. Facilities (16 percent has been developed for facilities or trails) and activities include:

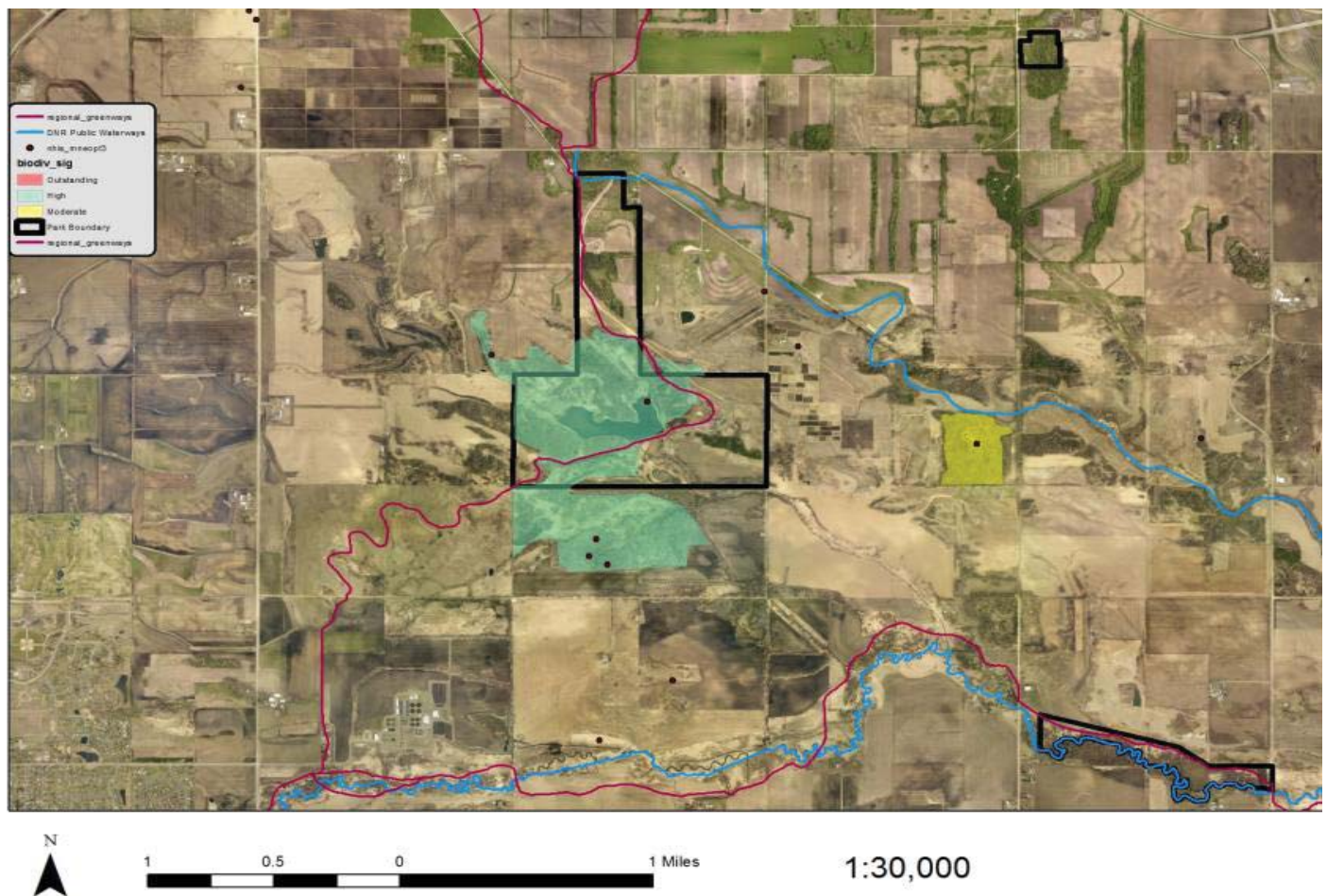
- Archery trail
- DNR boat launch
- Cross-country skiing and ski skating
- Cultural resource trail
- Hiking and nature trails
- Picnic shelters and grounds
- Playground
- Schaar’s Bluff Gathering Center
- Youth lodge and campground
- Newly completed Mississippi River Regional Trail

Whitetail Woods Regional Park

Whitetail Woods, a new 456-acre regional park, is located in Empire Township in the central portion of the County. The park is part of the Vermillion Highlands, which is an open space collaboration between the DNR, the University of Minnesota, Dakota County, and Empire Township. It includes the park, the Vermillion Highlands Wildlife Research and Recreation Area, the Vermillion River Wildlife Management Area (WMA) and Aquatic Management Area (AMA) on the Vermillion River, totaling nearly 5,000 acres of contiguous open space.

The park contains the 29-acre Empire Lake, 50 acres of woodland, savanna and brushland, 110 acres of formerly cultivated land being restored into native grasslands and 81 acres of wetlands. The MCBS mapped a large area of the center and western portions of the park as having “high biodiversity significance” (**Figure 38**).

Figure 38. Natural areas and areas of significant biodiversity at Whitetail Woods Regional Park.



Restoration:

Recent and on-going restoration projects include:

- Restoration and enhancement of 325 ac of woodland, savanna, wetland and prairie habitats; project completion in 2019.
- Restoration of 27.5 acres of prairie prior to 2015. Now on a regular maintenance schedule (burn, spot spray, biannually; inter- or over-seed as required).

Recreation:

51,900 visitors in 2015. Facilities and activities include:

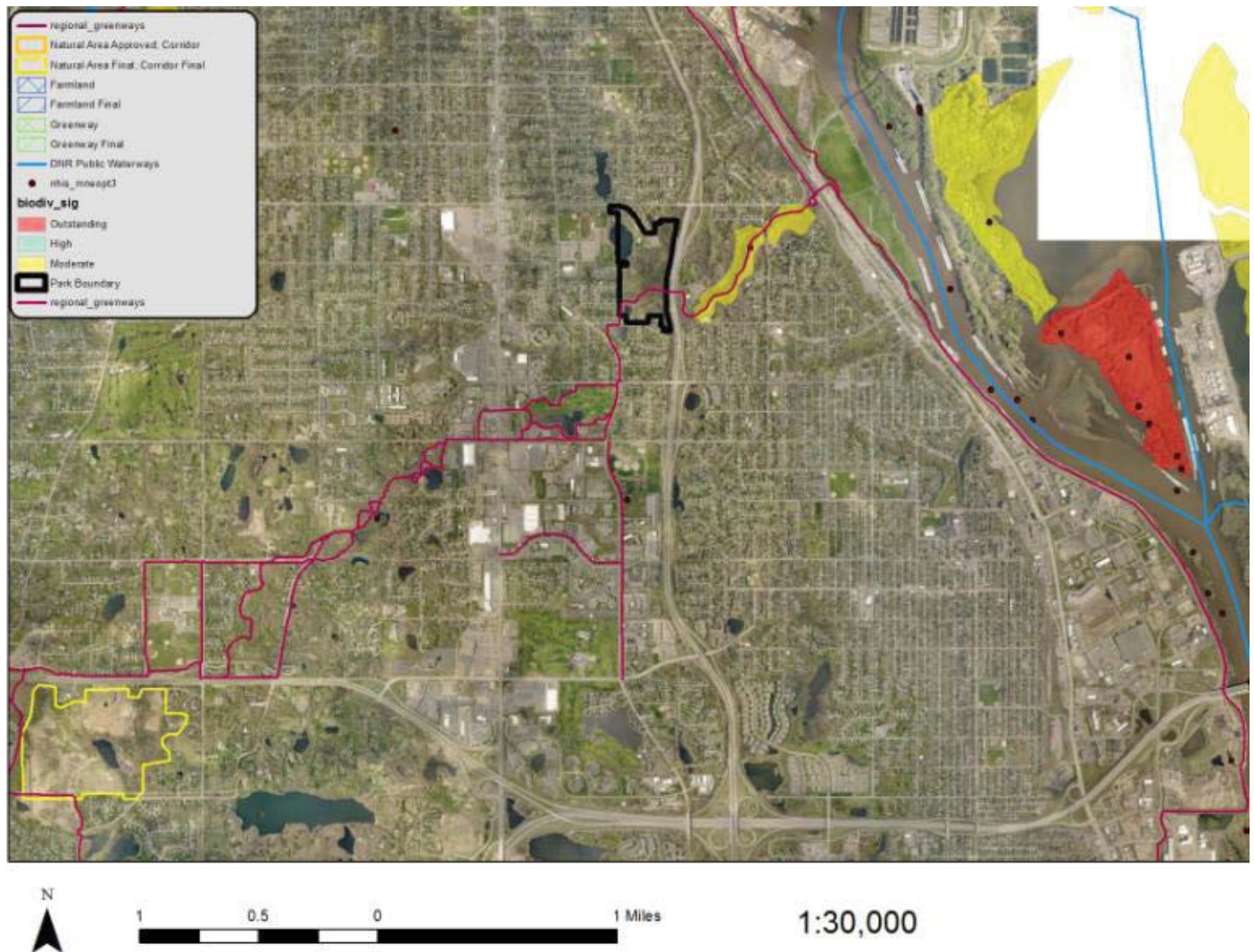
- Trails for hiking for skiing
- Empire Lake
- Outdoor creative play area

- Picnic shelter
- Outdoor amphitheater
- Other

Thompson County Park

Thompson County Park in West St. Paul is surrounded by residential development and the campus of St. Croix Lutheran High School. The park is named for the ten-acre Thompson Lake which more accurately is a deep, open water marsh. The 58-acre park consists of a hilly, urban retreat with mixed hardwood forest, oak woodland, cattail marsh, grassland, and grassy openings along the undeveloped lake shoreland. The River to River Regional Greenway connects Thompson County Park to Kaposia Park (in South St. Paul) via a trail bridge over Trunk Highway 52 and then continues east to the Mississippi River Regional Trail.

Figure 39. Natural areas and areas of significant biodiversity at Thompson County Park



Nearly 90 percent of the park is in natural and semi-natural vegetation which is unusual for a park surrounded by urban development. However, most of the park's vegetation consists of non-prairie grassland and altered forest with none of the area mapped by MCBS as having biodiversity significance (**Figure 39**). About 2.7 acres of Thompson Park consist of degraded native mesic forest and oak forest (including some large, mature oak trees) and 6.7 acres of degraded marsh/pond. Together with non-prairie grassland and prairie plantings around the parking lot, visitors can experience a wide range of habitats found in the County in one small area.

Restoration:

Recent and on-going restoration projects include:

- 39 acres of buckthorn removal completed in 2016
- 2,000 square feet of shoreline restoration installed in 2003; minimal maintenance occurs

Recreation:

Facilities and activities include:

- Dakota Lodge and Senior Center
- Cross-country ski trails
- Hiking and bicycling trails
- Fishing dock
- Picnic shelter
- Playground
- Segment of the River to River Regional Greenway

Dakota Woods Dog Park

Located in Empire Township, this 14-acre special park area was the County's first official off-leash dog exercise area, and it has proven to be immensely popular. Residents like the large size, woodland trails, open play area, and lack of open water so dogs stay relatively clean. Canines And People Ensuring Running Space (CAPERS), a volunteer group, assists with maintenance. Despite its primary function and use, 82 percent of the park is in natural and semi-natural vegetation.

Recreation:

Facilities and activities include:

- Open play area
- Parking lot
- Picnicking area
- Walking trails

Vermillion River Conservation Area

Located along the Vermillion River in Empire Township, this 62-acre area is adjacent to the Vermillion

River WMA and part of the larger Vermillion Highlands complex. The property includes woodlands, grasslands, and nearly 1.5 miles of the northern shore of the Vermillion River. It was acquired in 2015, in part to provide a future segment of a planned regional greenway between the cities of Farmington and Hastings.

Restoration:

Recent and on-going restoration projects include:

- Four old fields totaling 18 acres were seeded to upland and wet prairie in 2016
- Approximately 30 acres were cleared of woody invasive species

South Creek Conservation Area

Located along the South Creek tributary to the Vermillion River in the City of Farmington, this 24-acre area is adjacent to the Vermillion includes woodlands, grasslands, 1,430 feet of South Creek, and 650 feet of a smaller tributary. This section of South Creek is noted for its excellent trout fishing. It was acquired in 2016, in part to provide a future segment of the approved Lake Marion Regional Greenway between the cities of Farmington and Lakeville.

Restoration:

Recent restoration projects include:

- Approximately 20 acres were cleared of invasive woody brush
- A geomorphic assessment of this reach was completed to assess conditions such as bank erosion, channel movement, bed degradation/aggradation, and riparian vegetation conditions.
- From 2010 to 2016, fish and macroinvertebrates were collected from this reach to assess abundance and species makeup, and in-stream habitat conditions were documented.
- Based on the results of these various activities, a grant and watershed funding has been secured to install or construct in-stream habitat features such as root wads, boulders veins, stream cobble, tree pins, backwater pools, and removal of nuisance trees. These restoration activities will introduce and improve habitats as well as clear and narrow the stream channel.

7.4. COUNTY REGIONAL GREENWAYS

The County has several regional greenways with 60 miles of completed trails and more planned as part of a 200-mile system. The variety of settings and destinations is a signature accomplishment and known throughout the metro region. For this NRMSP, four regional trails were analyzed to represent the planned system. **Figure 2** shows the location of these regional greenways, and **Appendix I** summarizes their characteristics.

The County classifies regional greenways as urban (100 foot target width), suburban (200 foot target width), and rural (300 foot target width). The constructed trail portions of existing greenways are 14 percent urban, 57 percent suburban, and 29 percent rural. The four representative greenways are described below.

Minnesota River Regional Greenway (MRRG)

The 17-mile long Minnesota River Regional Greenway is located along the Minnesota River between the cities of Burnsville and Lilydale. On the north end, it connects to St. Paul's Lilydale Regional Park, which continues along the river to Harriet Island and downtown St. Paul. On the south end, it will connect to future regional corridors in Scott County. This corridor is part of the larger Minnesota Valley State Trail corridor between Le Sueur and St. Paul being planned by the DNR.

The MRRG includes significant natural features, with scenic views of the Minnesota River, the confluence with the Mississippi River and the Mississippi River. The Greenway broadens to include portions of the Minnesota Valley National Wildlife Refuge and Fort Snelling State Park, which provide habitat for waterfowl, fish and other wildlife. The greenway offers numerous opportunities to watch birds and other wildlife. The riverine environment hosts large cottonwood, silver maple, ash, and willow trees along the channels of the Minnesota River. Key facilities and activities include picnic sites, fishing, hunting, hiking, bicycling, and cross-country skiing.

The County and partners have developed regional trail component in two units:

Big Rivers Regional Trail Unit.

The 5.1-mile long section extends from Lilydale Road in Lilydale to I-494 in Eagan. The trail was constructed on the midbluff bed of one of the oldest railroads in Minnesota and possesses many historical and cultural features. While the County has a 30-foot wide, long-term lease for the trail, the wider greenway corridor includes significant natural and historical features, with scenic views of the

Mississippi and Minnesota rivers and their confluence, high limestone bluffs, floodplain, woodlands, and prairie.

Minnesota River Regional Trail Unit.

This 4.0-mile long segment closely follows the Minnesota River, roughly following a former road on a dike between the river and Black Dog Lake. Located within the bottom of the broad river valley, the predominant vegetation is floodplain forest, wetlands and grasslands.

River to River Regional Greenway Trail (RTR)

This eight-mile long greenway is located in northern Dakota County with a connection between the Minnesota and Mississippi Rivers through the cities of Mendota Heights, West St. Paul and South St. Paul. This urban and suburban corridor includes city parks, a high school campus, Dodge Nature Center, and Thompson County Park. The natural resource features and corridor width vary greatly, ranging from existing and planned bridges over busy transportation thoroughfares, to a narrow turf grass corridor between two roads, to extensive forested ravines.

Mississippi River Regional Greenway (MRRG)

The 27-mile long Mississippi River Regional Greenway is located along the Mississippi River between South St. Paul and Hastings. On the north end, it connects to the east end of the River to River Greenway and will connect to the planned corridor through the downtown St. Paul Airport to Harriet Island. On the south end, the corridor will connect with the planned Washington County corridor along the St. Croix River, a planned State trail between Hastings and Redwing and a planned regional greenway along the Vermillion River between Hastings and Farmington.

The MRRG is very diverse, ranging from a narrow corridor along roads, along a flood levee, and adjacent to large industrial facility properties, to extensive natural areas including the state Pine Bend Bluffs Scientific and Natural Area and Spring Lake Park Reserve. Key facilities and activities include: parking and trailhead areas, scenic overlooks, and trail activities such as hiking, bicycling, and in-line skating.

7.5. COUNTY CONSERVATION EASEMENTS

A conservation easement is a set of restrictions a private landowner voluntarily places on their property in order to perpetually preserve its conservation values. Each conservation easement is unique, specifically tailored to the conservation values of the land and to the particular situation of the landowner. Conservation easements can

be used to protect a variety of lands: shorelines of lakes, rivers and streams; wildlife habitat; productive agricultural or forestry lands; scenic qualities; and public trails. Conservation easements must provide public benefits of improved water quality, farm and range-land preservation, scenic views, wildlife habitat, outdoor recreation, educational opportunities, and/or historic preservation.

The conservation values of the property and the restrictions created to preserve those values, along with the rights reserved by the landowner, are detailed in a legal document known as a conservation easement. The conservation values of the land are defined, and the restrictions protect those values. Typically, easements prevent most development and land disturbance, and provide for management. The restrictions apply to the current and future landowners, granting permanent protection.

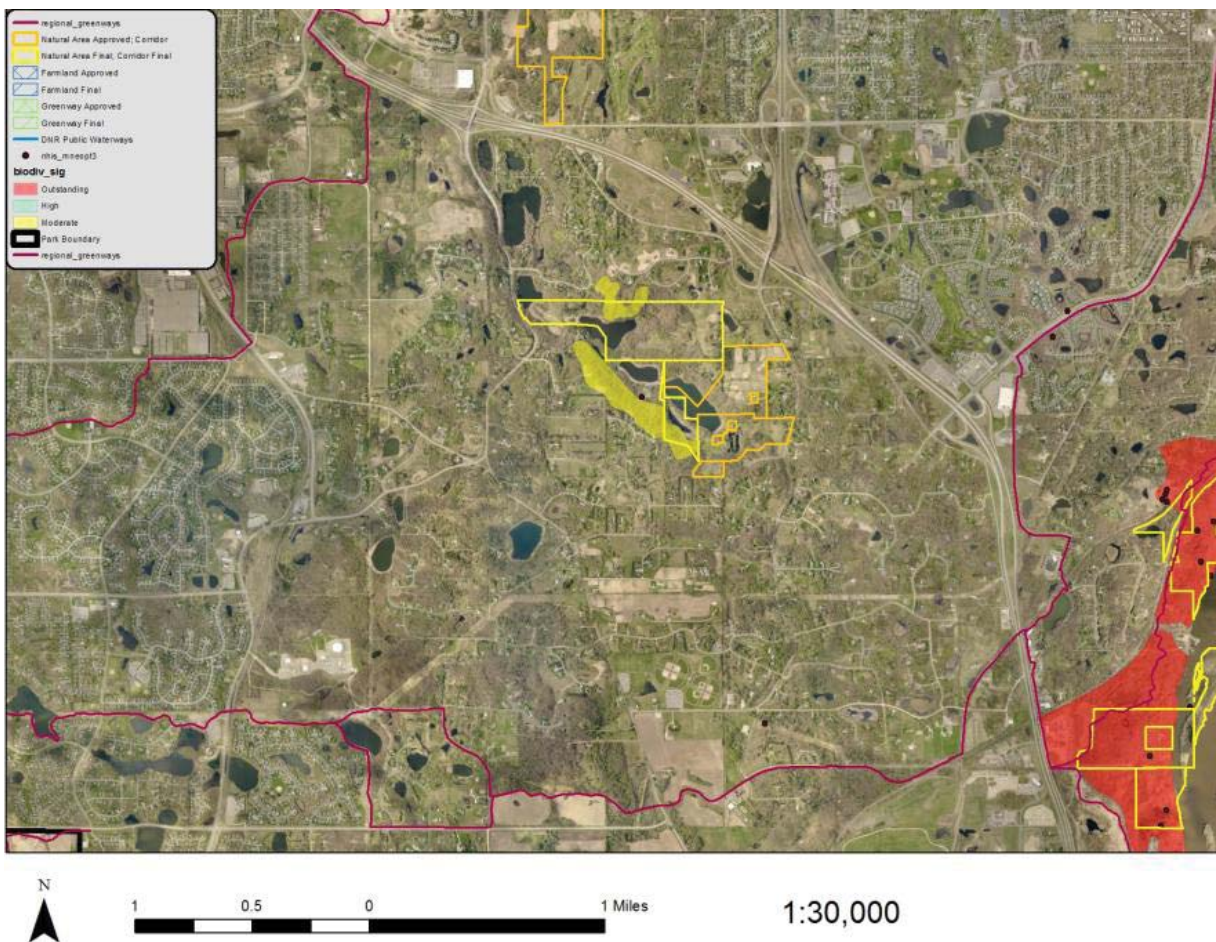
The landowner still owns the land and has the right to use it except as prohibited by the easement. They can sell, transfer, or bequest

the land. Since the land remains private and other property rights remain, an easement continues to generate economic activity, such as work and property taxes. Typically, landowners retain the right to restrict public access. **Figure 2** shows the location of the County's conservation easements, and **Appendix J** summarizes their characteristics.

Natural Area Easements

The County has acquired 37 natural area conservation easements encompassing 1,583 acres and nearly 30 miles of shoreland. The average size is 43 acres, the smallest 4.6 acres and the largest 159 acres. Twenty-five percent of the protected lands are forested, 35 percent is grassland, and 35 percent is wetland. Ownership is usually private, but also includes the Dakota County Agricultural Society, Dodge Nature Center, the DNR, and the cities of Eagan and Lakeville. The natural area easements represent some of the best quality privately-owned natural communities left in the County—most of them were mapped by MCBS (**Figure 40**).

Figure 40. Natural areas and areas of significant biodiversity at several privately-owned natural area easements (outlined in yellow), clustered in Inver Grove Heights and Rosemount.



All natural area conservation easements include an NRMP jointly developed by the County and landowner. Although NRMP implementation has been voluntary, 51 percent of landowners have undertaken some management. Almost all NRMPs are up-to-date or being revised using the County's new NRMP template. The County secures state grant funds and works with agency partners to give landowners technical assistance and share the costs of implementing NRMPs. For recently-acquired easements, landowners are required to have and execute an NRMP, with significant assistance from the County according to the terms of the state grant requirements.

Agricultural Easements

The County holds 68 agricultural conservation easements, protecting 7,758 acres that includes 1,291 acres of forest, grasslands, and wetlands and 49 miles of shoreland. The average size is 114 acres, with the smallest 34 acres and the largest 379 acres. In Greenvale, Sciota, and Hampton Townships, clusters of several easements form continuous blocks of protected land, preventing landscape fragmentation. The easements allow cultivation and agricultural practices in existing cropland and farmland, but existing natural vegetation must be preserved.

All agricultural easements required voluntary Stewardship Plans. These plans specify BMPs for agricultural activities, establish grass waterways, and provide vegetative buffers along rivers, streams and wetlands. The Dakota SWCD was contracted by the County to write these plans; the SWCD also provides technical help and cost share to install best practices. The County also shares the costs to install buffers, fencing, and other conservation practices. More than 50 percent of easements include former cultivated land restored to native vegetation as part of permanent shoreland buffers. With a few exceptions, there are no NRMPs for the natural vegetation on agricultural easements.

Other Easements.

The County also acquired two conservation easements (11.6 acres) on private property in Spring Lake Park Reserve; two regional greenway easements (38.1 acres); and a 20-foot wide landscape buffer on a new residential development adjacent to Lebanon Hills Regional Park.

Conclusions about the County's easement program draws from the data and experiences of staff managing the program.

- The County's natural area conservation easement program is unique in the Midwest, except for a very limited program in

Washington County; the agricultural easement program is nationally unique due to its emphasis on water quality.

- The County's NRMP requirement has established the standard for other easement acquisition programs.
- Having and implementing NRMPs is now required for easements purchased with state funds.
- Landowner interest and capacity to manage natural resources vary widely. With few exceptions, financial incentives were critical to spur landowner management.
- The requirement that natural resources be managed has led some landowners to withdraw their land from the program.
- In a 2016 question posed to landowners whose easements contain natural areas, 68 percent of respondents indicated interest in doing more natural resource management on their property.
- In non-scientific surveys and public meetings, the public has indicated strong support for using public funds for natural resource management on private lands protected by conservation easements.

7.6. WATER RESOURCES ON COUNTY LANDS AND EASEMENTS

People are attracted to water, whether for recreation or the open views. It is not a coincidence that most parks, greenways and easements include water resources or connect to water resources. The water resources associated with County parks, greenways, and easements are presented in **Appendix K**. The NRMSP focuses on water resources on the DNR Public Waters Inventory (**Figure 2**). Public water "basins" include lakes and certain wetlands (Types 3, 4 or 5) of ten acres and larger in unincorporated areas, or larger than 2.5 acres in incorporated areas. Public water "watercourses" are natural and altered rivers, streams and channels with a drainage area larger than two square miles; they can also be designated as trout streams by the DNR Commissioner. They do not need to be navigable. For the purposes of this assessment, water resources are divided into these classes: deep lake, shallow lake, pond/open water wetland, river, and stream.

7.6.1. Lakes

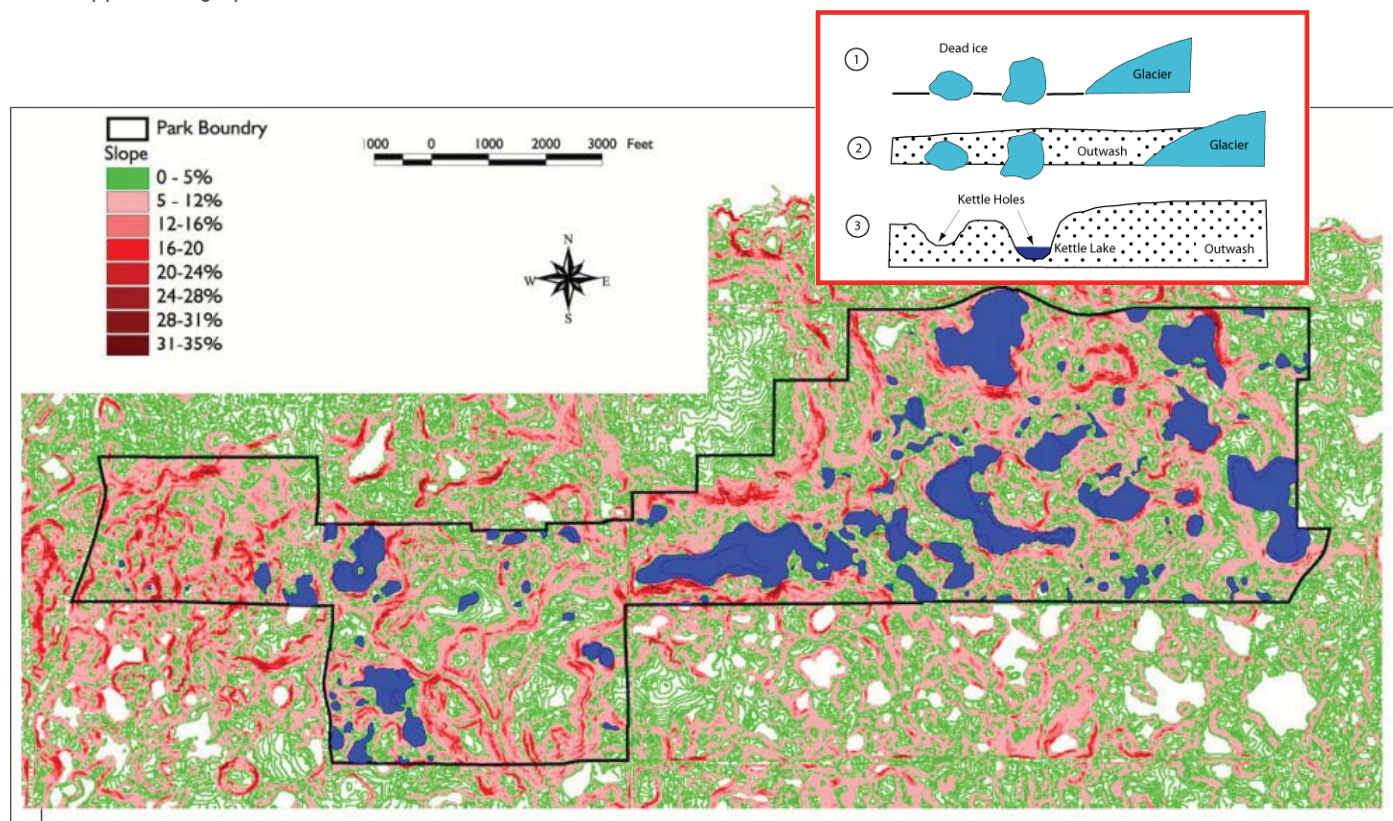
Most of the lakes in or adjacent to County parks, greenways, or easements are shallow. A shallow lake has standing fresh water to a maximum depth of 15 feet or has over 80 percent of its surface shallow enough to support emergent and submerged rooted

aquatic plants. In general, shallow lakes tend to be more nutrient rich than deep lakes and often have lower water clarity.

The majority of the lakes in County parks, greenways or easements are located in Lebanon Hills Regional Park, which contains ten lakes over ten acres and many more, smaller open water or vegetated

wetlands. These are “kettle lakes” formed in depressions in the glacial material (**Figure 41**). People enjoy these lakes for fishing, swimming, paddling, and wildlife watching. A designated canoe and portage route is maintained through several lakes at Lebanon Hills.

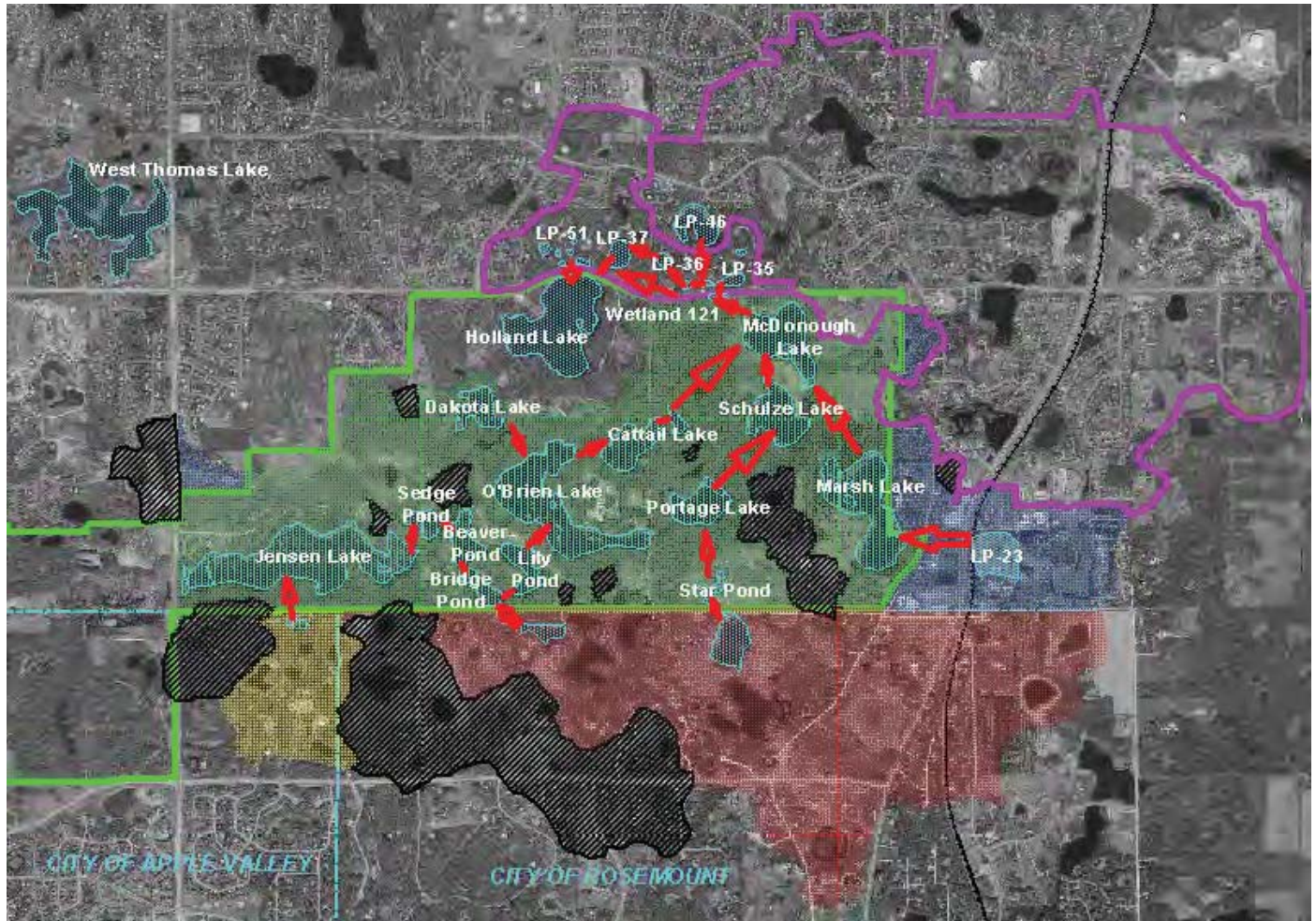
Figure 41. Kettle lakes and steeply-sloped hills (kames) of northern Dakota County, including Lebanon Hills Regional Park and surrounding areas. Upper inset graphic shows formation of kettle lakes.



As would be expected, the local watershed that contains Lebanon Hills Park extends beyond the bounds of the park, into adjacent subwatersheds from the cities of Eagan, Apple Valley, and Rosemount. Surface water flows into the park from the all directions, so the park acts as a basin or end-point for the local watershed area. In the east end of the park, water generally flows from the southwest to the northeast, and ultimately towards McDonough Lake and

“Wetland 121” (**Figure 42**). The system flooded onto Cliff Road in a large rain event in 2,000 (**Figure 43**), which prompted a lake study (Barr Engineering, 2006) that called for large-scale native plant community restoration in the park and stormwater mitigation and control BMPs in the watershed at large.

Figure 42. Subwatersheds of Lebanon Hills Regional Park. Green area = core subwatershed (McDonough subwatershed); Blue areas = drains from City of Eagan; Purple outlined area = City of Eagan drains to pipe which pumps to Thomas Lake and overflow drains to Lebanon Hills Park; Brown area = drains from City of Rosemount; Yellow area = drains from City of Apple Valley (Valleywood Golf Course); Black-hatched areas = isolated basins not draining to Lebanon Hills Park. Source: Lebanon Hills Stormwater Management Plan, Barr Engineering Company, April, 2006.



The most significant lakes in LHRP are:

Holland Lake is 36 acres in size and the deepest lake in the park with a maximum depth of 65 feet. At the same time, 64 percent of the lake area consists of a large littoral zone (light able to penetrate to bottom sediments). There is a fishing pier where park visitors can fish for panfish and northern pike. Holland Lake is a designated trout lake. The DNR has stocked the lake with brown and rainbow trout since 2006. It is very clear for a Twin Cities metro region lake with moderate nutrient levels. Monitoring indicates it is mesotrophic based on chlorophyll and transparency, but high phosphorus concentrations suggest it may be eutrophic. Eurasian watermilfoil and curly-leaf pondweed are present, and the good water clarity could allow these invasive plants to spread.

Jensen Lake is the park's largest lake at 54 acres, but has maximum depth of only 6 feet. The entire lake basin is therefore a littoral zone, and lake depth has decreased steadily and relatively quickly over the past two decades. There are very dense stands of native water lilies. Although water lilies provide habitat for fish, insects and other species and contribute to a healthy lake ecosystem, they can shade other submerged plants and plankton, reducing species diversity and affecting the food chain. The canoe route through Jensen is difficult to paddle without the application of aquatic herbicides about once every other year.

McDonough Lake (Figure 44) is 16.5 acres in size with a maximum depth of 8-11 feet. It has an extensive littoral zone, fairly clear water, and is considered mesotrophic to eutrophic. Eurasian water-

milfoil and curly-leaf pondweed were found in the lake during a survey conducted in 2016.



Figure 43. Inundation of McDonough Lake and Wetland 121 flooded Cliff Road and residential areas north of the park in 2000.

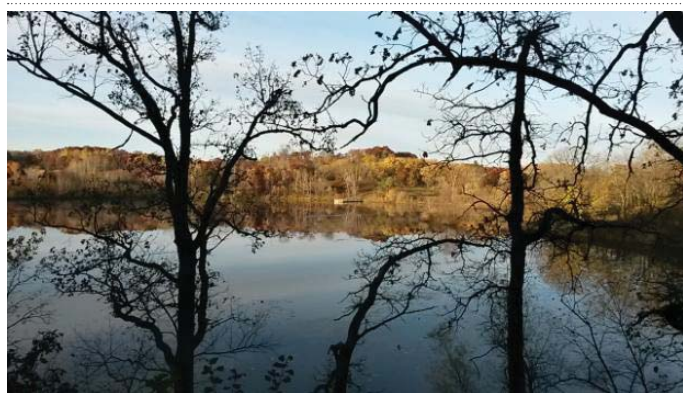


Figure 44. McDonough Lake.

O'Brien Lake is 34 acres in size with a maximum depth of 10 feet and an extensive littoral zone. It has fairly clear water and is rated as mesotrophic to eutrophic. It is part of the park's canoe route. Eurasian watermilfoil was found in the lake during a survey conducted in 2016. Approximately 72 percent of the lake basin and the majority of the shoreline is privately-owned by Camp Butwin. The County and the camp are discussing ownership and management issues.

Schulze Lake is 12 acres in size, with a maximum depth of 15.5 feet and a fairly narrow, vegetated littoral zone. The lake is moderately nutrient enriched, and transparency measurements indicate fairly clear water. Invasive Eurasian watermilfoil and curly-leaf pondweed grow here. Despite these issues, a public beach and fishing pier support fishing, swimming, and body-contact recreation. Canoes, kayaks and paddleboards can be rented. A rain garden was installed to treat runoff from the parking lot before it runs into to the lake.

Other large lakes in Dakota County parks include:

Empire Lake, located within Whitetail Woods Regional Park, is 30.6 acres in size and only five feet deep. This water body is best described as a deep marsh, rather than a lake. It is located entirely inside the park and was created by a dike, designed by the Soil Conservation Service in 1965 and built by the previous landowner, probably to water his cattle. A control structure regulates flow from the marsh to a tributary of the Vermillion River. Monitoring in 2009 to 2011 rated the marsh as eutrophic. Sometimes, however, the water clarity makes the bottom visible. In one year's study, the invertebrate animal diversity and abundance was moderate, and vegetation diversity and native cover excellent. Although the deep marsh is surrounded by woodland and grassland, upstream agricultural areas send runoff into it via two small, unnamed tributaries, probably affecting its water quality. Extensive restoration work is occurring throughout the park, which will improve ground cover and more effectively filter runoff. The dike is being evaluated for trail improvements.

Lake Byllesby forms the center of Lake Byllesby Regional Park, located in two units at its east and west ends. The lake is a 1,300-acre reservoir created in 1910 when a hydroelectric dam was constructed on the Cannon River. It has a maximum depth of 50 feet in a small area near the dam, but the average depth is eight feet. The lake is hyper-eutrophic with low water clarity and susceptible to algae blooms. Flowering rush, an aquatic invasive emergent plant, was found in the lake in 2016. Sediments from upstream agricultural lands fill the west end of the reservoir, and winds and water currents stir up the bottom sediments, re-circulating phosphorus and other nutrients. Much of the upper lake consists of shallow sand and mud flats at normal lake levels. The river cuts a meandering channel through the expanding delta. A TMDL study was prepared for the watershed as a way to reduce sediment and nutrient inputs, with the burden of implementation to be shared among those in the watershed who contribute to the pollution. A threshold for pollution was set in the TMDL, which will be the basis for measuring whether the plan is working. A master plan is being completed for Lake Byllesby Regional Park, which will include a NRMP addressing the specific natural resource management needs of the park.

People use the lake for boating, fishing and swimming. From fall through spring, the lake level is purposefully lowered. This exposes even more mudflats which attract two dozen different species of shorebirds and waterbirds. This, naturally, attracts many birders. The reservoir has a large carp population. This species of introduced fish stirs up bottom sediments and destroys aquatic vege-

tation. Since 2010, the carp and other undesirable fish have been removed regularly in a commercial seining operation. Low water clarity and the algal blooms prevent aquatic vegetation from growing and likely affect the quality of the fishery. The fish community is like that in many reservoirs; it is diverse and includes many river species. Of preferred species, anglers seek black crappie and wall-eye, especially in winter.

Thompson Lake (Figure 45) is a central feature of Thompson County Park in West St. Paul. It is about eight acres and is nine feet deep at most. About two-thirds of the lake is surrounded by park, and the western shore is owned by a private school. The biotic indices used to measure the quality of vegetation and aquatic invertebrates suggest that the lake is of moderate quality, which is a good rating for an urban lake. Fish species include black bullheads, crappies, bluegills, sunfish, largemouth bass, golden shiners, and northern pike. Trails follow the shoreline, and there is a pier in the lake. Invasive curly-leaf pondweed grows in the lake. Some shoreline restoration was done, but it has fallen into disrepair.



Figure 45. Thompson Lake in late winter. View from the south shore looking northward.

The County and Lower Mississippi River WMO conduct water quality monitoring because the lake is on the MPCA's impaired waters list for nutrients/eutrophication, biological indicators and chloride. High concentrations of polycyclic aromatic hydrocarbons (PAHs) also were found in the lake sediments. PAHs are produced by chemicals from now-banned asphalt driveway products. These contaminants have bound to the sediments located throughout the upland, delta, and lake bed portions of Thompson Lake. Removal of the PAH-contaminated sediments in Thompson Lake will improve water quality. This assures that the park recreational service quality is maintained for current and future generations, water based

recreation is enhanced, and the ecologic health of the lake is improved. The clean-up costs for the PAH-contaminated sediments at the inlet and delta components of Thompson Lake are estimated at \$1,300,000. The majority of the costs are related to removal and replacement of 20,000 cubic yards of sediments and proper disposal in accordance with state regulatory requirements. The County and City are working to secure funds to remove the PAH-contaminated sediments.

In conjunction with this project, Dakota County, Lower Mississippi River Watershed Management Organization and City of West Saint Paul will be constructing stormwater water best management practices at the inlet of the lake to prevent future phosphorus laden sediments from entering the lake. A TMDL was placed on Thompson Lake in 2009 for phosphorus content. This proposed project will reduce the amount of phosphorus on the lake, achieving the goals of the state required TMDL. A Watershed Restoration and Protection Strategy (WRAPS) report and restoration plan state that phosphorus input needs to be reduced by 30 to 34 percent to rehabilitate the lake.

The Thompson County Park Master Plan identifies Thompson Lake as a critical resource for the park as it enhances recreational use and provides scenic views within the park. Thompson Lake water quality improvements are identified as a critical long term park goal, with the potential to provide further recreational value and benefit to the region.

Spring Lake is a large, shallow expanse of water at a bend of the river upstream from Hastings. Once an oxbow marsh and floodplain forest, the construction of a mill in the 1850s and Lock and Dam No. 2 in 1930 submerged the area. This turbid 1,483-acre water body has an average depth of four feet and a maximum depth of 15 feet. Algae floating in the water column restrict the growth of submersed aquatic vegetation. The lake features permanent islands, temporary islands (**Figure 46**), sandbars, and floating debris; it is constantly changing and interesting to visit. In the past, there were extensive wild rice beds, but today there is a general lack of aquatic vegetation due to turbidity and fast-flowing deep water that tends to keep lake sediments loose and easily moved. The long fetch distance on the lake makes this worse, with strong winds readily stirring up sediment. Carp and other bottom-feeding fish, together with motor boat turbulence, compound the issue. The generally low water clarity prevents light from penetrating very far into the water, making vegetation establishment spotty. In areas where currents and turbulence are slowed (in protected bays, hugging shorelines), floating-leaved vegetation has become established; for instance,

there are large lotus beds in certain areas (**Figure 47**). Scattered throughout the lake are numerous, barely-submerged tree stumps, remnants of the floodplain and mesic forest that once were; these “dead-heads” can surprise unwary boaters. People using the area say that sedimentation appears to be getting worse, with some areas, especially on the west end of the lake, filling in with sediment.



Figure 46. View of Spring Lake, in background, behind the Schaar's Bluff Visitor Center. Note the many islands that abound in the lake.



Figure 47. A protected bay in Spring Lake. Note the floating-leaved vegetation in the distance, just fore of the shoreline in the photo. These are American lotus, *Nelumbo lutea*, which, in summer, produce large, magnificent, fragrant, pale yellow flowers and rattle-like fruits. The buoyant seed pods are remarkably adapted for dispersing seeds in river environments and are eaten by a variety of animals.

In spite of the vegetation issues, the lake has a good fish population, but little fishing takes place due to limited access, shallow water and the many snags. The submerged trees and scattered vegetation make decent spawning areas, and carp, freshwater drum, mooneye, goldeye, redhorse, bluegill, and black crappie are abundant. Channel catfish is the most common gamefish, while sauger, walleye, and northern pike are sparse. The lake attracts a variety of uncommon birds—bald eagle, osprey, white pelican, and tundra swan; the latter two species form large rafts during migration. The lake is infested with Eurasian watermilfoil and zebra mussel.

The 2011 Mississippi Makeover Implementation Plan provides implementation priorities for Spring Lake as well as chemical and biological targets to measure success of ecological restoration. The priority strategies included large-scale restoration efforts such as island building and water level management. This would require extensive planning, engineering, stakeholder involvement, and funding, with the U.S. Army Corps of Engineers being the lead agency and primary funding source.

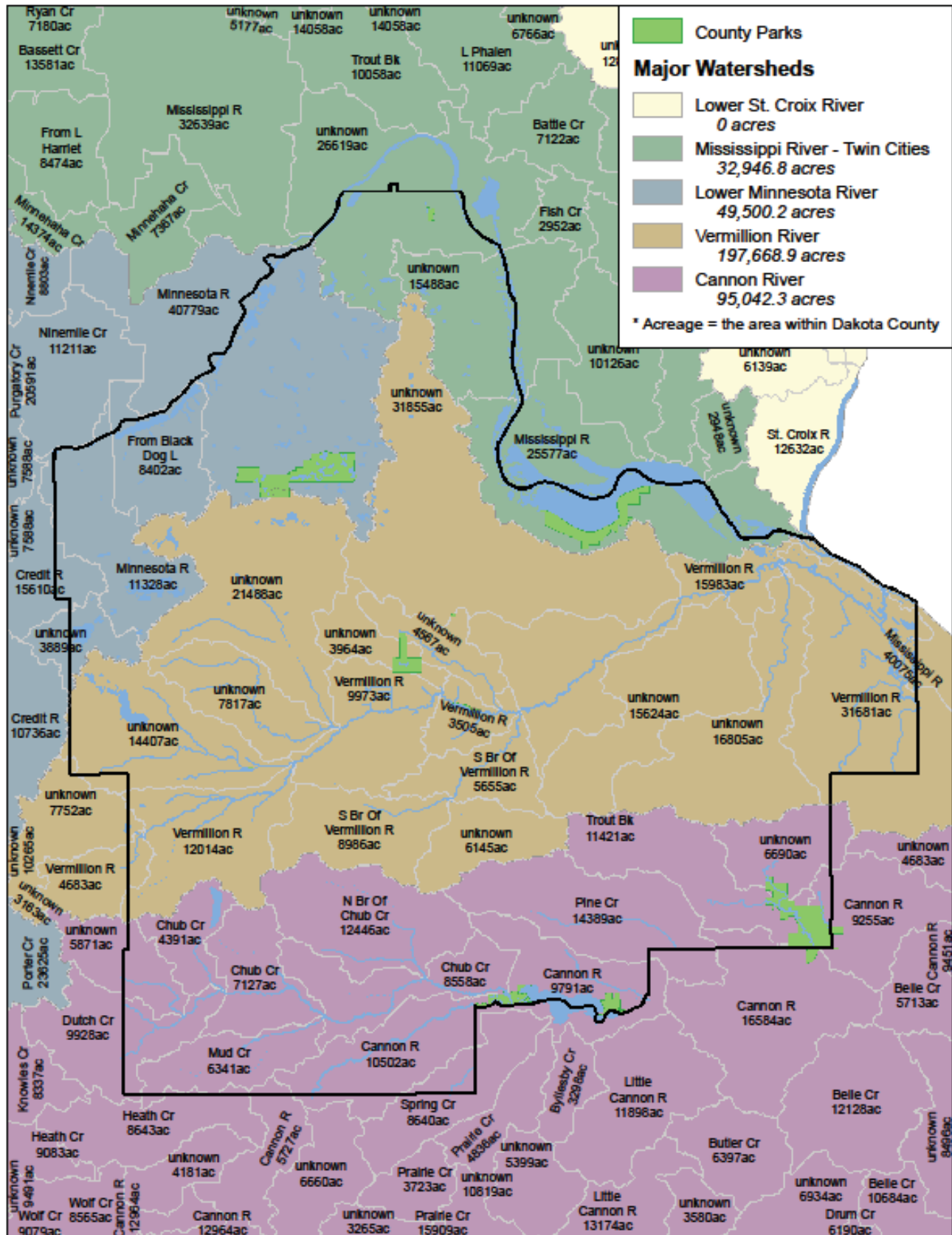
Miscellaneous

Many other smaller lakes abound in the park system; often they are ephemeral, forming in spring and drying up in summer. These lakes are important for the ecology of the parks, especially for breeding areas for invertebrates and amphibians like frogs and salamanders, since they are not predated upon by fish.

7.6.2. Rivers and Streams

Rivers and streams are prominent features of the County's parks, greenways and easements. The Mississippi River flows next to the Mississippi River Regional Greenway and Spring Lake Park Reserve. The Minnesota River is adjacent to the Minnesota River Regional Greenway. The Cannon River is the main feature of Lake Byllesby Regional Park and lies adjacent to Miesville Ravine Park Reserve. Portions of the Vermillion River and its various tributaries flow through the two County Park Conservation Areas and several natural area and agricultural conservation easements. One Cannon River tributary, Trout Brook, bisects Miesville Ravine Park Reserve, and three other creeks (Chub, Pine and Spring Creeks) flow among and through a number of conservation easements. A map illustrating the watersheds of Dakota County is shown in **Figure 48**.

Figure 48. Major watersheds and sub-watersheds of Dakota County.



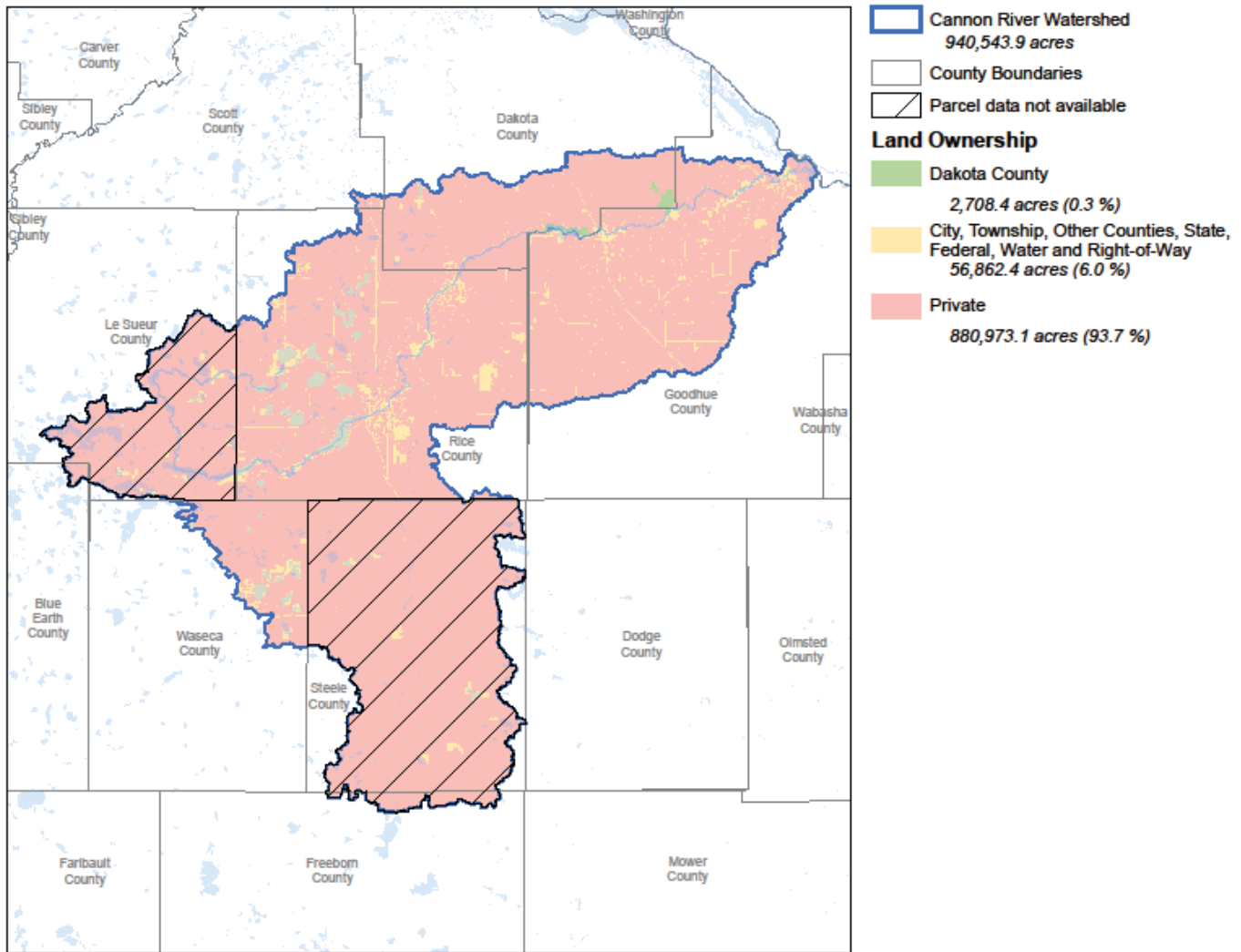
Source: DNR

The County system's smaller rivers and creeks are:

Cannon River. The Cannon River watershed drains 880,973 acres (1,460 square miles) in southeastern Minnesota and contains the Cannon River and the Straight River. The Cannon River travels 112 miles from Shields Lake in the west to the Mississippi River north

of Redwing. The Straight River flows 56 miles northward through Owatonna and Medford before reaching the Cannon River below the dam at Faribault. The Cannon River watershed spans nine counties, nearly to the Iowa border, with Dakota County accounting for only 0.3 percent of its watershed area (**Figure 49**).

Figure 49. Cannon River Watershed.



The watershed's scenic landscapes range from prairies and flat wooded floodplains in its upper portions to rocky bluffs in its lower reaches. Nearly all the land is privately owned (97 percent). There are 3,172 farms in the watershed, with agricultural lands predominant: row crops at 61 percent and grass/pasture/hay at 16 percent. Forest, wetland, and open water make up 14 percent of the watershed, and development the rest. Rivers and streams are impaired for turbidity, mercury and bacteria. The quality of the soil is a major concern because it affects surface water quality. The watershed is affected by too much erosion (often from stream and

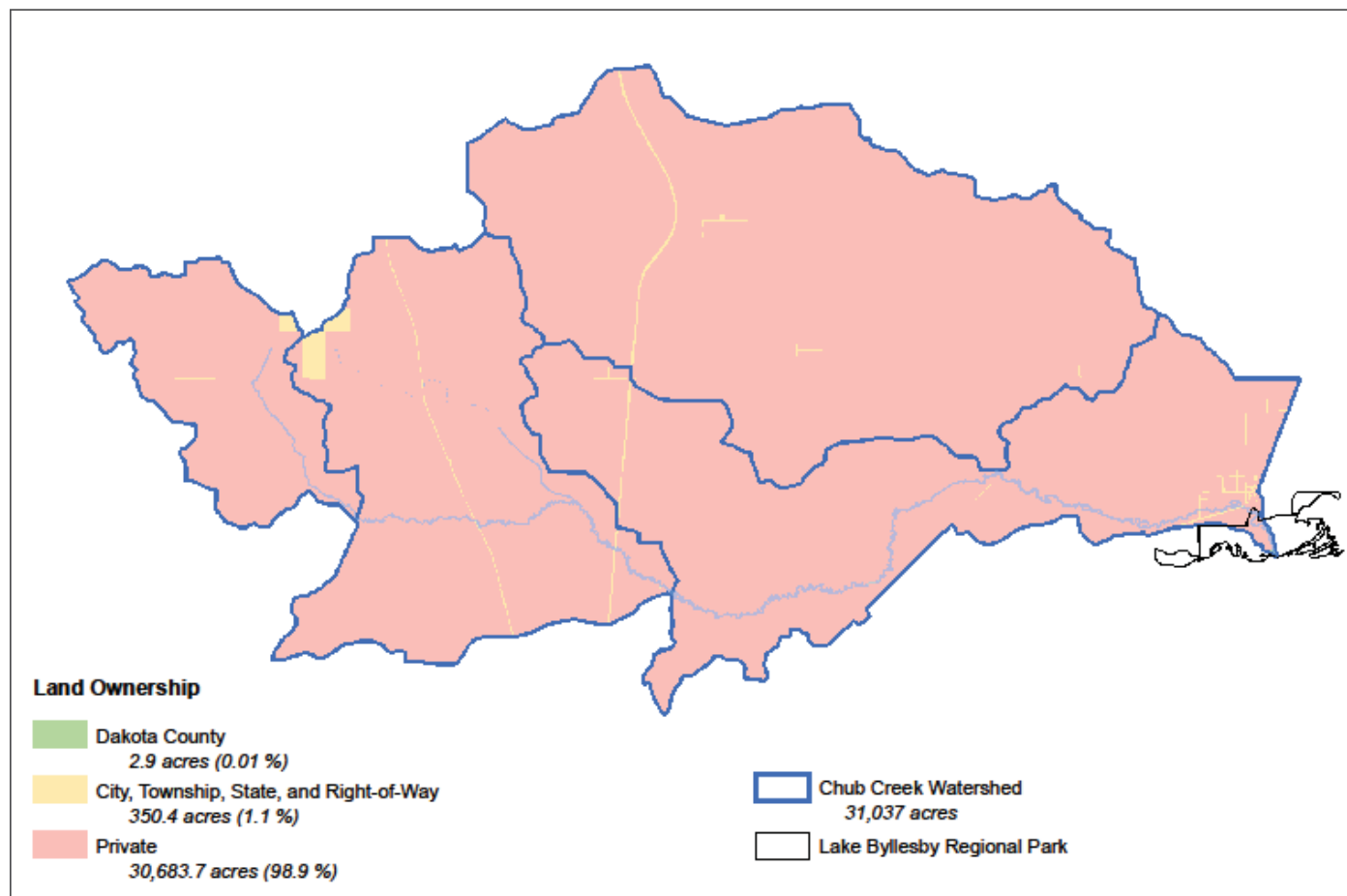
river banks and beds). Other problems involve managing animal waste and stormwater runoff, protecting groundwater, and addressing the lack of wetlands in a watershed that formerly had extensive wetlands.

From below its confluence with the Straight River, the Cannon River is designated a Wild and Scenic River. The Cannon and Straight Rivers are managed by the DNR as state watercourses which are navigable by canoe and kayak.

Chub Creek. The Chub Creek watershed covers 31,037 acres of southwestern Dakota County (Figure 50). It extends into southeastern Scott County and north-central Rice County. The main stem is 22.7 miles long. It has tributaries—Dutch, Mud, and the North Branch of Chub Creek—that are 7.0 to 9.3 miles long. Many smaller tributaries and ditches also flow into Chub Creek. All told, there are 169 miles of stream channel in the watershed. Agriculture dom-

inates, with row crops, alfalfa fields, sod farms, dairy farms, and horse farms. Wetlands cover less than ten percent of the watershed. Channel modifications throughout the watershed have changed how the creek functions. For example, the creek was routed around Highway 86 and now enters the Cannon River at a different location than before.

Figure 50. Chub Creek watershed.



Water quality in Chub Creek and its main tributaries are rated fair to good between storms, when most of the water is from groundwater discharge and slowly-moving runoff. When snow melts and storms occur, however, bacteria counts exceed recommended standards, and the creeks are considered impaired. On the other hand, the macroinvertebrate community that forms the base of the food chain is rated good to excellent. The most sensitive macroinvertebrates, the mayflies, caddisflies and stoneflies, do not find much good habitat, however, because riffles of gravel and cobble are rare. Riffles often occur only near bridges due to the rock riprap used in road construction. The watershed supports typical warm water spe-

cies, northern pike, and many species of small minnows and dace, which are sometimes quite colorful though seldom seen. Most fish counted in surveys are tolerant or somewhat tolerant of polluted or degraded waters. Carp exist at numerous places.

Pine Creek. Pine Creek is a designated trout stream located in the North Cannon River Watershed. The Pine Creek watershed drains 13,217 acres (20.7 square miles) in Hampton, Randolph and Douglas townships in Dakota County. Eighty-two percent of the land in the watershed is in agriculture, including row crops, sod farms, alfalfa fields and vegetable crops. Pine Creek flows into the Cannon River near Cannon Falls (Goodhue County). Much of the creek

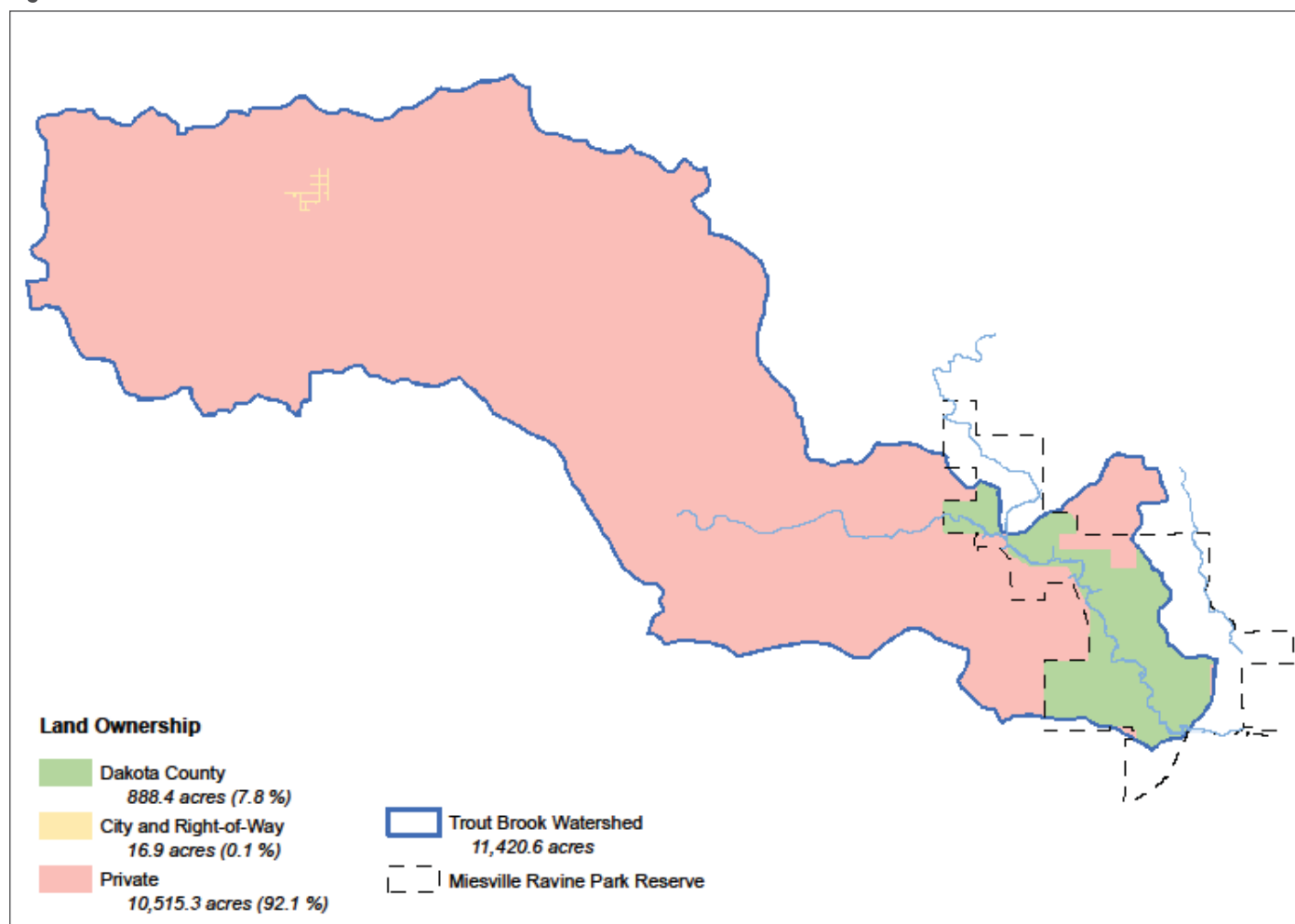
above Highway 20 was ditched and straightened in 1960 to create County ditch #1. Pine Creek travels about 5.8 miles within Dakota County and has an average gradient of 13.3 feet per mile.

Nitrate concentrations exceed the State standard, and Pine Creek is impaired for nitrates for drinking water concern. Phosphorus and turbidity are well below the State standards. Turbidity is high in some parts of the creek during runoff events. Macroinvertebrate communities indicate fairly poor to good water quality. Since the creek was ditched, very few riffle areas exist; these habitats support diverse and more sensitive macroinvertebrates. Bottom habitat is mud, sand, and silt with tall grasses on the banks. A 2001 survey found that Pine Creek supports a naturally-reproducing population

of brown trout (which can tolerate warmer and more polluted water than native brook trout), as well as warm water fish including small minnows, dace, and white sucker. The fish IBI score was in the excellent range.

Trout Brook. The 11,420-acre Trout Brook watershed (**Figure 51**) is largely cultivated. The land is gently rolling, becoming steep in ravines. Many farmers irrigate their row crops because the sandy soil loses moisture quickly. Livestock feedlots also occur. Very little water flows over the land except in spring snowmelt and after very large, intense rainfall. The ravines are an abrupt change in topography, containing the West and East Branches of Trout Brook.

Figure 51. Trout Brook watershed.



The brook meanders over a flat-bottomed valley with steep ravines. Eighteen springs and seeps and two sink holes fringe the brook and its tributaries. Groundwater discharge and stream flow measurements suggest that 30 to 40 percent of stream water comes from springs. General groundwater discharge makes up 60 to 70

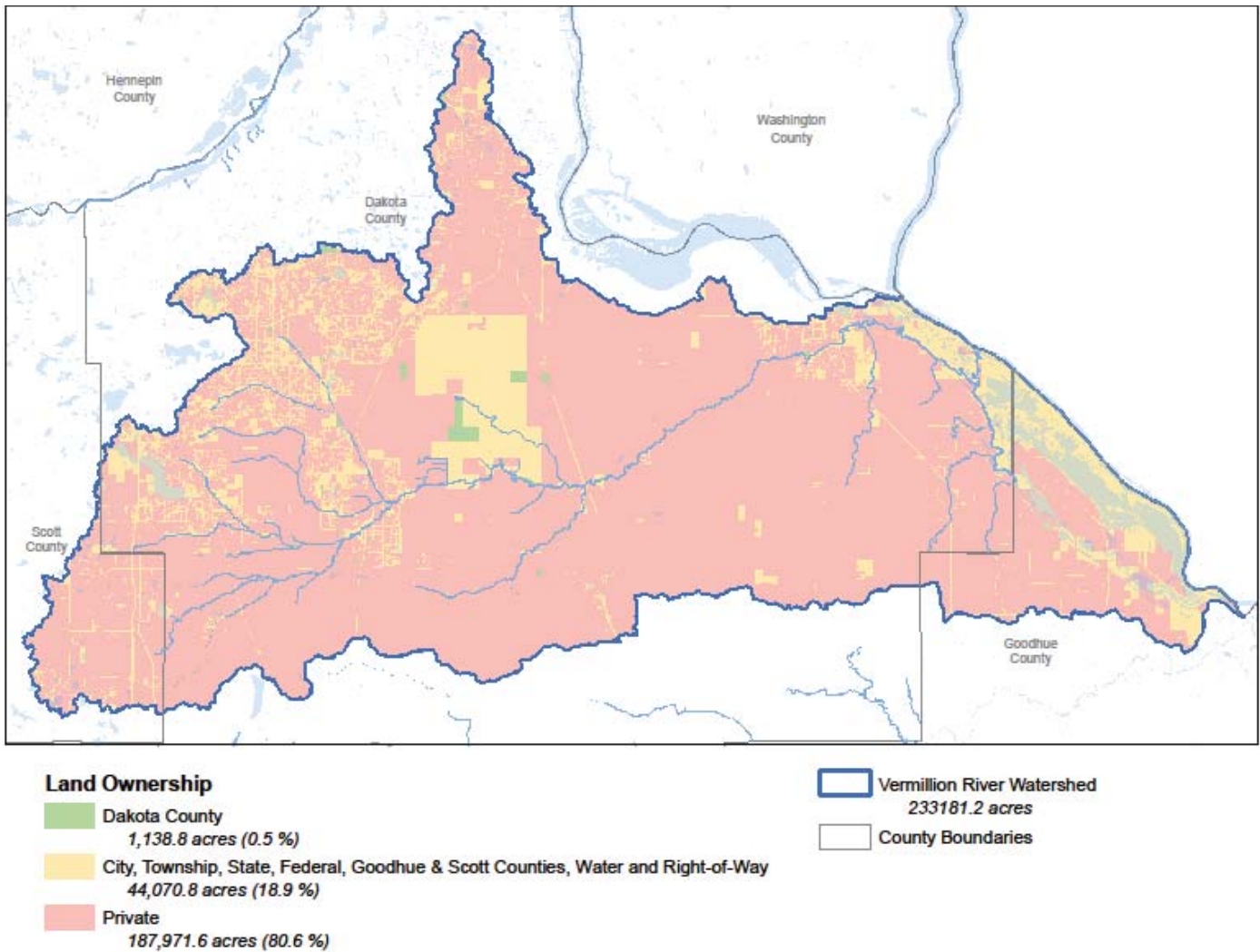
percent of baseflow. Nitrogen fertilizer and animal waste applied upstream and interacting with groundwater makes nitrate the biggest water quality concern. The frequent intense storms in recent years are causing significant erosion and sediment deposition into the stream.

Despite higher than normal nitrate levels, Trout Brook has a naturally reproducing population of brook trout, the only native trout in southern Minnesota. Brook trout streams were once common in the Twin Cities region, but have become rare due to land use change and other forces.

Vermillion River. The Vermillion River Watershed (Figure 52) is the largest by area in the seven county Twin Cities region. The water-

shed encompasses 335 square miles in Dakota and Scott Counties, mostly in central Dakota. It is agricultural in the south and east and suburban and urban in the north and northwest. Its headwaters leave Scott County and water flows east-northeast to Hastings and a 35-foot natural waterfall. From there, it meanders over bottomlands of the Mississippi River. The river's waters come from four tributaries, North Creek, Middle Creek, South Creek, and the South Branch.

Figure 52. Vermillion River Watershed (MN DNR definition).



The Vermillion River is managed by the Vermillion River Watershed JPO. The JPO has monitored the river and tributaries for more than ten years. Parts of the river and some tributaries are impaired for turbidity, bacteria, dissolved oxygen, and aquatic life. At some times in some reaches of the stream, a lack of shade and weak groundwater discharge caused water temperatures needed to maintain cold, trout-friendly waters to exceed the MPCA standard. It had been believed that heated runoff from impervious cover was

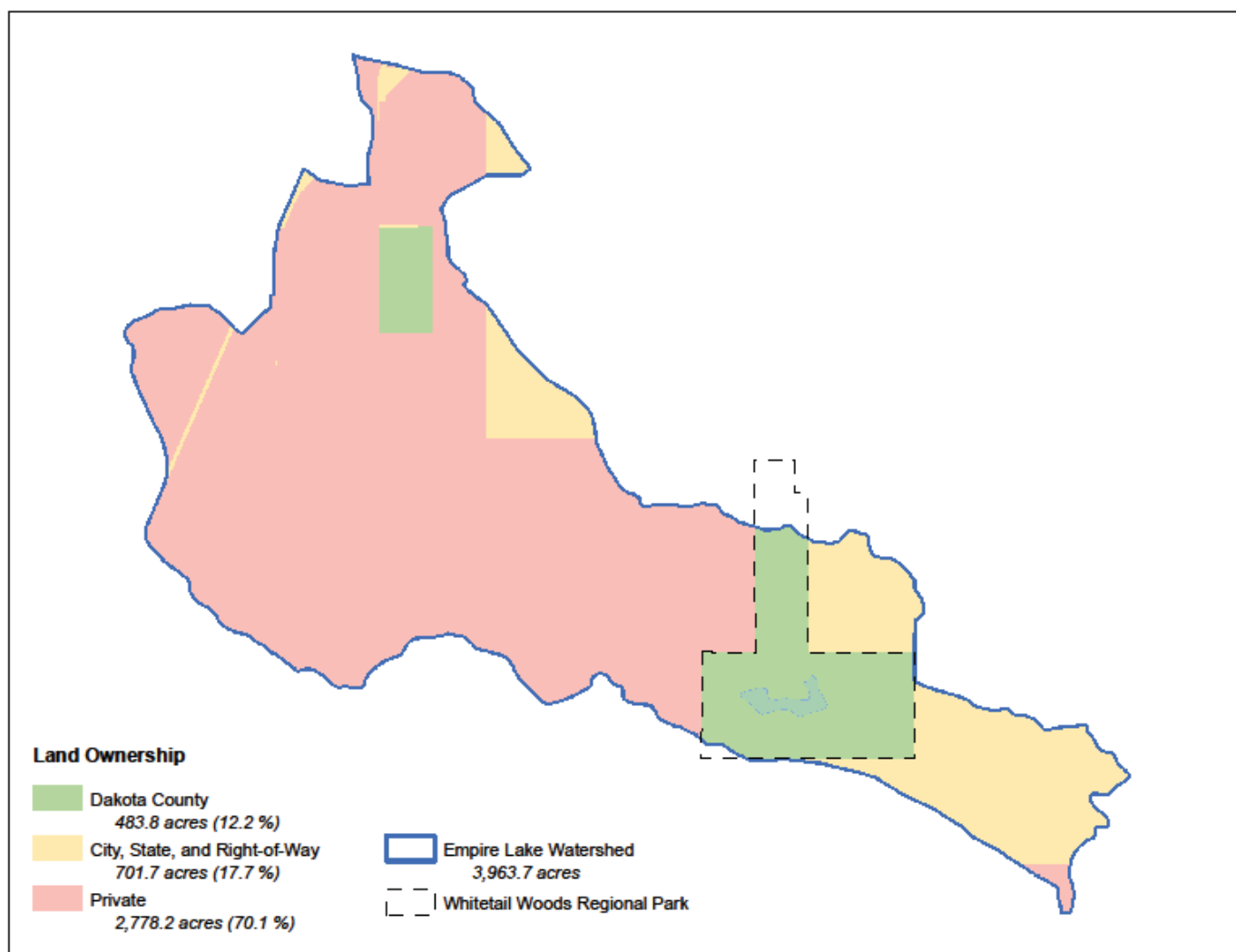
a significant threat, but a temperature trading study completed in 2007 determined that this threat was site-specific and localized, rather than a universal problem. The chief risk is now known to be loss of groundwater recharge when runoff from rooftops and pavement is sent directly to storm sewers and surface waters. This short-circuits the natural flow of water in the watershed and starves the stream of its steady, cold, groundwater. The most stable reaches for brown trout, which though not native naturally reproduce here,

are where temperatures are steady and coldest. These are also places where strong groundwater discharge permeates the streambed. As groundwater input is interrupted by expansion of impervious cover and storm sewers, those reaches will experience less stable and warmer temperatures.

Empire Lake Watershed. This subwatershed is 3,964 acres large (Figure 53). Water flows generally from the northwest to the

southeast. Land use is primarily agricultural, with some areas of sand-gravel mining. The City of Farmington is nearby. Whitetail Woods Regional Park is located at the downstream or “down-watershed” end of the watershed. Dakota County owns about 12 percent of the area of this watershed, so therefore does not have much control of what impacts Whitetail Woods park.

Figure 53. Empire Lake watershed.



7.7. KEY FINDINGS

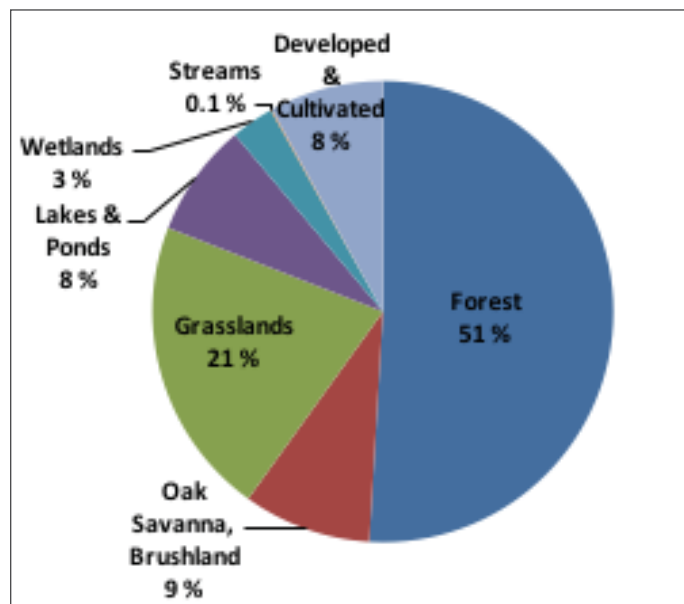
The inventory and assessment of Dakota County lands and waters above identified numerous opportunities that should be considered for the County's natural resource management program. Lands and waters in the County's system support some of the most important natural areas remaining.

7.7.1. Vegetation

A summary of vegetation types for all parks combined is in Figure 54. Forests occupy the largest land cover type in the parks, at just over half the land area. Next most abundant are grasslands and savannas, then lakes and ponds, developed and cultivated land, and lastly a small amount of wetlands. Streams comprise a very small portion of the land surface. Most forests are oak, with some altered

forest that is either recovering from over-harvesting or was formerly cultivated and has been colonized by trees. A small amount of mesic forest and lowland forest also exists.

Figure 54. Proportion of major vegetation type for all parks combined.



The primary issues facing vegetation management on Dakota County lands are summarized in **Table 7**.

Table 7. Vegetation management issues.

Issue	Affected Plant Communities	Amount Affected
Invasive plants	Upland forest, woodland, savanna, grasslands, and wetlands	Most
Loss of fire from landscape	Woodland, savanna, grasslands, and wetlands	Most
Reduced plant diversity	All	Most
Eroding ravines	Forest and woodland	Some
Overall deterioration	All	Most

The largest and highest quality plant communities owned and managed by Dakota County, which also provide core wildlife habitat, are:

- The forests and prairies of Miesville Ravine Park Reserve
- The forests of Spring Lake Regional Park
- The forests, grasslands, and savanna-like areas at Lebanon Hills Regional Park

These areas are the County's best chance to retain the full spectrum of native plants and animals at a large scale, with a complexity and quality resembling historical conditions. These areas are also the most likely places where uncommon wildlife, such as SGCN, can persist in the long run.

Some of the rarer or more sensitive plant communities on County lands are:

- Tamarack swamp (Lebanon Hills Regional Park)
- Seepage meadow (Spring Lake Park Reserve)
- Native prairies (several locations)

7.7.2. Water Resources

Dakota County is fortunate to have such variety in its water resources, from major rivers to headwater streams, and from large deep lakes to small shallow ones. Based on a review of existing data and discussions with Dakota County staff, the highest quality surface waters in the County's system were identified (**Table 8**).

Table 8. Highest quality waters in County parks, greenways and easements.

Waterbody/ Water Course	Water- shed Size (acres)	Watershed Under County Control (%)	Trophic State	Fishery	Primary Recreational Use	Impairments	Other
Cannon River		0.3	NA	Diverse	Fishing, paddling, tubing	E. coli, turbidity, PCB in fish tissue; 2016 draft list: fecal coliform, aquatic macroinvertebrate bioassessments, fishes bioassessments, dissolved oxygen, mercury in fish tissue	
Chub Creek (parts)		0.01	NA	Diverse	Fishing	Fecal coliform 2016 draft list: aquatic macroinvertebrate bioassessments, fishes bioassessments	
Empire Lake		12.2	Eutrophic		Paddling		Curly-leaf pondweed
Holland Lake	1,953	46	Meso to Eutrophic	Stocked trout	Fishing, paddling		Eurasian watermilfoil, curly-leaf pondweed
Jensen Lake	1,953	46	Eutrophic		Paddling		
McDonough Lake	1,953	46	Meso to Eutrophic		Paddling		Eurasian watermilfoil, curly-leaf pondweed
O'Brien Lake	1,953	46	Meso to Eutrophic		Paddling		Eurasian watermilfoil
Schulze Lake	1,953	46	Meso to Eutrophic		Swimming, paddling		Eurasian watermilfoil, curly-leaf pondweed
Spring Lake		6.0	Hyper-eutrophic		Paddling, hunting	PCB in fish tissue, perfluorooctane sulfonate, turbidity, mercury in fish tissue, mercury in water column	Eurasian watermilfoil, flowering rush, bighead carp, silver carp, zebra mussels
Thompson Lake		0.9	Eutrophic	Stocked panfish, bullheads	Fishing		Curly-leaf pondweed, Chinese mystery snail
Trout Brook		7.8	NA	Brook Trout	Fishing	Nitrates, turbidity 2016 draft list: macroinvertebrate bioassessments	Trout stream
Vermillion River		0.5	NA	Brown trout, Diverse	Fishing, paddling	PCB in fish tissue, aquatic macroinvertebrate bioassessments, fecal coliform, fishes bioassessments, dissolved oxygen, turbidity 2016 draft list: Escherichia coli, mercury in fish tissue	

The primary issues facing water resources on Dakota County lands are summarized in **Table 9**.

Table 9. Water management issues.

Issue	Affected Water Type	Amount Affected
Altered and lost hydrology	Wetlands, lakes, ponds, streams	All
Sedimentation	All	Most
Impaired water quality	All	All
Untreated stormwater runoff	All	Some
Aquatic invasive species	Lakes	Some
Eroding shoreline	All	Most
Accelerated filling in ("aging")	Shallow lakes	All
Toxicity (pesticides and salt)	Most	All

7.7.3. Wildlife

The complex variety in Dakota County's lands and waters creates suitable habitat for thousands of plant and animals species. However, a large percentage of the County's wildlife is uncommon and rare. The larger number of potential SGCN in the County (179 species highlighted in **Appendix 1**) illustrates the magnitude of uncommon and declining wildlife species in the County as a result of the ecological diversity and the landscape-level changes over the last 150 years.

There are only limited wildlife survey data available. This has revealed some notable wildlife in the past decade, while other species have been known for some time. Badger and fisher were recently identified by trail cameras, while loggerhead shrike, Blanding's turtle and brook trout have received attention for some time. Species that have been lost to the County, like the regal fritillary, a large prairie butterfly whose larvae feed on violets, could someday return if enough habitat existed.

The primary issues facing Dakota County's wildlife are summarized in **Table 10**.

Table 10. Wildlife management issues.

Issue	Affected Wildlife Types	Affected Area
Habitat loss, fragmentation, and degradation; edge effects	All	All
Reduced diversity (e.g., loss of pollinators)	All	All
Species of Greatest Conservation Need (SGCN)	All	All
Invasive species (e.g., earth worms, emerald ash borer, etc.)	Some	Woodland
Shifts in native species ranges	Many	Most
Overabundance (e.g., deer)	Some	Woodlands
Excessive predation due to extensive edge conditions	Some	Most
Toxicity of pesticides and other chemicals	Some	Most

8. BENCHMARKING



Lebanon Hills Regional Park. Photo by AES.

Dakota County's 2012 Benchmarking Study defined benchmarking as “the process of improving products, services, and practices by measuring them against those organizations with similar characteristics (e.g., socio-demographic factors). Benchmarking provides a tool for public sector staff and administrators to address the changing needs of their constituencies.”

Benchmarking in this NRMSP compares the County's current natural resource management practices and level of effort with comparable agencies. Comparable agencies were selected because they:

- Were used in previous County benchmarking studies
- Were of similar size and demographics
- Represented a cross-section of agencies engaged in natural resource management
- Managed a large, diverse land base
- Had an established program and good reputation

Of the agencies considered, six were chosen for comparison with Dakota County:

- Anoka County, MN
- Three Rivers Park District, MN
- Washington County, MN
- Dane County (Madison), WI
- DuPage County (Chicago metro), IL
- Polk County (Des Moines), IA

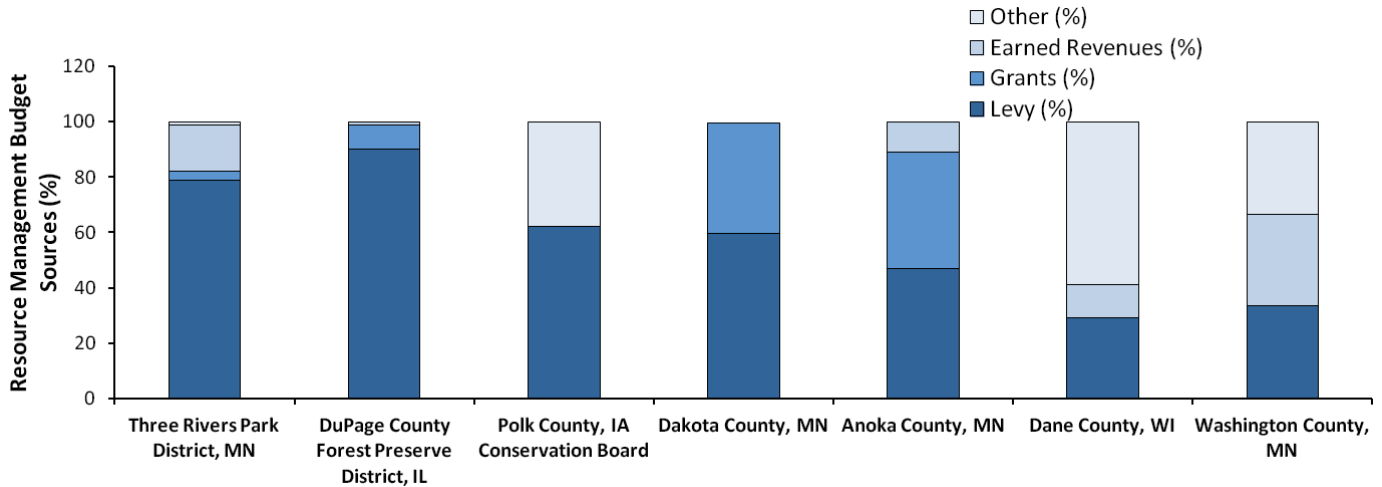
The County and consulting team developed a list of questions to confirm similarities, identify differences, and evaluate natural resources and management practices and outcomes among the entities. The County completed the same survey. Answers to questions were summarized and results tabulated. Since some responses were inconsistent, the results are best used to assess at a high level what success in natural resource management might look like, and what resources would be needed to achieve that success. For instance, comparisons with Anoka County need to consider the fact that since Anoka County consists of almost 50percent wetlands, Dakota County is actually managing much more land. Comparisons with Washington County need to consider that Washington has a very limited natural resource management program compared to the current program at Dakota County, and accomplishments will reflect that reality. A copy of the benchmarking survey is provided in **Appendix M**.

An important finding was that, while Dakota County is not yet managing as large a percent of its lands as Three Rivers, DuPage County, Polk County, and Anoka County, it is well positioned to move into that league in the future. This is due to recent County Board com-

mitments to increased County natural resource staff, to significant state grants from the Outdoor Heritage Fund and Environment and Natural Resource Trust Fund, and to available County Environmental Legacy funds (**Figure 55**). This funding structure is similar to the

successful Polk County program. Polk County reported that most of its "other" funds are grants.

Figure 55. Sources of natural resource management budgets for the County and similar agencies.



Lessons learned from the benchmarking study are:

- Well-established natural resource management systems have invested significant resources at an initial high cost per acre over decades to restore degraded areas. Success comes from continuing to invest significant funds to maintain these areas.
- The significant increase in Dakota County's natural resource budget since 2013 allowed the County to match programs in most benchmark counties and move towards the higher achievements of the larger agencies.
- Recent and expected grant funds (currently \$2.5 million) significantly increased available County resources and accelerated natural resource management. Adequate County resources are necessary to secure and administer grants and to direct the restoration and maintenance of areas recently brought under management.
- Volunteers can benefit the program, but their involvement should be strategic and will require County investment and County staff involvement.
- The County's regional greenway system is the most extensive among the benchmarked agencies.
- The County's conservation easements on private land is unique in scope and diversity among all of the benchmark agencies.

Results of the benchmarking study characterize the County's natural lands and management practices as comparable to earlier stages of development for the most mature programs, but at a good stage considering its relatively recent start and the financial disruption of the 2008 Great Recession. As in other programs, higher initial per acre costs for restoration will be needed, but after a few to several years the per-acre maintenance costs will be significantly less.

9. PLAN INPUT



Monarch butterfly feeding on aster flowers. Photo by Dakota County Staff.

9.1. MEETING TYPES AND SCHEDULE

Input for this NRMSP was solicited and received in a series of meetings over the course of the project. Meetings were planned and executed to share and receive information from many stakeholders. Information from the meetings added to the information from surveys, discussed above. The meetings built sequentially from discussions with technical advisors, to public input, then the Planning Commission review, and lastly the County Board. There were three rounds of these sequential meetings.

- Technical Advisory Committee (TAC). Dozens of the Twin Cities most experienced and respected natural resources managers were invited to participate in these NRMSP meetings. Information about the project was shared with the TAC, which in turn served as a sounding board to critique and improve the approach. A summary of TAC meetings and participants is provided in **Appendix N**.
- Public Meetings. Using a variety of techniques (e.g., posters, slide presentations, Audience Participation System), the public was informed of project progress and had opportunities to provide input to the plan's development. A summary of the public meetings is provided in **Appendix O**.
- Planning Commission. The County Planning Commission received regular updates throughout the project and provided an important internal review and critique of the project as it evolved.
- County Board. As with the Planning Commission, the County Board (in the form of the Physical Development Committee) received project updates and participated in two workshops to better understand the project and provide invaluable guidance, especially with regard to the preferred plan option.

Table 11 summarizes the NRMSP meeting schedule throughout the project.

Table 11. Summary of NRMSP meetings and dates.

Project Phase	Meeting Date
1. Scoping	
	Kick-off Meeting (10/8/15)
2. Research	
	TAC Meeting (2/24/16)
	Public Meeting (3/7/16 and 3/8/16)
	Planning Commission Meeting (3/24/16)
	County Board Meeting (4/12/16)
3. Vision & Concepts	
	TAC Meeting (5/23/16)
	Public Meeting (6/13/16)
	Public Meeting 6/13/16
	Planning Commission Meeting (6/23/16)
	County Board Workshop (9/13/16)
	County Board Workshop (11/29/16)
4. Develop Preferred Plan Option	
	TAC Meeting (2/8/17)
	Planning Commission Meeting (2/23/17)
	County Board Meeting (3/14/17)
5. Public Review and Plan Adoption	
	Public Meeting (mid-April/17)
	Planning Commission Meeting (4/28/17)
	County Board Meeting (5/9/17)
	County Board Approval (5/23/17)

9.2. OTHER SOURCES OF PLAN INPUT

As discussed in detail in section 5.2, the NRMSP project also gave County residents several opportunities to express their opinion and make recommendations. These included:

- County Web Page. The County created a hot link on the website for news, events, and project products.
- County Listserve. The County notified municipalities, organizations, and individuals of news, upcoming events, and project products.
- County Public Opinion Survey. The County included natural resource questions in its winter 2015 and 2016 public opinion surveys.
- Survey Monkey. The County and consulting team created a questionnaire to ask the public questions about its opinions of natural resources; the questionnaire was promoted on the County web page and listserv.
- Intercept Surveys. The County placed surveys at key locations around the County, primarily libraries, to give the questionnaire to County residents.

10. PRINCIPLES, VISION, GOALS, AND APPROACHES FOR NATURAL RESOURCES MANAGEMENT



Miesville Ravine Park Reserve. Photo by AES.

This section presents principles, vision, goals and approaches for successfully managing natural resources. It also includes important considerations for implications of managing natural resources. Based on the current conditions of the resources and principles, the plan goals and approaches set a path for reaching the vision.

The principles, vision, goals, and approaches were presented to and reviewed by the following groups: the public, the Technical Advisory Committee, the County Planning Commission, and the County Board of Commissioners.

10.1. PRINCIPLES

A principle, according to the Webster Dictionary, is “a fundamental truth or proposition that serves as the foundation for a system of belief or behavior or for a chain of reasoning.” Principles form the foundation for managing the natural resources in Dakota County parks, easements, and greenways.

It is important to consider that one of the primary reasons to manage natural resources is to preserve biological diversity—biodiversi-

ty—the variety of life, including all species, species interactions, and the underlying genetic diversity. For several decades, the scientific community has considered the loss of species and genetic diversity as one of the great challenges of our time. The main contributors to biodiversity loss are habitat loss and fragmentation, forest and other habitat deterioration; invasion by non-local species, and climate change. Addressing biodiversity loss in Dakota County, where considerable loss has already occurred, is helped by using the precautionary principle. In the absence of information about the damaging effects of development and management on natural resources, developers and managers should exercise caution when implementing development and management plans. An assumption of no harm in the absence of data does not mean no harm will result. A thoughtful approach to development and management

requires that unforeseen and unintended consequences be identified and considered when executing plans.

The principles for natural resource management, listed below were influenced and modified by the public. For instance, since the public places such a high value on the County's natural resources, this was reflected in the principles. At a high level, these principles reflect what is considered to be the well-established and accepted foundation for natural resource management by the profession.

10.1.1. Foundational Principles of Natural Resources Management

Foundational natural resource management principles include:

- Natural resources and natural communities exist as interrelated, dynamic systems that have developed over thousands of years.
- Natural resources have value apart from public benefits.
- Natural areas and habitat have been significantly lost, fragmented and degraded.
- Natural processes have been disrupted, resulting in degradation (diminished function and reduced benefits).
- Natural resource management is necessary to halt and reverse the trends of degradation.
- Biodiversity is an important measure of site quality, community resilience and biotic potential.
- Larger, contiguous habitat areas provide more ecological success than many smaller or linear areas, and connectivity between habitat areas is important.
- Restoration is a process, not a point in time and often there is no clear endpoint.
- Natural resources, natural communities and ecosystems are not confined to jurisdictional or property boundaries.
- Natural resources provide multiple public benefits.

10.1.2. Shared Principles between NRMSP and Visitor Services Strategic Operations Plan

At the same time the County was developing the NRMSP, the County was also developing the Visitor Services Strategic Operations Plan (VSSOP). The purpose of the VSSOP is to improve and deliver public services that enrich the overall County park and greenway experience, including recreation amenities (like food), events, outdoor education, volunteerism, rentals, customer service, and mar-

keting. Since both plans have overlapping goals and outcomes that affect in the visitor's experience, the NRMSP and the VSSOP were developed in conjunction with each other.

The following are the shared NRMSP and the VSSOP principles:

- **Balance:** Nature-based parks should protect natural resources while encouraging recreational use, to gain the benefits of people experiencing the natural world.
- **Build Appreciation:** Nature-based parks and visitor services build appreciation of the natural world through discovery, learning, and recreation in natural settings.
- **Stewardship Benefits:** Natural resource management provides cleaner air and water, biological diversity, native species habitat, improved visitor experience, community attractiveness, and public appreciation for natural resources.
- **Synergy:** Nature-based parks should build synergy between visitor services and resource management through events, education, volunteerism, marketing and thoughtful design.
- **Community Engagement:** Natural resource management on County land should recognize public values and preferences, and provide opportunities for public engagement, education and volunteerism.

10.1.3. Working Principles of NRMSP

The following principles will guide the short- and long-term implementation of this NRMSP:

- Natural resource management is necessary to halt and reverse degradation to natural systems, and requires long-term commitment.
- Natural resource management should improve and sustain interrelated natural resource systems (especially for rare and declining native species).
- Natural resource management should address historic, current and adjacent land uses.
- Natural resource management on protected private lands (easements) improves resource quality and provides public benefits.

10.2. VISION

A vision, according to the Webster Dictionary, is "an aspirational description of what an organization would like to achieve or accomplish in the mid-term or long-term future. It is intended to serve as a clear guide for choosing current and future courses of action."

It is important to have an inspiring, but pragmatic vision for natural resource management on appropriate public and private lands based on a number of integrated social, ecological and economic principles and other considerations. After understanding the quality of the County's natural resources through inventory and assessment, and then applying planning principles, what emerged was as a realistic and compelling vision to take Dakota County's natural resources from their current baseline conditions. Through internal County/consultant discussions and consideration of public input, the following vision statement was developed for this NRMSP:

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.

10.3. GOALS

A goal, according to the Webster Dictionary, is "the object of a person's ambition or effort; an aim or desired result. What you want to accomplish." A "SMART" goal is Specific, Measurable, Assignable, Realistic, and Time-based. The following goals, organized by topic, emerged from the principles and vision:

10.3.1. Vegetation Management Goals in Parks

- Focus initial invasive species control on the most invasive species in the highest quality areas
- Sufficiently install native seed/plants to limit response of invasive plants
- Follow best management practices and latest scientific methods to achieve success
- Monitor to track progress and facilitate adaptive management
- Maintain vegetation perpetually in restored areas
- Designate higher quality natural areas, unique habitat value, or already restored areas) within the park system where the priority use and management will be to improve and maintain natural resource integrity
- Refine natural resource management priorities and activities through park-specific Natural Resource Management Plans (NRMPs) and Master Plans and updates

10.3.2. Water Resources Management Goals in Parks

- Focus efforts to address listed surface water impairments based on lakes study and collected data
- Focus on the most significant aquatic invasive species (AIS) (Eurasian watermilfoil and curly leaf pondweed) and the most significant wetland invasive species
- Employ an early detection-rapid response approach to preventing new AIS invasion
- Work with partners outside park boundaries, in park watersheds to install stormwater best practices at priority locations to address listed impairments
- Monitor (by County and others) to track progress and facilitate adaptive management
- Refine management priorities and activities through park-specific NRMPs and Master Plans
- Water leaving parks should be as clean or cleaner than water entering the parks

10.3.3. Wildlife Management Goals in Parks

- Surveys will be conducted for wildlife indicator species associated with major plant communities
- Monitoring (both short- and long-term, by County and by others) will track progress and be used to guide adaptive management activities and priorities for selected resident and migratory species
- Ongoing development of park-specific NRMPs and Master Plans will refine management activities and priorities
- Include wildlife management in the development and updates of NRMPs; include wildlife as potential priority feature of each park's NRMP

10.3.4 Greenway Goals

- The most highly invasive species should be controlled since greenways can contribute to the spread of invasive species.
- Restoration and enhancement of high quality areas within County-owned lands and easements will improve visitor experience and can reduce long-term maintenance costs.
- It will be important to work with a wide range of partners to restore and enhance non-County-owned lands and easements within regional greenway corridors and to identify opportunities for collaboration and increased efficiencies

- Wildlife surveys should be conducted for key indicator species
 - Monitoring will track progress and facilitate adaptive management
 - NRMPs should be developed for each regional greenway
 - Greenway-specific NRMPs, Master Plans and updates will refine management activities and priorities

10.3.5 Conservation Easement Goals

- Public investments should be based on a public-private cost-share formula that will be differentiated based on potential impacts to impaired waters and high quality natural areas.
- Annual monitoring will ensure easement compliance and track progress and facilitate adaptive management
- NRMPs should be developed for important natural areas within agricultural easements and updated every five years for all easements
- Landowners are responsible for maintenance for three years beyond restoration project completion

10.4. APPROACHES

An approach, according to the Webster Dictionary, is “a way of dealing with something.” It answers how something will be done. The

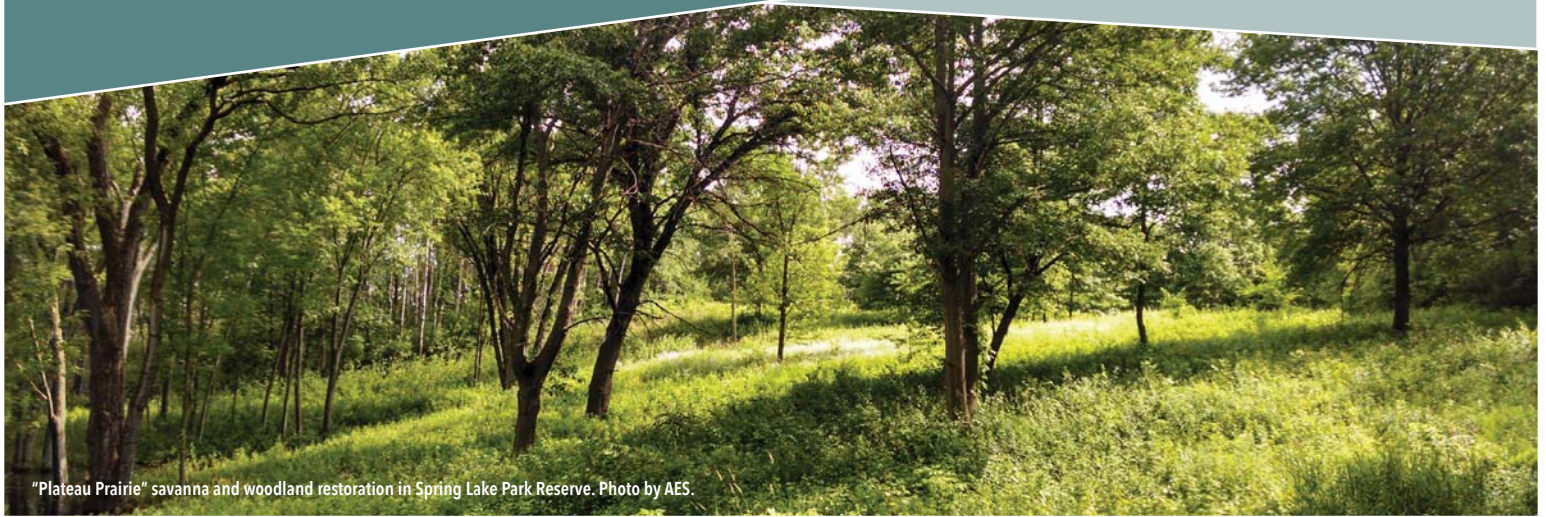
approaches for the NRMSP were rooted in the principles, guided by the vision and informed by the goals. These approaches were developed by County staff and consultants, and modified and refined by the TAC, the Public, the Planning Commission, and ultimately, the County Board. What emerged was a two-tiered approach, described in Section 11 below.

This two-tiered approach attempted to balance a number of considerations, primarily:

- Tier 1 and Tier 2 restoration/improvement initiatives and outcomes for the five primary components (below)
- Estimated Tier 1 restoration/improvement expenses and estimated revenue sources, including anticipated County costs
- Estimated Tier 1 maintenance expenses and estimated revenue sources, including anticipated County costs
- Estimated Tier 1 staffing requirements and costs
- Estimated Tier 1 component and cumulative costs

Tier 1 and Tier 2 activities were each divided into the five plan components: vegetation, water, and wildlife in parks; greenways; and easements. Implementation of the Tier 1 and Tier 2 approaches is discussed in detail starting in Section 11.2.

11. IMPLEMENTING THE NATURAL RESOURCE MANAGEMENT SYSTEM PLAN



"Plateau Prairie" savanna and woodland restoration in Spring Lake Park Reserve. Photo by AES.

Successful implementation of this NRMSP will require strategic actions, phased over time, followed by perpetual management. In discussions with the Technical Advisory Committee, the public, the Dakota County Planning Commission, and the County Board of Directors, the tiered approach to implementation seemed most useful. Tier 1 represents the highest priority and most time-sensitive natural resource activities that should be implemented in the next five years (2018 to 2022). Tier 2 represents important but less urgent actions that should be implemented over the following 15 years (2023 to 2037).

11.1. COUNTY GOVERNMENT CAPACITY FOR NATURAL RESOURCES

The County's existing capacity for natural resource management was described in Section 6. The County fully recognizes that an increase in capacity will be required to implement this NRMSP. This increased capacity will be realized through increased commitment of County resources as well as by leveraging County resources through grants, volunteers, and partnering arrangements.

11.1.1. Increased Commitment of County Resources

Staffing. Hiring additional County staff is a cost-effective way to advance the goals of this NRMSP. Hiring and use of internal staff can provide greater consistency, control, and flexibility as opposed to hiring contractors.

Contractors. While some natural resources restoration and management activities can be done cost-effectively with internal County staff, volunteers, and partners, other tasks are best conducted by contractors. Qualified consulting ecologists and ecological contractors can augment County staff by providing specialized services (sometimes requiring special equipment) and more intensive ef-

forts when needed. These intermittent needs of the County can be more affordably met by utilizing contractors rather than by using County staff.

11.1.2. Leveraging County Resources

Grants. Several State of Minnesota grant programs provide substantial funds to natural resource projects. Dakota County has been successful in securing significant grant funds to advance the County's natural resources program. Some of these are identified in **Table 2**, Section 6.1, of this Plan. The County will continue to pursue these grants, as they are a critical funding source for implementing this NRMSP.

Collaboration for Improved Outcomes. Raising the capacity of the County to implement the NRMSP depends on partnerships. Collaboration leverages County resources, increases project efficiencies, and extends high quality natural resource management over more acres, and not just County lands. As a result, the integrity and health of ecosystems will be restored and brought under regular management more quickly. Likewise, ecosystem services of wildlife production, water regulation, and air and water purification will continue at a high level, despite land use and climate change.

The County partnered with the following organizations:

- Dakota County Soil and Water Conservation District
- Vermillion River Watershed Joint Powers Organization
- County Cities and Townships
- Friends of the Mississippi River
- Great River Greening
- Trout Unlimited
- Pheasants Forever
- Conservation Minnesota
- Minnesota Department of Natural Resources
- Mississippi Park Connection
- Carpenter Nature Center
- Conservation Corps Minnesota
- Minnesota Zoo

Collaborating with other organizations to advance natural resource restoration and management can take many forms. The following strategies can produce a variety of benefits, including reduced costs to the County, strengthened relationships with partners, and expanded public outreach and goodwill:

- Share staff expertise, equipment, and resources
- Share and technical knowledge and skill
- Provide funds to leverage staff capacity,
- Coordinate management of adjacent and nearby natural areas, and increasing efficiency of project execution
- Coordinate planning and execution of volunteer events
- Partner on grant applications to increase chances of success

Partnerships can significantly enhance opportunities for volunteer engagement. The membership of many conservation nonprofits has specific interests and a particular dedication to the organization's cause. While these members may not necessarily have an interest in volunteering for the County, they may be very interested in that same volunteer project if it were endorsed or hosted by a favorite nonprofit. Nonprofit and community partners may also be better positioned to organize dynamic volunteer events, making them more attractive. This may include providing refreshments, t-shirts, and other giveaways. These partnerships can increase the County's capacity to engage volunteers and relieve County staff of the burden of recruiting volunteers and managing event logistics.

Partnering organizations can also provide staff to manage volunteers. Volunteers are discussed further below.

The County may wish to establish a collaborative fund, into which the County contributes with the guarantee that those funds will be leveraged by partners working on specific projects and initiatives. That leverage may play out in the partner's greater efficiency or closer proximity, for example. There are also opportunities to collaborate with private sector partnerships and to achieve mutual goals by pooling resources.

Using Volunteers. The characteristics and many benefits of volunteer programs were discussed in Section 6.4. As mentioned, volunteer programs require staff commitment for planning and execution. In 2016, Natural Resources volunteers contributed over 2,600 hours (1.25 FTEs) to the County. During that same year, Natural Resources staff committed 548 hours to manage volunteer-related tasks. These hours do not include significant work by the County's Volunteer Coordinator (housed in Communications). Due to the County's partnership with Wilderness in the City, volunteer program development and growth at Lebanon Hills Regional Park was accelerated. Without similar partnerships at other parks, the program cannot be expected to grow as quickly.

A volunteer component is included in grant requests wherever practical. This makes requests more appealing to funders and bolsters community support for these projects. While the volunteer target varies greatly by park and project scope, based on recent averages, Dakota County should aim to engage 0.1 FTE (208 hours) in volunteer labor for every \$240,000 in restoration project cost. This will require approximately 52 staff hours (0.025 FTE) in volunteer management, which can be counted as in-kind match for these grants.

County staff resources will be needed to maintain and expand existing volunteer initiatives. In 2016, 0.2 FTE were dedicated to managing volunteers on projects that were not funded by grant dollars. These programs were responsible for nearly 1,500 volunteer hours, primarily at Lebanon Hills. While this staffing level is sufficient to maintain existing initiatives at that one park, additional resources would be needed to expand volunteer initiatives, particularly to parks that do not have an existing volunteer base.

Capitalize on Potential Revenue Streams. Management of the County's natural resources has the potential to generate revenue. Sustainable timber harvest on County lands to advance ecosystem health could generate revenue through the sale of saw logs, firewood, wood chips, and biomass. Native seed could be harvested and sold sustainably from County-owned or -managed prairies; af-

ter seed harvest, these prairies could be mowed, with the clippings sold as prairie hay. (Haying has some of the same benefits as burning a prairie.)

11.2. COUNTY'S PREFERRED APPROACH TO NATURAL RESOURCES MANAGEMENT

11.2.1. Overview and Support for the Preferred Approach

The preferred approach for implementing this NRMSP was introduced in Section 10.4. This consists of Tier 1 (most urgent) and Tier 2 (important, but less urgent) activities that will occur in each of the five plan components. Tier 1 is slated for 2018 to 2022 and Tier 2

for 2023 to 2037. The tiers are not, strictly speaking, phases, but are generally approached as such in this plan. For example, in a phased approach, one phase follows another, sequentially. With tiers, they can be implemented simultaneously, or in sequence. However, since many of the activities and initiatives in Tier 2 depend on having completed Tier 1, phasing them is recommended. This also allows better assessment of success and adaptive management, along the way. With tiers, some of the biggest benefits are 1) reduced costs of maintenance in the long-term, and 2) increased level of resource quality in both the short and long terms. With vegetation, for example, as more effort is inputted at each tier, the resource quality will improve and the per-unit maintenance cost will fall to a lower level than at the previous tier (**Figures 56 and 57**).

Figure 56. Tier 1 Vegetation Restoration and Enhancement Model. The graph illustrates how resource quality increases steadily and maintenance costs drop with added management inputs. Restoration is considered the initial steps in the model, which involves the most difficult and expensive activities, such as exotic brush removal and seedling establishment. Enhancement refers to added inputs such as increasing diversity of wildflowers in a prairie.

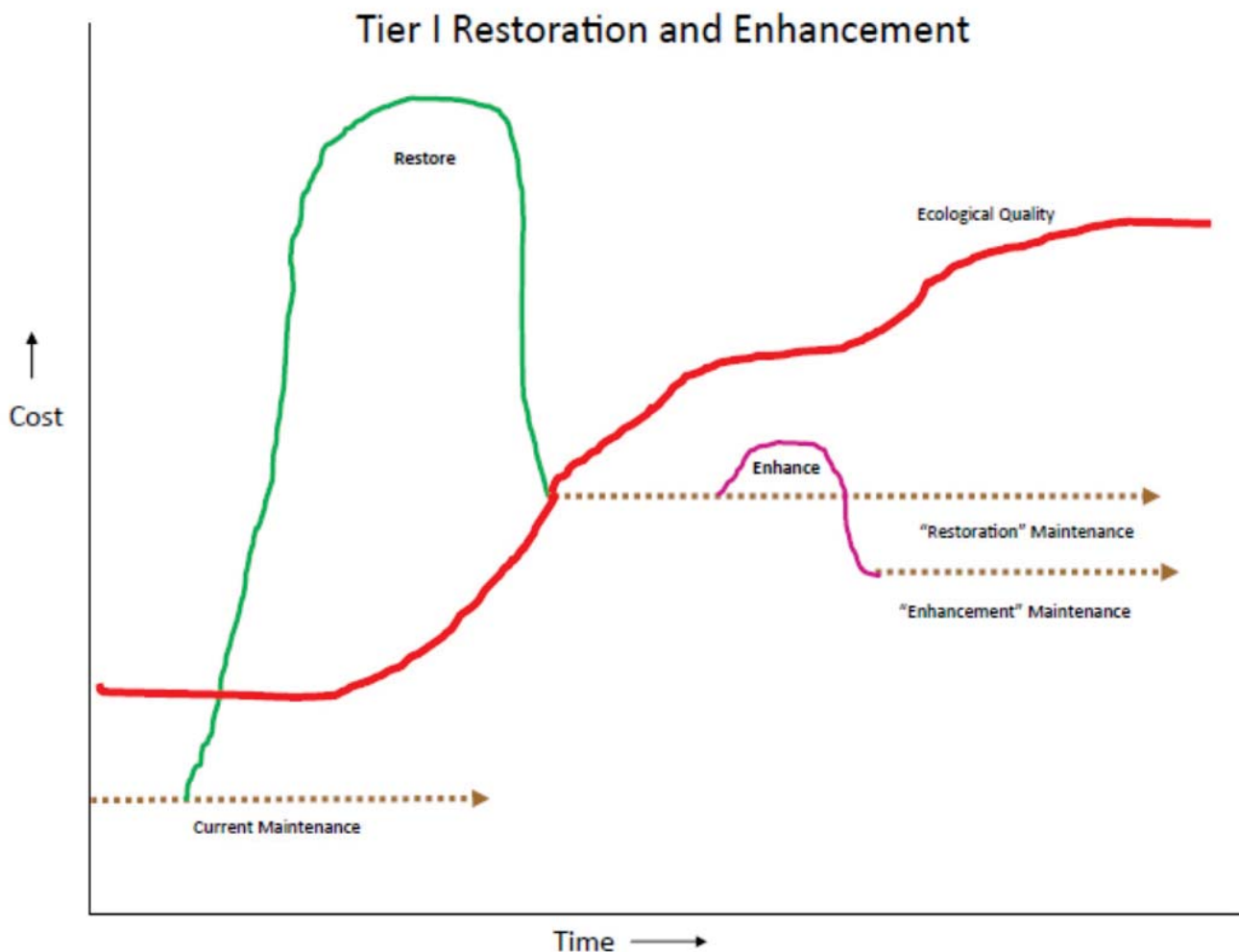
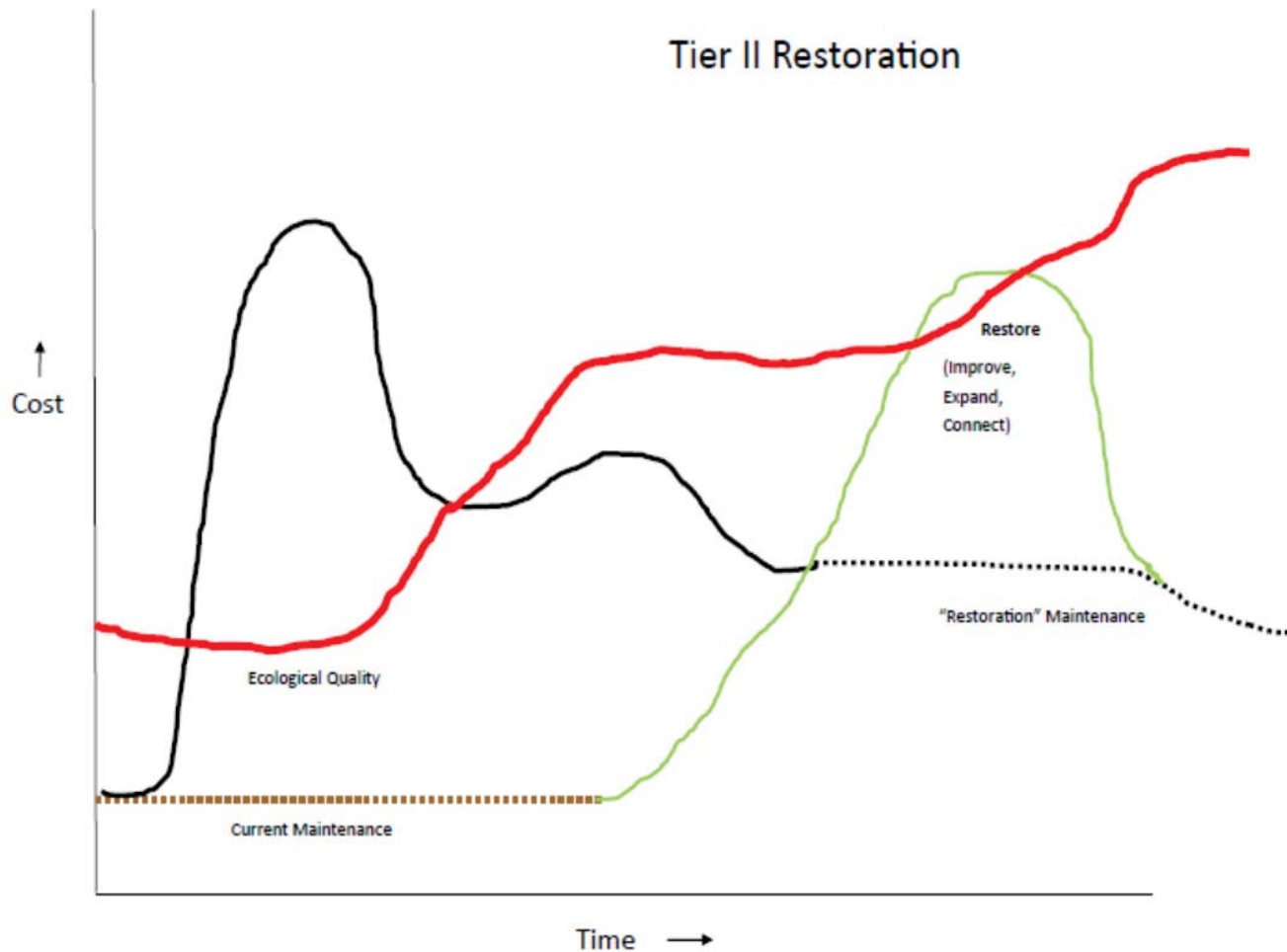


Figure 57. Tier 2 Vegetation Restoration and Enhancement Model. As with Tier 1, the graph illustrates how resource quality increases steadily and maintenance costs drop with added management inputs. The rate of ecological quality increase will vary; this is a conceptualization. As is shown in the graph, many of the greatest benefits occur in the initial stages and when expansion (because of habitat reconstruction gains and connection of habitat, since larger core habitats result).



In **Tier 1**, outcomes are described for each activity, with the estimated number of acres, projects, or species being considered. Individual activities were characterized as either restoration/improvement or maintenance. A range of unit costs was developed for each activity in the restoration/improvement and maintenance categories, with a range of total costs estimated over five years. Every effort was made to develop costs based on experience with past restoration and management projects, or to use professional judgment to estimate costs. Variation around the low and high costs could be as much as 50 percent.

Tier 2 consists of recommended activities without specific outcomes or costs. These activities will be more fully developed in the next few years based on County Board comments and direction,

and the data gathered by monitoring the effects of implementing the Tier 1 activities.

For both Tier 1 and Tier 2, the quality of outcome in vegetation, water and wildlife of parks, and in greenways and easements, will be rated using a four point scale. The rating scale for vegetation follows that used by the Minnesota Department of Natural Resources: A = excellent, B = good, C = fair, and D = poor. See **Appendix P** for a full explanation of this rating system.

In general, the public indicated the strongest support for vegetation and water management, and for conservation easement management, with slightly less support for wildlife management and natural resource management in greenways (see **Appendix O** for public meeting summaries). Planning Commission members indi-

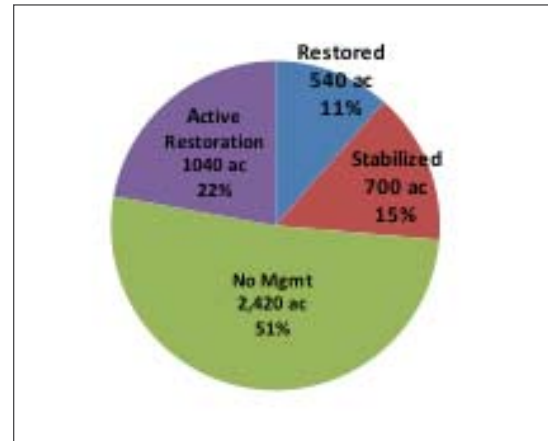
cated a strong support for the proposed implementation approach, but felt that the draft plan was too ambitious and should be scaled back. As a result of this input, the activities were not altered significantly, but the expectations for some outcomes were reduced.

11.2.2. Increasing County Capacity

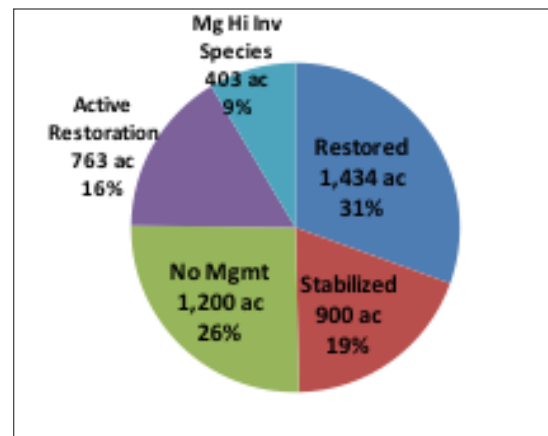
Earlier surveys and public meetings and those completed during this NRMSP process underscored how strongly County residents feel about improving natural resources. While the County's natural resource management program has expanded recently, the County's capacity needs to be augmented to achieve the goals outlined in this plan. At the County's current capacity, all of the lands infested with invasive plants are not being managed, old fields proposed for conversion to prairie have not all been converted, many water quality issues have not been addressed, and some high quality natural areas have not been protected from future degradation. In implementing this NRMSP, lands not currently being actively managed under a formal plan will be brought into the intensive initial phase of restoration and management.

About half of the County's 4,700 acres of natural vegetation in parks and greenways are currently receiving some kind of natural resource management (**Figure 58**). Not all of this management is as intensive as restoring a cornfield to prairie. Some management involves simply removing the oldest buckthorn plants to prevent them from shedding seed. After implementing this NRMSP for five years, by 2022 the County anticipates that about three-quarters of its park and greenway vegetation will be under natural resource management. About one-third of the vegetation will have been fully restored and under long term management, at a lower per-acre cost than the per-acre cost of restoration. Furthermore, after 20 years of implementation, the County anticipates that 98 percent of its park and greenway vegetation will be under natural resource management, with nearly three-quarters of that restored.

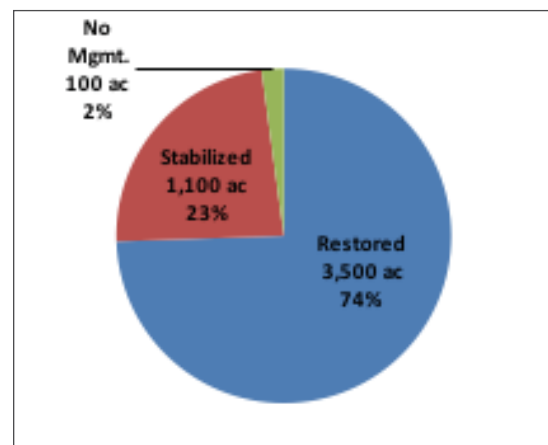
Figure 58. Expansion of Dakota County park and greenway vegetation management, 2017 to 2037
Current Status (2017)



Tier 1 Status (2022)



Tier 2 Status (2037)



Using the strategies discussed in Section 11.1, Dakota County will implement Tier 1 activities and bridge the gap between existing capacity and needed capacity. The details of bridging the gap are discussed in detail in Section 11.3 below.

11.3. IMPLEMENTING TIER 1 MANAGEMENT (2018-2022)

Goals for management of vegetation, water resources, wildlife, greenways, and easements were discussed earlier in Section 10.3 of this plan. The following sections lay out the County's top priority Tier 1 activities for achieving these goals. As this plan is strategic, not operational, the activities in Tier 1 provide guidance, rather than present the specifics of what should happen. For that level of detail, a Natural Resource Management Plan will be written (Section 6.3), developing activities to fit the particulars of each County park, greenway, and easement.

11.3.1. Vegetation Management in Parks

The County's native plant communities are most threatened by invasive plants, lack of management (especially in high quality natural areas), lack of consistent monitoring, and lack of site-specific plans for all major natural areas. The following actions have been identified as top priorities for vegetation management in the County.

11.3.1.1. Control/Manage Most Highly Invasive Species on All County Lands

Invasive plants have been identified as one of the most significant natural resource concerns in the County. Invasive plant species that pose the greatest threat to Dakota County lands and vegetated wetlands will be removed as described in **Table 12**. As a Tier 1 priority, strategic management of these species will take place in all uplands and wetlands on County lands.

Table 12. Invasive plants that pose the greatest threat to County lands and wetlands.

Common Name	Scientific Name	Notes and General Control Strategy
Uplands		
Common & glossy buckthorn	<i>Rhamnus cathartica & Frangula alnus</i>	Very common. Remove all, but begin with seed-bearing plants if total removal is not feasible.
Non-native honeysuckles	<i>Lonicera tatarica, L. morrowii & L. x bella</i>	Very common. Remove all, but may begin with seed-bearing plants.
Siberian elm	<i>Ulmus pumila</i>	Common. Selective removal where it can spread easily.
Black locust	<i>Robinia pseudoacacia</i>	Common. Selective removal where it can spread easily.
Amur maple	<i>Acer ginnala</i>	Uncommon. Selective removal where it can spread easily.
Spotted knapweed	<i>Centaurea stoebe subsp. micranthos</i>	Common. Remove all.
Bull & nodding thistles	<i>Cirsium vulgare & Carduus nutans</i>	Common. Remove all.
Garlic mustard	<i>Alliaria petiolata</i>	Common. Remove all.
Japanese hedge parsley	<i>Torilis japonica</i>	Uncommon early invader. Remove all.
Wild parsnip	<i>Pastinaca sativa</i>	Common. Remove all.
Smooth brome	<i>Bromus inermis</i>	Very common. Remove where it threatens active restoration/management areas.
Wetlands		
Reed canary grass	<i>Phalaris arundinacea</i>	Very common. Remove where it threatens natural area.
Invasive cattails	<i>Typha angustifolia and T. x glauca</i>	Very common. Remove where it threatens natural area.
Purple loosestrife	<i>Lythrum salicaria</i>	Very common. Remove where it threatens natural area (biological control options)
Canada thistle	<i>Cirsium arvense</i>	Very common. Remove all.

Based on the presence and distribution of target invasive species, it is estimated that approximately 400 acres of uplands and wetlands will be specifically managed for the most highly invasive species, in the first five years of this plan. This acreage is in addition to the areas that are to be restored (Section 11.3.1.2).

Management will include a variety of proven methods to kill, remove, and control these aggressive plants. Techniques include cutting, mowing, pulling, herbicide, prescribed burning, and biocontrol. Techniques will be selected and applied based on individual site conditions and other factors.

11.3.1.2. Restore/Enhance Important Natural Areas and High-use/Educational Areas

Lands included in this activity will be restored or enhanced in the first five years of the plan. Areas meeting the following criteria total approximately 820 acres:

- Native plant communities identified by the DNR County Biological Survey
- Minnesota Land Cover Classification System (MLCCS) natural communities identified as BC quality or better (see **Appendix P** for quality rank definitions)
- All wetlands warranting restoration or enhancement
- Aquatic buffers (land within 100 feet of public waters)
- High-use or educational areas in County Parks

High-use and educational areas in the parks include the following:

Lake Byllesby Regional Park

- Boat launch
- RV campground
- East unit trail network

Lebanon Hills Regional Park

- Around McDonough Lake
- North of Schulze Lake
- North of Portage Lake
- North of Marsh Lake
- Area between Portage and Marsh Lakes
- Holland Lake picnic area and fishing pier
- Jensen Lake picnic area and lake loop trail

- Camp Sacajawea
- Wheaton Pond campground and lake loop trail
- West trailhead

Miesville Ravine Park Reserve

- Trout Brook trail network
- Cannon River picnic area and water access

Spring Lake Park Reserve

- Schaar's Bluff Gathering Center and nearby areas and trails
- Archery Trail
- Camp Spring Lake Retreat Center

Whitetail Woods Regional Park

- Camper cabins
- Picnic area
- Trail along south shore of Empire Lake

Thompson County Park

- Dakota Lodge
- Entire trail network

Restoration and enhancement needs and activities will vary significantly over these diverse areas. Actions may include the invasive plant management techniques listed above as well as live native plantings, native seeding, and establishment or enhancement of aquatic buffers.

Although all of the County parks in the system have high-use areas, the following maps (**Figure 59** and **Figure 60**) show examples of high use areas from two parks: Lebanon Hills Regional Park, and Spring Lake Park Reserve.

Install signage (permanent and/or temporary) or add information to the existing kiosks, or new kiosks, at various locations throughout the park, but especially at the site of restoration activity, which explains and showcases natural resource restoration efforts and the benefits of such restoration, to help educate and inform people. Continue to partner with experts to provide programming on natural resource management issues to the public (e.g., "Parks & Pints").

Figure 59. High-use areas in Lebanon Hills Regional Park

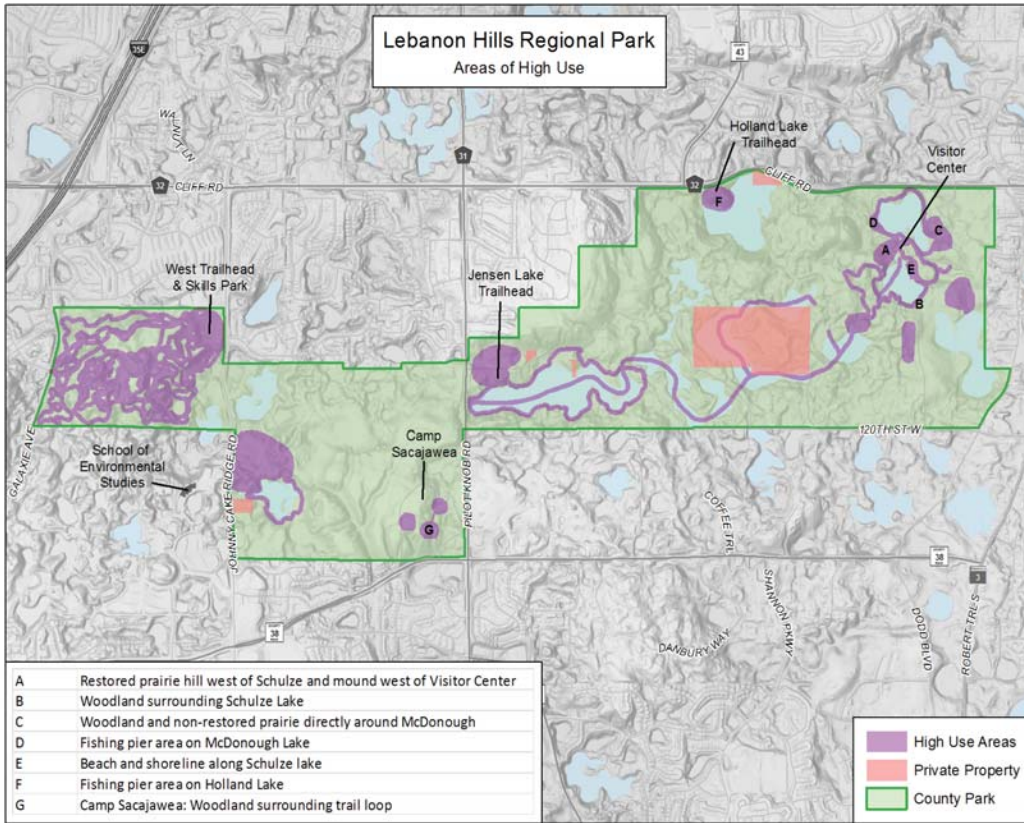
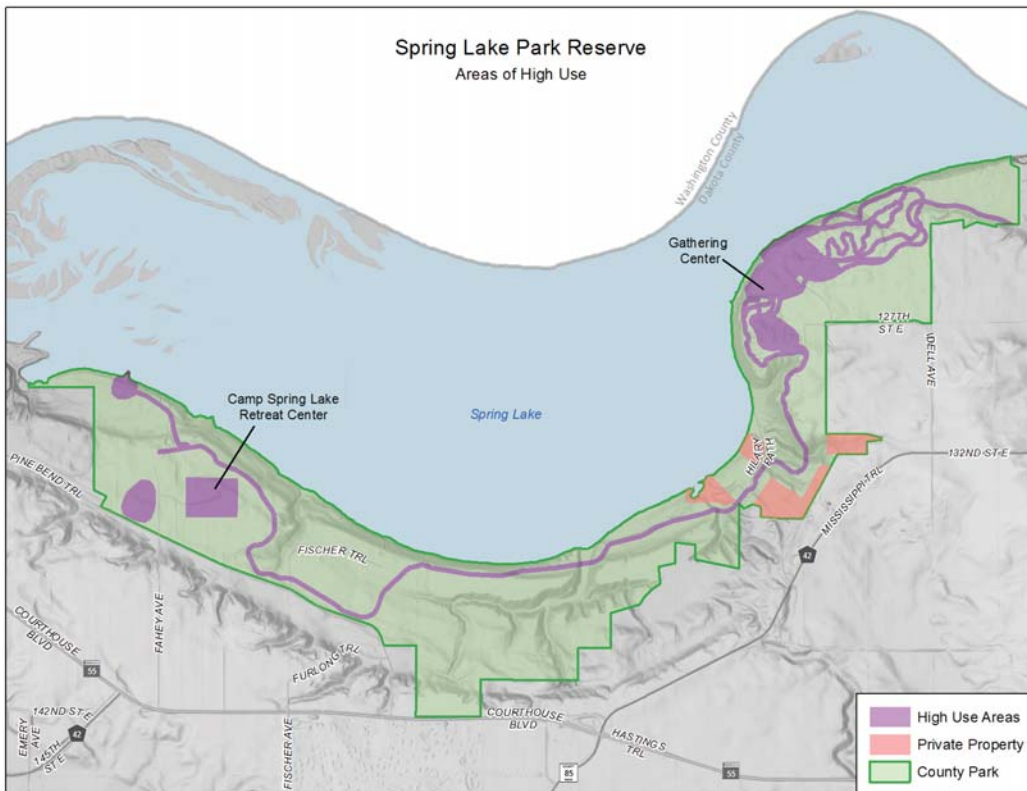


Figure 60. High-use areas in Spring Lake Park Reserve



11.3.1.3. Maintain All Existing and Newly Restored Areas

In order to protect natural resources investments already made, the County will provide perpetual management for all existing and newly restored County natural areas. **Table 2** in Section 6.1 represents a partial inventory and acreages of many of the County's restored natural areas, which will total approximately 2,400 to 2,700 acres at the close of the first five years of the implementation of this plan. The level of restoration will vary among these areas, but all will be inspected and managed on a schedule. Perpetual management will consist primarily of monitoring, invasive plant control, and prescribed burning of fire-dependent ecosystems. Performance standards will vary depending on the location and character of each restored natural areas. Regularly monitor prairie restoration sites for forb diversity. If forb diversity is too low, take steps to increase forb diversity.

11.3.1.4. Stabilize Invasive Plant Species Control Areas

Following initial invasive control (addressed under Section 12.3.1.1), follow-up invasive plant species control will occur at least every five years, but will focus on seed-producing woody invasive shrubs (generally ≥ 0.5 " diameter at breast height). These stabilization activities are estimated to cover a total of 1,100 acres. Stabilization activities are like those for other invasive species discussed in section 11.3.1.1.

11.3.1.5. Collect Baseline and Trend Data

Ecological monitoring helps to assess if project goals are being achieved and allows adjustments to be made to improve outcomes. Monitoring is a key component of adaptive management. Vegetation monitoring can be accomplished using a variety of techniques, ranging from basic to more rigorous methods. Several monitoring techniques are listed in **Table 13**. A more detailed approach to monitoring is found in Section 11.5.

Table 13. Techniques for vegetation monitoring.

Monitoring Technique	Description and Notes
Reconnaissance Level (Basic Effort)	
Walkabout	General site observations
Photo-documentation	Fixed-photo reference points; plot and landscape photos
Qualitative Level (Intermediate Effort)	
Vegetation species lists	General plant species observations
Quantitative Level (Rigorous, Detailed Effort)	
Timed-meander search	Semi-quantitative species list, with diversity estimation
Vegetation plots (e.g., relevés)	Size varies by plant community; gives structure, composition and diversity
Vegetation transects	Type varies by plant community; gives structure, composition and diversity
Tree cores	Measures the age of trees

The County already conducts vegetation monitoring at select locations, including most planted prairies, some prairie remnants, most grant-funded restoration areas, and in some woodlands. Woodland monitoring includes portions of Whitetail Woods, Miesville Ravine, Lebanon Hills, and Spring Lake Park. The County inventories plants using relevés and transects. It also documents overall site conditions with repeat photography.

County lands and wetlands will be monitored in the following way. Specific natural areas may warrant more rigorous techniques.

Conduct a walkabout three times each year (May, July & September). Focus on high quality areas, areas of concern and areas that experienced recent restoration, enhancement and management attention.

Where warranted, assess specific performance standards using appropriate monitoring methods, especially work by contractors and areas of high profile or concern.

Prepare brief year-end report summarizing observations and performance measurements.

11.3.1.6. Develop Individual NRMPs for Each Park

The County has already made a commitment and begun to prepare Natural Resource Management Plans (NRMPs) for all of its parks (Section 6.3). These NRMPs will provide park-specific restoration, enhancement and management recommendations, and include details regarding performance standards and monitoring tech-

niques appropriate for each park. NRMPs will be updated every five to ten years following adaptive management. For details on how the NRMPs will be coordinated with the Master Plans, that is, how natural resources objectives will be coordinated with visitor services objectives, see section 11.6.2.

11.3.1.7. Develop a New Private Sector Funding Program

Acknowledging that the primary responsibility for natural resource management on public lands lies with public agencies and with the owners of private lands on which the County holds easements, there is also significant interest on the part of citizens, organizations and businesses to improve natural resources. The County will research other models from across the country and explore options to develop a private sector program to support the County's efforts.

There are several cities, watersheds, and the SWCD that have established private sector funding programs in place. Collaboration with other organizations could reduce the need to develop an independent policy, criteria and process for a funding program.

Coordination with existing and established programs has been emphasized throughout the Technical Advisory Committee meetings as a need to accomplish plan goals. Efforts should be coordinated to the extent possible.

The various Tier 1 vegetation management activities to be implemented in parks, as well as estimated acreages and costs, are summarized in **Table 14**.

Table 14. Tier I vegetation management in parks.

Activity	Acres	Estimated Cost
1. Control/manage most highly invasive species on all County lands	403	\$869K
2. Restore/enhance important natural areas and high-use/educational areas	763*	\$3.2M
3. Maintain all existing and newly restored areas (annually)	1,434	\$2.9M
4. Stabilize invasive plant species control areas (every 5 years)	900	\$728K
5. Collect baseline and trend data	4,000	\$33K
6. Develop individual NRMPs for each park	-	\$0 (in CIP)
7. Develop a new Private Sector Funding Program	-	\$54K
TOTAL	4,700 (3,500 managed and 1,200 not managed)	\$7.8M

*Does not include the active restoration of an additional 355 acres that will carry over to year 6 (2023)

11.3.2. Water Management in Parks

The County's most important surface waters will be managed more aggressively to address surface water impairments. Protection and restoration of priority County waters will necessitate working with partners in the watershed. The County will also increase its efforts to proactively detect and manage the most significant aquatic invasive species (AIS) in County-owned/managed waters. It is an overarching County goal that water leaving parks should be as clean or cleaner than water entering parks. The following actions were identified as top priorities for water resources management in the County:

11.3.2.1. Restore, Enhance, and Manage Highest Quality/ Most-Used Park Waters in Parks

The County's highest quality and most recreationally-used lakes and streams located within its parks are described in **Table 8**. Of these waters, the following were identified as Tier 1 priorities to be managed within County lands in the first five years of this plan.

- Schulze Lake – Mesotrophic lake; the only designated swimming lake in Dakota County Parks
- Jensen Lake – Eutrophic lake; popular for canoeing, but dense with aquatic vegetation

- Other lakes in Lebanon Hills that will be identified by the Lake Study (2017)
- Empire Lake – Eutrophic lake; quite shallow
- Thompson Lake – Shallow lake; eutrophic; contaminated with Polyromantic Hydrocarbons (PAHs)
- Trout Brook – Trout stream, valued highly by anglers, harboring rare native brook trout
- Spring Lake Park Ravines – Stabilize and restore “blowouts” in ravines

Using the County’s previous work, its consultants, and its partners, watershed assessments will be completed for these water bodies. Those assessments will identify the best opportunity on County-owned land for addressing existing or anticipated future impairments. Projects to improve water quality and address impairments can include rain gardens, drain tile intercepts, treatment wetlands, stormwater treatment trains, and other proven stormwater BMPs. In-lake treatments, such as alum applications, may also be utilized.

11.3.2.2. Control the Most Harmful Aquatic Invasive Species (AIS)

The most harmful AIS in waters of Dakota County parks, greenways, and easements are Eurasian watermilfoil and curly-leaf pondweed. Control of these species will entail mechanical removal and/or chemical treatments. Recent lake studies by Blue Water Science (BWS) will guide future implementation of AIS projects. Control goals are listed below:

- Removal/treatment of known AIS populations shall occur on 200 acres of County waters
- Removal/treatment shall occur in target areas at least once every three years
- Each removal/treatment effort shall result in at least a 75 percent reduction of visible biomass

There is a risk of spreading these invasive aquatic plants when using mechanical removal methods. Only highly regarded specialists should be engaged in this work. Furthermore, unless there is a reasonably robust local population of native plants, vegetation competition against the invasives will be weak, allowing regrowth to occur more quickly. Controlling nutrient inputs with other Tier 1 activities will also help reduce competition by invasive species. Additional AIS control techniques are discussed in Section 11.3.2.5.

11.3.2.3. Work with Partners to Protect and Manage Areas Outside of Parks that Benefit Park Waters

Informed by the watershed assessments discussed in Section 12.3.2.1 above and similar studies throughout the County (including “One Watershed, One Plan” reports), the County will identify 15 water resources management projects to protect and enhance County-owned or managed waters. Projects will be focused on Trout Brook since it has been well-studied, and the SWCD has already identified over 400 potential projects to protect and enhance this valued resource. Recent lake studies by BWS will guide future implementation of lake protection and improvement projects. The County will work with partners in each project subwatershed to identify and pursue the most cost-effective solutions. Partners may include cities, SWCD, conservation nonprofits, University of Minnesota, private corporations, and private landowners.

Cities, watershed management organizations and the SWCD continue to conduct planning efforts, complete targeted sub-watershed analyses, and implement natural resource projects in areas that encompass or contribute runoff to County properties. These countywide efforts should be coordinated and incorporated with appropriate adjustments through adaptive management.

11.3.2.4. Collect Baseline and Trend Data

Baseline monitoring data and subsequent annual monitoring for detecting and characterizing trends will take place annually at the following three parks:

- Lebanon Hills
- Miesville Ravine
- Whitetail Woods

The following water bodies will also likely be monitored:

- Schulze Lake (Lebanon Hills)
- Jensen Lake (Lebanon Hills)
- Holland Lake (Lebanon Hills)
- McDonough Lake (Lebanon Hills)
- Marsh Lake (Lebanon Hills)
- O’Brien Lake (Lebanon Hills)
- Portage Lake (Lebanon Hills)
- Wheaton Pond (Lebanon Hills)
- Empire Lake (Whitetail Woods)
- Trout Brook (Miesville Ravine)

Thompson Lake is being monitored in a separate study. Lake Bylesby, extensively monitored by the MPCA, presents significant management challenges given its location downstream of a large portion of the Cannon River watershed.

Monitoring techniques that will be used for baseline and trend monitoring in these waters include:

- Water clarity sampling, using Secchi disk readings in lakes and Secchi or transparency tubes in flowing waters
- Water quality analyses, especially of total phosphorus and chlorophyll-a, which together with water clarity, allow calculation of a water quality index called the Carlson Trophic State Index. Other important data to collect include: conductivity/chloride, alkalinity, and total Calcium. Much of this data has been collected for Dakota County Lakes during a survey conducted by BWS in 2016.
- Aquatic macroinvertebrate sampling in streams

The DNR's Lake Finder and the MPCA's Environmental Data Access internet sites have data on individual lakes which will be reviewed when NRMPs are written. The County is using the Wetland Health Evaluation Program (WHEP) as a structure for macroinvertebrate sampling and vegetation monitoring in wetlands. WHEP, River Watch, and the Stream Health Evaluation Program will be reviewed and adapted to monitor surface waters in County parks.

Salt is commonly used to reduce the negative effects of icy conditions on roads, park lots, driveways, and sidewalks. Unfortunately excessive use has led to increased salt levels in area lakes and ponds - especially those in watersheds that have high amounts of impervious surfaces. Find ways to abstain, limit or reduce salt usage on trails, board walks and paths, especially near (within 500 feet) surface waters within parks and greenways and work with partners to reduce salt in associated watersheds.

Coordination with entities within the county (cities, watershed management organizations, SWCD) that implement existing monitoring programs is highly encouraged to properly identify the monitoring needs, maintain consistency in the type and quality of the data collected, and ensure that proper standards and protocol are used.

11.3.2.5. Prevent New AIS from Invading Surface Waters

The County's surface waters are vulnerable to the introduction of new AIS, including those already found in the state and newly discovered species. A harsh reality of AIS is that they will never be eliminated, but their spread can be slowed using a variety of programs.

The County will periodically monitor its lakes to search for AIS. Early detection and rapid response provides the best opportunity for eradication or control. If AIS are found, the County will consult with the DNR to identify the best treatment options and will attempt to eradicate or control new infestations, as warranted. Quarantine programs (where boats are tagged as either infested or uninfested watercraft and their use limited accordingly) are another effective way to prevent new invasions and limit the spread of AIS.

The lakes of Lebanon Hills Regional Park (LHRP) are the biggest AIS concern in the County, due to all the perimeter lakes being colonized to a light or moderate level by curly-leaf pondweed and Eurasian watermilfoil. Watercraft access restrictions are very appropriate to prevent the spread of these plants to the few remaining uninfested lakes. The water route at LHRP may inadvertently spread AIS. Watercraft on Empire Lake (currently not open to the public) could be limited to County-rented watercraft. The ongoing BWS study of AIS distribution in lakes has the potential to identify locations where AIS are likely to first become established. This and other information will enable the County to plan for early detection and prevention of AIS spread in its waters, estimated at 300 acres.

The County has recently undertaken a study to work with and educate garden centers/nurseries and pet stores to prevent the introduction of AIS from these sources and their customers. Common aquarium plants such as Brazilian waterweed, or water garden plants such as parrot feather, can become invasive if released to surface waters intentionally or unintentionally. Fish such as koi or goldfish can infest and adversely affect lakes, streams, and wetlands.

The various Tier 1 water management activities to be implemented in parks, as well as metrics and estimated costs, are summarized in **Table 15**.

Table 15. Tier I water management in parks.

Activity	Metric	Estimated Cost
Restore, enhance and manage highest quality/most-used park waters via park projects	4 projects	\$305K
Control the most harmful aquatic invasive species (AIS)	200 acres	\$0 (already underway via external funds)
Work with partners to protect and manage areas outside of parks that benefit park waters	15 projects	\$1.3M
Collect baseline and trend data (annually)	5 parks	\$145K
Prevent new AIS from invading surface waters	300 acres	\$0 (already underway via external funds)
TOTAL		\$1.7M

11.3.3. Wildlife Management in Parks

Wildlife species are important natural resources in and of themselves, but some species are also useful indicators of ecosystem health. Monitoring “umbrella species” (which, if protected, result in the protection of many other species) are particularly useful for guiding natural resource management programs. This approach can also be effective at protecting Species of Greatest Conservation Need.

Wildlife species vary significantly with regard to their habitat needs, including the size and arrangement of habitat areas necessary for populations to persist long term. The County places wildlife in three management groups related to how populations use the County’s parks (**Table 16**).

Table 16. Wildlife management groups.

Wildlife Management Group	Definition and Implications for Management
Group 1	Park-specific or very local species. Populations of individual species whose habitat and range are almost entirely within a park, and hence can be managed and sustained inside a park. Butterflies, dragonflies, damselflies, some small mammals, and some reptiles and amphibians are in this group.
Group 2	Local to regional species. Populations of individual species that regularly use County parkland, but to persist long-term must also use lands outside parks. Large mammals, many bird species, large reptiles and amphibians, many fish species, many aquatic macroinvertebrates, and freshwater mussels are in this group. Managing species in this group requires partnerships with others, often at a regional level.
Group 3	Migratory. Populations of individual species that use County park habitat in the spring and fall migration, but do not breed there. Managing these species can occur at a continental scale, with some bird migrants traveling from southern South America to the Arctic tundra each year.

11.3.3.1. Collect Baseline and Trend Data

As with vegetation monitoring, collection of baseline and trend data on wildlife will allow the County to track progress and allow for adaptive management. Wildlife monitoring will also help refine priorities for selected species. Trends are usually established only after several years, so increased sightings of target species, offspring, or tracks may not be evident until 2021 or 2022. To establish a solid baseline against which future measurements can be compared, the first monitoring effort should be at the six major County parks using quantitative methods, including bird point counts, dragonfly/damselfly transects, and frog/toad calling surveys. Also beginning

immediately should be multiple walkabouts each monitoring year, with monitoring conducted every other year in each park. Volunteers can assist with some types of surveys (e.g., frog and toad surveys), depending on their experience level, training, and supervision. Trail cameras, already in use by the County, can also be an important component of wildlife monitoring programs.

11.3.3.2. Work with Partners Outside of Parks

The County, working with partners, will identify, design, and proceed with five habitat improvement projects outside County parks. Ideal partners will own large parcels adjacent to or near County nat-

ural areas. These habitat improvement projects will target the same five species listed above in Section 12.3.3.1. Because the County has limited experience with managing wildlife, especially in partnerships, this activity will proceed slowly at first, in order to learn how to do these types of projects.

11.3.3.3. Focus on Group 1 Rare and Endangered Wildlife Species

The County has the greatest opportunity to protect and improve populations of Group 1 wildlife since they can control most of the habitat requirements of these species. In order to improve habitat for rare species, the concept of indicator species is used. When an indicator species is present, it means that the size and quality of habitat is good overall, not just for that species, but for others, too. The County selected the following indicator species to represent quality of major habitat types in its parks:

- Forests: Ovenbird
- Shrublands/Woodlands: Brown thrasher and Eastern towhee
- Grasslands: Regal fritillary
- Wetlands: Blanding’s turtle, Spotted salamander, Virginia rail
- Streams: Brook trout

Habitat improvement projects for these species will be undertaken on County lands. This will require a census to determine where they are in the parks, followed by evaluation of habitat suitability for increasing their numbers, and related research. This effort could be greatly aided by partnerships with other land owners and managers (see Section 11.3.3.2 below).

11.3.3.4. Protect Other Important Wildlife

The County will improve habitat for other wildlife species, focusing on animals that are important, interesting, or popular with the public (e.g., badger, fisher, and otter). These improvements will consist of ten projects, strategically located and designed for specific wildlife species. Expand butterfly and other pollinator and beneficial insect habitat. Expand bat habitat and promote increases in bat populations.

11.3.3.5. Control Problem Wildlife

A variety of animal species can cause problems for natural areas and restoration and management efforts. The only nuisance wildlife species managed currently by the County is white-tailed deer. As mentioned previously, controlled deer hunts occur at three parks (Lebanon Hills, Spring Lake, and Miesville Ravine) and they will continue in order to prevent high deer densities, which lead to over-browsing of native vegetation and damage to restoration

plantings. Deer population control efforts also result in human safety benefits by reducing collisions with cars and slightly reducing the incidence of Lyme disease. While Canada geese can be a problem, especially in mowed turf areas next to water, they are not a major concern of the County. However, the County may wish to engage, in managing predators such as raccoon and house cats which have a devastating effect on small mammals, nesting songbirds, reptiles, and amphibians. Many of the animals preyed on by these predators are SGCNs experiencing population declines in part due to excessive predation. Also, attention should be given to controlling problematic and nuisance pests such as emerald ash borer, oak wilt fungus, and gypsy moth.

The various Tier 1 wildlife management activities to be implemented in parks, as well as metrics and estimated costs, are summarized in **Table 17**.

Table 17. Tier I wildlife management in parks.

Activity	Metric	Estimated Cost
Collect baseline and trend data (every other year)	6 parks	\$489K
Work with partners outside of parks	5 sites	\$323K
Focus on rare and endangered wildlife that are Group 1 species	3 to 5 species	\$107K
Protect other important wildlife and improve populations	10 sites	\$211K
Control problem wildlife	6 parks	\$111K
TOTAL		\$1.1M

11.3.4. Management of Greenways

Due to the multiple-ownerships in greenways and the County's limited control, only priority investments should be made in greenways. The County, working with partners, should control the most highly invasive species, restore and enhance the most important greenway lands and easements, monitor wildlife indicator species, and develop NRMPs for each greenway.

11.3.4.1. Control Highly Invasive Species on County-Owned Greenway Land

Highly invasive plant species (**Table 12**, Section 11.3.1.1) will be managed annually on approximately 180 acres of County-owned greenway land.

11.3.4.2. Restore/Enhance, High Quality Natural Areas and Areas within County-Owned Land

An estimated 60 acres of high quality natural areas on County-owned greenway land will be restored or enhanced in order to improve water quality, wildlife habitat and recreational experiences.

11.3.4.3. Maintain Existing Restored Areas within County-Owned Lands

Existing restored greenway areas on County-owned greenway land (approximately 180 acres) will be maintained annually.

11.3.4.4. Develop NRMPs for each Regional Greenway

NRMPs will be developed for each regional greenway and updates will be completed every five years.

The various Tier 1 greenway management activities, as well as estimated acreages and costs, are summarized in **Table 18**.

Table 18. Tier I greenway management.

Activity	Acres	Estimated Cost
Control highly invasive species on County-owned greenway land	180	\$151K
Restore/enhance, high quality natural areas and areas within County-owned land	60	\$140K
Maintain existing restored areas within County-owned lands	180	\$25K
Develop NRMPs for each regional greenway	All	\$215K
TOTAL		\$531K

11.3.5. Natural Resource Management On Private Property with County Easements

Since easements are on privately owned property, public investment for natural resource management on these protected lands should focus on the highest quality natural resources, priority areas that benefit water resources (including shoreland and wetlands), lands adjacent to large protected natural habitats, and lands with committed landowners. Public investments would be leveraged using cost-share agreements based on the following ratios:

- Shoreland Areas: Public (County plus external) provides up to 90 percent Landowner provides at least 10 percent
- Upland Areas: Public (County plus external) provides up to 75 percent Landowner provides at least 25 percent

Landowners would be required to conduct two to three years of management following publicly-funded restoration projects. The restoration and maintenance responsibilities of the County, land-

owner and other partners would be based on updated NRMPs developed between the landowner and the County (and partners) and formulated into a five-year natural resource management agreement between the landowner and the County.

11.3.5.1. Control Highly Invasive Species

Highly invasive plant species (**Table 12**) will be managed annually on approximately 800 acres at an estimated cost of \$600,000.

11.3.5.2. Restore/Enhance High Quality Areas and Shoreland Buffers

Approximately 600 acres would be restored where invasive species control has already been initiated at an estimated cost of \$1,000,000. Restoration activities are to be funded using the following cost-share ratio:

- Shoreland (which comprises approximately 50% of the total management area) = County/Landowner: 90/10
- Upland (which comprises approximately 50% of the total management area) = County/Landowner: 75/25

11.3.5.3. Maintain High Quality Shoreland Buffers and Restored Areas

Private landowners will be primarily responsible for long-term maintenance of high quality shoreland buffers and restored areas on their properties estimated to total 2,000 acres. This maintenance would follow the respective NRMP or similar County guidance and be monitored annually by the County.

11.3.5.4. Develop NRMPs for 20 Agricultural Easements

NRMPs will be developed for twenty agricultural easements that contain high quality natural areas and shoreland. This is estimated to address 800 acres of priority lands at an estimated cost of \$150,000. These NRMPs would be updated every five years.

11.3.5.5. Develop NRMPs for All New Conservation Easements

NRMPs would be developed for all newly acquired or donated easements and updated every five years. Costs would be determined based on number of acquisitions.

11.3.5.6. Update existing NRMPs

NRMPs should be updated every five years and would include approximately 1,600 acres with an estimated cost of \$60,000. The various Tier 1 easement management activities, as well as estimated acreages and costs, are summarized in **Table 19**.

Table 19. Tier I easement management.

Activity	Acres	Estimated Cost
Control highly invasive species	800	\$697K*
Restore/enhance high quality areas and shoreland buffers	600**	\$1.1M*
Maintain high quality shoreland buffers and restored areas	2,000	Landowner
Develop NRMPs for 20 agricultural easements	800	\$175K
Develop NRMPs for all new natural area easements	TBD	\$190K
Update existing NRMPs	1,600	\$71K
TOTAL		\$2.2M

* Reflects proposed cost-share ratios under Section 11.3.5.2.

** Invasive species control already occurring

11.3.6. Summary of Tier 1 Expense and Revenue Estimates

Tier 1 activities for all five plan components are grouped in **Table 20** below with expense and revenue totaled for each component. The expenses are the average of a range of expenses for each activity, as detailed in the previous sections. There is uncertainty around the averages, but they provide a working idea of the cost to expand natural resource management on County parks, greenways and easements as described in this NRMSP.

Table 20. Tier I estimated costs, revenues and FTEs.

Service Area	FTE* Permanent	FTE* Temporary	External Funds(\$)	Additional County Cost (\$)	Total Expenses (\$)
Vegetation in Parks	0.4	0.8	3,250,370	-530,775	2,719,595
Water in Parks	0.3	0.4	1,117,500	660,564	1,778,064
Wildlife in Parks	0.2	0.4	540,000	551,458	1,091,458
Greenways	0.1	0.1	202,200	329,419	531,619
Easements	1.0	0.3	1,419,000	803,422	2,222,422
TOTALS	2.0	2.0	6,529,070	1,814,088	8,343,158

***NOTE: Permanent and temporary FTEs should be hired right away, starting in 2018.**

Vegetation is the greatest expense for restoration and improvement, at more than \$7.2 million of project expenses over five years. However, since a considerable amount is anticipated to come from external sources, and since there is already a significant amount allotted in the current CIP (\$5.4 million), the County actually has more money than it needs for vegetation management, producing the negative number in **Table 20**. Work on vegetation management has been occurring longer and the planning and budgeting is more mature than for other Plan components. Easements are the next biggest expense because they are similar to parks in their natural resource management issues, but cover more acres. Water is also a significant expense and warranted given how much is known about how to improve water quality. Poor water quality and aquatic invasive species are also noticeable to users of lakes and streams, more than management issues such as garlic mustard in forests. Although the Natural Resources Department has limited experience

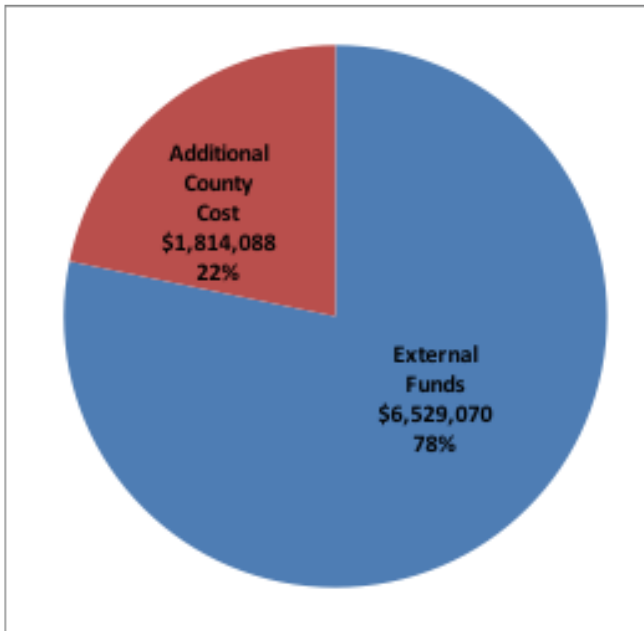
with improvement projects, it can rely on the Dakota County SWCD and Environmental Services department, with whom they will be working closely during project implementation. Wildlife is also a significant expense, but its proposed activities will be refined by completing initial survey work. Greenways receive much smaller amounts, in large part due to the recent idea of managing them and the complexity of land ownership. Greenway vegetation management, however, should not be significantly different than managing vegetation in parks.

In the cost-heavy restoration and improvement phase for Tier 1, about 80 percent of the revenue is anticipated to be leveraged from grants and other sources external to the County (**Figure 61**). The County has had great success thus far in securing grants for this work, and expects that success to continue. By contrast, in the maintenance phase for Tier 1 activities, the County must shoulder about 90 percent of the expense. As each year unfolds, more land will be

added to the maintenance phase, which means that proportionately more money for vegetation will need to be provided each year by the County. On the other hand, the per-acre cost of managing the vegetation will decrease as the quality of the vegetation improves.

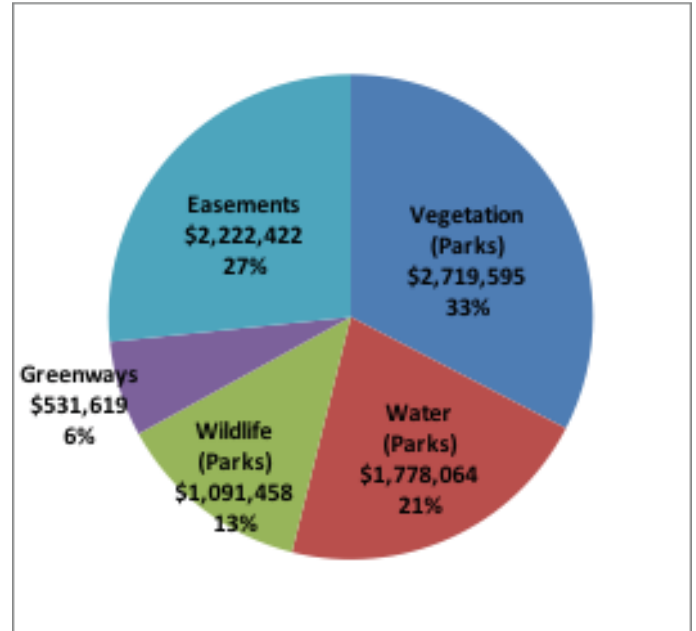
For the five years to execute the Tier 1 activities, the County is estimated to expend \$8.3 million, or averaging about \$1.7 million each year. This cost includes both external costs and currently budgeted CIP for the five-year period of 2018-2022. Lastly, executing the Tier 1 activities will require that 2.0 new permanent and 2.0 temporary employees be hired. Hiring of these new employees should be done right away, starting in 2018.

Figure 61. Tier 1 estimated external funding versus additional County cost.



Of the five plan components (vegetation, water, wildlife, greenways, and easements), the County has done the most natural resources management, has grants in place, and has the best tracking data for vegetation (**Figure 62**).

Figure 62. Tier 1 estimated costs per service area at end of Year 5 of the NRMSP (2022).

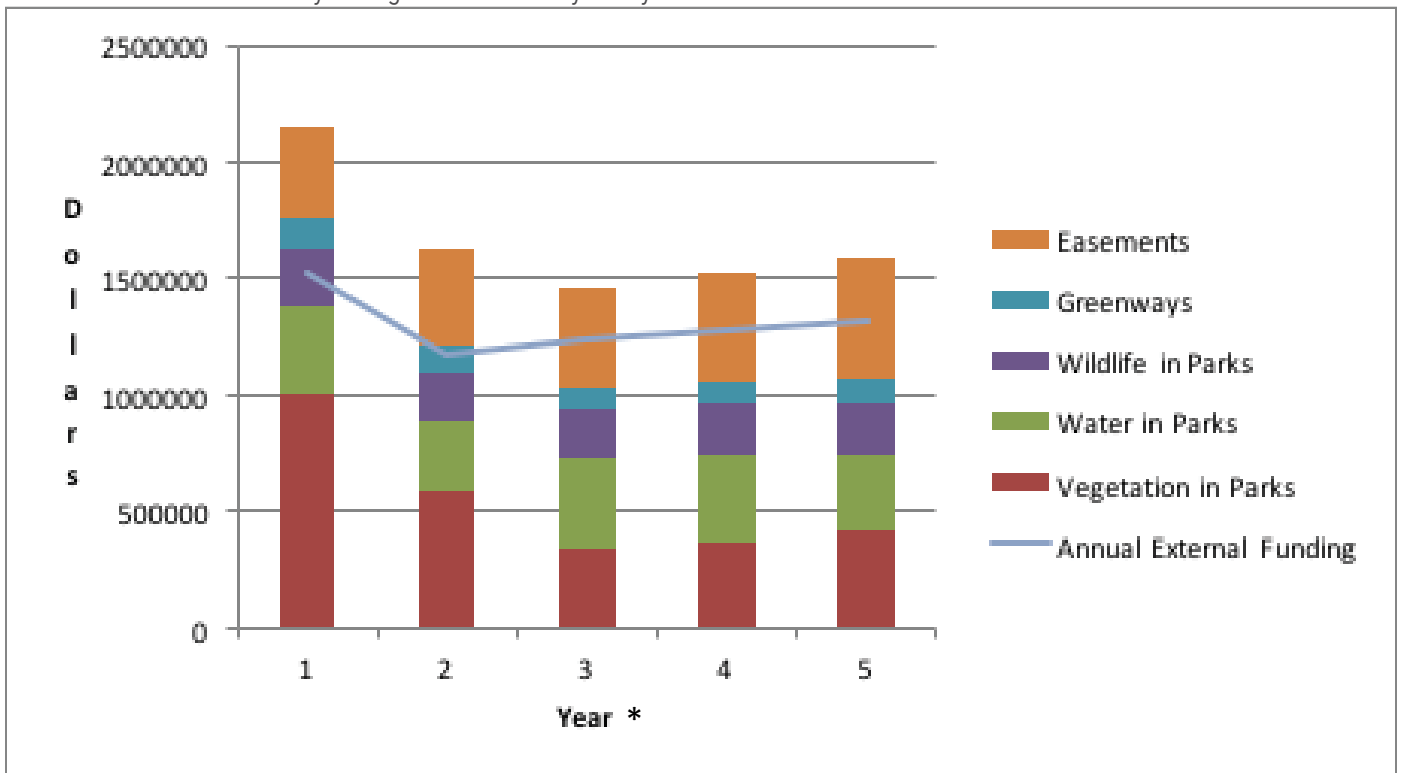


The information above, together with other data and assumptions, leads to the anticipated work that needs to be accomplished, and to the associated costs over the Tier 1 five-year implementation period (**Table 21, Figure 63**). This is presented in the last two lines of Table 21 as external funds and County funds, and is illustrated visually as a proportion of total costs in **Figure 63**.

Table 21. Tier 1 estimated costs over the first five years of implementation (2018-2022).

Service Area	Year 1 2018	Year 2 2019	Year 3 2020	Year 4 2021	Year 5 2022
Vegetation in Parks	1,000,885	583,417	344,576	366,993	423,722
Water in Parks	378,220	308,140	389,001	379,469	323,234
Wildlife in Parks	250,636	207,511	207,511	212,901	212,901
Greenways	131,121	110,636	89,073	97,698	103,089
Easements	389,955	411,518	433,081	461,200	526,670
TOTALS	2,150,817	1,621,222	1,463,242	1,518,261	1,589,616
Annual External Funding	1,526,455	1,177,213	1,234,734	1,279,464	1,311,204
Annual County Funding	597,362	444,008	228,507	238,798	305,412

Figure 63. Estimated annual Tier 1 costs for years 1-5 (2018-2022). The area above the line is the estimated additional funding above current levels which the County must generate internally each year.



*Assumes same CIP funding at Year 5 (2022) as that of Year 4 (2021).

Note: These estimated costs may differ somewhat from other estimates in this plan due to more refined sub-analyses.

11.4. IMPLEMENTING TIER 2 MANAGEMENT (YEARS 6-20)

While Tier 1 activities are the County's top priorities for natural resource management (Section 11.3), Tier 2 represents other important activities that will help achieve the longer-term goals of this NRMSP. However, these activities are less detailed than those in Tier 1. Over this 15-year period (2023-2037), many Tier 1 initiatives will be expanded across more acres in the County system. Several Tier 2 activities repeat commitments made in Tier 1, such as perpetual management of restored natural areas and regular updates to NRMSPs.

The Tier 2 activities described below are intentionally general. Refinement of Tier 2 programs will occur as information from the implementation of Tier 1 activities becomes available, especially the results of Tier 1 monitoring. Holding off on detailed planning and budgeting for Tier 2 has the added advantage of allowing the County to respond to unforeseen opportunities and issues that will certainly arise before 2023 when the Tier 2 period begins. The County's CIP and other budgeting at that time will thus be more refined and accurate.

11.4.1. Tier 2 Vegetation Management in Parks

Vegetation management in Tier 2 will expand the list of targeted invasive species. In addition, restoration and enhancement will focus on habitat connections that enlarge and link wildlife habitats, not just inside parks but also to natural areas beyond County lands. Making habitats more physically connected will improve conditions for wildlife. Vegetation monitoring will continue.

Table 22. Tier 2 Vegetation Management in Parks.

Activities
Control additional invasive species
Restore, enhance, and connect key areas within parks
Work with partners to restore, enhance, and connect other areas outside of parks
Continue vegetation monitoring programs

11.4.2. Tier 2 Water Management in Parks

Water management will expand the list of targeted AIS. Collaborating with partners will be expanded, in order to improve stormwater management in all watersheds that affect parks. Water monitoring will continue.

Table 23. Tier 2 Water Management in Parks.

Activities
Control additional AIS in surface waters
Collaborate and lead in major storm water management best practices and other activities in all watersheds that affect parks
Continue water monitoring programs

11.4.3. Tier 2 Wildlife Management in Parks

Wildlife management will focus on collaboration with partners to protect and manage habitat outside County lands, expansion of wildlife studies, beginning species re-introductions, and continued wildlife monitoring.

Table 24. Tier 2 Wildlife Management in Parks.

Activities
Work with partners and owners of adjacent or large nearby natural areas to protect and manage habitat outside of parks
Expand wildlife studies to include other important species
Re-introduce select wildlife species that are not currently living in parks but once did
Continue wildlife monitoring programs

11.4.4. Tier 2 Management of Greenways

Greenway management will also offer additional opportunities to engage partners to improve natural resources in corridors outside of County lands. On County land, natural resource management work will be expanded to improve plant diversity, manage stormwater runoff, and enhance wildlife habitat.

Table 25. Tier 2 Greenway Management.

Activities
Work with partners to restore, enhance, and maintain high quality vegetation and surface waters within greenway corridors outside of County-owned land.
Various management activities will be increased on existing County-owned lands and/or expanded to new areas or easements depending on: <ol style="list-style-type: none"> changes to existing natural resource conditions changes to adjacent or nearby land ownership or management landowner interest availability of non-County resources

11.4.5. Tier 2 Natural Resource Management on Easements

Easement management will expand efforts to control the most invasive species on a larger amount of easement lands, improve key natural resource areas and buffers, and ensure perpetual management of restored areas.

11.4.6. Funding Summary for Tier 2 Management Activities

Tier 2 activities and estimated costs are presented in **Table 27**. These are broad estimates, so the figures will most likely change. Many components are yet to be determined, so costs are speculative and a range is therefore provided.

Table 26. Tier 2 Easement Management.

Activities
Control highly invasive species on additional land
Restore/enhance key areas that expand and connect high quality areas and shoreland buffers
Maintain additional restored areas

Table 27. Tier 2 Activities and Estimated Costs

Activity	Outcomes & Costs		
	Estimated Acres/Sites Affected	Total Cost (Low)	Total Cost (High)
Park Vegetation (capital)	4,000 ac. inside + 1,000 ac. outside parks	\$5M	\$15M
Park Vegetation (maintenance)	4,600 ac	\$6M	\$12M
Water in Parks (capital)	850 ac. + watersheds outside parks	\$300K	\$2M
Water in Parks (maintenance)	350 ac	\$50K	\$1M
Wildlife in Parks (capital)	600 ac. - 4,000 ac.	\$200K	\$900K
Wildlife in Parks (maintenance)	TBD	\$50K	\$300K
Greenways (capital)	TBD	TBD	TBD
Greenways (maintenance)	TBD	TBD	TBD
Easements (capital)	1,200 ac.	\$1.2M	\$4M
Easements (maintenance)	2,000	\$100K	\$500K
Subtotal, Capital (20 years)	~5,000	\$7M	\$22M
Subtotal, Maintenance (20 years)	~6,000	\$6.2M	\$14M

11.5. MEASURING OUTCOMES

Judging the progress and success of natural resource management on the County's lands and waters requires information. The County will collect information that answers the most important natural resource questions, in the simplest way possible, for the least cost, over the longest time. Questions will reflect the County's vision and goals for natural resources, as expressed in its plans and policies, and the contents of this NRMS. Outcomes will be measured operationally and biologically, the latter in areas of vegetation, water resources, and wildlife. The reality of monitoring is that people want to measure more indicators than staff and budgets can afford. Recognizing this tendency, the most important questions are asked first and as few metrics as possible used to measure outcomes. Measuring outcomes has three steps; 1) establishing a baseline, 2) taking the same measurement on a regular schedule, and 3) comparing several measurements to detect positive, neutral, or negative trends over time.

11.5.1 Operations

Questions

- Do all parks and greenways have an NRMP?
- Do all easements requiring an NRMP have one?
- Are projected CIP funds enough to complete the Tier 1 work by 2022?
- Is County staffing right-sized and efficient for grant and volunteer administration needs?
- Does the County have the needed technical expertise to implement the program?
- Are all easements regularly monitored?

Table 28. Measurement of Operation Outcomes

Question	Metric	Approach
Parks & Greenways With NRMP	Percent completed	Number of NRMPs in new format divided by number of parks and greenways
NRMPs for Easements Needing NRMP	Percent completed	Number of NRMPs in new format divided by number of easement needing NRMPs
CIP Funds Allocated	Percent of needed funds allocated	Allocated 2018-2022 CIP funds divided by 2018-2022 need
Grant & Volunteer Staffing	Percent of needed FTEs	Allocated 2018-2022 FTEs divided by 2018-2022 need
Technical Expertise	Key functions assigned to staff with proper training and licenses	Document fulfillment of key functions: herbicide application training, planting/seeding experience, prescribed burn certification
Easement Monitoring	Percent of all easements monitored annually	Number of easements monitored each year divided by number of easements (3-year rotation)

11.5.2 Vegetation

Questions

- How much of the target vegetation (natural, semi-natural) in parks is being managed?
- How much of the target vegetation in greenways is being managed?
- How much of the target vegetation on easements (if required) is being managed?
- Are uncommon plant communities persisting in parks?
- Is the ecological quality of park vegetation improving?
- Are large core habitats in parks getting bigger or smaller?

Table 29. Measurement of Vegetation Outcomes

Question	Metric	Approach
Target Vegetation in Parks	Percent managed	Acres of managed target vegetation divided by total acres of target vegetation
Target Vegetation in Greenways	Percent managed	Acres of managed target vegetation divided by total acres of target vegetation
Target Vegetation in Easements (required)	Percent managed	Acres of managed target vegetation divided by total acres of target vegetation
Uncommon Plant Communities	Percent managed	Acres of managed uncommon plant communities divided by total acres of same
Ecological Quality	Percent good/fair quality (BC) or better	Assign quality ranks to sample of MLCCS polygons and re-rank every three years; Number of polygons of BC and above divided by all polygons in sample
Core Habitat	Current compared to baseline acres	Acres of core habitat in 2017 divided by acres of core habitat in future

11.5.3 Water Resources

Questions

- Are desired uses of water resources being maintained?
- Is the number of impaired waters in parks decreasing?
- Is water quality in the park’s high quality water resources stable or getting better?
- Do all important park water resources have a watershed plan with projects to fix problems?

Table 30. Measurement of Water Outcomes

Question	Metric	Approach
Impaired Waters	Percent impaired	Count of impaired waters each year divided by count of impaired waters in 2017 baseline
High Quality Water Resources	Percent below trophic status index (TSI) of 50, or equivalent water clarity	Number of high quality water resources with TSI below 50 (or equivalent water clarity) divided by designated high quality water resources in parks
Watershed Plans	Percent completed	Number of watersheds of important water resource with management plan, divided by all watershed of important water resources

11.5.4 Wildlife

Questions

- Are uncommon animal species of forest, shrubland/woodland and grassland stable or increasing in parks?
- Are uncommon animal species in streams and lakes stable or increasing in parks?
- Is habitat generally improving for wildlife?
- Are deer harming plant communities in parks?

Table 31. Measurement of Wildlife Outcomes

Question	Metric	Approach
Uncommon Upland Animals	Number of locations of indicator species	Transect census in forest, shrublands/woodland, grassland for indicator species
Uncommon Aquatic Animals	Number of locations of indicator species	Fish census in streams for brook trout
General Wildlife	Number of native bird species, of dragonflies & damselflies, and of frogs & toads	Point count bird censuses in major habitats, transect dragonfly & damselfly censuses in suitable habitat, frog & toad calling surveys in suitable habitat
Deer Damage	Amount of browsing	Meandering transect to estimate percent of trees and shrubs browsed in past year

11.6. OTHER CONSIDERATIONS FOR IMPLEMENTATION

11.6.1. Project Identification and Prioritization

It is important that potential projects are evaluated individually to ensure that they are soundly conceived and designed, and that they are actually a high priority project. To this end, each potential project will be run through a set of criteria and scored. The criteria will be weighted according to their relative importance to achieving the goals of the NRMSP. Projects that receive a high score would receive the highest priority for funding and execution.

One method being considered is STAPLE-E, a typical bottom-up set of criteria. STAPLE-E considers the following in its scoring:

- S = Social
- T = Technical
- A = Administrative
- P = Political
- L = Legal
- E = Environmental
- E = Economic

A bottom-up scoring system should be balanced by a top-down set of criteria. For example, no one park should receive the majority of funding, even if the needs of that park result in the identification of many important projects. This would help spread the restoration and management work more evenly among parks.

Other criteria, especially when pursuing grants, will be employed. For example, the DNR uses criteria for selecting candidate projects for Legacy grants. The County should evaluate projects being submitted for this funding using the DNR's criteria.

Lebanon Hills Regional Park is the County's largest and most-used park and should receive more consideration than other parks, such as ensuring that each year a project occurs there, even if it is a small one.

11.6.2 Coordination between Individual Park and Greenway NRMPs and Master Plans

Parks

Individual NRMPs will be developed in the beginning of the planning process for each County park to provide background information, site inventory and assessment, and prioritization of important natural resource areas. The draft NRMP will be coordinated with other planning activities such as visitor services, interpretation and other stakeholder interests. The resulting draft Master Plan will attempt to incorporate and balance these priorities, goals and objectives. The draft Park Master Plan, which will include alternatives for various concepts, will be released for public comment and review with final approval by the County Board. Once the Park Master Plan is approved, the draft NRMP will be finalized to reflect the approved Master Plan. The NRMP will then be used to direct all natural resource management activities within the park.

Greenways

Regional greenway master plans describe priority corridors, not specific boundaries, involve many potential landowners and become established in segments over many years. As a result, development of greenway NRMPs will also take place in phases. Natural resource assessments will be a critical component for reviewing and recommending the preferred greenway corridor. Once the draft greenway master plan is developed, reviewed and approved, draft NRMPs will be developed for publicly-owned segments and County-owned easements within the greenway corridor. Draft NRMPs will include recommendations and priorities for management and will guide implementation. The Master Plan will be updated with new infor-

mation produced by the draft NRMPs, and then finalized. Natural Resource Management Agreements, with other jurisdictional entities, will be developed for implementing natural resource activities within the greenway corridor.

11.6.3 Public Awareness for Improved Outcomes

It will be useful to measure public perception of activities during the Tier 1 implementation phase of this NRMSP. Using surveys and structuring public meetings similar to those used in developing this NRMSP would solicit comparable feedback during Tier 1 implementation. This will allow the County to make adjustments as warranted.

The County would like to brand this NRMSP in a way that the public can quickly recognize its purpose, activities, and outcomes. Branding may take the form of a logo or brochure that conveys to the public implementation activities. Further branding could be achieved by special solicitations of volunteers, tailored signage in parks describing the restoration and management activities, as well as general interpretive and educational signage, and periodic but consistently-formatted updates on the County website pointing out progress and milestones reached. In the County's annual residential survey, questions could be posed to assess the public's knowledge of this plan, implementation activities, and their thoughts regarding the County's efforts to date.

11.6.4. Managing Data

Implementing this NRMSP will entail the development of numerous work products and collection of considerable data in various formats. Work products and data will include:

- Major reports and plans (NRMPs, monitoring plans and watershed plans)
- Annual monitoring reports (walkabout reports, summaries of vegetation, water, and wildlife monitoring)
- GIS shapefiles, GPS locations and other geospatial data
- Photographs
- Annual NRMSP progress reports to the County Board

All work products and collected data, including digital photographs should be archived on the County computer server, which should be backed up regularly to ensure data are not lost. All paper field maps, completed paper forms and other "hard-copy" data should be scanned to .pdf files and archived on the County server within seven days of data acquisition. Original hard copy data forms and

maps should be stored at the County offices for a minimum of five years.

Well-designed digital file naming conventions can greatly facilitate data management. This enables data to be found faster and helps prevent loss of data. A recommended digital file naming convention is described below. This should be reviewed by County staff, modified if necessary, adopted, and used consistently.

The digital file naming convention for all electronic project data will include the following information, separated by “_”s: site name (e.g., “Lebanon Hills”), data type (e.g., “2017 spring bird survey”) and date stamp (YYYY-MM-DD format, representing the date the file was created or last modified). This date code will automatically sort files by date created/modified. If multiple people will be accessing or modifying the file, it is recommended that staff initials be appended to the end of the file name, representing the person who created or last modified the file. Therefore, an example filename for the data described above might be: “Lebanon Hills_2017 spring bird survey_2017-06-15_jw.xls”. For some datasets, it will be advantageous to develop a cumulative master file, often a spreadsheet. Adding subsequent datasets to this file will result in a series of cumulatively updated master files, which should follow the file naming convention above. Creation of a “VOID” folder on the County server can be useful to archive (not delete) outdated versions of files.

11.6.5. Responding to Emerging Natural Resource Issues

It is certain that new natural resource issues will become apparent in Dakota County over the next 20 years. While the specific changes cannot be predicted, the general types of changes may include the following:

- **Climate Change.** The importance of this issue is discussed in Section 4.7.
- **New Invasive Species.** It is expected that species currently absent from the County or not recognized today as concerns will emerge in the coming decades. The phenomenon of invasive species is expected to increase as a side-effect of climate change, as more southern invasive plants and animals migrate north into Minnesota. The County would be well served by keeping abreast of new invasive threats and taking proactive measures to identify, control, and when possible, eradicate new invasive species.

- **Continued Development.** While the residential housing boom of the early 2000s has not reached the same pace as before the 2008 Great Recession, development has continued and will accelerate in the coming years as population continues to grow. This NRMSP will help the County to identify areas threatened by future development, and also areas where development puts adjacent to natural areas and surface waters at risk or destroys the chance for a strong ecological buffer or connection. Ecological buffering and locating easements strategically, will reduce the negative effect of future development on the County’s natural resources.
- **Sand and Gravel Mining.** A certain type of sand is needed for hydraulic fracturing (or “fracking”), a drilling technique used to extract oil and gas from the Earth. Dakota County contains deposits of these sand resources. While the fracking industry has in the last two years greatly shrunk with lower oil prices, it is possible that this sand resource will be in higher demand in the future. The County should revisit its sand and gravel resources—sometimes in conflict with protecting other natural resources—to ensure that regulations and guidelines are in place that protect the County’s natural resources.

11.6.6. Updates and Amendments

While this NRMSP was prepared by looking two decades into the future, it inevitably will need updates and amendments. The County will learn from implementing Tier 1 activities, monitoring, each new NRMP that is written, and from analysis of trends seen in the monitoring data. New opportunities for better ways to do natural resource management will present themselves, and new natural resource challenges will need to be tackled.

This NRMSP will undergo periodic review and be open for formal revision every five years. Therefore, the first revision to this plan will be done at the completion of the Tier 1 projects in 2022. Updates and amendments should be documented by County staff and with outside expertise as warranted. Updates and amendments to the plan should be summarized for County Board review and discussion and shared with the public on the County website and through other means. More significant changes to this plan deserve a public meeting to convey those changes, to present the County’s rationale, and solicit input on the recommended changes. Following these steps, the County Board will vote to approve an update and amendments to this NRMSP, which will remain in effect for the following five years (2023-2027).

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**Dakota County
Natural Resource Management System Plan**

APPENDICES

Appendix A. Glossary and Acronyms

Glossary

Adaptive Management	Structured decision making in the face of uncertainty, with an aim to reducing uncertainty over time by a cycle of implementation, monitoring, evaluation, and adjustment.
Bioblitz	Typically a 24-hour period when professionals and volunteers document all living species within a given area, such as a public park.
Biodiversity	The variety of life in a particular habitat or ecosystem, including plants and animals.
Climate Moderation	Less extreme fluctuations in temperature.
Ecological Health	As defined by Aldo Leopold, “Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity.”
Ecological Restoration	Improving the natural environment by stabilizing and enhancing biodiversity, resilience, and ecosystem services.
Ecological Stewardship	Refers to responsible use and protection of the natural environment through conservation and sustainable practices.
Eutrophic	Waterbody condition where nutrient levels are moderately high, with very low water clarity and significant algal blooms.
Eutrophication	Process whereby nutrient levels increase in a lake or other body of water, frequently due to runoff from the land, which can cause dense growth of plant life and death of animal life from lack of oxygen.
Generalist Species	Species that can live in the unused small spaces of cities, towns, and crop fields.
Green Infrastructure	Natural vegetated systems that mimic natural processes, usually focused on surface water management (e.g., rain gardens).
Groundwater Recharge	Hydrologic process where water moves downward from surface water to groundwater. Recharge is the primary method that water enters an aquifer.
Habitat Fragmentation	Habitat fragmentation is the process by which habitat loss results in the division of large, continuous habitats into smaller, more isolated remnants.
Hyper-eutrophic	Water body condition where nutrient levels are excessively high, with low water clarity and algal blooms.
Impairment Threshold	Thresholds that may be used to assess whether beneficial uses of surface water or groundwater are likely to be threatened.
Indicator Species	An organism whose presence, absence or abundance reflects a specific environmental condition. Indicator species can signal a change in the biological condition of a particular ecosystem, and may be used as a proxy to diagnose the health of an ecosystem.

Invasive Species	Aggressive species whose introduction does or is likely to cause economic or environmental harm or harm to human health.
Mesotrophic	Water body condition where nutrient levels are moderate.
Native Plants	Plants indigenous to a given area in geologic time. This includes plants that have developed, occur naturally, or existed for many years in an area.
Natural Area	A land and water designation that recognizes the quality, size, and diversity of a landscapes where natural conditions largely prevail.
Natural/Semi-Natural Vegetation	Plant communities ranging from intact native plant communities to degraded remnants to unmanaged vegetated landscapes.
Non-invasive Species	Species that are not likely to cause economic or environmental harm.
Oligotrophic	Water body condition with low nutrient levels, excellent water clarity (often to 20-25 feet), and no algae blooms.
Specialist Species	Species that need significantly large areas or special habitat resources to carry out their life cycle. Many endangered, threatened, and special concern species (including SGCNs) are specialists.
Water Quality	Measure of the condition of water relative to the requirements of one or more biotic species and/or to any human need or purpose.
Wisconsinan Glaciation Period	Most recent major advance of the North American ice sheet complex.

Acronyms

CIP	Capital Improvement Projects
CRWD	Capital Region Watershed District
DNR	Department of Natural Resources
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
MLCCS	Minnesota Land Cover Classification System
MPCA	Minnesota Pollution Control Agency
NHIS	Natural Heritage Information System
NRCS	Natural Resources Conservation Service
SBS	Site of Biological Significance
SGCN	Species of Greatest Conservation Need
USDA	United States Department of Agriculture
WRAPS	Watershed Restoration and Protection Strategies

Appendix B. Invasive Species that May Warrant Control in Dakota County

Table B.1. Invasive Terrestrial Woody Species

Scientific Name	Common Name	Relative Threat	Action
<i>Acer ginnala</i>	Amur maple	Low	Remove all
<i>Acer platanoides</i>	Norway maple	Low to Medium	Remove all
<i>Acer negundo</i>	Boxelder	Low to Medium	Selective removal
<i>Berberis thunbergii</i>	Japanese barberry	Low	Remove all
<i>Caragana arborescens</i>	Siberian peashrub	Low	Remove all
<i>Celastrus orbiculatus</i>	Oriental bittersweet	Medium to High	Remove all
<i>Eleagnus angustifolia</i>	Russian olive	Low	Remove all
<i>Euonymus alatus</i>	Winged euonymus	Low to Medium	Remove all
<i>Lonicera x bella</i>	Showy fly honeysuckle	High	Remove all
<i>Lonicera morrowii</i>	Morrow's honeysuckle	High	Remove all
<i>Lonicera tatarica</i>	Tartarian honeysuckle	High	Remove all
<i>Lonicera xylosteum</i>	European fly honeysuckle	Low	Remove all
<i>Morus alba</i>	White mulberry	Low	Remove all
<i>Populus alba</i>	White or European poplar	Low	Remove all
<i>Rhamnus cathartica</i>	Common buckthorn	High	Remove all
<i>Rhamnus frangula</i>	Glossy buckthorn	Moderate	Remove all
<i>Robinia pseudoacacia</i>	Black locust	Moderate	Remove all
<i>Rosa multiflora</i>	Multiflora rose	Moderate	Remove all
<i>Ulmus pumila</i>	Siberian elm	High	Remove all
<i>Zanthoxylum americanum</i>	Prickly ash	Low to Moderate	Selective removal

Table B.2. Invasive Terrestrial Herbaceous Species

Scientific Name	Common Name	Threat Level	Action
<i>Alliaria petiolata</i>	Garlic mustard	High	Remove all
<i>Arctium minus</i>	Common burdock	Low	Remove all
<i>Bromus inermis</i>	Smooth brome grass	High	Selective removal
<i>Cardamine impatiens</i>	Narrow-leaf bittercress	Medium	Remove all
<i>Centaurea maculosa</i>	Spotted knapweed	Low to Medium	Remove all
<i>Cirsium arvense</i>	Canada thistle	Medium to High	Remove all
<i>Cirsium vulgare</i>	Bull thistle	Low	Remove all
<i>Conium maculatum</i>	Poison hemlock	Medium	Remove all
<i>Coronilla varia</i>	Crown vetch	Medium	Remove all
<i>Dactylis glomerata</i>	Orchard grass	Low	Remove all
<i>Daucus carota</i>	Queen Anne's lace	Low	Remove all
<i>Echinochloa muricata</i>	Barnyard grass	Low	Remove all
<i>Elytrigia repens</i>	Quack grass	Low	Remove all
<i>Euphorbia esula</i>	Leafy spurge	High	Remove all
<i>Glechoma hederacea</i>	Creeping Charlie	Low to Medium	Remove all
<i>Hesperis matronalis</i>	Dame's rocket	Low	Remove all
<i>Lotus corniculatus</i>	Birds foot trefoil	Medium	Remove all
<i>Lythrum salicaria</i>	Purple loosestrife	High	Remove all
<i>Medicago sativa</i>	Alfalfa	Low	Selective removal
<i>Melilotus alba</i>	White sweet clover	Medium to High	Remove all
<i>Melilotus officinalis</i>	Yellow sweet clover	Medium to High	Remove all
<i>Pastinaca sativa</i>	Wild parsnip	High	Remove all
<i>Phalaris arundinacea</i>	Reed canary grass	High	Selective removal
<i>Phleum pratense</i>	Timothy	Low	Remove all
<i>Phragmites australis</i>	Giant reed grass	High	Remove all
<i>Poa pratensis</i>	Kentucky bluegrass	Low to Medium	Selective removal
<i>Rumex crispus</i>	Curly dock	Low to Medium	Remove all
<i>Setaria spp</i>	Foxtail grasses	Low to Medium	Remove all
<i>Solanum dulcamara</i>	Bittersweet nightshade	Low	Remove all
<i>Tanacetum vulgare</i>	Common tansy	Medium	Remove all
<i>Taraxacum officinale</i>	Dandelion	Low	Remove all
<i>Torilis japonica</i>	Japanese hedge parsley	Medium	Remove all
<i>Trifolium pratense</i>	Red clover	Low to Medium	Remove all
<i>Trifolium repens</i>	White clover	Low to medium	Remove all
<i>Typha angustifolia</i>	Narrow-leaf cattail	High	Selective removal
<i>Typha x glauca</i>	Hybrid cattail	High	Selective removal
<i>Verbascum thapsus</i>	Mullein	Low	Remove all

Table B.3. Aquatic Invasive Species (AIS)¹

Scientific Name	Common Name	Threat Level and Notes
Plants		
<i>Butomus umbellatus</i>	Flowering rush	Prohibited invasive species in MN; actively expanding
<i>Egeria densa</i>	Brazilian Elodea	Regulated invasive species in MN; reported in few lakes in state
<i>Iris pseudacorus</i>	Yellow iris	Regulated invasive species
<i>Lythrum salicaria</i> , <i>L. virgatum</i> , and hybrids	Purple loosestrife	Prohibited Noxious Weed
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Major AIS threat; first discovered in MN in 1987, and as of end of 2004, found in 106 MN lakes, rivers, and streams; biological control being researched
<i>Najas minor</i>	Brittle Naiad	Prohibited invasive species in MN; reported in very few lakes in state
<i>Nitellopsis obtusa</i>	Starry Stonewort	First confirmed in MN in 2015
<i>Nymphaea spp</i>	Non-native waterlilies	Regulated exotic species
<i>Phalaris arundinacea</i>	Reed canary grass	Major AIS threat; planted throughout the U.S. since the 1800s for forage and erosion control
<i>Phragmites australis subsp. australis</i>	Common Reed (non-native subspecies)	Restricted Noxious Weed
<i>Potamogeton crispus</i>	Curly-leaf pondweed	Prohibited invasive species in MN; major AIS threat; reported in >750 lakes in 70 of MN's 87 counties
Animals		
<i>Hypophthalmichthys nobilis</i> & <i>H. molitrix</i>	Bighead and silver carp	Prohibited invasive species; no established populations known in MN, but individual invasive carp have been caught
<i>Bellamy (Cipangopa ludina) chinensis</i> & <i>Viviparus georgianus</i>	Chinese and Banded Mystery Snails (CMS & BMS)	Regulated invasive species; CMS present in >80 waters and BMS in ~50 waters
<i>Cyprinus carpio</i>	Common carp, German carp, European carp	Regulated invasive species; present in hundreds of MN waters
<i>Bithynia tentaculata</i>	Faucet Snail	Proposed as a prohibited invasive species
<i>Ctenopharyngodon idella</i>	Grass carp	Prohibited invasive species; no populations known in MN, although individual fish have been caught
<i>Potamopyrgus antipodarum</i>	New Zealand Mudsnail	Prohibited invasive species; discovered in Duluth-Superior harbor in 2005
<i>Neogobius melanostomus</i>	Round goby	Prohibited invasive species; present in all Great Lakes but not known in MN's inland waters
<i>Gymnocephalus cernuus</i>	Ruffe	Prohibited invasive species; spread from Duluth harbor to other rivers and bays in Great Lakes
<i>Orconectes rusticus</i>	Rusty crayfish	Regulated invasive species; discovered in MN ~1960 and confirmed in ~50 MN waters, mostly in central and northern counties
<i>Petromyzon marinus</i>	Sea lamprey	Prohibited invasive species; present throughout Great Lakes and many tributaries
<i>Bythotrephes longimanus</i>	Spiny waterflea	Regulated invasive species; spread throughout

		Great Lakes and established in some inland lakes and rivers
<i>Morone americana</i>	White perch	Prohibited invasive species; found in all Great Lakes, but not known in MN's inland waters
<i>Dreissena polymorpha</i>	Zebra mussel	Prohibited invasive species; major AIS threat; found throughout Great Lakes, parts of Miss. R., and other rivers and inland lakes

¹ AIS information derived from DNR website (http://www.dnr.state.mn.us/invasives/aquatic_id.html); see Appendix K for known AIS in Dakota County waters.

Appendix C. Effects of Not Managing Natural Resources

Effects on Vegetation and Soils

- *Plant communities have fewer species.* Changes in the type and number of invasive plants and animals, changes in water levels and the speed of its flow, changes soil structure and organic content, and lack of historical, rejuvenating disturbances such as fire or natural water level fluctuations can individually or collectively have negative effects. Natural plant communities may have blocked or suppressed ability of to regenerate themselves, as fewer species are available to adapt to changing environmental conditions. For example, as mentioned above, invasive shrubs can prevent the regeneration of oak trees and other plants and crowding out native plant species. This in turn leads to a reduction in the diversity of plant life in the ecosystem.
- *Native plant communities disappear.* Eliminates uncommon plants (and animals) that make up a quarter to a third of all native species in the County which can only survive in native plant communities.
- *Erosion and sedimentation worsen.* Vegetation is often sparse on woodland slopes under the dense shade of exotic shrubs. Rain and snowmelt gradually strips away the topsoil and the seedbank (seeds that naturally accumulate in the soil), reducing soil fertility and the germination and abundance of native trees, shrubs and other plants.

Effects on Water Resources

- *Water levels become erratic.* In watersheds with ten percent or more impervious/non-porous surfaces such as rooftops and pavement, streams, lakes and wetlands become noticeably damaged. At 20 to 25 percent impervious cover, streams become afflicted with “urban stream (and lake) syndrome.” A similar issue usually occurs with row crop agriculture. More water than can be handled flows from impervious surfaces into water bodies. Water arrives quickly, in large amounts, after even small storms. These “flashy” hydrologic systems cause water levels to fluctuate too fast for many of the plants that live in the water or at its edge. Over time, they disappear, exposing the banks which then erode. Management of vegetation and soil in streams, lakes and ravines can help stabilize the situation, but managing upstream and up-watershed runoff, using best stormwater practices, is also required in most cases.
- *Water becomes polluted.* Water pollution can take several forms, and it may or may not be readily apparent. Toxins may be present in surface waters that appear clear and clean. However, more common are water bodies that become murky due to poor water quality. Erosion contributes sediment-borne phosphorus into water bodies, stimulating algae growth. In most lakes affected by runoff from developed areas with high impervious cover and agricultural lands, visibility into the water during mid-summer may be only one to two feet compared to 10-20 feet of visibility in clear water bodies. Beyond water clarity, the fine sediment accumulating in water bodies can be detrimental to species such as trout that prefer spawning areas of exposed gravel, or many stream invertebrates that other species depend on for food. Low water clarity also limits the growth of aquatic vegetation that serves as habitat for fish and wildlife and helps stabilize the bottom sediments. Managing vegetation and soil around the water body can improve the situation, but often management projects located higher up in the watershed are needed. Sometimes improvements are required in the stream or lake itself, such as structures to keep the current in the middle of the channel, water drawdown in lakes to harden bottom sediment, or treatment with alum, which temporarily locks phosphorus to a lake bottom and prevents it from producing excessive algae.
- *Groundwater supplies decrease.* Impervious cover, drained agricultural lands, and a lack of wetlands on the landscape speed the flow of stormwater runoff into water bodies, short-circuiting the natural percolation of rainfall to groundwater (infiltration). Over one to several years, shallow groundwater levels fall, and shallow wetlands, ponds and lakes may dry up. A regional example is the significantly lower water levels of White Bear Lake this problem to some extent, worsened by dry weather. Over many years, this can affect deep groundwater aquifers where drinking water, commercial water, and irrigation water are drawn from. Managing vegetation and soil to maximize infiltration helps recharge

groundwater aquifers. One of the greatest threats to the Vermillion River is that of falling aquifers since groundwater discharge keeps this trout stream cold.

Effects on Wildlife

- *Generalist species increase.* Species that do not require highly specific habitat requirements to survive are called generalists. Well recognized examples include deer, raccoons, gray squirrels, crows, starlings, and house sparrows. Their numbers are high because they can thrive in spite of altered habitats and with the resources that are created by development and agriculture.
- *Sensitive species decrease.* Although not well known, a quarter to a third of the several hundred vertebrate and large insect species in the County needs significantly large areas or special habitat resources to carry out their life cycle. Because these needs are often not met, these species are in danger of becoming extinct. Uncommon species contribute to the County's biodiversity and serve as "back-up" species for ecosystems, making them more able to change as climate and landscapes change. In 2006, the DNR identified these species and called them Species of Greatest Conservation Need (SGCN).

Effects on Cultural and Economic Values

- *Some people worry about the state of their public lands.* Without seeing management taking place, there is a tendency for people to perceive public lands as unkempt landscapes, possibly even unhealthy. If they understand natural processes and have seen plant communities in good ecological health, they likely judge public lands from that positive perspective.
- *Some people don't recognize unhealthy ecosystems.* Some people will view degraded landscapes as normal, or even mistake them for healthy natural systems (if they don't know the difference). This undermines public understanding of and appreciation for healthy natural resources and systems.
- *People worry about safety.* Especially in woodlands and oak savannas with a layer of invasive shrubs, sight lines are limited. Most people feel safer when they can see farther ahead.
- *Governments spend more in the long-term.* Allowing ecosystems to decline means that governments must spend more on bridges, roads, trails, and sewer outfalls due to erosion caused by excessive runoff to compensate for damages. A less obvious example is the well-known decline of pollinators on the landscape—among other causes, there are not enough flowering plants to meet pollinators' food needs. Ensuring a continuous, abundant array of flowering trees, shrubs, and herbs from April through October, when pollinators are active, requires management of natural resources on public and private lands. This need is being increasingly recognized by agencies and municipalities, and some federal and state grant funding is now linked to a project's pollinator benefits. Other ecosystem services (see Section 2.1 of NRMSP) can be compromised by not managing natural resources, often necessitating increased public (and private) spending. For example, loss of water-purifying wetlands and forested landscapes increases the demand for water purification plants. A well-known case is the decision by New York City to protect forestland in the Catskills in order to ensure clean drinking water sources, rather than build water treatment facilities. Acquisition of the forested landscape cost \$250 million, whereas the cost to build and operate three treatment facilities was \$6 to \$8 billion. Preserving watersheds in the Catskills not only guaranteed a supply of clean water that required minimal treatment, it yielded other benefits, such as supporting local tourism. Investments in natural resource management, including creation and maintenance of green infrastructure, can produce significant cost-savings over the long-term compared to engineered gray infrastructure and related solutions. While studies of return on investment (ROI) are few, there are indications that, when goods and services from ecosystems are tallied, the ROI is nearly double the investment, or more. For example, in 2010 University of Minnesota, using an ecosystem service valuation tool called Invest, calculated that for every dollar spent to purchase conservation land in Minnesota, \$1.70 to \$4.40 is returned in the form of timber production, water quality improvement, outdoor recreation, habitat quality and carbon sequestration. This ROI is invisible to managers and landowners because there is no formal market to buy and sell ecosystem services, and the assets and

earnings don't appear in capital and operating budgets. Ecosystem services are not a panacea, but rather a frame of reference. Currently, ecosystem services are largely absent from public consciousness. Those that do get noticed usually involve water.

Appendix D

NRMP Template – Parks

Template Legend:

- *Black text – generic for all/most NRMPs*
- *Red text – requires editing*

Park Name **Natural Resource Management Plan**

Date

Consultant or Contributing Author(s)

Insert photo of park

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Insert list of figures.

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Insert list of tables.

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Appendix A. Plant Species Inventory (including invasives)

Appendix B. Wildlife Species Inventory (including invasives)

Appendix C. Acceptable Source Location for Native Species Seed

1. EXECUTIVE SUMMARY

Provide maximum 2-page summary (front and back) of

- *Major natural resource findings (issues, opportunities, etc.)*
- *County and partner vision and goals for park*
- *Previous restoration/management efforts on the park*
- *Major recommendations*

The NRMP will be reviewed and updated every five years or as needed to maintain its relevancy.

2. INTRODUCTION

2.1. Precedent Planning Efforts

The Dakota County 2030 Park System Plan was approved by the Dakota County Board in 2008 and consists of the three main components: Great Places, Connected Places and Protected Places. Previous Park Master Plans were completed in Year(s). In 2010, Dakota County and several cities within the County (constituting The Dakota County Greenway Collaborative) adopted *The Greenway Guidebook*. In 2017 a Natural Resource Management System Plan (NRMSP) was approved by the County Board for all parks, greenways and County conservation easements. Also in 2017, a Visitor Services Strategic Operations Plan (VSSOP) was completed for all parks and greenways. This **Park Name** Natural Resource Management Plan was developed with the goal of incorporating previous natural resource management efforts for **Park Name**, being consistent with the goals outlined in the NRMSP and being compatible with the overall park system plan and the VSSOP.

2.1.1. Dakota County 2030 Park System Plan (2008)

The 2008 Park System Plan (System Plan) provides an all-encompassing view that describes the existing status of Dakota County's Park System, a vision for the County's parks going forward, and a strategy for how to achieve this vision. The System Plan also identifies immediate priorities for the next ten years and is organized into the following chapters: 1) System Overview, Research Findings, 2) System Vision for 2030, 3) Ten-Year Implementation Priorities, 4) Delivering the Vision, 5) Funding the Vision, and 6) Performance Measures.

2030 Park System Vision

This chapter describes a vision based on meeting desires for things people wanted most from County Parks. The vision as it applies to **Park Name** is described below:

1. Great Places
 - a. *Include elements specific to park.*
2. Connected Places
 - a. *Include elements specific to park.*
3. Protected Places
 - a. *Include elements specific to park.*

Ten-Year Implementation Priorities

The ten-year priorities for implementing master plan projects included the following three recreational objectives for all County parks:

Objective 1: Provide **Popular Recreation Basics** at all parks including walking, biking, hiking, picnicking, fishing, programming, and events. *Add any other elements specific to park*

Objective 2: Provide **Popular Opportunity-Based Recreation** using water features, terrain and seasons, with a focus on areas with demonstrated popularity or need (e.g., canoe/kayak access points, cross-country skiing sites, and off-leash dog areas). *Add any other elements specific to park*

Objective 3: Add or expand **Signature Use Recreation** to reflect each park's natural resources, location and unique qualities. *Add any other elements specific to park*

Delivering the Vision

Broad implementation strategies and an overview of the care, maintenance, resource management, planning, program and service delivery, and administration required to keep the park system operating are described. Policies, goals and strategies discussed include: a) building awareness and informing and engaging the public through targeted marketing efforts and b) identifying needs, establishing expectations and building capacity.

2.1.2. Natural Resource Management System Plan (2017)

The County recently developed a Natural Resource Management System Plan (NRMSP) to guide natural resource management in county parks, greenways and conservation easements over the next 20 years. Combined with the Visitors Service Plan (VSSOP), near and long term operations for the park system will be determined in the context of the existing or new master plan.

The process for developing the NRMSP consisted of four phases:

- Phase I: Scoping. Defined goals of the NRMSP and data used to complete the plan.
- Phase II: Research. Highlighted research completed to determine the type and condition of natural resources on County-owned lands and easements, including an inventory of measures needed to improve the health and condition of these lands.
- Phase III: Principles, Vision and Preliminary Concepts. Described the vision for natural resource management and the principles used to guide the overall approach.
- Phase IV: Preferred Plan Option. Specified five and twenty-year priorities for managing natural resources in the system, and provided natural resource management plan templates for individual parks, greenways and easements.

Development of the NRMSP required an extensive review process, including public workshops/open houses and public input to a dedicated NRMSP webpage on the County's website; and a Technical Advisory Committee comprised of members from academia, non-profit conservation organizations, private landowners, community leaders, Soil and Water Conservation District, and State Agency staff. The Plan was presented to the County Planning Commission and County Board at several points, and the County Board approved the NRMSP in May 2017.

The following tables summarize the initiatives for each of the major service areas, vegetation, water, and wildlife for the first five years of implementing the NRMSP.

Vegetation Management Activities	Acres	Estimated Cost
1. Control/manage most highly invasive species on all County lands	403	\$869K
2. Restore/enhance important natural areas and high-use/educational areas	763*	\$3.2M
3. Maintain all existing and newly restored areas (annually)	1,434	\$2.9M
4. Stabilize invasive plant species control areas (every 5 years)	900	\$728K
5. Collect baseline and trend data	4,000	\$33K
6. Develop individual NRMPs for each park	-	\$0 (in CIP)
7. Develop a new Private Sector Funding Program	-	\$54K
TOTAL	4,700 (3,500 managed and 1,200 not managed)	\$7.8M

Water Management Activities	Metric	Estimated Cost
1. Restore, enhance and manage highest quality/most-used park waters via park projects	4 projects	\$305K
2. Control the most harmful aquatic invasive species (AIS)	200 acres	\$0 (already underway via external funds)
3. Work with partners to protect and manage areas outside of parks that benefit park waters	15 projects	\$1.3M
4. Collect baseline and trend data (annually)	5 parks	\$145K
5. Prevent new AIS from invading surface waters	300 acres	\$0 (already underway via

		external funds)
SUBTOTAL		\$1.7M

Wildlife Management Activities	Metric	Estimated Cost
1. Collect baseline and trend data (every other year)	6 parks	\$489K
2. Work with partners outside of parks	5 sites	\$323K
3. Focus on rare and endangered wildlife that are Group 1 species	3 to 5 species	\$107K
4. Protect other important wildlife and improve populations	10 sites	\$211K
5. Control problem wildlife	6 parks	\$111K
SUBTOTAL		\$1.1M

Wildlife Management Group	Definition and Implications for Management
Group 1	Park-specific or very local species. Populations of individual species whose habitat and range are almost entirely within a park, and hence can be managed and sustained inside a park. Butterflies, dragonflies, damselflies, some small mammals, and some reptiles and amphibians are in this group.
Group 2	Local to regional species. Populations of individual species that regularly use County parkland, but to persist long-term must also use lands outside parks. Large mammals, many bird species, large reptiles and amphibians, many fish species, many aquatic macroinvertebrates, and freshwater mussels are in this group. Managing species in this group requires partnerships with others, often at a regional level.
Group 3	Migratory. Populations of individual species that use County park habitat in the spring and fall migration, but do not breed there. Managing these species can occur at a continental scale, with some bird migrants travelling from southern South America to the Arctic tundra each year.

*Describe how the **PARK NAME** NRMP will fulfill the above initiative and management activities for the five-year NRMSP work plan. (May reference tables or passages that appear later in the document).*

2.1.3. Park Name Master Plan (year)

Summarize key findings from existing plan:

- *Main recreation elements in park*
- *Cultural resource features and constraints on natural resource restoration and management activities*
- *Natural resources and related issues and opportunities*
- *Implementation plan effects on natural resources (proposed or new infrastructure and modified programs); and major natural resource projects completed, underway or proposed*

Insert important summary graphics.

2.1.4. Park Name Natural Resource Management Plan (year)

Summarize key findings from previous plan(s):

- *Vegetation types and qualities presents, and extent of invasive species issues*
- *Surface water quality, issues and opportunities, including aquatic invasive species*
- *Wildlife present and wildlife-related issues and opportunities*
- *Implementation plan summary and effect on natural resources; and proposed major natural resource projects*

Insert important summary graphics.

2.2. Regional Natural Resource Conservation Context

Describe briefly the park's landscape setting, proximity to other conservation lands, proximity to conservation corridors and greenways, the effects of surrounding land uses, and nearby conservation efforts or conflicts that affect the park. Additional details can be provided in Section 3.1.

2.3. Natural Resource Public Values

The natural world is a powerful influence in the lives of many, and has been for millennia. County residents in survey after survey express their desire to have nearby natural places that are out of the ordinary where they can be close to and even fully immersed in the natural world. For its residents, County parks can be an antidote to a fast-paced, technologically connected, buildings-and-road centered lifestyle.

Insert any park-specific public perceptions/priorities (based on previous surveys, etc.).

3. EXISTING NATURAL RESOURCES

3.1. Landscape Context

3.1.1. Location

Describe location

Insert location map(s) showing:

- *Park boundary*
- *Municipal boundaries*
- *Watershed boundaries (smallest HUC that is useful) for the water bodies inside the park*
- *General land use and other significant features*

3.1.2. Regional Natural Resources Context

Describe ecological subsection(s) and characteristics

Insert ecological subsection map

3.1.3. Adjacent Land Use

The adjacency of agricultural, commercial, industrial, residential, open space, and other types of land use can affect vegetation, water and wildlife management options, and may present opportunities to enlarge existing habitat areas, create corridors for wildlife movement, and determine the characteristics of local surface water hydrology.

Describe immediately adjacent land uses and known effects on the park.

3.2. Physical Conditions

The natural resources within the park are affected by a number of physical conditions that influence their origin, current status and future condition. These features include local geology, topography and soils.

3.2.1. Geology

Describe geology as it directly relates to the plant communities and surface water features of the park:

- *Bedrock as it relates to special plant communities, groundwater chemistry of water bodies, etc.*
- *Glacial history and deposits as it relates to plant communities, groundwater, water bodies, etc.*

Insert bedrock map with park boundary

Insert surficial geology map with park boundary

3.2.2. Topography

Topography and aspect (slope orientation relative to north, south, east, and west) are important factors in the development and formation of soil, soil erosion potential, and the type and stability of

vegetation for a given location. The primary factors involved with topography, as it concerns natural features, are relief and variation. The difference from the highest to the lowest elevation is referred to as “relief”. The differences in contours from place to place across the landscape determine the amount of topographic variation. Taken together with variation in soil type, these factors help determine overall site heterogeneity. In general, greater heterogeneity within a site creates more complexity in vegetation and hydrologic features, which leads to greater biological diversity.

Aspect can have a strong influence on soil temperature and moisture. In the northern hemisphere, north- and east-facing slopes are often shaded or cooler, while south- to west-facing slopes are hotter and receive more solar radiation. Aspect can significantly influence the local climate (microclimate). Soil temperatures and soil moisture on south- to west-facing slopes are typically warmer and dryer than those on north- to east-facing slopes, due in part to the increased solar radiation and direction of the prevailing winds in the summer. Likewise, soils on north- to east-facing slopes tend to be cooler and wetter, due to diminished solar energy and late afternoon shading during the hottest part of the day.

Describe landforms and slopes as they directly relate to erosion, aspect, or other forces affecting plant communities, surface waters, etc.

Insert topographic map with contours, water bodies, and park boundary. Generate in GIS a steep slope (>12 percent) overlay for this map.

3.2.3. Soils

The “Soil Survey of Dakota County Minnesota,” (issued April 1983 and updated in May 1994), provides a generalized depiction and descriptions of soils found in the County. Soil formation is the result of the interaction of parent material, climate, organisms, topographic position or slope, and time. Collectively, these factors help determine the dominant plant and animal communities, which in turn influences future soil development. Soil units/types suggest the most appropriate use and management of the land.

Describe soils as they directly relate to plant communities, surface waters, etc.

- *Classification of soils—soil unit name, family or higher taxonomic class, texture, and hydrological class*

Insert soils table and map showing SSURGO map units and soil unit names. Highlight hydric soils and highly erodible soils.

3.3. Vegetation

The vegetation found in the park is determined by such factors as: physical site conditions (topography, soils and hydrology); historic and current land use; climate; invasive species; and wildlife. Vegetation is also affected by natural processes such as succession or natural events that create change and variation. Abrupt changes (disturbances), including wildfires, high winds and floods, can quickly change the vegetative structure and composition. There is a spectrum of disturbance intensity from light, frequent events to catastrophic, uncommon events. The frequency

and interval of different types of disturbance results in a myriad of potential vegetation types. After thousands of years, these dynamics influenced vegetation patterns and native plant communities prior to human settlement. More recent European settlement induced dramatic changes such as cultivation, draining, pasturing, logging, mining, and development have created profound changes through disruptions of natural cycles and processes. Natural succession, the gradual change in structure and species composition, occurs as the vegetation changes in response to changes in light, water, nutrients, herbivory, predation, parasitism, and competition. Under natural conditions, succession tends to occur gradually over time and cause broadly predictable changes in the diversity and extent of vegetation communities and associated wildlife. The effects of disturbance and succession can vary widely. Different areas will be at varying successional stages due to diverse history, disturbance regimes and time interval since the last major disturbance. These conditions interact with the environmental variability and genetic plasticity to create a mosaic of vegetation in various conditions across landscapes, including parks.

3.3.1. Historical Vegetation and Land Use

One major consideration for developing a comprehensive Natural Resource Management Plan (NRMP) is to understand the types of vegetation found on and around **Park Name** prior to European settlement. This information can be a helpful indicator of plants that may be found or thrive in the park. Fortunately, field notes on vegetation were taken during original territorial surveys during the 1840s-1860s and compiled into a valuable information source entitled “The Original Vegetation of Minnesota, compiled from U.S. General Land Office Survey Notes” (Notes) in 1974.

In general, the northern and western portions of the County consisted of hardwood forests among rolling hills and many lakes. American basswood, sugar maple, elm, red oak, and an understory of shade-loving wildflowers made up the “Big Woods” in the moist areas protected from fire. Bur and white oak, aspen and black cherry were the dominant tree species in the drier areas. The southern part of the County consisted primarily of prairie and savanna. Depending on soils, topography and hydrology, tall grasses measuring as high as eight feet would have been the prominent vegetation type, with a diverse mix of other grasses and wildflowers (forbs). Shorter grasses and a wide variety of other forbs were found on sandy and gravel areas and steeper slopes. Wet prairies were common on wetter soils where the water table was close to the surface. Wet meadows and marshes were present on soils that had standing water, but that burned often enough to prevent trees and shrubs from becoming dominant. Near smaller rivers, prairie or savanna would often be found, even up to the water’s edge. A large number of wetlands once existed in the southwestern portion of the County with only 12 to 15 percent remaining in Dakota County. Savannas with scattered oak trees formed transitional plant communities between grasslands and forests within the much larger transitional zone between the vast grasslands of the American West and the deciduous forests of Eastern America. Forested floodplains with cottonwood, silver maple, willow, and American elm were found in wider river valleys.

Figure x shows the predominant, pre-settlement plant communities of the park.

Describe pre-European settlement vegetation, including descriptions of each native plant community

Describe Native American use of park area

Interpret implications of pre-European settlement vegetation and Native American land use for current plant communities and surface waters in park.

3.3.2. Land Cover and Use Trends

European settlement significantly changed the Dakota County landscape. Native prairies were plowed, forests and woodlands cut, wetlands drained, fires suppressed, and intense agricultural practices introduced, including row cropping and livestock grazing. Since WWII residential and commercial development has replaced much of the agricultural land cover in the northern half of the County. However, the southern half is predominantly open space though dominated by agriculture.

Some of the best evidence of past land use is depicted in a progression of historical aerial photographs. Figures x-x are historical aerial photos of the park and surrounding area starting from 1937 through 20xx.

Describe European settlement and use of park area

Describe land cover and use changes in terms of plant community modifications, surface water modifications, wildlife population changes.

3.3.3. Land Cover Mapping and Assessment

Describe all existing land cover types and their condition/quality within the park. Include photos from assessment.

Insert map(s) showing current land cover/vegetation mapping and quality ranks.

Prepare a table summarizing landcover and vegetation types with a quality rank (see below for criteria) for each previous plan(s) and the current year, indicated by year.

Summarize any changes/updates/refinements to previous classification, quality ranking, and mapping of each plant community.

Reference Appendix A.

3.4. Aquatic Resources

3.4.1. Groundwater and Aquifer Sensitivity

Groundwater accumulates below the surface of the land and is stored in complex, underground layers of sand, gravel and porous rock. If groundwater exists in suitable quantity and quality, and can be tapped for human use, it is of great economic value. In the northern portion of the County where the glacial deposits tend to be deeper, groundwater is often extracted from drilled wells into sand and gravel deposits. In the southern part of the County where the layer of glacial deposits is shallower, most drilled wells extend into the porous bedrock. Throughout the County most public water supplies are obtained from one of the deeper bedrock aquifers.

Due to its relative abundance, quality and reasonable access, groundwater provides drinking water for the majority of County citizens, irrigation water for agricultural crops (especially on the sandier

soils in the southeastern portion of the County), and process and cooling water for industrial and manufacturing companies. Although the amount of available groundwater appears to be stable, there is growing concern about the groundwater supply due to increased agricultural irrigation, suburban water use, changing climate. Improved information on the role of groundwater to ecological systems like trout streams corroborates this. At the same time, much of the County's groundwater is "highly sensitive" to surface contamination, meaning that it takes only days or months for contaminants to reach the aquifer. Once an aquifer is polluted, it takes a long time for contaminants to either leave or be immobilized. It is very or prohibitively expensive to improve a polluted aquifer's quality to attain drinking water standards.

Given its importance and potential vulnerability, every effort should be made to prevent groundwater contamination, including from pesticide and herbicide use. Factors to consider during natural resource management activities are 1) depth to groundwater and 2) the ability of the overlying geologic materials to protect the groundwater aquifer (deeper and less porous soils are best—thinner and more porous soils are worse).

Describe the groundwater conditions affecting the park's surface waters.

Describe aquifer sensitivity rating(s) in the park (include map).

Describe best practices to prevent pollution of groundwater in the park and to maintain groundwater recharge rates in the park.

Describe off-site pollution or off-site diversion of groundwater from surface waters in the park.

3.4.2. Surface Waters

One of the unique and attractive features of Dakota County is the amount and diversity of its surface waters. Major riverine systems, including the Mississippi, Minnesota, Cannon, and Vermillion Rivers create the borders or flow within the County. A number of creeks, streams and brooks are found in the southern portion of the County. Numerous small lakes are found in the northern and western portions of the County as a result of previous glaciation. The two largest lakes, Crystal and Marion, are highly desirable for their scenic beauty and recreation. Different types of wetlands are scattered throughout the County and several unique wetlands, known as fens, are found in the Minnesota River Valley. Two large reservoirs, Lake Byllesby and Spring Lake were formed with the creation of dams.

Over time, most of these surface waters have been significantly degraded due to agricultural and municipal stormwater run-off. Entire wetland complexes that were important for filtering, and retaining water and recharging the groundwater have been lost. Pollution often includes excess bacteria, sediment and nutrients (especially nitrogen and phosphorous from fertilizer), causing lower levels of dissolved oxygen that limits reproduction and survival of fish populations and other aquatic organisms. Although state and federal regulations and voluntary efforts have improved water conditions, protection and management of natural areas, especially those adjacent to water bodies, is an important strategy for achieving water quality goals.

Lake Name

Describe each park lake in terms of:

- Physical characteristics (size, depth, watershed acres, water chemistry, etc.)
- Water quality (Carlson TSI or similar metric, algae bloom records, possible cause of poor water quality, etc.)
- Water quantity
- Regulatory environment (Section 303(d) impairments, TMDL, etc.)
- Aquatic habitat types, locations, and quality (linked to vegetation cover, diversity, invasive aquatic plants)
- Shoreline erosion type, extent, and possible cause(s)

Insert map showing lakes in park, watershed of lake, watershed management jurisdictions, and 303(d) impaired waters.

Stream Name

Describe each park stream, including:

- Physical characteristics (average flow, length in park, total length, watershed acres, percentage of stream in park compared to total watershed, etc.)
- Upstream land uses and stream conditions
- Water quality (sediment and phosphorus metrics, etc.)
- Regulatory environment (303(d) impairments, TMDL, etc.)
- Aquatic habitat types, locations, and quality for fish and macroinvertebrates
- Stream bank erosion, type, extent and possible cause(s)

Insert map showing MnDNR Protected Watercourses (streams), stream watersheds, watershed management jurisdictions, and 303(d) impaired waters

Wetlands

Wetlands are addressed in Land Cover (Section 3.3.3).

Insert this sentence:

Wetlands are described in the Land Cover Section (3.3.3), but are referenced here due to their protection under state and federal law. Wetlands may not be dredged, filled or drained without a permit. However, vegetation can be altered or even completely removed (sometimes requiring a permit), especially for the purpose of ecological restoration and invasive plant management.

Insert map showing NWI wetlands.

Insert summary table showing type, description and size of wetland on the NWI map.

3.5. Wildlife

3.5.1. General Wildlife Habitat

With a heterogeneous landscape, diverse vegetation and an abundance of surface water, Dakota County historically had a highly diverse wildlife community. Several sub-ecoregions converged and

intersected providing opportunities for the existence of a wide array of species endemic to different ecosystems, , forming a diversity of wildlife habitats.

Historic Fauna of the County

In the 1800s, early explorers and settlers documented that bison grazed the prairie terraces near Fort Snelling and nearly all of the early explorers from Radisson to Hennepin mentioned their abundance. Though elk were not considered common at the time of European settlement, Bison and elk were hunted to near extinction across their Midwestern range, including Dakota County, but agriculture eliminated habitat as well. White-tailed deer also suffered from hunting pressure, but then began to thrive in the fragmented agricultural landscape, once a hunting season was imposed and over-harvesting was controlled. Mountain lions, although present, were never common, but black bears were quite common in the first half of the 1800s.

Smaller mammals such as beaver, mink and muskrat also existed in high numbers. However, over the course of two centuries of heavy trapping, these species' populations nearly crashed. Due to better regulation of trapping beginning in the 1930s, populations of beaver and other species rebounded.

As with the mammals, the County's diverse landscapes supported a wide array of resident and migratory bird species. Over one hundred species of birds nested in the County, and another hundred or more passed through in the spring and fall migrations. Large core habitat sustained many types of birds that are today uncommon or in decline, including forest interior birds, grassland birds, waterbirds and waterfowl, and raptors. The many species which once were common include upland sandpiper, loggerhead shrike, grasshopper sparrow, American bittern, red-shouldered hawk, red-headed woodpecker, bobolink, black tern, Virginia rail, and eastern towhee.

Populations of amphibians, fish, aquatic insects, and mollusks were once teeming in the County's rivers, streams, and wetlands. Overharvesting and pollution, plus large increases in impervious cover from buildings, roads and parking lots, took a sharp toll on aquatic animal populations. In the case of trout, increased stormwater runoff near waterways has reduced levels of groundwater recharge, which in turn reduces the influx of cold groundwater to trout streams. Sediment from cropland, overgrazed pastures, and roads, together with excessive water from impervious cover and cropland, is a major cause of heavy sediment loads and bank erosion in streams, rivers, and ponds. The introduction of water quality rules at federal and state levels beginning in the 1970s reduced pollution from point sources like wastewater treatment plants and factory outfalls, and in recent decades has provided a solid framework to quantify and limit non-point sources such as stormwater. This has and will continue to benefit aquatic wildlife.

Many other species have disappeared from the County or are in steep decline. Declining species have been identified by the Minnesota DNR, in the State Wildlife Action Plan, as Species of Greatest Conservation Need (SGCN). This topic will be discussed in the following sections (3.5.2 and 3.6).

Despite the dramatic changes to wildlife in the last 150 years, protected areas, such as the Minnesota Valley National Wildlife Refuge and the Gores Pool Aquatic Management Area (AMA), still provide the County with diverse though fragmented habitats—riverine wetlands, fens, seeps,

floodplain forests, oak savannas, forest, and grasslands. Over 250 species of birds, including nesting bald eagles and peregrine falcons, some fifty species of mammals, and thirty species of reptiles and amphibians have been noted here.

3.5.2. Wildlife in the Park Today

Describe the park's habitat types and examples of typical wildlife which occur in those types.

Use the following habitat categories: Deciduous Forest, Mixed Forest, Woodland-Brushland, Savanna-Brushland, Grassland/Prairie, Floodplain Forest, Wet Forest/Swamp, Wet Meadow, Emergent Marsh, Lake/Pond, and River/Stream.

Mention some of the species observed during recent surveys. Can group with vegetation type, if desired.

Reference Appendix B.

3.5.3. At Risk Wildlife Populations

Using a SGCN list specific for the park, identify species in each habitat category (above) which use or could potentially use the park. Including a table that lists each of these is recommended.

For each species, discuss the following:

- *Evidence of species using the park*
- *If no evidence, potential for species to use the park, with rationale*
- *Potential barriers to the species using the park*

3.6. Rare Natural Features

The Minnesota Department of Natural Resources' Natural Heritage Database was searched for rare natural feature records within one mile of the boundaries of the park. This search identified the following rare natural features:

Insert table of rare natural features from DNR. For each record, provide the following information:

- *Feature type (plant community, rare plant, rare animal, other feature)*
- *Feature name (common, scientific)*
- *Global/state rarity rank*
- *Last observed date*

For each feature, discuss obstacles to its persistence in the park, and specify restoration and management measures to address the obstacles.

4. NATURAL RESOURCES ISSUES AND OPPORTUNITIES

4.1. Issues

4.1.1. Issue 1

Describe significant issues (constraints), organized under major categorical headings. Issues should address:

- *Invasive plant and animal species*

There are a number of plants and animals that if present in the park, are potentially injurious to the health of animals humans, uncommon plant and wildlife species, and the environment in general. Field assessment of the park identified the following noxious/invasive plants and animals:

List all exotics plants and animal species and those that are invasive. Provide a map showing locations of infestations. Note: This information has been already done for aquatic invasive species (AIS)—see the most current AIS report for the parks, and include information from the report that is pertinent here.

Other issues that need to be considered:

- *Habitat fragmentation, edge effects, core habitats, and habitat connectivity*
- *Vegetation management*
- *Pests and diseases*
- *Pesticide and herbicide use*
- *Stormwater management/conveyance, including from adjacent properties*
- *Pollinator habitat*
- *Residential, commercial, or industrial activities*
- *Buildings, improvements, small structures*
- *Utilities and septic systems, roads, parking areas, paths, and trails*
- *Fences, including adjacent fences*
- *Alteration of natural water bodies*
- *Alteration of topography/presence of erosion*
- *Harvesting of timber, berries, or fruit*
- *Agricultural crops and livestock grazing*
- *Recreational horseback riding*
- *Motorized vehicles*
- *Signs*
- *Recreational activities*

Add issues, as necessary

4.2. Opportunities

4.2.1. Opportunity 1

Describe how the County can capitalize on opportunities presented by the park, including opportunities to overcome issues described in the previous section, as well as park user opportunities such as education, volunteerism, etc.

Add opportunities, as necessary.

5. NATURAL RESOURCE VISION AND GOALS

5.1. Vision for **Park Name**

Insert natural resource vision for park.

5.2. Goals for **Park Name**

Ecological restoration is a long-term process. It takes time to restore ecosystems to their former functionality and diversity. And even under the best circumstances and human abilities, generally, this can only be approximated. It took many decades to degrade the ecosystem and biological communities on the property, so it will not be restored overnight. Many steps are typically involved in a successful restoration; even deciding when a restoration is complete/successful can be very difficult. Restoration should be viewed as a process and not as an end point. The ultimate goal is to achieve and maintain a diverse natural community at the site, though this will not always proceed in a linear fashion. Using the concept of *adaptive management* will be the key to continual progress at the site. Adaptive management is a strategy commonly used by land managers, which integrates thought and action into the restoration process. It can be described as a strategy that uses evaluation, reflection, communication, and also incorporates learning into planning and management. It is set up like a feedback loop and looks like this: Assess Problem → Design → Implement → Monitor → Evaluate → Adjust → Assess Problem → and so forth. Thus, moving forward with restoration, each round of adaptive management refines and hones the process to better fit the conditions of the site. This strategy should be emphasized on the greenway.

5.2.1. Goal 1

Describe goal based on issues and opportunities. One goal should be proposed for each native plant community/land cover type. For native plant communities, briefly describe a typical reference site or sites, including vegetation structure and composition, landscape setting and soils, natural history of the community (see MnDNR [Field Guide to the Native Plant Communities of Minnesota](#)).

Define performance standard(s) used to measure success for each goal.

Insert map of proposed land cover, with management units identified and labeled.

5.2.2. Goal 2

Add goals, as necessary.

5.2.3. Goal 3

Add goals, as necessary.

Etc.....

6. PARK MANAGEMENT UNITS

6.1. Management Unit 1

6.1.1. Description

Provide general description of management unit.

6.1.2. Amenities

Describe amenities within each unit.

6.1.3. Plant Communities

Based on the greenway's geology, soils, topography, hydrology, existing land cover and use, current and anticipated ecological conditions, and the landowner and County goals, target plant communities are recommended for each of the existing land cover units (see Table x and Figure x). Each of the target plant communities is described, with descriptions taken directly from the *Field Guide to the Native Plant Communities of Minnesota: the Eastern Broadleaf Forest* (DNR 2005).

Describe existing and proposed plant communities within each unit.

Insert summary table showing acres converted from existing to proposed cover types.

Seed mixes should be selected and/or designed to meet the park's environmental conditions and restoration goals. When selecting or designing native seed mixes, do not include species that are:

- 1. Very difficult to establish by seed*
- 2. Noxious*
- 3. Invasive*
- 4. Exotic*
- 5. Native that are overabundant or highly aggressive*

Include the following text:

Source origin of native seed should be from within the location depicted in Appendix C. The closer to the center of the circle (Dakota County), the better.

6.1.4. Invasive Species

Describe invasive species within each unit, level of control, and to what level or priority they need to be managed.

6.1.5. Wildlife

Describe wildlife and use within each unit.

Describe proposed/desirable wildlife and how to accommodate/introduce.

6.1.6. Water

Describe water features and quality within unit.

Describe proposed/desirable water quality and quantity and how to achieve.

6.1.7. Additional Management Recommendations

Describe additional/special management recommendations within each unit.

Examples include: re-establishing ecosystem processes such as natural disturbance, historic hydrology, hydrologic cycles, seed dispersal, pollination, nutrient cycling, etc.

6.2. Management Unit 2

Repeat section and above subsections as necessary, for each unit.

7. MONITORING AND REPORTING

7.1. Monitoring

Explain the purpose of ecological monitoring.

Describe ecological monitoring proposed to measure performance standards (described in Goals above); this may address:

- *Soils*
- *Vegetation*
- *Water*
- *Wildlife*

7.2. Reporting

Describe reporting methods to document and track monitoring and inform adaptive management

8. PRIORITIZATION, SCHEDULING AND COSTS

8.1. Prioritization

Prioritization System-Wide (excerpt from NRMSP, Section 11.6.1)

It is important that potential projects are evaluated individually to ensure that they are soundly conceived and designed, and that they are actually a high priority project. To this end, each potential project will be run through a set of criteria and scored. The criteria will be weighted according to their relative importance to achieving the goals of the NRMSP. Projects that receive a high score would receive the highest priority for funding and execution.

One method being considered is STAPLE-E, a typical bottom-up set of criteria. STAPLE-E considers the following in its scoring:

- S = Social
- T = Technical
- A = Administrative
- P = Political
- L = Legal
- E = Environmental
- E = Economic

A bottom-up scoring system should be balanced by a top-down set of criteria. For example, no one park should receive the majority of funding, even if the needs of that park result in the identification of many important projects. This would help spread the restoration and management work more evenly among parks.

Other criteria, especially when pursuing grants, will be employed. For example, the DNR uses criteria for selecting candidate projects for Legacy grants. The County should evaluate projects being submitted for this funding using the DNR's criteria.

Lebanon Hills Regional Park is the County's largest and most-used park and should receive more consideration than other parks, such as ensuring that each year a project occurs there, even if it is a small one.

Prioritization at **PARK NAME**

Provide general description of prioritization for management units and/or activities and rationale. Typically, high priority units contain one or more of the following:

- *rare or uncommon features such as rare plant populations, rare animal populations or observations, high quality native plant communities, unusual or unique geologic features, etc.,*
- *areas that could provide important buffer habitat*

- *areas that could effectively connect rare or unique features*
- *high recreational use areas that merit attention, mitigation, or restoration e.g., Visitor/Gathering Centers or highly used trails*
- *areas of erosion (degraded streambanks, lakeshores, ravines or slopes)*
- *areas that have been previously restored*
- *areas that are particularly sensitive or threatened (e.g. high sensitivity to groundwater contamination*
- *areas that provide crucial habitat to declining wildlife species e.g. hibernacula for snakes and bats, shoreland/mudflats for shore birds, prairie-wetland complexes for Blanding's turtles, milkweed for monarch butterflies, etc.)*
- *headwaters of rivers*
- *protected trout streams*
- *steep slopes or bluffs*
- *groundwater infiltration areas*
- *Important Bird Areas (IBAs)*

8.2. Initial Implementation Schedule and Costs

Insert table/chart (see example) showing short-term (typically, a five-year work plan) implementation of priority management units/tasks and associated estimates of probable cost in format suitable for County planning/budgeting.

Include a more general long-term (20-year) work plan.

Table X. Short-Term (5- Year) Schedule and Costs

Example

Restoration and Management Areas and Tasks	YEAR					Area 1 Totals
	2016	2017	2018	2019	2020	
1. Dry/Mesic Oak Forest (xx ac)						
a) Remove Trash	\$ 1,500					\$ 1,500
b) Remove Invasive Woody Species	\$ 46,000	\$ 4,600				\$ 50,600
c) Control Invasive Herbaceous Species	\$ 2,300	\$ 2,300				\$ 4,600
d) Install Native Seed (no Herbaceous Plants)		\$ 2,900				\$ 2,900
e) Install Native Woody Plants			\$ 20,000			\$ 20,000
f) Conduct control burn						
g) Ecological Monitoring & Management	\$ 5,000	\$ 5,000	\$ 6,000	\$ 5,000	\$ 4,000	\$ 25,000
Totals	\$ 54,800	\$ 4,800	\$ 26,000	\$ 5,000	\$ 4,000	\$ 104,600
2. Wet Meadow (xx ac)						
a) Re-establish hydrology						
b) Control Invasive Herbaceous Species	\$ 10,000	\$ 5,000				\$ 15,000
c) Install Native Seed (no Herbaceous Plants)		\$ 6,500				\$ 6,500
d) Install Native Woody Plants			\$ 3,000			\$ 3,000
e) Ecological Monitoring & Management	\$ 3,000	\$ 3,000	\$ 4,000	\$ 3,000	\$ 2,500	\$ 15,500
Totals	\$ 13,000	\$ 14,500	\$ 7,000	\$ 3,000	\$ 2,500	\$ 40,000
3. Emergent Marsh (xx ac)						
a) Control Invasive Herbaceous Species	\$ 3,000	\$ 3,000				\$ 6,000
b) Install Native Seed & Herbaceous Plants		\$ 22,000				\$ 22,000
c) Ecological Monitoring & Management	\$ 2,000	\$ 2,000	\$ 2,500	\$ 2,000	\$ 1,500	\$ 10,000
Totals	\$ 5,000	\$ 27,000	\$ 2,500	\$ 2,000	\$ 1,500	\$ 38,000
4. Mesic Prairie Planting (xx ac)						
a) Remove Turf Grass	\$ 600					\$ 600
b) Install Native Seed (no Herbaceous Plants)	\$ 600					\$ 600
c) Conduct control burn						
d) Ecological Monitoring & Management	\$ 800	\$ 800	\$ 800	\$ 800	\$ 600	\$ 3,800
Totals	\$ 2,000	\$ 800	\$ 800	\$ 800	\$ 600	\$ 5,000
Short-Term Ecological Restoration & Management						
Annual Totals	\$ 74,800	\$ 57,100	\$ 36,300	\$ 10,800	\$ 8,600	\$ 187,600

9. REFERENCES

List references

Standard format:

Author's last name, first initial, second initial; other authors' first initial, second initial and last name; title of book/report/paper; journal name, issue number (if applicable); publisher name, city and state (abbreviation).

Appendix A. Plant Species Inventory (including invasives)

Dominant Flora and Invasive Species by Natural Land Cover Type and Layer (including cover class):

Species (by Stratum)	Common Name	Dry/Mesic Oak Forest	Other Mesic Forest	Savanna	Mesic Prairie	Non-native Grassland	Wet Meadow
Canopy Layer							
<i>Acer negundo</i>	Box elder		1	1			
...	....	2					
<i>Ulmus americana</i>	American elm	2	1				
Shrub/Vine/Sapling Layer							
<i>Amorpha canescens</i>	Lead plant			1	1		
<i>Rhamnus cathartica</i>	Common buckthorn	3	1				
...	....	2					
<i>Vitis riparia</i>	Riverbank grape	2	1				
Herbaceous Layer							
<i>Acer nigrum</i>	Black maple		2				
...	....	2					
<i>Zizia aurea</i>	Golden Alexanders			1			

Cover Classes: 1 uncommon (<10%); 2 common (10 - 30%); 3 sub-dominant (30 - 50%); 4 dominant (>50%)

Red font = invasive species of concern

Appendix B. Wildlife Species Inventory (including invasives)

Wildlife Observations/Indications by Natural Land Cover Type (including abundance class):

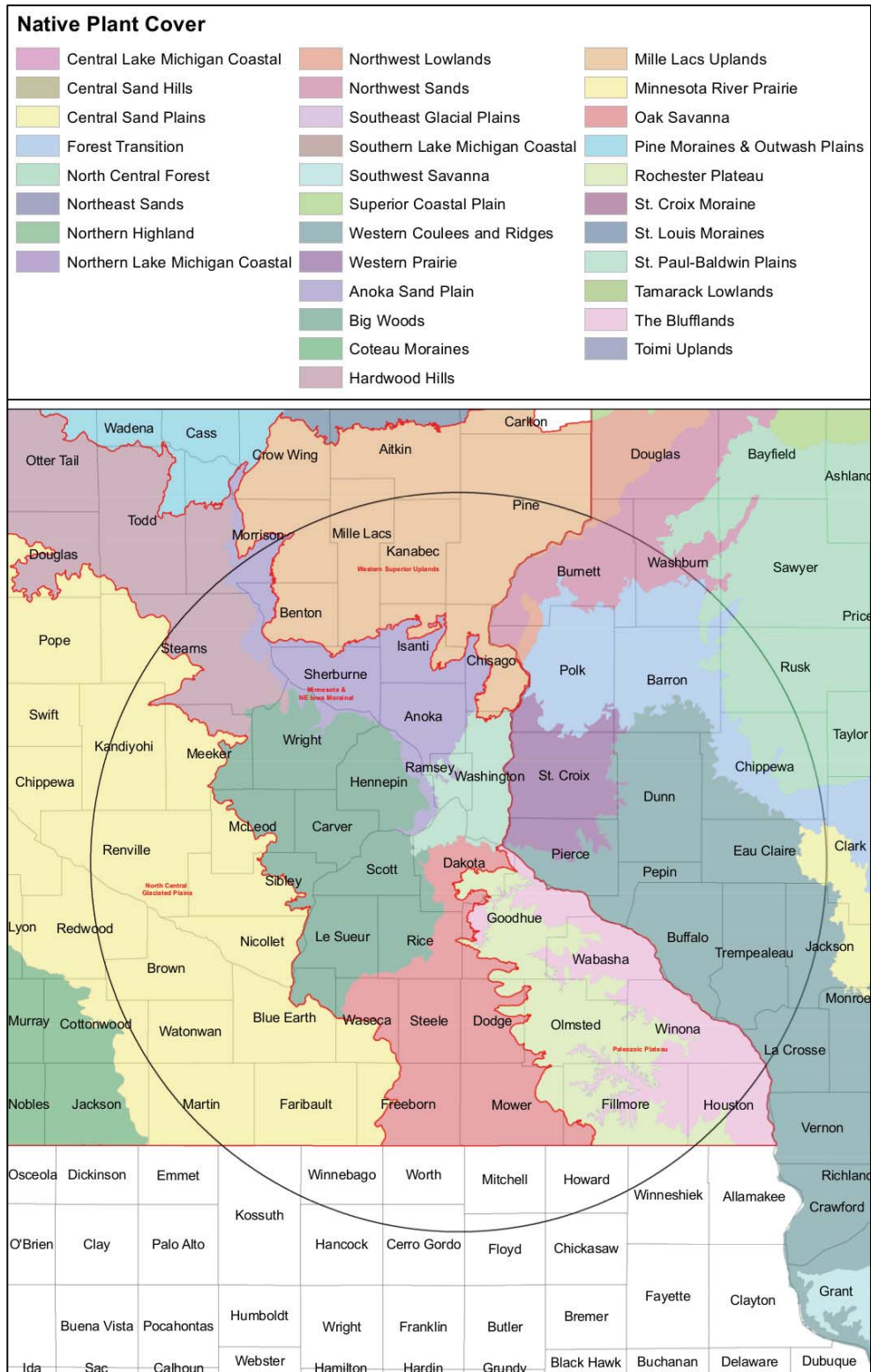
Common Name (by Stratum)	Deciduous Forest	Mixed Forest	Savanna-Brushland	Grassland/Prairie	Wet Meadow	Emergent Marsh
Mammals						
White-tailed deer	1	1				
...						
Birds						
Redwing blackbird						3
...						
Amphibians and Reptiles						
Leopard frog						1
...						
Fish						
Common carp						1
...						
Invertebrates						
Earthworm		3				
Monarch butterfly				2	1	
...						

Abundance Classes: 1 uncommon (1-4 individuals); 2 common (5-25 individuals); 3 abundant (>25 individuals)

Red font = invasive species of concern

Appendix C. Acceptable Source Origin of Native Seed

Native seed source origin should be from within circle shown below.



Appendix E

NRMP Template – Greenways

Template legend:

- *Black text – generic for all/most NRMPs*
- *Red text – requires editing*

Greenway Name **Natural Resource Management Plan**

Date

Consultant or Contributing Author(s)

Insert photo of greenway

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Appendix A. Plant Species Inventory (including invasives)

Appendix B. Wildlife Species Inventory (including invasives)

Appendix C. Acceptable Source Origin of Native Seed

1. EXECUTIVE SUMMARY

Provide maximum 2-page summary (front and back) of

- *Major natural resource findings (issues, opportunities, etc.)*
- *County and landowner vision and goals for greenway*
- *Previous restoration/management efforts on the greenway*
- *Major recommendations*
- *If it exists, reference any agreements between greenway landowners/partners and the County that describes priority activities, schedule, costs, roles, responsibilities, and cash and in-kind contributions that is included in the Final NRMP*

The NRMP will be reviewed and updated every five years, or as needed to maintain its relevancy.

Dakota County contact information:

Dakota County Environmental Resources Department
14955 Galaxie Avenue, Apple Valley, MN 55124
Project Lead: *Insert name and contact information*

2. INTRODUCTION

2.1. Precedent Planning Efforts

The Dakota County 2030 Park System Plan was approved by the Dakota County Board in 2008 and consists of the three main components: Great Places, Connected Places and Protected Places. Previous Park Master Plans were completed in Year(s). In 2010, Dakota County and several cities within the County (constituting The Dakota County Greenway Collaborative) adopted *The Greenway Guidebook*. In 2017 a Natural Resource Management System Plan (NRMSP) was approved by the County Board for all parks, greenways and County conservation easements. Also in 2017, a Visitor Services Strategic Operations Plan (VSSOP) was completed for all parks and greenways. This GREENWAY NAME Natural Resource Management Plan was developed with the goal of incorporating previous natural resource management efforts for Park Name, being consistent with the goals outlined in the NRMSP and being compatible with the overall park system plan and the VSSOP.

2.1.1. The Greenway Guidebook (2010)

The Greenway Guidebook was developed collaboratively by Dakota County and the cities in Dakota County: Apple Valley, Burnsville, Eagan, Farmington, Hastings, Inver Grove Heights, Lakeville, Mendota Heights, Rosemount, South St. Paul and West St. Paul. The publication describes public support of greenways, presents a vision for the County's greenway system, and gives guidance to identify, protect, design, and maintain effective greenways. Important issues are also addressed, such as joint ownership, cost-sharing, grant funding, signage, wayfinding, safety, education, and enforcement.

2.1.2. Natural Resource Management System Plan (2017)

The County recently developed a Natural Resource Management System Plan (NRMSP) to guide natural resource management in county parks, greenways and conservation easements over the next 20 years. Combined with the Visitors Service Plan (VSSOP), near and long term operations for the park system will be determined in the context of the existing or new master plan.

The process for developing the NRMSP consisted of four phases:

- Phase I: Scoping. Defined goals of the NRMSP and data used to complete the plan.
- Phase II: Research. Highlighted research completed to determine the type and condition of natural resources on County-owned lands and easements, including an inventory of measures needed to improve the health and condition of these lands.
- Phase III: Principles, Vision and Preliminary Concepts. Described the vision for natural resource management and the principles used to guide the overall approach.
- Phase IV: Preferred Plan Option. Specified five and twenty-year priorities for managing natural resources in the system, and provided natural resource management plan templates for individual parks, greenways and easements.

Development of the NRMSP required an extensive review process, including public workshops/open houses and public input to a dedicated NRMSP webpage on the County’s website; and a Technical Advisory Committee comprised of members from academia, non-profit conservation organizations, private landowners, community leaders, Soil and Water Conservation District, and State Agency staff. The Plan was presented to the County Planning Commission and County Board at several points, and the County Board **approved the NRMSP in May, 2017.**

Summary of NRMSP Initiatives for Tier 1, years 2018-2022

The following tables summarize the initiatives for each of the major service areas, vegetation, water, and wildlife, for the first five years of implementing the NRMSP.

Activity	Acres	Estimated Cost
1. Control highly invasive species on County-owned greenway land	180	\$151K
2. Restore/enhance, high quality natural areas and areas within County-owned land	60	\$140K
3. Maintain existing restored areas within County-owned lands	180	\$25K
4. Develop NRMPs for each regional greenway	All	\$215K
TOTAL		\$531K

*Describe how the **GREENWAY NAME** NRMP will fulfill the above initiative and management activities for the five-year NRMSP work plan. (May reference tables or passages that appear later in the document).*

2.1.3. Greenway Name Master Plan (year)

Summarize key findings from existing plan:

- *Main recreation provided by greenway*
- *Cultural resource features and constraints on natural resource restoration and management activities*
- *Natural resources and related issues and opportunities*
- *Implementation plan effects on natural resources (proposed or new infrastructure and modified programs); and major natural resource projects completed, underway or proposed*

Insert important summary graphics.

2.2. Regional Natural Resource Conservation Context

Describe briefly the greenway's landscape setting, proximity to other parks or conservation lands, proximity to conservation corridors, the effects of surrounding land uses, and conservation efforts by others nearby that affect the greenway. Additional details can be provided in Section 3.1.

2.3. Natural Resource Public Values

The natural world is a powerful influence in the lives of many, and has been for millennia. County residents in survey after survey express their desire to have nearby natural places that are out of the ordinary where they can be close to and even fully immersed in the natural world. For its residents, County greenways represent important recreation and transportation corridors that help connect them to the natural world and maintain a healthy lifestyle.

Insert any greenway-specific public perceptions/priorities (based on previous surveys, etc.).

3. EXISTING NATURAL RESOURCES

3.1. Landscape Context

3.1.1. Location

Describe location using City, township, etc.

Insert location map(s) showing:

- *Greenway boundary, based on County definition of urban segments (100 foot target width), suburban segments (200 foot target width), and rural segments (300 foot target width).*
- *Municipal boundaries*
- *Watershed boundaries (smallest HUC that is useful) for the water bodies inside the greenway*
- *General land use*

3.1.2. Regional Natural Resources Context

Describe ecological subsection(s) and characteristics

Insert ecological subsection map

3.1.3. Adjacent Land Use

The adjacency of parkland, cultivated land, open areas, and residential subdivisions can affect vegetation and wildlife management options, and may present opportunities to enlarge existing habitat areas, create corridors for wildlife movement, and determine the characteristics of local surface water hydrology.

Describe the use of land adjacent to the greenway, and its current and likely future impact on the greenway as a natural area. Explain the greenway's importance and compatibility with neighboring properties in more detail with reference to figures.

3.2. Physical Conditions

The natural resources within the greenway are affected by a number of physical conditions that influence their origin, current status and future condition. These features include the local geology, topography, and soils.

3.2.1. Geology

Describe geology as it directly relates to the plant communities and surface water features of the greenway:

- *Bedrock as it relates to special plant communities, groundwater chemistry of water bodies, etc.*
- *Glacial history and deposits as it relates to plant communities, groundwater, water bodies, etc.*

Insert bedrock map with greenway boundary

Insert surficial geology map with greenway boundary

3.2.2. Topography

Topography and aspect (slope orientation relative to north, south, east, and west) are important factors in the development and formation of soil, soil erosion potential, and the type and stability of vegetation for a given location. The primary factors involved with topography, as it concerns natural features, are relief and variation. The difference from the highest to the lowest elevation is referred to as “relief”. The differences in contours from place to place across the landscape determine the amount of topographic variation. Taken together with variation in soil type, these factors help determine overall site heterogeneity. In general, greater heterogeneity within a site creates more complexity in vegetation and hydrologic features, which leads to greater biological diversity.

Aspect can have a strong influence on soil temperature and moisture. In the northern hemisphere, north- and east-facing slopes are often shaded or cooler, while south- to west-facing slopes are hotter and receive more solar radiation. Aspect can significantly influence the local climate (microclimate). Soil temperatures and soil moisture on south- to west-facing slopes are typically warmer and dryer than those on north- to east-facing slopes, due in part to the increased solar radiation and direction of the prevailing winds in the summer. Likewise, soils on north- to east-facing slopes tend to be cooler and wetter, due to diminished solar energy and late afternoon shading during the hottest part of the day.

Describe landforms and slopes as they directly relate to erosion, aspect, or other forces affecting plant communities, surface waters, etc.

Insert topographic map with contours, water bodies, and greenway boundary. Generate in GIS a steep slope (>12 percent) overlay for this map.

3.2.3. Soils

The “Soil Survey of Dakota County Minnesota,” issued April 1983 and updated in May 1994, provides a generalized depiction and descriptions of soils in Dakota County. Soil formation is the result of the interaction of parent material, climate, organisms, topographic position or slope, and time. Collectively, these factors can help determine the dominant plant and animal communities, which in turn influences future soil development. Soil units/types suggest the most appropriate use and management of the land.

Describe soils as they directly relate to plant communities, surface waters, etc.

- *Classification of soils—soil unit name, family or higher taxonomic class, texture, and hydrological class*

Insert soils table and map showing SSURGO map units and soil unit names. Highlight hydric soils and highly erodible soils.

3.3. Vegetation

The vegetation found in the greenway is determined by such factors as: physical site conditions (topography, soils and hydrology); historic and current land use; climate; invasive species; and

wildlife. Vegetation is also affected by natural processes such as succession or natural events that create change and variation. Abrupt changes (disturbances), including wildfires, high winds and floods, can quickly change the vegetative structure and composition. There is a spectrum of disturbance intensity from light, frequent events to catastrophic, uncommon events. The frequency and interval of different types of disturbance results in a myriad of potential vegetation types. After thousands of years, these dynamics influenced vegetation patterns and native plant communities prior to human settlement. More recent European settlement induced dramatic changes such cultivation, draining, pasturing, logging, mining, and development have created profound changes through disruptions of natural cycles and processes. Natural succession, the gradual change in structure and species composition, occurs as the vegetation changes in response to changes in light, water, nutrients, herbivory, predation, parasitism, and competition. Under natural conditions, succession tends to occur gradually over time and cause broadly predictable changes in the diversity and extent of vegetation communities and associated wildlife. The effects of disturbance and succession can vary widely. Different areas will be at varying successional stages due to diverse history, disturbance regimes and time interval since the last major disturbance. These conditions interact with the environmental variability and genetic plasticity to create a mosaic of vegetation in various conditions across landscapes, including parks.

3.3.1. Historical Vegetation and Land Use

One major consideration for developing a comprehensive Natural Resource Management Plan (NRMP) is to understand the types of vegetation found on and around the greenway prior to European settlement. This information can be a helpful indicator of plants that may be found or thrive on the greenway. Fortunately, field notes on vegetation were taken during original territorial surveys in the 1840s-1860s and compiled into a valuable information source entitled “The Original Vegetation of Minnesota, compiled from U.S. General Land Office Survey Notes” (Notes) in 1974.

In general, the northern and western portions of the County consisted of hardwood forests among rolling hills and many lakes. American basswood, sugar maple, elm, red oak, and an understory of shade-loving wildflowers made up the “Big Woods” in the moist areas protected from fire. Bur and white oak, aspen and black cherry were the dominant tree species in the drier areas. The southern part of the County consisted primarily of prairie and savanna. Depending on soils, topography and hydrology, tall grasses measuring as high as eight feet would have been the prominent vegetation type, with a diverse mix of other grasses and wildflowers (forbs). Shorter grasses and a wide variety of other forbs were found on sandy and gravel areas and steeper slopes. Wet prairies were common on wetter soils where the water table was close to the surface. Wet meadows and marshes were present on soils that had standing water, but that burned often enough to prevent trees and shrubs from becoming dominant. Near smaller rivers, prairie or savanna would often be found, even up to the water’s edge. A large number of wetlands once existed in the southwestern portion of the County with only 12 to 15 percent remaining in Dakota County. Savannas with scattered oak trees formed transitional plant communities between grasslands and forests within the much larger transitional zone between the vast grasslands of the American West and the deciduous forests of Eastern America. Forested floodplains with cottonwood, silver maple, willow, and American elm were found in wider river valleys.

Figure x shows the predominant, pre-settlement plant communities of the greenway.

Describe pre-European settlement vegetation, including descriptions of each natural plant community

Describe Native American use of greenway area

Interpret implications of pre-European settlement vegetation and Native American land use for current plant communities and surface waters in greenway.

3.3.2. Land Cover and Use Trends

European settlement significantly changed the Dakota County landscape. Native prairies were plowed, forests and woodlands cut, wetlands drained, fires suppressed, and intense agricultural practices introduced, including row cropping and livestock grazing. Since WWII residential and commercial development has replaced much of the agricultural land cover in the northern half of the County. However, the southern half is predominantly open space though dominated by agriculture.

Some of the best evidence of past land use is depicted in a progression of historical aerial photographs. Figures x-x are historical aerial photos of the park and surrounding area starting from 1937 through 20xx.

Describe European settlement and use of greenway area (e.g., density of buildings; loss of natural features; intensive agriculture; areas too difficult to develop (because hard to reach, too dry, too wet, rocky terrain, etc.).

Describe land cover and related ecological changes (e.g., vegetation conversion; woody vegetation increased over time; encroachment of housing development; lake or stream levels increased or decreased and the likely reason(s); evidence of erosion issues; likely wildlife responses to changes).

3.3.3. Land Cover Mapping and Assessment

Prepare a table summarizing by year each previous plan(s) land cover and vegetation types, with a quality rank (see below for criteria) for each plant community. Columns should be for previous years and the current year, indicated by each year's date.

Insert map(s) showing current land cover/vegetation mapping and quality ranks. Summarize any changes/updates/refinements to previous classification, quality ranking, and mapping of each plant community.

Reference Appendix A.

3.4. Aquatic Resources

3.4.1. Groundwater and Aquifer Sensitivity

Groundwater accumulates below the surface of the land and is stored in complex, underground layers of sand, gravel and porous rock. If groundwater exists in suitable quantity and quality, and can be tapped for human use, it is of great economic value. In the northern portion of the County where the glacial deposits tend to be deeper, groundwater is often extracted from drilled wells into

sand and gravel deposits. In the southern part of the County where the layer of glacial deposits is shallower, most drilled wells extend into the porous bedrock. Throughout the County most public water supplies are obtained from one of the deeper bedrock aquifers.

Due to its relative abundance, quality and reasonable access, groundwater provides drinking water for the majority of County citizens, irrigation water for agricultural crops (especially on the sandier soils in the southeastern portion of the County), and process and cooling water for industrial and manufacturing companies. Although the amount of available groundwater appears to be stable, there is growing concern about the groundwater supply due to increased agricultural irrigation, suburban water use, changing climate. Improved information on the role of groundwater to ecological systems like trout streams corroborates this. At the same time, much of the County's groundwater is "highly sensitive" to surface contamination, meaning that it takes only days or months for contaminants to reach the aquifer. Once an aquifer is polluted, it takes a long time for contaminants to either leave or be immobilized. It is very or prohibitively expensive to improve a polluted aquifer's quality to attain drinking water standards.

Given its importance and potential vulnerability, every effort should be made to prevent groundwater contamination, including from pesticide and herbicide use. Factors to consider during natural resource management activities are 1) depth to groundwater and 2) the ability of the overlying geologic materials to protect the groundwater aquifer (deeper and less porous soils are best—thinner and more porous soils are worse).

Describe the groundwater conditions affecting the greenway's surface waters.

Describe aquifer sensitivity rating(s) in the greenway (include map).

Describe best practices to prevent pollution of groundwater in the greenway and to maintain groundwater recharge rates in the greenway.

Describe off-site pollution of or off-site diversion of groundwater from surface waters in the greenway.

3.4.2. Surface Waters

One of the unique and attractive features of Dakota County is the amount and diversity of its surface waters. Major riverine systems, including the Mississippi, Minnesota, Cannon, and Vermillion Rivers create the borders or flow within the County. A number of creeks, streams and brooks are found in the southern portion of the County. Numerous small lakes are found in the northern and western portions of the County as a result of previous glaciation. The two largest lakes, Crystal and Marion, are highly desirable for their scenic beauty and recreation. Different types of wetlands are scattered throughout the County and several unique wetlands, known as fens, are found in the Minnesota River Valley. Two large reservoirs, Lake Byllesby and Spring Lake were formed with the creation of dams.

Over time, most of these surface waters have been significantly degraded due to agricultural and municipal stormwater run-off. Entire wetland complexes that were important for filtering, and retaining water and recharging the groundwater have been lost. Pollution often includes excess bacteria, sediment and nutrients (especially nitrogen and phosphorous from fertilizer), causing lower levels of dissolved oxygen that limits reproduction and survival of fish populations and other

aquatic organisms. Although state and federal regulations and voluntary efforts have improved water conditions, protection and management of natural areas, especially those adjacent to water bodies, is an important strategy for achieving water quality goals.

Lake Name

Describe each greenway lake in terms of:

- Physical characteristics (size, depth, watershed acres, water chemistry, etc.)
- Water quality (Carlson TSI or similar metric, algae bloom records, possible cause of poor water quality, etc.)
- Water quantity
- Regulatory environment (Section 303(d) impairments, TMDL, etc.)
- Aquatic habitat types, locations, and quality (linked to vegetation cover, diversity, invasive aquatic plants)
- Shoreline erosion type, extent, and possible cause(s)

Insert map showing lakes in greenway, watershed of lake, watershed management jurisdictions, and 303(d) impaired waters.

Stream Name

Describe each greenway stream, including:

- Physical characteristics (average flow, length in greenway, total length, watershed acres, percentage of stream in greenway compared to total watershed, etc.)
- Upstream land uses and stream conditions
- Water quality (sediment and phosphorus metrics, etc.)
- Regulatory environment (303(d) impairments, TMDL, etc.)
- Aquatic habitat types, locations, and quality for fish and macroinvertebrates
- Stream bank erosion, type, extent and possible cause(s)

Insert map showing MnDNR Protected Watercourses (streams), stream watersheds, watershed management jurisdictions, and 303(d) impaired waters

Wetlands

Wetlands are addressed in Land Cover (Section 3.3.3).

Insert this sentence:

Wetlands are covered in Land Cover (Section 3.3.3), but are referenced here due to their protection under state and federal law. Wetlands may not be dredged, filled, or drained without a permit, but vegetation can be altered or even completely removed (sometimes requiring a permit), especially for the purpose of ecological restoration and invasive plant management.

Insert map showing NWI wetlands.

Insert table showing type, description, and size of wetland on the NWI map.

3.5. Wildlife

3.5.1. General Wildlife Habitat

With a heterogeneous landscape, diverse vegetation and an abundance of surface water, Dakota County historically had a highly diverse wildlife community. Several sub-ecoregions converged and intersected providing opportunities for the existence of a wide array of species endemic to different ecosystems, forming a diversity of wildlife habitats.

Historic Fauna of the County

In the 1800s, early explorers and settlers documented that bison grazed the prairie terraces near Fort Snelling and nearly all of the early explorers from Radisson to Hennepin mentioned their abundance. Though elk were not considered common at the time of European settlement, Bison and elk were hunted to near extinction across their Midwestern range, including Dakota County, but agriculture eliminated habitat as well. White-tailed deer also suffered from hunting pressure, but then began to thrive in the fragmented agricultural landscape, once a hunting season was imposed and over-harvesting was controlled. Mountain lions, although present, were never common, but black bears were quite common in the first half of the 1800s.

Smaller mammals such as beaver, mink and muskrat also existed in high numbers. However, over the course of two centuries of heavy trapping, these species' populations nearly crashed. Due to better regulation of trapping beginning in the 1930s, populations of beaver and other species rebounded.

As with the mammals, the County's diverse landscapes supported a wide array of resident and migratory bird species. Over one hundred species of birds nested in the County, and another hundred or more passed through in the spring and fall migrations. Large core habitat sustained many types of birds that are today uncommon or in decline, including forest interior birds, grassland birds, waterbirds and waterfowl, and raptors. The many species which once were common include upland sandpiper, loggerhead shrike, grasshopper sparrow, American bittern, red-shouldered hawk, red-headed woodpecker, bobolink, black tern, Virginia rail, and eastern towhee.

Populations of amphibians, fish, aquatic insects, and mollusks were once teeming in the County's rivers, streams, and wetlands. Overharvesting and pollution, plus large increases in impervious cover from buildings, roads and parking lots, took a sharp toll on aquatic animal populations. In the case of trout, increased stormwater runoff near waterways has reduced levels of groundwater recharge, which in turn reduces the influx of cold groundwater to trout streams. Sediment from cropland, overgrazed pastures, and roads, together with excessive water from impervious cover and cropland, is a major cause of heavy sediment loads and bank erosion in streams, rivers, and ponds. The introduction of water quality rules at federal and state levels beginning in the 1970s reduced pollution from point sources like wastewater treatment plants and factory outfalls, and in recent decades has provided a solid framework to quantify and limit non-point sources such as stormwater. This has and will continue to benefit aquatic wildlife.

Many other species have disappeared from the County or are in steep decline. Declining species have been identified by the Minnesota DNR, in the State Wildlife Action Plan, as Species of Greatest Conservation Need (SGCN). This topic will be discussed in the following sections (3.5.2 and 3.6).

Despite the dramatic changes to wildlife in the last 150 years, protected areas, such as the Minnesota Valley National Wildlife Refuge and the Gores Pool Aquatic Management Area (AMA), still provide the County with diverse though fragmented habitats—riverine wetlands, fens, seeps, floodplain forests, oak savannas, forest, and grasslands. Over 250 species of birds, including nesting bald eagles and peregrine falcons, some fifty species of mammals, and thirty species of reptiles and amphibians have been noted here.

3.5.2. Wildlife in the Park Today

Describe the greenways habitat types and examples of typical wildlife which occur in those types.

Use the following habitat categories: Deciduous Forest, Mixed Forest, Woodland-Brushland, Savanna-Brushland, Grassland/Prairie, Floodplain Forest, Wet Forest/Swamp, Wet Meadow, Emergent Marsh, Lake/Pond, and River/Stream.

Mention some of the species observed during recent surveys. Can group with vegetation type, if desired.

Reference Appendix B.

3.5.3. At Risk Wildlife Populations

Using an SGCN list specific for the greenway, identify species in each habitat category (above) which use or could potentially use the greenway.

For each species, discuss the following:

- *Evidence of species using the greenway.*
- *If no evidence, potential for species to use the greenway, with rationale*
- *Potential barriers to the species using the greenway*

3.6. Rare Natural Features

The Minnesota Department of Natural Resources' Natural Heritage Database was searched for rare natural feature records within one mile of the boundaries of the park. This search identified the following rare natural features:

Insert table of rare natural features. For each record, provide the following information:

- *Feature type (plant community, rare plant, rare animal, other feature)*
- *Feature name (common, scientific)*
- *Global/state rarity rank*
- *Last observed date*

For each feature, discuss obstacles to its persistence in the greenway, and specify restoration and management measures to address the obstacles.

3.7. Ownership

Greenways present unique challenges for establishment, protection, and maintenance. These challenges are due in large part to the definition of a greenway and its ownership by multiple entities.

As mentioned earlier, the County classifies regional greenways as urban (100 foot target width), suburban (200 foot target width), and rural (300 foot target width). Applying these widths to designated segments of County greenways paints a general picture of a greenway's geographic extent. Counties, cities, state agencies, public and semi-public institutions, and private landowners all may own portions of a single greenway. The following table lists land ownership and acreages for the **Greenway Name**.

Insert greenway summary table providing land ownership and associated acres.

4. NATURAL RESOURCES ISSUES AND OPPORTUNITIES

4.1. Issues

4.1.1. Issue 1

Describe significant issues (constraints), organized under major categorical headings. Issues should address:

- *Invasive species (plants and animals)*

There are a number of plants and animals that if present on the greenway, are potentially injurious to the health of animals (especially livestock), humans, uncommon plant and wildlife species, and the environment in general. Field assessment of the greenway identified the following noxious/invasive plants and animals:

List all exotics plants and animal species and those that are invasive. Provide a map showing locations of infestations. Note: This information has been already done for aquatic invasive species (AIS)—see the most current AIS report for the parks, and include information from the report that is pertinent here.

Other issues that may be considered:

- *Habitat fragmentation, edge effects, core habitats, and habitat connectivity*
- *Vegetation management*
- *Pests and diseases*
- *Pesticide and herbicide use*
- *Stormwater management/conveyance, including from adjacent properties*
- *Pollinator habitat*
- *Residential, commercial, or industrial activities*
- *Buildings, improvements, small structures*
- *Utilities and septic systems, roads, parking areas, paths, and trails*
- *Fences, including adjacent fences*
- *Alteration of natural water bodies*
- *Alteration of topography/presence of erosion*
- *Harvesting of timber, berries, or fruit*
- *Agricultural crops and livestock grazing*
- *Recreational horseback riding*
- *Motorized vehicles*
- *Signs*
- *Recreational activities*

Repeat Issues as necessary

4.2. Opportunities

4.2.1. Opportunity 1

Describe how County can capitalize on opportunities presented by greenway, including opportunities to overcome issues described in previous section, as well as greenway user opportunities such as education, volunteerism, etc.

Repeat Opportunities as necessary.

5. NATURAL RESOURCE VISION AND GOALS

5.1. Vision for **Greenway Name**

Insert natural resource vision for greenway.

5.2. Goals for **Greenway Name**

Ecological restoration is a long-term process. It takes time to restore ecosystems to their former functionality and diversity. And even under the best circumstances and human abilities, generally, this can only be approximated. It took many decades to degrade the ecosystem and biological communities on the property, so it will not be restored overnight. Many steps are typically involved in a successful restoration; even deciding when a restoration is complete/successful can be very difficult. Restoration should be viewed as a process and not as an end point. The ultimate goal is to achieve and maintain a diverse natural community at the site, though this will not always proceed in a linear fashion. Using the concept of *adaptive management* will be the key to continual progress at the site. Adaptive management is a strategy commonly used by land managers, which integrates thought and action into the restoration process. It can be described as a strategy that uses evaluation, reflection, communication, and also incorporates learning into planning and management. It is set up like a feedback loop and looks like this: Assess Problem → Design → Implement → Monitor → Evaluate → Adjust → Assess Problem → and so forth. Thus, moving forward with restoration, each round of adaptive management refines and hones the process to better fit the conditions of the site. This strategy should be emphasized on the greenway.

5.2.1. Goal 1

Describe goal based on issues and opportunities; one goal should be proposed per native plant communities/land cover.

Define performance standard(s) used to measure success for each goal.

Insert map of proposed land cover, with management units identified and labeled.

5.2.2. Goal 2

Repeat Goals as necessary.

6. GREENWAY MANAGEMENT UNITS

6.1. Management Unit 1

6.1.1. Description

Provide general description of management unit.

6.1.2. Amenities

Describe amenities within unit.

6.1.3. Plant Communities

Based on the greenway's geology, soils, topography, hydrology, existing land cover and use, current and anticipated ecological conditions, and the landowner and County goals, target plant communities are recommended for each of the existing land cover units (see Table x and Figure x). Each of the target plant communities is described, with descriptions taken directly from the *Field Guide to the Native Plant Communities of Minnesota: the Eastern Broadleaf Forest* (DNR 2005).

Describe existing and proposed plant communities within unit.

Insert table showing acre conversion, from existing to proposed cover types.

Seed mixes should be selected and/or designed to meet the particular greenway's environmental conditions and restoration goals. When selecting or designing native seed mixes, do not include species that are:

1. *very difficult to establish by seed*
2. *noxious*
3. *overabundant (aggressive) native*
4. *invasive*
5. *exotic*

Include the following text:

Source origin of native seed should be within the circle shown in Appendix C.

6.1.4. Invasive Species

Describe invasive species within unit, how controlled, and to what level or priority.

6.1.5. Wildlife

Describe wildlife use within unit.

Describe proposed/desirable wildlife and how to accommodate/introduce.

6.1.6. Additional Management Recommendations

Describe additional/special management recommendations within unit.

6.2. Management Unit 2

Repeat section and above subsections as necessary, for each unit.

7. MONITORING AND REPORTING

7.1. Monitoring

Describe ecological monitoring proposed to measure performance standards (described in Goals above); this may address:

- *Soils*
- *Vegetation*
- *Water*
- *Wildlife*

7.2. Reporting

Describe reporting methods to document and track monitoring and inform adaptive management

8. PRIORITIZATION, SCHEDULING AND COSTS

8.1. Prioritization

Provide general description of prioritization for management units and/or activities and rationale. Typically, high priority units contain one or more of the following:

- *rare or uncommon features such as rare plant populations, rare animal populations or observations, high quality native plant communities, unusual or unique geologic features, etc.,*
- *areas that could provide important buffer habitat*
- *areas that could effectively connect rare or unique features*
- *high recreational use areas that merit attention, mitigation, or restoration e.g., Visitor/Gathering Centers or highly used trails*
- *areas of erosion (degraded streambanks, lakeshores, ravines or slopes)*
- *areas that have been previously restored*
- *areas that are particularly sensitive or threatened (e.g. high sensitivity to groundwater contamination*
- *areas that provide crucial habitat to declining wildlife species e.g. hibernacula for snakes and bats, shoreland/mudflats for shore birds, prairie-wetland complexes for Blanding's turtles, milkweed for monarch butterflies, etc.)*
- *headwaters of rivers*
- *protected trout streams*
- *steep slopes or bluffs*
- *groundwater infiltration areas*
- *Important Bird Areas (IBAs)*

8.2. Initial Implementation Schedule and Costs

Insert table/chart (see example) showing short-term implementation of priority management units/tasks and associated estimates of probable cost in format suitable for County planning/budgeting.

Include a more general long-term (20-year) work plan.

Table X. Short-Term (5- Year) Schedule and Costs - example

Restoration and Management Areas and Tasks	YEAR					Area 1 Totals
	2016	2017	2018	2019	2020	
1. Dry/Mesic Oak Forest (xx ac)						
a) Remove Trash	\$ 1,500					\$ 1,500
b) Remove Invasive Woody Species	\$ 46,000	\$ 4,600				\$ 50,600
c) Control Invasive Herbaceous Species	\$ 2,300	\$ 2,300				\$ 4,600
d) Install Native Seed (no Herbaceous Plants)		\$ 2,900				\$ 2,900
e) Install Native Woody Plants			\$ 20,000			\$ 20,000
f) Conduct control burn						
g) Ecological Monitoring & Management	\$ 5,000	\$ 5,000	\$ 6,000	\$ 5,000	\$ 4,000	\$ 25,000
Totals	\$ 54,800	\$ 4,800	\$ 26,000	\$ 5,000	\$ 4,000	\$ 104,600
2. Wet Meadow (xx ac)						
a) Re-establish hydrology						
b) Control Invasive Herbaceous Species	\$ 10,000	\$ 5,000				\$ 15,000
c) Install Native Seed (no Herbaceous Plants)		\$ 6,500				\$ 6,500
d) Install Native Woody Plants			\$ 3,000			\$ 3,000
e) Ecological Monitoring & Management	\$ 3,000	\$ 3,000	\$ 4,000	\$ 3,000	\$ 2,500	\$ 15,500
Totals	\$ 13,000	\$ 14,500	\$ 7,000	\$ 3,000	\$ 2,500	\$ 40,000
3. Emergent Marsh (xx ac)						
a) Control Invasive Herbaceous Species	\$ 3,000	\$ 3,000				\$ 6,000
b) Install Native Seed & Herbaceous Plants		\$ 22,000				\$ 22,000
c) Ecological Monitoring & Management	\$ 2,000	\$ 2,000	\$ 2,500	\$ 2,000	\$ 1,500	\$ 10,000
Totals	\$ 5,000	\$ 27,000	\$ 2,500	\$ 2,000	\$ 1,500	\$ 38,000
4. Mesic Prairie Planting (xx ac)						
a) Remove Turf Grass	\$ 600					\$ 600
b) Install Native Seed (no Herbaceous Plants)	\$ 600					\$ 600
c) Conduct control burn						
d) Ecological Monitoring & Management	\$ 800	\$ 800	\$ 800	\$ 800	\$ 600	\$ 3,800
Totals	\$ 2,000	\$ 800	\$ 800	\$ 800	\$ 600	\$ 5,000
Short-Term Ecological Restoration & Management						
Annual Totals	\$ 74,800	\$ 57,100	\$ 36,300	\$ 10,800	\$ 8,600	\$ 187,600

9. REFERENCES

List references

Standard format:

Author last name, Author first initial, second initial, other Authors' first initial, second initial and last name. Title of book/report/paper. Journal name, issue number (if applicable). Publisher Name, Publisher city name, Publisher state abbreviation.

Appendix A. Plant Species Inventory (including invasives)

Dominant Flora and Invasive Species by Natural Land Cover Type and Stratum (including cover class):

Species (by Stratum)	Common Name	Dry/Mesic Oak Forest	Other Mesic Forest	Savanna	Mesic Prairie	Non-native Grassland	Wet Meadow
Canopy Stratum							
<i>Acer negundo</i>	Box elder		1	1			
...	....	2					
<i>Ulmus americana</i>	American elm	2	1				
Shrub/Vine/Sapling Stratum							
<i>Amorpha canescens</i>	Lead plant			1	1		
<i>Rhamnus cathartica</i>	Common buckthorn	3	1				
...	....	2					
<i>Vitis riparia</i>	Riverbank grape	2	1				
Herbaceous Stratum							
<i>Acer nigrum</i>	Black maple		2				
...	....	2					
<i>Zizia aurea</i>	Golden Alexanders			1			

Cover Classes: 1 uncommon (<10%); 2 common (10 – 30%); 3 sub-dominant (30 – 50%); 4 dominant (>50%)

Red font = invasive species of concern

Appendix B. Wildlife Species Inventory (including invasives)

Wildlife Observations/Indications by Natural Land Cover Type (including abundance class):

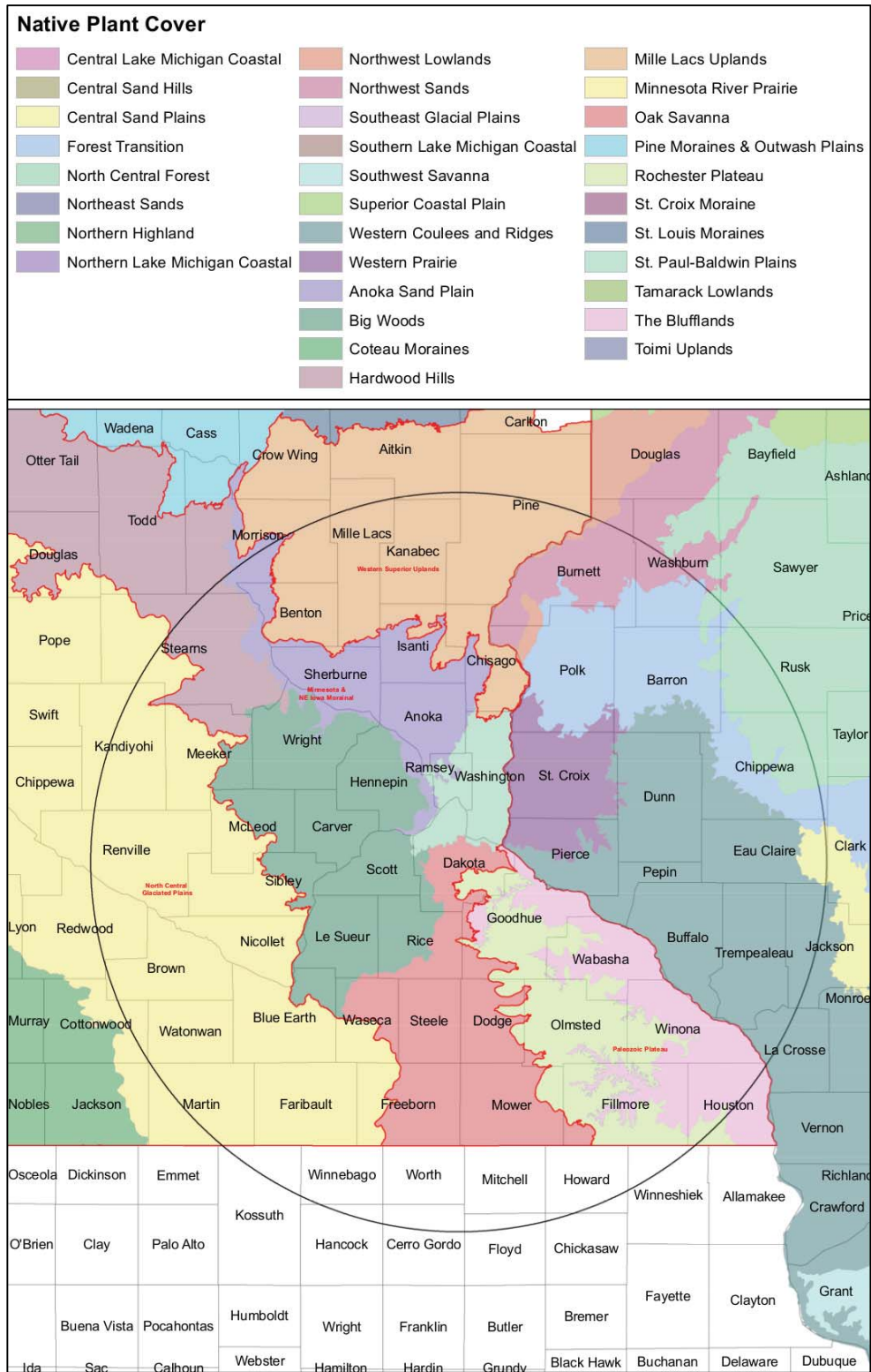
Common Name (by Stratum)	Deciduous Forest	Mixed Forest	Savanna-Brushland	Grassland/Prairie	Wet Meadow	Emergent Marsh
Mammals						
White-tailed deer	1	1				
...						
Birds						
Redwing blackbird						3
...						
Amphibians and Reptiles						
Leopard frog						1
...						
Fish						
Common carp						1
...						
Invertebrates						
Earthworm		3				
Monarch butterfly				2	1	
...						

Abundance Classes: 1 uncommon (1-4 individuals); 2 common (5-25 individuals); 3 abundant (>25 individuals)

Red font = invasive species of concern

Appendix C. Acceptable Source Origin of Native Seed

Native seed source origin should be from within circle shown below.



Appendix F

NRMP Template – Natural Area Conservation Easements

Template Legend:

- *Black text – generic for all/most NRMPs*
- *Red text – requires editing*

Property Owner **Natural Resource Management Plan**

Date

Consultant or Contributing Author(s)

Insert photo of easement

Signature Page

LANDOWNER

As the landowner(s) of the property permanently protected by a natural area conservation easement (Easement) held by Dakota County, we have reviewed and approve this Natural Resource Management Plan (NRMP). We agree to follow the guidelines included in this NRMP to manage that portion of our property included in the Easement (Protected Property). The NRMP will be used to develop a mutually acceptable Management Agreement with the County to begin implementing the NRMP. Other applicable local, state and federal laws and regulations not addressed within this NRMP will still be followed.

Full Name of Landowner

Date

Full Name of Landowner

Date

DAKOTA COUNTY

Dakota County has prepared and discussed this NRMP with the landowner. The County agrees to work with the landowner in using the NRMP as the basis for creating a jointly developed Management Agreement to implement the NRMP in a fair and reasonable manner. The County will assess and update the NRMP to assist the landowner in managing the Protected Property.

Alan Singer, Land Conservation Manager

Date

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Appendix A. Plant Species Inventory (including invasives)

Appendix B. Wildlife Species Inventory (including invasives)

Appendix C. Acceptable Source Location for Native Species Seed

1. EXECUTIVE SUMMARY

Provide maximum 2-page summary (front and back) of

- *Major natural resource findings (issues, opportunities, etc.)*
- *County and landowner vision and goals for easement*
- *Previous restoration/management efforts on the easement*
- *Major recommendations*
- *If it exists, reference the draft/signed Management Agreement between the landowner and the County (and partners) that describes priority activities, schedule, costs, roles, responsibilities, and cash and in-kind contributions that is included in the Final NRMP*

The status of any approved activity under the Agreement will be monitored and assessed as part of the annual Easement monitoring process. The NRMP will be reviewed and updated every five years, or as needed to maintain its relevancy.

Dakota County contact information:

Dakota County Environmental Resources Department
14955 Galaxie Avenue, Apple Valley, MN 55124
Project Lead: *Insert name and contact information*

General Conservation Easement Information

Landowner Information

Name(s): _____
Address: _____
City: _____ State: ___ Zip Code: _____
Phone Numbers: Home: _____ Mobile: _____ Work: _____
Email Address: _____

Protected Property Information

Address, if different than landowner address: _____
Section __, Township __ and Range__
Name of Watershed: _____ Sub-Watershed: _____
Watershed Organization: _____
Parcel Identification Number(s): _____

Legal Description of Protected Property

Insert legal description

Access to Protected Property

General Description: *Insert route by paved and unpaved road from the north, south, east, and west (as applicable) from nearest public street*

Legal Description of Protected Property Access Easement (if any):

Insert legal description

Easement Acquisition Date: _____

Recorded Document Number and Date: _____

Funding Sources for Acquisition of the Easement:

List all of the following that apply:

- *Outdoor Heritage Fund*
- *Environmental and Natural Resources Trust Fund*
- *County Funds*
- *Other*

2. INTRODUCTION

2.1. Easement Program Background

Most of Dakota County's 400,000 residents live in the highly urbanized northern one-third of the County, a rolling landscape bordered by major rivers on the north and dotted with lakes, forests, wetlands and other natural areas. The southern two-thirds of the County are generally level and open where agriculture is the predominant land use. This portion of the County is dissected by many streams and tributaries, and includes the largest tracts of natural areas.

As a result of the County's rich soils and close proximity and easy transportation access to St. Paul and Minneapolis, the combination of agricultural use and suburban development has resulted in the loss of most pre-settlement wetlands, prairies, savannas, and upland forests. Many of the remaining natural areas are degraded and fragmented which make it increasingly difficult for them to function as healthy ecosystems. Moreover, many of the remaining natural areas are the most attractive undeveloped areas for future residential development. Although relatively few in number and extent, some of these natural areas include important plant and animal communities. Residential surveys consistently indicate that the majority of County citizens think it is important that the County has an active role in protecting these areas.

To address citizen's concerns over the loss of open space and natural areas throughout the County, and to determine how to protect these areas using incentive-based tools, the Dakota County Board adopted the "Dakota County Farmland and Natural Area Protection Plan" (Plan) in 2002. The Plan identified 36,000 acres of high quality natural areas as a priority for protection which overlapped with the nearly 60,000 acres of land eligible for farmland protection. The Plan identified the following public purposes for protecting natural areas:

- Increase property values and enhance neighborhoods appeal
- Provide close-to-home opportunities for people to enjoy and interact with nature
- Provide critical habitat for plants and animals and preserving critical ecological connections between habitat areas
- Provide environmental services, including filtering pollutants from soil and water, reducing soil erosion, and absorbing air pollutants and carbon dioxide
- Provide natural flood control for area streams and rivers by retaining wetlands and vegetated corridors to absorb flood waters

Citizen input was used to identify the desired characteristics for natural areas:

- Lands of biological significance
- Lands adjacent to lakes, rivers, and streams to improve water quality
- Lands that provide wildlife habitat
- Lands that provide some level of public access

The Plan found that there were high quality natural areas worth protecting and identified three primary strategies to protect these areas:

Strategy 1: Protect priority natural areas in eligible areas and corridors using conservation easements and fee title acquisition from willing sellers and donors.

Strategy 2: Work with other agencies through their programs to protect County priority natural areas.

Strategy 3: Work with owners of large land tracts and agencies to protect natural areas on their properties with conservation easements and natural resource management plans.

The Farmland and Natural Areas Program (FNAP) was developed to implement the Plan and was initially funded through a \$20 million bond referendum approved by voters in November 2002. Half of the funds were targeted for protecting highly productive farmland and associated natural areas and half of the funds were focused entirely on natural areas. The first FNAP application round occurred in 2003, with annual application rounds thereafter. The program seeks to work with landowners and a wide variety of partners to protect, restore, and connect threatened natural areas throughout the County to assure that the ecological, social, and financial benefits of these areas can be maintained and enhanced. A County Board-appointed Citizen Advisory Committee reviewed and evaluated land protection projects and made recommendations to the County Board of Commissioners until 2011 when the bond funds had been entirely expended. Currently, County and Dakota County Soil and Water Conservation District staff evaluate and recommend projects for County Board consideration. Projects are funded through a mix of federal, state, County, and local funds.

Building on the concepts in the FNAP, the County Board approved the Vermillion River Corridor Plan in November 2010, which sought the enhanced protection and improvement of water quality and wildlife habitat with increased opportunities for outdoor recreation for the Vermillion River corridor and its major tributaries. In 2012, the County began the ShoreHolders Program to implement the Corridor Plan goals along all of the rivers, streams and undeveloped lakeshore throughout the County. In 2015, these programs were merged into the Land Conservation Program. Matching State Environment and Natural Resource Trust Fund and Outdoor Heritage Fund grants have been appropriated to the County to implement its programs.

2.1.1. Natural Area Protection

Natural area projects include permanent conservation easements on private lands and funding assistance to other public entities to acquire fee title. Diverse projects ranging from private open spaces and special city parks to Minnesota Department of Natural Resources Wildlife and Aquatic Management Areas and Scientific and Natural Areas, totaling over [REDACTED] acres, have been completed. These easement and fee title acquisition projects are located throughout Dakota County. The County has expended more than \$[REDACTED] million on projects to-date, which has leveraged an additional \$[REDACTED] million in non-County funding and landowner donation. An estimated [REDACTED] miles of river, stream and lake shoreline have been protected through the County's related conservation efforts on private and public land. Natural area protection and natural resource management focuses on the improvement and preservation of water quality, wildlife habitat and other benefits of protecting and managing undeveloped open space and shoreland areas. All local government and private Easement projects require a Natural Resource Management Plan (NRMP).

2.1.2. Farmland Protection

More than 7,700 acres have been protected since 2004 through agricultural conservation easements. Many of these projects involve the creation of permanent, vegetative buffers along all rivers, streams and wetlands and maintaining significant associated natural areas in addition to preventing development on cultivated land. Approximately 1,300 acres of riparian and other natural areas have been protected within these agricultural easements, including 49 miles of shoreline. Stewardship Plans, describing voluntary best management practices, are required for all agricultural easements. With the assemblage of larger blocks of contiguous, protected land and changes in the project evaluation criteria, agricultural easement projects are protecting more substantive natural areas. NRMPs are developed for appropriate agricultural easement projects.

2.2. Related and Previous Easement Planning

2.2.1. Natural Resource Management System Plan (2017)

The County recently developed a Natural Resource Management System Plan (NRMSP) to guide natural resource management in county parks, greenways and conservation easements over the next 20 years. The process for developing the NRMSP consisted of four phases:

- Phase I: Scoping. Defined goals of the NRMSP and data used to complete the plan.
- Phase II: Research. Highlighted research completed to determine the type and condition of natural resources on County-owned lands and easements, including an inventory of measures needed to improve the health and condition of these lands.
- Phase III: Principles, Vision and Preliminary Concepts. Described the vision for natural resource management and the principles used to guide the overall approach.
- Phase IV: Preferred Plan Option. Specified five and twenty-year priorities for managing natural resources in the system, and provided natural resource management plan templates for individual parks, greenways and easements.

Development of the NRMSP required an extensive review process, including public workshops/open houses and public input to a dedicated NRMSP webpage on the County's website; and a Technical Advisory Committee comprised of members from academia, non-profit conservation organizations, private landowners, community leaders, Soil and Water Conservation District, and State Agency staff. The Plan was presented to the County Planning Commission and County Board several times and the County Board approved the NRMSP in May 2017.

The following table summarize the initiatives for easements for the first five years of implementing the NRMSP.

Easement Management Activities	Metric	Estimated Cost
1. Control highly invasive species	800	\$697K*
2. Restore/enhance high quality areas and shoreland buffers	600**	\$1.1M*
3. Maintain high quality shoreland buffers and restored areas	2,000	Landowner
4. Develop NRMPs for 20 agricultural easements	800	\$175K
5. Develop NRMPs for all new natural area easements	TBD	\$190K
6. Update existing NRMPs	1,600	\$71K
TOTAL		\$2.4M

2.2.2. Property Owner Natural Resource Management Plan (year)

If previous NRMPs exist for the easement, summarize key findings from previous plan(s):

- *Vegetation types and qualities presents, and extent of invasive plant issues*
- *Surface water quality, issues and opportunities, including aquatic invasive species*
- *Wildlife present and wildlife-related issues and opportunities*
- *Implementation plan summary and effect on natural resources; and proposed major natural resource projects*

Insert important summary graphics.

2.3. Regional Natural Resource Conservation Context

Describe briefly the easement’s landscape setting, proximity to parks and other conservation lands, conservation corridors and greenways, the effects of surrounding land uses, and nearby conservation efforts or conflicts that affect the easement. Additional details can be provided in Section 3.1.

Discuss the merits of the easement as a high priority natural area in terms of the citizen-desired natural area characteristics noted in the Introduction.

2.4. Natural Resource Public Values

The natural world is a powerful influence in the lives of many, and has been for millennia. County residents in survey after survey express their desire to have nearby natural places. Despite their private ownership and lack of public access, conservation easements are recognized as an important conservation tool in the County, and one that contributes to the public good.

Insert any easement-specific public perceptions/priorities (based on previous surveys, etc.).

This **Easement Name** Natural Resource Management Plan was developed with the goal of incorporating previous natural resource management efforts for **Easement Name**, being consistent with landowner goals and the goals outlined in the NRMSP.

3. EXISTING NATURAL RESOURCES

3.1. Landscape Context

3.1.1. Location

Describe location using City, township, etc.

Insert location map(s) showing:

- *Easement boundary*
- *Municipal /Township boundaries*
- *Watershed boundaries (smallest HUC that is useful) for the water bodies inside the easement*
- *General land use and other significant features*

3.1.2. Regional Natural Resources Context

Describe ecological subsection(s) and characteristics

Insert ecological subsection map

3.1.3. Adjacent Land Use

The adjacency of agricultural, commercial, industrial, residential, open space, and other types of land use can affect vegetation, water and wildlife management options, and may present opportunities to enlarge existing habitat areas, create corridors for wildlife movement, and determine the characteristics of local surface water hydrology.

Describe the use of land adjacent to the easement, and its current and likely future impact on the Protected Property as a natural area. Explain the easement's importance and compatibility with neighboring properties in more detail with reference to figures.

3.2. Physical Conditions

The natural resources within the Protected Property are affected by a number of physical conditions that influence their origin, current status and future condition. These features include the local geology, topography and soils.

3.2.1. Geology

Describe geology as it directly relates to the plant communities and surface water features of the easement:

- *Bedrock as it relates to special plant communities, groundwater chemistry of water bodies, etc.*
- *Glacial history and deposits as it relates to plant communities, groundwater, water bodies, etc.*

Insert bedrock map with easement boundary

Insert surficial geology map with easement boundary

3.2.2. Topography

Topography and aspect (slope orientation relative to north, south, east, and west) are important factors in the development and formation of soil, soil erosion potential, and the type and stability of vegetation for a given location. The primary factors involved with topography, as it concerns natural features, are relief and variation. The difference from the highest to the lowest elevation is referred to as “relief”. The differences in contours from place to place across the landscape determine the amount of topographic variation. Taken together with variation in soil type, these factors help determine overall site heterogeneity. In general, greater heterogeneity within a site creates more complexity in vegetation and hydrologic features, which leads to greater biological diversity.

Aspect can have a strong influence on soil temperature and moisture. In the northern hemisphere, north- and east-facing slopes are often shaded or cooler, while south- to west-facing slopes are hotter and receive more solar radiation. Aspect can significantly influence the local climate (microclimate). Soil temperatures and soil moisture on south- to west-facing slopes are typically warmer and dryer than those on north- to east-facing slopes, due in part to the increased solar radiation and direction of the prevailing winds in the summer. Likewise, soils on north- to east-facing slopes tend to be cooler and wetter, due to diminished solar energy and late afternoon shading during the hottest part of the day.

Describe landforms and slopes as they directly relate to erosion, aspect, or other forces affecting plant communities, surface waters, etc.

Insert topographic map with contours, water bodies, and easement boundary. Generate in GIS a steep slope (>12 percent) overlay for this map.

3.2.3. Soils

The “Soil Survey of Dakota County Minnesota,” (issued April 1983 and updated in May 1994), provides a generalized depiction and descriptions of soils found in the County. Soil formation is the result of the interaction of parent material, climate, organisms, topographic position or slope, and time. Collectively, these factors help determine the dominant plant and animal communities, which in turn influences future soil development. Soil units/types suggest the most appropriate use and management of the land.

Describe soils as they directly relate to plant communities, surface waters, etc.

- *Classification of soils—soil unit name, family or higher taxonomic class, texture, and hydrological class*

Insert soils table and map showing SSURGO map units and soil unit names. Highlight hydric soils and highly erodible soils.

3.3. Vegetation

The vegetation found in the park is determined by such factors as: physical site conditions (topography, soils and hydrology); historic and current land use; climate; invasive species; and wildlife. Vegetation is also affected by natural processes such as succession or natural events that

create change and variation. Abrupt changes (disturbances), including wildfires, high winds and floods, can quickly change the vegetative structure and composition. There is a spectrum of disturbance intensity from light, frequent events to catastrophic, uncommon events. The frequency and interval of different types of disturbance results in a myriad of potential vegetation types. After thousands of years, these dynamics influenced vegetation patterns and native plant communities prior to human settlement. More recent European settlement induced dramatic changes such cultivation, draining, pasturing, logging, mining, and development have created profound changes through disruptions of natural cycles and processes. Natural succession, the gradual change in structure and species composition, occurs as the vegetation changes in response to changes in light, water, nutrients, herbivory, predation, parasitism, and competition. Under natural conditions, succession tends to occur gradually over time and cause broadly predictable changes in the diversity and extent of vegetation communities and associated wildlife. The effects of disturbance and succession can vary widely. Different areas will be at varying successional stages due to diverse history, disturbance regimes and time interval since the last major disturbance. These conditions interact with the environmental variability and genetic plasticity to create a mosaic of vegetation in various conditions across the Protected Property and the larger landscape.

3.3.1. Historical Vegetation and Land Use

One major consideration for developing a comprehensive Natural Resource Management Plan (NRMP) is to understand the types of vegetation found on and around the Protected Property prior to European settlement. This information can be a helpful indicator of plants that may be found or thrive in the park. Fortunately, field notes on vegetation were taken during original territorial surveys during the 1840s-1860s and compiled into a valuable information source entitled “The Original Vegetation of Minnesota, compiled from U.S. General Land Office Survey Notes” (Notes) in 1974.

In general, the northern and western portions of the County consisted of hardwood forests among rolling hills and many lakes. American basswood, sugar maple, elm, red oak, and an understory of shade-loving wildflowers made up the “Big Woods” in the moist areas protected from fire. Bur and white oak, aspen and black cherry were the dominant tree species in the drier areas. The southern part of the County consisted primarily of prairie and savanna. Depending on soils, topography and hydrology, tall grasses measuring as high as eight feet would have been the prominent vegetation type, with a diverse mix of other grasses and wildflowers (forbs). Shorter grasses and a wide variety of other forbs were found on sandy and gravel areas and steeper slopes. Wet prairies were common on wetter soils where the water table was close to the surface. Wet meadows and marshes were present on soils that had standing water, but that burned often enough to prevent trees and shrubs from becoming dominant. Near smaller rivers, prairie or savanna would often be found, even up to the water’s edge. A large number of wetlands once existed in the southwestern portion of the County with only 12 to 15 percent remaining in Dakota County. Savannas with scattered oak trees formed transitional plant communities between grasslands and forests within the much larger transitional zone between the vast grasslands of the American West and the deciduous forests of Eastern American. Forested floodplains with cottonwood, silver maple, willow, and American elm were found in wider river valleys.

Figure x shows the predominant, pre-settlement plant communities of the Protected Property.

Describe pre-European settlement vegetation, including descriptions of each natural plant community

Describe Native American use of easement area

Interpret implications of pre-European settlement vegetation and Native American land use for current plant communities and surface waters in easement.

3.3.2. Land Cover and Use Trends

European settlement significantly changed the Dakota County landscape. Native prairies were plowed, forests and woodlands cut, wetlands drained, fires suppressed, and intense agricultural practices introduced, including row cropping and livestock grazing. Since WWII residential and commercial development has replaced much of the agricultural land cover in the northern half of the County. However, the southern half is predominantly open space though dominated by agriculture.

Some of the best evidence of past land use is depicted in a progression of historical aerial photographs. Figures x-x are historical aerial photos of the Protected Property and surrounding area starting from 1937 through 20__.

Describe European settlement and use of easement area (e.g., density of buildings; loss of natural features; intensive agriculture; areas too difficult to develop (because hard to reach, too dry, too wet, rocky terrain, etc.).

Describe land cover and related ecological changes (e.g., vegetation conversion; woody vegetation increased over time; encroachment of housing development; lake or stream levels increased or decreased and the likely reason(s); evidence of erosion issues; likely wildlife responses to changes).

3.3.3. Land Cover Mapping and Assessment

Describe all existing land cover types and their condition/quality within the park. Include photos from assessment.

Insert map(s) showing current land cover/vegetation mapping and quality ranks.

Prepare a table summarizing land cover and vegetation types with a quality rank (see below for criteria) for each previous plan(s) and the current year, indicated by year.

Summarize any changes/updates/refinements to previous classification, quality ranking, and mapping of each plant community.

Reference Appendix A.

3.4. Aquatic Resources

3.4.1. Groundwater and Aquifer Sensitivity

Groundwater accumulates below the surface of the land and is stored in complex, underground layers of sand, gravel and porous rock. If groundwater exists in suitable quantity and quality, and

can be tapped for human use, it is of great economic value. In the northern portion of the County where the glacial deposits tend to be deeper, groundwater is often extracted from drilled wells into sand and gravel deposits. In the southern part of the County where the layer of glacial deposits is shallower, most drilled wells extend into the porous bedrock. Throughout the County most public water supplies are obtained from one of the deeper bedrock aquifers.

Due to its relative abundance, quality and reasonable access, groundwater provides drinking water for the majority of County citizens, irrigation water for agricultural crops (especially on the sandier soils in the southeastern portion of the County), and process and cooling water for industrial and manufacturing companies. Although the amount of available groundwater appears to be stable, there is growing concern about the groundwater supply due to increased agricultural irrigation, suburban water use, changing climate. Improved information on the role of groundwater to ecological systems like trout streams corroborates this. At the same time, much of the County's groundwater is "highly sensitive" to surface contamination, meaning that it takes only a months for contaminants to reach the aquifer. Once an aquifer is polluted, it takes a long time for contaminants to either leave or be immobilized. It is very or prohibitively expensive to improve a polluted aquifer's quality to attain drinking water standards.

Given its importance and potential vulnerability, every effort should be made to prevent groundwater contamination, including from pesticide and herbicide use. Factors to consider during natural resource management activities are 1) depth to groundwater and 2) the ability of the overlying geologic materials to protect the groundwater aquifer (deeper and less porous soils are best—thinner and more porous soils are worse).

Describe the groundwater conditions affecting the easement's surface waters.

Describe aquifer sensitivity rating(s) in the easement.

Describe best practices to prevent pollution of groundwater in the easement and to maintain groundwater recharge rates in the easement.

Describe off-site pollution or off-site diversion of groundwater from surface waters in the easement.

3.4.2. Surface Waters

One of the unique and attractive features of Dakota County is the amount and diversity of its surface waters. Major riverine systems, including the Mississippi, Minnesota, Cannon, and Vermillion Rivers create the borders or flow within the County. A number of creeks, streams and brooks are found in the southern portion of the County. Numerous small lakes are found in the northern and western portions of the County as a result of previous glaciation. The two largest lakes, Crystal and Marion, are highly desirable for their scenic beauty and recreation. Different types of wetlands are scattered throughout the County and several unique wetlands, known as fens, are found in the Minnesota River Valley. Two large reservoirs, Lake Byllesby and Spring Lake were formed with the creation of dams.

Over time, most of these surface waters have been significantly degraded due to agricultural and municipal stormwater runoff. Entire wetland complexes that were important for filtering, and retaining water and recharging the groundwater have been lost. Pollution often includes excess

bacteria, sediment and nutrients (especially nitrogen and phosphorous from fertilizer), causing lower levels of dissolved oxygen that that limits reproduction and survival of fish populations and other aquatic organisms. Although state and federal regulations and voluntary efforts have improved water conditions, protection and management of natural areas, especially those adjacent to water bodies, is an important strategy for achieving water quality goals.

Lake Name

Describe each easement lake in terms of:

- Physical characteristics (size, depth, watershed acres, water chemistry, etc.)
- Water quality (Carlson TSI or similar metric, algae bloom records, possible cause of poor water quality, etc.)
- Water quantity
- Regulatory environment (Section 303(d) impairments, TMDL, etc.)
- Aquatic habitat types, locations, and quality (linked to vegetation cover, diversity, invasive aquatic plants)
- Shoreline erosion type, extent, and possible cause(s)

Insert map showing lakes in easement, watershed of lake, watershed management jurisdictions, and 303(d) impaired waters.

Stream Name

Describe each easement stream, including:

- Physical characteristics (average flow, length in easement, total length, watershed acres, percentage of stream in easement compared to total watershed, etc.)
- Upstream land uses and stream conditions
- Water quality (sediment and phosphorus metrics, etc.)
- Regulatory environment (303(d) impairments, TMDL, etc.)
- Aquatic habitat types, locations, and quality for fish and macroinvertebrates
- Stream bank erosion, type, extent and possible cause(s)

Insert map showing MnDNR Protected Watercourses (streams), stream watersheds, watershed management jurisdictions, and 303(d) impaired waters

Wetlands

Wetlands are addressed in Land Cover (Section 3.3.3).

Insert this sentence:

Wetlands are covered in Land Cover (Section 3.3.3), but are referenced here due to their protection under state and federal law. Wetlands may not be dredged, filled or drained without a permit. However, vegetation can be altered or even completely removed (sometimes requiring a permit), especially for the purpose of ecological restoration and invasive plant management.

Insert map showing NWI wetlands.

Insert table showing type, description, and size of wetland on the NWI map.

3.5. Wildlife

3.5.1. General Wildlife Habitat

With a heterogeneous landscape, diverse vegetation and an abundance of surface water, Dakota County historically had a highly diverse wildlife community. Several sub-ecoregions converged and intersected providing opportunities for the existence of a wide array of species endemic to different ecosystems and forming a diversity of wildlife habitats.

Historic Fauna of the County

In the 1800s, early explorers and settlers documented that bison grazed the prairie terraces near Fort Snelling and nearly all of the early explorers from Radisson to Hennepin mentioned their abundance. Though elk were not considered common at the time of European settlement, Bison and elk were hunted to near extinction across their Midwestern range, including Dakota County, but agriculture eliminated habitat as well. White-tailed deer also suffered from hunting pressure, but then began to thrive in the fragmented agricultural landscape, once a hunting season was imposed and over-harvesting was controlled. Mountain lions, although present were never common, but black bears were quite common in the first half of the 1800s.

Smaller mammals such as beaver, mink and muskrat also existed in high numbers. However, over the course of two centuries of heavy trapping, these species' populations nearly crashed. Due to better regulation of trapping beginning in the 1930s, populations of beaver and other species rebounded.

As with the mammals, the County's diverse landscapes supported a wide array of resident and migratory bird species. Over one hundred species of birds nested in the County, and another hundred or more passed through in the spring and fall migrations. Large core habitat sustained many types of birds that are today uncommon or in decline, including forest interior birds, grassland birds, waterbirds and waterfowl, and raptors. The many species which once were common include upland sandpiper, loggerhead shrike, grasshopper sparrow, American bittern, red-shouldered hawk, red-headed woodpecker, bobolink, black tern, Virginia rail, and eastern towhee.

Populations of amphibians, fish, aquatic insects, and mollusks were once teeming in the County's rivers, streams, and wetlands. Overharvesting and pollution, plus large increases in impervious cover from buildings, roads and parking lots, took a sharp toll on aquatic animal populations. In the case of trout, increased stormwater runoff near waterways has reduced levels of groundwater recharge, which in turn reduces the influx of cold groundwater to trout streams. Sediment from cropland, overgrazed pastures, and roads, together with excessive water from impervious cover and cropland, is a major cause of heavy sediment loads and bank erosion in streams, rivers, and ponds. The introduction of water quality rules at federal and state levels beginning in the 1970s reduced pollution from point sources like wastewater treatment plants and factory outfalls, and in recent decades has provided a solid framework to quantify and limit non-point sources such as stormwater. This has and will continue to benefit aquatic wildlife.

Many other species have disappeared from the County or are in steep decline. Declining species have been identified by the Minnesota DNR, in the state wildlife action plan, as Species of Greatest Conservation Need (SGCN). This topic will be discussed in the following sections (3.5.2 and 3.6).

Despite the dramatic changes to wildlife in the last 150 years, protected areas, such as the Minnesota Valley National Wildlife Refuge and the Gores Pool Aquatic Management Area (AMA), still provide the County with diverse though fragmented habitats—riverine wetlands, fens, seeps, floodplain forests, oak savannas, forest, and grasslands. Over 250 species of birds, including nesting bald eagles and peregrine falcons, some fifty species of mammals, and thirty species of reptiles and amphibians have been noted here.

Describe the easements habitat types and examples of typical wildlife which occur in those types.

Use the following habitat categories: Deciduous Forest, Mixed Forest, Woodland-Brushland, Savanna-Brushland, Grassland/Prairie, Floodplain Forest, Wet Forest/Swamp, Wet Meadow, Emergent Marsh, Lake/Pond, and River/Stream.

Reference Appendix B.

3.5.2. At Risk Wildlife Populations

Using an SGCN list specific for the easement, identify species in each habitat category (above) which use or could potentially use the easement.

For each species, discuss the following:

- *Evidence of species using the easement.*
- *If no evidence, potential for species to use the easement, with rationale*
- *Potential barriers to the species using the easement*

3.6. Rare Natural Features

The Minnesota Department of Natural Resources' Natural Heritage Database was searched for rare natural feature records within one mile of the boundaries of the Protected Property. This search identified the following rare natural features on or near the Protected Property.

Insert table of rare natural features. For each record, provide the following information:

- *Feature type (plant community, rare plant, rare animal, other feature)*
- *Feature name (common, scientific)*
- *Global/state rarity rank*
- *Last observed date*

For each feature, discuss obstacles to its persistence in the easement, and specify restoration and management measures to address the obstacles.

4. NATURAL RESOURCES ISSUES AND OPPORTUNITIES

4.1. Issues

4.1.1. Issue 1

Describe significant issues (constraints), organized under major categorical headings. Issues should address:

- *Invasive plant and animal species*

There are a number of plants and animals that if present on the Protected Property, are potentially injurious to the health of animals, humans, uncommon plant and wildlife species, and the environment in general. Field assessment of the Protected Property identified the following noxious/invasive plants and animals:

List invasive plants and animals.

Other issues that may be considered:

- *Habitat fragmentation, edge effects, core habitats, and habitat connectivity*
- *Vegetation management*
- *Pests and diseases*
- *Pesticide and herbicide use*
- *Stormwater management/conveyance, including from adjacent properties*
- *Pollinator habitat*
- *Residential, commercial, or industrial activities*
- *Buildings, improvements, small structures*
- *Utilities and septic systems, roads, parking areas, paths, and trails*
- *Fences, including adjacent fences*
- *Alteration of natural water bodies*
- *Alteration of topography/presence of erosion*
- *Harvesting of timber, berries, or fruit*
- *Agricultural crops and livestock grazing*
- *Recreational horseback riding*
- *Motorized vehicles*
- *Signs*
- *Recreational activities*

Repeat Issues as necessary

4.2. Opportunities

4.2.1. Opportunity 1

Describe how the landowner and County can capitalize on opportunities presented by easement, including opportunities to overcome issues described in previous sections, as well as opportunities such as education, volunteerism, etc.

5. NATURAL RESOURCE VISION AND GOALS

5.1. Vision for **Property Owner Land**

Insert natural resource vision for easement.

5.2. Goals for **Property Owner Land**

Ecological restoration is a long-term process. It takes time to restore ecosystems to their former functionality and diversity. And even under the best circumstances and human abilities, generally, this can only be approximated. It took many decades to degrade the ecosystem and biological communities on the property, so it will not be restored overnight. Many steps are typically involved in a successful restoration; even deciding when a restoration is complete/successful can be very difficult. Restoration should be viewed as a process and not as an end point. The ultimate goal is to achieve and maintain a diverse natural community at the site, though this will not always proceed in a linear fashion. Using the concept of *adaptive management* will be the key to continual progress at the site. Adaptive management is a strategy commonly used by land managers, which integrates thought and action into the restoration process. It can be described as a strategy that uses evaluation, reflection, communication, and also incorporates learning into planning and management. It is set up like a feedback loop and looks like this: Assess Problem → Design → Implement → Monitor → Evaluate → Adjust → Assess Problem → and so forth. Thus, moving forward with restoration, each round of adaptive management refines and hones the process to better fit the conditions of the site. This strategy should be emphasized on the Protected Property.

5.2.1. Goal 1

Describe goal based on issues and opportunities; one goal should be proposed per native plant community/land cover type.

Define performance standard(s) used to measure success for each goal.

Insert map of proposed land cover, with management units identified and labeled.

5.2.2. Goal 2

Repeat Goals as necessary.

6. EASEMENT MANAGEMENT UNITS

6.1. Management Unit 1

6.1.1. Description

Provide general description of management unit.

6.1.2. Amenities

Describe amenities within unit.

6.1.3. Plant Communities

Based on the Protected Property's geology, soils, topography, hydrology, existing land cover and use, current and anticipated ecological conditions, and the landowner and County goals, target plant communities are recommended for each of the existing land cover units (see Table x and Figure x). Each of the target plant communities is described, with descriptions taken directly from the *Field Guide to the Native Plant Communities of Minnesota: the Eastern Broadleaf Forest* (DNR 2005).

Describe existing and proposed plant communities within unit.

Insert table showing acre conversion, from existing to proposed cover types.

Seed mixes should be selected and/or designed to meet the particular easement's environmental conditions and restoration goals. When selecting or designing native seed mixes, do not include species that are:

- 1. Very difficult to establish by seed*
- 2. Noxious*
- 3. Invasive*
- 4. Exotic*
- 5. Native that are overabundant or highly aggressive*

Include the following text:

Source origin of native seed should be within the circle shown in Appendix C. The closer to the center of the circle (Dakota County), the better.

6.1.4. Invasive Species

Describe invasive species within unit, how controlled, and to what level or priority.

6.1.5. Wildlife

Describe wildlife use within unit.

Describe proposed/desirable wildlife and how to accommodate/introduce.

6.1.6. Water

Describe water features and quality within unit.

Describe proposed/desirable water quality and quantity and how to achieve.

6.1.7. Additional Management Recommendations

Describe additional/special management recommendations within unit.

6.2. Management Unit 2

Repeat section and above subsections as necessary, for each unit.

7. MONITORING AND REPORTING

7.1. Monitoring

Explain the purpose of ecological monitoring.

Describe ecological monitoring proposed to measure performance standards (described in Goals above); this may address:

- *Soils*
- *Vegetation*
- *Water*
- *Wildlife*

7.2. Reporting

Describe reporting methods to document and track monitoring and inform adaptive management

8. PRIORITIZATION, SCHEDULING AND COSTS

8.1. Prioritization

Provide general description of prioritization of management units and/or activities and rationale. Typically, high priority units contain one or more of the following:

- *rare or uncommon features such as rare plant populations, rare animal populations or observations, high quality native plant communities, unusual or unique geologic features, etc.,*
- *areas that could provide important buffer habitat*
- *areas that could effectively connect rare or unique features*
- *areas of erosion (degraded streambanks, lakeshores, ravines or slopes)*
- *areas that have been previously restored*
- *areas that are particularly sensitive or threatened (e.g. high sensitivity to groundwater contamination*
- *areas that provide crucial habitat to declining wildlife species e.g. hibernacula for snakes and bats, shoreland/mudflats for shore birds, prairie-wetland complexes for Blanding's turtles, milkweed for monarch butterflies, etc.)*
- *headwaters of rivers*
- *protected trout streams*
- *steep slopes or bluffs*
- *groundwater infiltration areas*
- *Important Bird Areas (IBAs)*

8.2. Initial Implementation Schedule and Costs

Insert table/chart (see example) showing short-term (typically, a three- to five-year work plan) implementation of priority management units/tasks and associated estimates of probable cost in format suitable for landowner and County planning/budgeting.

Include a more general long-term (20-year) work plan.

Table X. Short-Term (5- Year) Schedule and Costs

Example

Restoration and Management Areas and Tasks	YEAR					Area 1 Totals
	2016	2017	2018	2019	2020	
1. Dry/Mesic Oak Forest (xx ac)						
a) Remove Trash	\$ 500					\$ 500
b) Remove Invasive Woody Species	\$ 26,000	\$ 4,600				\$ 30,600
c) Control Invasive Herbaceous Species	\$ 2,300	\$ 2,300				\$ 4,600
d) Install Native Seed (no Herbaceous Plants)		\$ 2,900				\$ 2,900
e) Install Native Woody Plants			\$ 12,000			\$ 12,000
f) Ecological Monitoring & Management	\$ 2,000	\$ 2,000	\$ 3,000	\$ 2,000	\$ 1,500	\$ 10,500
Totals	\$ 30,800	\$ 11,800	\$ 15,000	\$ 2,000	\$ 1,500	\$ 61,100
2. Wet Meadow (xx ac)						
a) Control Invasive Herbaceous Species	\$ 6,000	\$ 4,000				\$ 10,000
b) Install Native Seed (no Herbaceous Plants)		\$ 3,500				\$ 3,500
c) Install Native Woody Plants			\$ 2,000			\$ 2,000
d) Ecological Monitoring & Management	\$ 2,000	\$ 2,000	\$ 3,000	\$ 2,000	\$ 1,500	\$ 10,500
Totals	\$ 8,000	\$ 9,500	\$ 5,000	\$ 2,000	\$ 2,150	\$ 26,000
3. Emergent Marsh (xx ac)						
a) Control Invasive Herbaceous Species	\$ 3,000	\$ 3,000				\$ 6,000
b) Install Native Seed & Herbaceous Plants		\$ 12,000				\$ 12,000
c) Ecological Monitoring & Management	\$ 2,000	\$ 2,000	\$ 2,000	\$ 1,500	\$ 1,000	\$ 8,500
Totals	\$ 5,000	\$ 17,000	\$ 2,000	\$ 1,500	\$ 1,000	\$ 26,500
4. Mesic Prairie Planting (xx ac)						
a) Remove Turf Grass	\$ 600					\$ 600
a) Install Native Seed (no Herbaceous Plants)	\$ 600					\$ 600
c) Ecological Monitoring & Management	\$ 800	\$ 800	\$ 800	\$ 800	\$ 600	\$ 3,800
Totals	\$ 2,000	\$ 800	\$ 800	\$ 800	\$ 600	\$ 5,000
Short-Term Ecological Restoration & Management	2016	2017	2018	2019	2020	Grand Total
Annual Totals	\$ 45,800	\$ 39,100	\$ 22,800	\$ 6,300	\$ 4,600	\$ 118,600

9. REFERENCES

List references

Standard format:

Author's last name, first initial, second initial; other authors' first initial, second initial and last name; title of book/report/paper; journal name, issue number (if applicable); publisher name, city and state (abbreviation).

Appendix A. Plant Species Inventory (including invasives)

Dominant Flora and Invasive Species by Natural Land Cover Type and Layer (including cover class):

Species (by Stratum)	Common Name	Dry/Mesic Oak Forest	Other Mesic Forest	Savanna	Mesic Prairie	Non-native Grassland	Wet Meadow
Canopy Layer							
<i>Acer negundo</i>	Box elder		1	1			
...	....	2					
<i>Ulmus americana</i>	American elm	2	1				
Shrub/Vine/Sapling Layer							
<i>Amorpha canescens</i>	Lead plant			1	1		
<i>Rhamnus cathartica</i>	Common buckthorn	3	1				
...	....	2					
<i>Vitis riparia</i>	Riverbank grape	2	1				
Herbaceous Layer							
<i>Acer nigrum</i>	Black maple		2				
...	....	2					
<i>Zizia aurea</i>	Golden Alexanders			1			

Cover Classes: 1 uncommon (<10%); 2 common (10 - 30%); 3 sub-dominant (30 - 50%); 4 dominant (>50%)

Red font = invasive species of concern

Appendix B. Wildlife Species Inventory (including invasives)

Wildlife Observations/Indications by Natural Land Cover Type (including abundance class):

Common Name (by Stratum)	Deciduous Forest	Mixed Forest	Savanna-Brushland	Grassland/Prairie	Wet Meadow	Emergent Marsh
Mammals						
White-tailed deer	1	1				
...						
Birds						
Redwing blackbird						3
...						
Amphibians and Reptiles						
Leopard frog						1
...						
Fish						
Common carp						1
...						
Invertebrates						
Earthworm		3				
Monarch butterfly				2	1	
...						

Abundance Classes: 1 uncommon (1-4 individuals); 2 common (5-25 individuals); 3 abundant (>25 individuals)

Red font = invasive species of concern

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Appendix G. Dakota County Parks Land Cover

Park Name	Natural and Semi-Natural Vegetation										Aquatic		Cultural		Land Cover Statistics						
	Native Mesic Forest (ac)	Oak Forest (ac)	Savanna and Shrubland (ac) ²	Prairie (ac)	Non-Prairie Grassland (ac)	Altered Forest (ac)	Lowland Forest (ac) ³	Wet Meadow and Shrub Swamp (ac) ⁴	Marsh/Pond (ac)	Altered Wetland (ac)	Lake (ac)	River (ac)	Cultivated Land (ac)	Developed Land (ac)	Total (ac)	Natural/Semi-natural Vegetation (ac)	Natural/Semi-natural Vegetation (%)	Non-Prairie Grassland + Altered Forest (% of Natural/Semi-natural Vegetation)	Cultivated Land (%)	Estimated Impervious Cover (%)	
Lebanon Hills Regional Park	52	781	110	77	207	209	11	4	176	16	114			108	1864	1643	88%	25%	0%	2%	
Miesville Ravine Park Reserve	168	313	107	367	26	129	75	12	2	19		1	66	17	1300	1217	94%	13%	5%	1%	
Spring Lake Park Reserve		404	97	161	50	203	16	0				1	0	58	990	931	94%	27%	0%	2%	
Whitetail Woods Regional Park ¹			48	104	15	91	17	50	6	25	31		0	3	391	357	91%	30%	0%	0%	
Lake Byllesby Regional Park			73		31	33	75	5	52	8	4	4	55	96	436	278	64%	23%	13%	5%	
Thompson County Park	1	2	5		10	26	1				7			6	58	45	77%	81%	0%	5%	
Dakota Woods Dog Park			7		3	5								0	0	14	14	100%	51%	0%	0%
Total (ac)	221	1500	448	709	342	697	196	70	236	68	155	5	120	287	5053	4486	-	-	-	-	
Percent of Total	4.4%	29.7%	8.9%	14.0%	6.8%	13.8%	3.9%	1.4%	4.7%	1.4%	3.1%	0.1%	2.4%	5.7%	100.0%	88.8%	-	-	-	-	

¹ Dakota County Park System Plan named this park part of Vermillion Highlands

² Includes degraded systems

³ Includes floodplains and forested wetlands

⁴ Includes degraded systems

Sources: Dakota County, MnDNR Minnesota Land Cover Classification System (MLCCS), Sites of Biological Significance (SBS), and Native Plant Community (NPC) data.

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Appendix H. Dakota County Parks Characteristics

Park Name	Classification	Surrounding Land Use	Public Acres	Unique Attributes	Rare Natural Features	Core Habitats & Biodiversity Areas	Major Issues Management Will Address
Lebanon Hills Regional Park	Regional	Developed	1864	Kettle lakes and kames	Oak Forest (Southeast) (26.75 ac) Tamarack Swamp (5.39 ac) Blanding's Turtle (2008) Red-shouldered Hawk (1988)	Moderate Quality SBS Site; mostly Oak Forest (340.60 ac)	1) Invasive plants, 2) Risk of habitat fragmentation, 3) Shallow lake sedimentation and eutrophication, 4) Excessive aquatic vegetation, 5) Runoff from off site
Miesville Ravine Park Reserve	Reserve	Cultivated Land	1300	200-foot deep ravine, through which the pristine Trout Brook flows to the Cannon River	Maple-basswood Forest (Southeast) (127.92 ac) Oak Forest (Southeast) (139.12 ac) Dry Prairie (Southeast) (54.19 ac) White Pine-Hardwood Forest (Southeast) (12.70 ac) Wet Meadow (2.62 ac) Blanding's Turtle (2008) American Brook Lamprey (2000) Black Sandshell (2000) Fluted-shell (2000) Mucket (2000) American Ginseng (1993) Kitten-tails (1993) Ozark Minnow (1986)	High Quality SBS Site; Maple-Basswood and Oak Forest (781.27 ac)	1) Invasive plants, 2) Eroding ravines, 3) Runoff from off site affecting water quality of Trout Brook
Spring Lake Park Reserve	Reserve	Cultivated Land; River	990	Contains rare and unique ecosystems and species; archaeological sites within the park document 8,000 years of human use of this area	Oak Forest (Southeast) (163.46 ac) Dry Prairie (Southeast) (2.54 ac) Seepage Meadow (0.11 ac) Loggerhead Shrike (2012) Wartyback (2011) Rock Pocketbook (2011) Round Pigtoe (2009) Hickorynut (2005) Paddlefish (2004) Ebonyshell (1997) Kitten-tails (1994) American Ginseng (1994) Butterfly (1944) Spike (1944) Monkeyface (1944)	High Quality SBS Site; mostly Oak Forest (494.80 ac)	1) Risk of habitat fragmentation and loss of core forest and prairie habitat, 2) Invasive plants
Whitetail Woods Regional Park ¹	Regional	Cultivated Land	391	Part of a 5,000+ acre contiguous protected natural area adjacent to the park that includes the Vermillion Highlands Research, Recreation and WMA and the Vermillion River Wildlife and AMAs	Mesic Prairie (Southeast)(1.38 ac) Blanding's Turtle (1992)	High Quality SBS Site; Mosaic (198.50 ac)	1) Invasive plants, 2) Runoff from off site
Lake Byllesby Regional Park	Regional	Cultivated Land; Developed; Open Water	436	West park has mill ruins dating back to the nineteenth century	Sandhill Crane (2003) Paddlefish (2001)	none	1) Sediment accumulation in reservoir 2) Least natural of all County parks, 3) Impervious cover adjacent to lake
Thompson County Park	County	Developed	58	Restoration area inside project boundary	none	none	1) Runoff from off site, 2) Altered forest, 3) Greatest impervious cover of any County park
Dakota Woods Dog Park	Dog Park	Cultivated Land	14		endangered bird (2012)	none	1) Small, isolated, all edge habitat, 2) Wildlife disturbance
Total (ac)			5053				

¹ Dakota County Park System Plan named this park part of Vermillion Highlands

blue font = aquatic feature, potentially in water adjacent to park

Sources: Dakota County, MnDNR Minnesota Land Cover Classification System (MLCCS), Sites of Biological Significance (SBS), and Native Plant Community (NPC) data.

MnDNR Natural Heritage Database data (under License Agreement 728); Copyright 2017, State of Minnesota, Department of Natural Resources. Rare features data included here were provided by the Division of Ecological and Water Resources, Minnesota Department of Natural Resources (DNR), and were current as of (July 2016). These data are not based on an exhaustive inventory of the state. The lack of data for any geographic area shall not be construed to mean that no significant features are present.

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Appendix I. Dakota County Greenways Characteristics

Greenway	Total Length (mi)	Urban (mi)	Suburban (mi)	Rural (mi)	Acres	Urban (%)	Suburban (%)	Rural (%)	Connected Features
Minnesota River Greenway	10.91	0	7.52	3.39	306	0%	69%	31%	Minnesota Valley National Wildlife Refuge, Black Dog Lake, Fort Snelling State Park, C and NW Railroad
Big Rivers Greenway	5.13	0	5.13	0	124	0%	100%	0%	Sibley House, Faribault House, St. Peter's Church, and WPA work camp
Mississippi River Greenway	35.98	6.41	15.37	14.2	967	18%	43%	39%	Kaposia Park, the planned Port Crosby Park, North Urban Regional Trail in Kaposia Park, Pine Bend Bluffs Scientific Natural Area and Spring Lake Park Reserve.
River to River Greenway	8.42	2.03	6.39	0	180	24%	76%	0%	Dodge Nature Center, Kaposia Park
Totals	60.44	8.44	34.41	17.59	1576	14%	57%	29%	

Source: Dakota County

Easement Type	Easement Name	Acres	Relative Size and Proportion of All Easements	Count	Easement Type	Easement Name	Acres	Relative Size and Proportion of All Easements	Count
Natural Area	Miles	478.0	large		Farmland	Hallcock	379.5	large	
	Butler Trust	355.9	large			Rowan, John & Bernard	285.4	large	
	Freitag	302.4	large			Kluyer	259.5	large	
	Dodge Nature Center	159.1	large			Gergen, Paul Sr	210.2	large	
	Macalester	149.5	large			Mulligan	209.7	large	
	Jennings	110.0	large			Anfinson	202.9	large	
	Lindberg	103.1	large			Gergen, Dolores	199.2	large	
	Maher	76.7	medium			Schonning, Merlyn	187.3	large	
	Schoen Voelker (Chimney Rock)	76.0	medium			Lee	184.8	large	
	Curtis	68.6	medium			Gergen, Paul Jr	168.7	large	
	Rechtzigel	65.8	medium			Otte, Jay & Kerry	166.8	large	
	Almquist	59.0	medium			Swenson	161.9	large	
	Caponi Art Park li	45.8	medium			Lace Trust, Richard And Elda	158.8	large	
	Bakken	44.2	medium			Minar	149.4	large	
	Otting	43.8	medium			Wirtzfeld	147.1	large	
	Wilmar	42.3	medium			Taylor Carpenter	146.9	large	
	Otte, Janet & Mark	40.1	medium			Otte, Jerold & Karen	145.3	large	
	Niebur	39.3	medium			Boyum	143.9	large	
	Gelhar_Emrick	35.9	medium			Heinrich	141.3	large	
	Wergin, Francis And Renlund, Bridget	34.3	medium			Budin, Bernard And Deborah	137.9	large	
	Mccarthy	32.0	medium			Regenschied	137.2	large	
	Polkinghorne	31.7	medium			Hunter	136.5	large	
	Ozmun	30.7	medium			Kieffer	129.2	large	
	City Of Eagan	20.3	medium			Frandrup	120.0	large	
	Melson, Robert W; Breitschwerdt	20.1	medium			Volkert, Vernon And Rebecca	119.1	large	
	Hallcock (2), Wayne & Candace	19.0	medium			Stoffel, Dan & Greg	115.2	large	
	Caponi Art Park	17.9	medium			Legvold, David And Ruth	107.6	large	
	Grannis 1	16.8	medium			Hallcock 3	107.6	large	
	Shirley, Pearl R	15.2	medium			Niesen	107.1	large	
	Pilot Knob 2	15.0	medium			Otte, William & Mary	104.5	large	
	Wicklund	15.0	medium			Stein, Nicholas & Lori	102.7	large	
	East Lake Park	12.2	medium			Ozment, Richard	102.7	large	
	Anderson	8.5	small			Gardens Of Eagan	101.4	large	
Hinz Verch	8.4	small		Kimmes		100.6	large		
Pilot Knob 1	8.2	small		Mcnamara Hoffman		99.8	medium		
Murnane	6.8	small		Stoffel, Lewellyn & Bernadette 1		97.9	medium		
Guildner, Marlys M	5.1	small		Otte, Janet & Mark 3		94.6	medium		
Karpen	4.6	small		Juenke, Jon And Deborah		94.0	medium		
Betzler, David And Susan	3.4	small		Ozmun		92.2	medium		
Natural Area Easement Totals	2620.3	25.3%	39	Barrett		90.7	medium		
Corridor	Dakota County Ag Society, Inc	193.1	large			Taylor 1	89.1	medium	
	Finden, Stephen And Susan	27.8	medium			Messner, Christopher And Betsy	78.5	medium	
	Nicolai, David J	27.4	medium			Wollmering, James & Judith	78.3	medium	
	Gergen, Stephen And Victoria	26.1	medium			Stoffel, Lewellyn & Bernadette 2	76.6	medium	
	Riou	25.8	medium			Yanz	76.3	medium	
	Boucher, Alan A & Rachel A	11.3	medium			Adelmann	76.2	medium	
Corridor Easement Totals	311.5	3.0%	6	Diffley Trust, Atina And Martin		71.5	medium		
Greenway	Riou	37.1	medium			Rtkc, Inc. 1	68.9	medium	
	Finden, Stephen And Susan	1.1	small			Gilomen	68.2	medium	
Greenway Easement Totals	38.2	0.4%	2	Niebur 2		68.0	medium		
Natural Area, Corridor and Greenway Easements Totals		2970.1	28.6%	47		Leifeld	65.6	medium	
Source: Dakota County						Taylor, Dean & Sara	63.0	medium	
						Gergen, Paul Jr 2	57.9	medium	
						Betzold, Kenneth And Kathleen 2	54.6	medium	
						Taylor, Gerald & Mary	53.7	medium	
						Harmer, Austa	49.7	medium	
						Bakken	49.5	medium	
						Rtkc, Inc. 2	45.8	medium	
						Gergen, Paul Jr. & Lorri 3	45.0	medium	
						Messner, Steven And Elizabeth	40.0	medium	
						Harmer Farm	39.2	medium	
						Taylor 4	38.2	medium	
						Gergen, Paul Sr. & Shirley 2	36.2	medium	
						Mitchell, Ella	34.3	medium	
						Harmer, Chad & Jessica	28.3	medium	
					Farmland Easement Totals	7399.9	71.4%	65	
					All Easements Totals	10370.0	100.0%	112	

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Appendix K. Dakota County Water Resources Summary

TABLE K1 - WATERWAYS

Major River	Tributary	Intersects	Length of Overlap with County Lands (mi)	Trophic State	Impairments	Management Efforts to Date	Notes
Minnesota River	Black Dog Creek	Minnesota River Greenway	0.09				Trout stream
	Kennaley's Creek	Minnesota River Greenway	0.18	Fish IBI-fair 2001			Trout stream
	Unnamed	Minnesota River Greenway	0.03				Trout stream
Vermillion River				Fish IBIs generally very poor 2001		Vermillion River Watershed Restoration and Protection Plan Phase 1, Vermillion River WRAPS 2015, Lower Mississippi River Basin-Fecal Coliform Implementation Plan 2007 , Lower Vermillion River Turbidity Implementation Plan 2011, Mercury pollutant reduction plan 2009	
	South Branch Vermillion River	Nicolai, David J Easement	0.25		Fecal Coliform		
	South Branch Vermillion River	Juenke, John and Deborah Easement	0.4		Fecal Coliform		Trout stream
	South Branch Vermillion River	Dakota County Ag Society Easement	0.58		Fecal Coliform		
	Unnamed 758	Maher Easement	0.16				
	Unnamed 760	Murnane Easement	0.09				
	Unnamed to Vermillion River	Murnane Easement	0.09				
	Unnamed to Vermillion River	Niebur Easement	0.45				
	Unnamed to Vermillion River	Otting Easement	0.09				Trout stream
	Vermillion River	Finden, Stephen and Susan Easement	1.58		Macroinvertebrate IBI, Fish IBI, Fecal Coliform, Mercury in Fish Tissue, Dissolved Oxygen, Turbidity		Trout stream
	Vermillion River	Boucher, Alan A and Rachel A Easement	0.22		Fecal Coliform, Fish IBI, Mercury in Fish Tissue	Statewide mercury reduction plan	
	Vermillion River	Harmer Farm Easement	0.41		Macroinvertebrate IBI, Fecal Coliform, Fish IBI, Dissolved Oxygen, Turbidity, Mercury in Fish Tissue		Trout stream
	Vermillion River	Miles Easement	1.21		Macroinvertebrate IBI, Fish IBI, Fecal Coliform, Mercury in Fish Tissue	Statewide mercury reduction plan	Trout stream
	Vermillion River	Wilmar Easement	0.25		Fecal Coliform, Fish IBI, Mercury in Fish Tissue	Statewide mercury reduction plan	
	Vermillion River	Otting Easement	0.82		Macroinvertebrate IBI, Fish IBI, Fecal Coliform, Mercury in Fish Tissue	Statewide mercury reduction plan	Trout stream
	Vermillion River	McNamara Hoffman Easement	0.41		Fecal Coliform, Fish IBI, Mercury in Fish Tissue	Statewide mercury reduction plan	
	Vermillion River	Yanz Easement	0.35		Fecal Coliform, Fish IBI, Mercury in Fish Tissue	Statewide mercury reduction plan	
Unnamed to Vermillion River 1	Mississippi River Greenway	0.05					
Unnamed to Vermillion River 2	Mississippi River Greenway	0.06					
Unnamed to Vermillion River 3	Mississippi River Greenway	0.06					
Etter Creek	Mississippi River Greenway	0.12					
Vermillion River	Mississippi River Greenway	0.05			PCB in Fish Tissue, Turbidity, Mercury in Fish Tissue	Statewide mercury reduction plan	
Unnamed 112732	Whitetail Woods Regional Park	0.21					
Mississippi River	Unnamed 91949	Curtis Easement	0.34				
	Unnamed Creek	Mississippi River Greenway	0.08				
Cannon River						Cannon River WRAPS 2015, Cannon River Watershed Management Strategy 2011	
	North Branch Chub Creek	Adelman Easement	0.30				
	Cannon River	Bakken Easements	1.26		Turbidity, Fecal Coliform, Mercury in Fish Tissue	Statewide mercury reduction plan	
	Cannon River	Bakken Easements	0.58		Turbidity, Fecal Coliform, Mercury in Fish Tissue	Statewide mercury reduction plan	
	North Branch Chub Creek	Betzold, Kenneth and Kathleen Easement	0.20		Fecal Coliform		
	Unnamed to Dutch Creek	Boyum Easement	0.27				
	Unnamed to Dutch Creek	Budin, Bernard and Deborah Easement	0.08				
	Pine Creek	Frاندrup Easement	0.15		Nitrate	Cannon River Watershed Management Strategy 2011	Trout stream
	Chub Creek	Gergen, Stephen and Victoria Easement	0.47	Fish IBI very poor 2001	Fecal Coliform, proposed Fish bioassessment, and Aquatic macroinvertebrate bioassessments	Lower Mississippi River Basin-Fecal Coliform implementation plan 2007	
	Chub Creek	Hallcock, Wayne & Candace Easement	0.27	Fish IBI very poor 2001	Fecal Coliform, proposed Fish bioassessment, and Aquatic macroinvertebrate bioassessments	Lower Mississippi River Basin-Fecal Coliform implementation plan 2007	
Unnamed to Chub Creek	Hallcock, Wayne & Candace Easement	0.13		Fecal Coliform			

TABLE K1 - WATERWAYS

Major River	Tributary	Intersects	Length of Overlap with County Lands (mi)	Trophic State	Impairments	Management Efforts to Date	Notes
	Chub Creek	Jennings Easement	0.24	Fish IBI very poor 2001	Fecal Coliform, proposed Fish bioassessment, and Aquatic macroinvertebrate bioassessments		
	Mud Creek to Chub Creek	Kliver Easement	0.32		Fecal Coliform		
	Chub Creek	Lace Trust, Richard and Elda Easement	0.16	Fish IBI very poor 2001	Fecal Coliform, proposed Fish bioassessment, and Aquatic macroinvertebrate bioassessments	Lower Mississippi River Basin-Fecal Coliform implementation plan 2007	
	Cannon River	Lee Easement	0.17		Turbidity, Fecal Coliform, Mercury in Fish Tissue	Statewide mercury reduction plan	
	Unnamed to Chub Creek	Legvold, David and Ruth Easement	0.16		Fecal Coliform		
	Chub Creek	Otte, Janet and Mark Easement	0.88	Fish IBI very poor 2001	Fecal Coliform, proposed Fish bioassessment, and Aquatic macroinvertebrate bioassessments	Lower Mississippi River Basin-Fecal Coliform implementation plan 2007	
	Chub Creek	Otte, Jay & Kerry Easement	0.39	Fish IBI very poor 2001	Fecal Coliform	Lower Mississippi River Basin-Fecal Coliform implementation plan 2007	
	Chub Creek	Otte, William & Mary Easement	0.59	Fish IBI very poor 2001	Fecal Coliform	Lower Mississippi River Basin-Fecal Coliform implementation plan 2007	
	Chub Creek	Ozmun Easement	0.73	Fish IBI very poor 2001	Fecal Coliform, proposed Fish bioassessment, and Aquatic macroinvertebrate bioassessments	Lower Mississippi River Basin-Fecal Coliform implementation plan 2007	
	Pine Creek	Regenschied Easement	0.02	Coldwater Fish IBI good to excellent 2001	Nitrate	Cannon River Watershed Management Strategy 2011	Trout stream
	Dutch Creek	Rowan, John & Bernard Easement	0.53				
	Unnamed to Dutch Creek	Rowan, John & Bernard Easement	0.32				
	Dutch Creek	Swenson Easement	0.92				
	Spring Creek	Taylor Carpenter Easement	0.57			Cannon River Watershed Management Strategy 2011	
	Cannon River	Taylor Easement	0.82		Turbidity, Fecal Coliform, Mercury in Fish Tissue	Statewide mercury reduction plan	
	Cannon River	Taylor, Gerald and Mary Easement	0.08		Turbidity, Fecal Coliform, Mercury in Fish Tissue	Statewide mercury reduction plan	
	Chub Creek	Wergin, Francis and Renlund, Bridget Easement	1.06	Fish IBI very poor 2001	Fecal Coliform	Lower Mississippi River Basin-Fecal Coliform implementation plan 2007	
	Chub Creek	Lake Byllesbye Regional Park	0.10	Fish IBI very poor 2001	Fecal Coliform	Lower Mississippi River Basin-Fecal Coliform implementation plan 2007	
	Cannon River	Lake Byllesbye Regional Park			Turbidity, Fecal Coliform, Mercury in Fish Tissue, PCB in Fish Tissue	Statewide mercury reduction plan	
	Trout Brook	Miesville Ravine Park Reserve	4.15	Coldwater Fish IBI Excellent 2001	Nitrate, Turbidity	Cannon River Watershed Management Strategy 2011	Trout stream
	Unnamed 17198	Miesville Ravine Park Reserve	1.09				

Sources:

Eagan-Inver Grove Heights Watershed Management Organization 2015. Watershed Management Plan-December 2015 Final Review Draft, prepared by Wenck Associations, Inc.

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TABLE K2 - BASINS

Park, Easement or Greenway Name	Lake/Wetland Name	Classification	DNR ID	WHEP ID	Local Name	Basin Area (ac)	Trophic State	Impairments	Known Aquatic Invasive Species	Management Efforts to Date	Notes	Maximum Depth (ft)	Wetland Health
Lake Byllesby Regional Park	Byllesby	Public Water Basin	19-6	T-1		775.52	Hypereutrophic	Nutrients, Mercury in Fish Tissue	Flowering rush	Cannon River WRAPS 2015, site specific stds developed, statewide mercury reduction plan	48.48 ac inside park boundary	50	
Lebanon Hills Regional Park	Gerhardt	Public Water Wetland	19-69	E-38		13.50	Eutropic to Hypereutrophic		Curly-leaf pondweed	Lebanon Hills Stormwater Management Plan	1m transparency (WMO plan)	17	Moderate-Excellent
Lebanon Hills Regional Park	Holland	Public Water Basin	19-65			36.09	Meso to Eutrophic		Eurasian watermilfoil, curly-leaf pondweed	Lebanon Hills Stormwater Management Plan	75' deep (WMO plan, Eagan)	55	
Lebanon Hills Regional Park	Jensen	Public Water Basin	19-71			54.08	Eutrophic		None listed	Lebanon Hills Stormwater Management Plan		6	
Lebanon Hills Regional Park	McDonough	Public Water Basin	19-76			18.10	Meso to Eutrophic		Eurasian watermilfoil, curly-leaf pondweed	Lebanon Hills Stormwater Management Plan	11' deep (WMO plan)	8	
Lebanon Hills Regional Park	O'Brien	Public Water Basin	19-72			37.08	Meso to Eutrophic		Eurasian watermilfoil	Lebanon Hills Stormwater Management Plan	9.84 ac inside park boundary, 13' deep (WMO plan)	10	
Lebanon Hills Regional Park	Schulze (Schultz)	Public Water Wetland	19-75			12.81	Meso to Eutrophic		Eurasian watermilfoil, curly-leaf pondweed	Lebanon Hills Stormwater Management Plan	2m transparency (WMO plan)	15.5	
Lebanon Hills Regional Park	Unnamed 16499	Public Water Wetland	19-74W		Portage Lake	11.069			Eurasian watermilfoil	Lebanon Hills Stormwater Management Plan			Estimated good clarity
Lebanon Hills Regional Park	Unnamed 2523	Public Water Wetland	19-200W		Wheaton Pond	10.3			Curly-leaf pondweed	Lebanon Hills Stormwater Management Plan			
Lebanon Hills Regional Park	Unnamed 2531	Public Water Wetland	19-189W			2.66				Lebanon Hills Stormwater Management Plan			
Lebanon Hills Regional Park	Unnamed 2557	Public Water Wetland	19-190W		Building A Lake	8.85				Lebanon Hills Stormwater Management Plan	5.72 ac inside park boundary		Estimated low clarity
Lebanon Hills Regional Park	Unnamed 2558	Public Water Wetland	19-185W			16.63				Lebanon Hills Stormwater Management Plan	0.96 ac inside park boundary		
Lebanon Hills Regional Park	Unnamed 2568	Public Water Wetland	19-184W			5.71				Lebanon Hills Stormwater Management Plan	0.77 ac inside park boundary		
Lebanon Hills Regional Park	Unnamed 2570	Public Water Wetland	19-181W		Star Pond	2.71				Lebanon Hills Stormwater Management Plan			
Lebanon Hills Regional Park	Unnamed 2571	Public Water Wetland	19-179W		Bridge Pond	4.96			Eurasian watermilfoil	Lebanon Hills Stormwater Management Plan			Estimated clarity ok
Lebanon Hills Regional Park	Unnamed 2572	Public Water Wetland	19-178W		Sedge Pond - Beaver Pond	11.53				Lebanon Hills Stormwater Management Plan			Estimated clarity ok
Lebanon Hills Regional Park	Unnamed 2587	Public Water Wetland	19-173W	Connected with LH1	Dakota Lake	6.1				Lebanon Hills Stormwater Management Plan			
Lebanon Hills Regional Park	Unnamed 2602	Public Water Wetland	19-308W		Marsh Lake	29.75				Lebanon Hills Stormwater Management Plan	2m transparency (WMO plan)	7	
Lebanon Hills Regional Park	Unnamed 2614	Public Water Wetland	19-180W	E-29	Lily Pond	7.88			Eurasian watermilfoil	Lebanon Hills Stormwater Management Plan			2010 Poor-Excellent
Lebanon Hills Regional Park	Unnamed 2781	Public Water Wetland	19-73W		Cattail Pond	13.27				Lebanon Hills Stormwater Management Plan			
Miesville Ravine Park Reserve	NA					NA							
Spring Lake Regional Park	Spring Lake	Public Water Basin	19-5			1494.17		PCB in Fish Tissue, Perfluorooctane Sulfonate, Turbidity, Mercury in Fish Tissue, Mercury in Water Column	Eurasian watermilfoil, bighead carp, silver carp, grass carp, flowering rush, zebra mussel	Miss. Makeover Plan 2011 to address turbidity impairment, Statewide mercury reduction plan	0.79 ac inside park boundary	17	
Thompson County Park	Thompson	Public Water Wetland	19-48W	WSP-2		8.36	Eutrophic		Curly-leaf pondweed, Chinese mystery snail	WRAPS 2013, PAH study	5.67 ac inside park boundary	8	Moderate
Whitetail Woods Regional Park	Empire Lake	Public Water Wetland	19-342W			30.87	Eutrophic		Curly-leaf pondweed				
Dakota Woods Dog Park	NA					NA							
Big River Regional Trail Greenway	Pickereel Lake	Public Water Basin	19-79	LD-1		107.6	Eutropic to Hypereutrophic	Mercury in Fish Tissue	None listed	WRAPS 2013, Statewide mercury reduction plan	0.25 ac inside greenway, received overflow from Miss. River	11	Poor-Moderate
Minnesota River Greenway	Black Dog	Public Water Basin	19-83			479.8			None listed		1.11 ac inside greenway	3	
Minnesota River Greenway	Unnamed 1	Public Water Wetland	19-151W								1.16 ac inside greenway		
Minnesota River Greenway	Unnamed 2	Public Water Wetland	19-83								0.1 ac inside greenway		
Minnesota River Greenway	Unnamed 3	Public Water Wetland	19-83		Nicols Lake	9.02					0.79 ac inside greenway		
Minnesota River Greenway	Unnamed 4	Public Water Wetland	19-142W								5.19 ac inside greenway		
Mississippi River Greenway	Rebecca	Public Water Basin	19-3	H-6		81.6		Mercury in Fish Tissue	Zebra mussel	Statewide mercury reduction plan	0.56 ac inside greenway	15	Moderate
Mississippi River Greenway	Unnamed 1	Public Water Wetland	NA								0.89 ac inside greenway		
Mississippi River Greenway	US Lock & Dam 2	Public Water Basin	19-5						Eurasian watermilfoil, bighead carp, grass carp, flowering rush, zebra mussel, silver carp		9.43 ac inside greenway, poor clarity (DNR fisheries)		
Mississippi River Greenway	US Lock & Dam 3	Public Water Basin	25-17						Zebra mussel, silver carp, bighead carp, Eurasian watermilfoil, grass carp		2.39 ac inside greenway	9	
River to River Greenway	Unnamed 1	Public Water Basin	19-48W	WSP-2							0.66 ac inside greenway		
Boyum Easement	Dutch Creek Marsh	Public Water Wetland	19-428W			0.70							
Caponi Art Park Easement	Carlson	Public Water Wetland	19-66			14.63	Eutrophic		None listed			19	
City of Eagan Easement	Quigley	Public Water Wetland	19-155W				Eutrophic		None listed			6	
Dakota County Ag Culture Society Easement	Unnamed	Public Water Wetland	19-420W			19.65							
Dodge Nature Center Easement	Unnamed	Public Water Basin	19-103		Friendly Marsh Park	89.09				Water quality improvements 2014-15			Estimated clarity poor
Dodge Nature Center Easement	Unnamed	Public Water Wetland	19-102W			8.25							
East Lake Park Easement	Unnamed	Public Water Wetland	19-349W	L10		0.10		Nutrients					Poor - Moderate
Freitag Easement	Part of Mississippi River	Public Water Basin	19-331W or 25-17			173.41							
Grannis 1 Easement	Marcott 1	Public Water Basin	19-42			32.21	Meso to Eutrophic		None listed			33	
Jennings Easement	Chub Creek Marsh	Public Water Wetland	19-422W			245.89					59.29 ac inside project boundary		
Lindberg Easement	Marcott 1	Public Water Wetland	19-40W			12.33							
Lindberg Easement	Marcott 2	Public Water Wetland	19-39W			7.05							
Lindberg Easement	Unnamed	Public Water Wetland	19-284		Marcott Lake	3.98							
Macalester Easement	Part of Mississippi River	Public Water Basin	19-5		River Lake	173.41			Eurasian watermilfoil, bighead carp, grass carp, flowering rush, zebra mussel, silver carp			20	
McCarthy Easement	Hurley	Public Water Wetland	19-58W		Hurley Lake	6.71							

TABLE K2 - BASINS

Park, Easement or Greenway Name	Lake/Wetland Name	Classification	DNR ID	WHEP ID	Local Name	Basin Area (ac)	Trophic State	Impairments	Known Aquatic Invasive Species	Management Efforts to Date	Notes	Maximum Depth (ft)	Wetland Health
Polkinghorn Easement	Part of Mississippi River	Public Water Basin	19-5			173.41			Eurasian watermilfoil, bighead carp, grass carp, flowering rush, zebra mussel, silver carp				
Rechtzigel Easement	Part of Mississippi River	Public Water Basin	19-5			173.41							
Riou Easement	Unnamed	Public Water Wetland	19-321W			4.23							
Riou Easement	Unnamed	Public Water Wetland	19-12W	R14, R22, R23		13.46							
Riou Easement	Unnamed	Public Water Wetland	19-320W			17.17							
Rowan, John & Bernard Easement	Dutch Creek Marsh	Public Water Wetland	NA			258.2							
Wirtzfield Easement	Unnamed	Public Water Wetland	19-433W			29.04							

Sources:

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Minnesota's Wildlife Action Plan 2015-2025 (Appendix C)

Species in Greatest Conservation Need (SGCN) List for 2015 Update

SGCN are defined as native animals, nongame and game, whose populations are rare, declining, or vulnerable to decline and are below levels desirable to insure their long-term health and stability. Also included are species for which Minnesota has a stewardship responsibility.

All state-listed species and federally listed species that occur in Minnesota are automatically SGCN. Additional non-listed species are SGCN based on specific criteria and expert opinion.

The purpose of the SGCN list is to prioritize species and habitats on which to target conservation strategies and actions that are defined in Minnesota's 2015–25 Wildlife Action Plan.

The plan, including the SGCN list for 2015, will not be in effect until approval by the US Fish and Wildlife Service in late 2015.

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Highlighted species do or may occur in Dakota County

Status Key

State Status

- The state-listed status is noted to the right of the species common name.
- **END** = A species is considered **endangered (END)** if the species is threatened with extinction throughout all or a significant portion of its range within Minnesota.
- **THR** = A species is considered **threatened (THR)** if the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range within Minnesota.
- **SPC** = A species is considered a **species of special concern (SPC)** if, although the species is not endangered or threatened, it is extremely uncommon in Minnesota, or has unique or highly specific habitat requirements and deserves careful monitoring of its status. Species on the periphery of their range that are not listed as threatened may be included in this category along with those species that were once threatened or endangered but now have increasing or protected, stable populations.
- **NL = Nonlisted species (NL)** are species that are not included on the state or federal lists.

Federal Status

- The status of federally listed species that occur in Minnesota is noted to the left of the species criteria.
- **E**= endangered: A species that is in danger of extinction throughout all or a significant portion of its range.
- **T**= threatened: A species that is likely to become endangered in the foreseeable future throughout all or a significant portion of its range.
- **P**= proposed: A species that is proposed in the Federal Register to be listed under Section 4 of the Endangered Species Act
- **C** = candidate: A species for which the US Fish and Wildlife Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Mammals

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Mammals	<i>Alces americanus</i>	moose	SPC		habitat loss; disease; need special resources (narrow thermal preferences)
2	Mammals	<i>Cervus canadensis</i>	elk	SPC		state listed; no additional criteria identified
3	Mammals	<i>Cryptotis parva</i>	North American least shrew	SPC		need special resources (narrow thermal preferences); highly localized/restricted distribution
4	Mammals	<i>Eptesicus fuscus</i>	big brown bat	SPC		disease; need special resources (narrow thermal preferences); limited ability to recover (low reproductive rate); aggregate their populations
5	Mammals	<i>Lasionycteris noctivagans</i>	silver-haired bat	NL		habitat fragmentation; limited ability to recover (low reproductive rate)
6	Mammals	<i>Lasiurus borealis</i>	red bat	NL		habitat fragmentation; limited ability to recover (low reproductive rate)
7	Mammals	<i>Lasiurus cinereus</i>	hoary bat	NL		habitat fragmentation; limited ability to recover (low reproductive rate)
8	Mammals	<i>Lepus townsendii</i>	white-tailed jack-rabbit	NL		statistically valid decline documented; extensive surveys indicate a decline of unknown cause
9	Mammals	<i>Lynx canadensis</i>	Canada lynx	SPC	T	habitat degradation; need special resources (narrow thermal preferences); depend on ecological process no longer within NRV
10	Mammals	<i>Microtus ochrogaster</i>	prairie vole	SPC		habitat loss; habitat degradation; invasive species; highly localized/restricted distribution
11	Mammals	<i>Microtus pinetorum</i>	woodland vole	SPC		highly localized/restricted distribution
12	Mammals	<i>Mustela nivalis</i>	least weasel	SPC		highly localized/restricted distribution
13	Mammals	<i>Myotis lucifugus</i>	little brown myotis	SPC		disease; need special resources (narrow thermal preferences); limited ability to recover (low reproductive rate); aggregate their populations
14	Mammals	<i>Myotis septentrionalis</i>	northern long-eared bat	SPC	T	disease; need special resources (narrow thermal preferences); limited ability to recover (low reproductive rate); aggregate their populations
15	Mammals	<i>Onychomys leucogaster</i>	northern grasshopper mouse	SPC		state listed – no additional criteria identified
16	Mammals	<i>Perimyotis subflavus</i>	tri-colored bat	SPC		disease; need special resources (narrow thermal preferences); limited ability to recover (low reproductive rate); aggregate their populations
17	Mammals	<i>Perognathus flavescens</i>	plains pocket mouse	SPC		highly localized/restricted distribution
18	Mammals	<i>Phenacomys ungava</i>	eastern heather vole	SPC		highly localized/restricted distribution
19	Mammals	<i>Poliocitellus franklinii</i>	Franklin's ground squirrel	NL		populations in Minnesota stable, but have declined or are declining in a substantial part of range
20	Mammals	<i>Puma concolor</i>	mountain lion	SPC		state listed; no additional criteria identified
21	Mammals	<i>Reithrodontomys megalotis</i>	western harvest mouse	SPC		state listed; no additional criteria identified
22	Mammals	<i>Sorex fumeus</i>	smoky shrew	SPC		state listed; no additional criteria identified
23	Mammals	<i>Spilogale putorius</i>	eastern spotted skunk	THR		statistically valid decline documented; extensive surveys indicate a decline of unknown cause
24	Mammals	<i>Synaptomys borealis</i>	northern bog lemming	SPC		highly localized/restricted distribution
25	Mammals	<i>Taxidea taxus</i>	American badger	NL		habitat loss; habitat fragmentation
26	Mammals	<i>Thomomys talpoides</i>	northern pocket gopher	THR		habitat loss; deliberate killing; highly localized/restricted distribution
27	Mammals	<i>Urocitellus richardsonii</i>	Richardson's ground squirrel	SPC		habitat loss

Birds

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Birds	<i>Accipiter gentilis</i>	northern goshawk	SPC		habitat fragmentation; requires large home ranges/multiple habitats; depend on large habitat
2	Birds	<i>Aechmophorus occidentalis</i>	western grebe	NL		rare, vulnerable/declining habitat; aggregate their populations
3	Birds	<i>Aegolius funereus</i>	boreal owl	SPC		rare, vulnerable/declining habitat; requires large home ranges/multiple habitats; highly localized/restricted distribution; extensive surveys indicate a decline of unknown cause
4	Birds	<i>Ammodramus bairdii</i>	Baird's sparrow	END		rare, vulnerable/declining habitat
5	Birds	<i>Ammodramus henslowii</i>	Henslow's sparrow	END		rare, vulnerable/declining habitat; habitat loss
6	Birds	<i>Ammodramus leconteii</i>	Le Conte's sparrow	NL		rare, vulnerable/declining habitat; habitat loss
7	Birds	<i>Ammodramus nelsoni</i>	Nelson's sparrow	SPC		rare, vulnerable/declining habitat
8	Birds	<i>Ammodramus saviannarum</i>	grasshopper sparrow	NL		statistically valid decline documented; rare, vulnerable/declining habitat; habitat loss; depend on large habitat
9	Birds	<i>Anas acuta</i>	northern pintail	NL		statistically valid decline documented
10	Birds	<i>Anas rubripes</i>	American black duck	NL		highly localized/restricted distribution
11	Birds	<i>Anthus spragueii</i>	Sprague's pipit	END	C	rare, vulnerable/declining habitat; extensive surveys indicate a decline of unknown cause
12	Birds	<i>Antrostomus vociferus</i>	eastern whip-poor-will	NL		rare, vulnerable/declining habitat; habitat degradation; depend on ecological process no longer within NRV; extensive surveys indicate a decline of unknown cause
13	Birds	<i>Asio flammeus</i>	short-eared owl	SPC		rare, vulnerable/declining habitat; habitat loss
14	Birds	<i>Athene cucularia</i>	burrowing owl	END		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
15	Birds	<i>Aythya affinis</i>	lesser scaup	NL		statistically valid decline documented
16	Birds	<i>Bartramia longicauda</i>	upland sandpiper	NL		statistically valid decline documented; rare, vulnerable/declining habitat
17	Birds	<i>Botaurus lentiginosus</i>	American bittern	NL		statistically valid decline documented
18	Birds	<i>Buteo lineatus</i>	red-shouldered hawk	SPC		habitat degradation; habitat fragmentation; requires large home ranges/multiple habitats
19	Birds	<i>Buteo swainsoni</i>	Swainson's hawk	NL		rare, vulnerable/declining habitat
20	Birds	<i>Calcarius ornatus</i>	chestnut-collared longspur	END		rare, vulnerable/declining habitat; highly localized/restricted distribution
21	Birds	<i>Calidris canutus rufa</i>	rufa red knot		T	federally listed, no additional criteria identified
22	Birds	<i>Calidris pusilla</i>	semipalmated sandpiper	NL		migrating populations congregating in Minnesota represent a significant portion of the North American population
23	Birds	<i>Catharus fuscescens</i>	veery	NL		statistically valid decline documented; Minnesota population represents significant portion of their North American breeding or wintering population
24	Birds	<i>Chaetura pelagica</i>	chimney swift	NL		statistically valid decline documented
25	Birds	<i>Charadrius melodus</i>	pipit plover	END	E/T	rare, vulnerable/declining habitat; habitat loss; highly localized/restricted distribution
26	Birds	<i>Chlidonias niger</i>	black tern	NL		statistically valid decline documented; rare, vulnerable/declining habitat
27	Birds	<i>Chondestes grammacus</i>	lark sparrow	SPC		rare, vulnerable/declining habitat; habitat degradation
28	Birds	<i>Chordeiles minor</i>	common nighthawk	NL		extensive surveys indicate a decline of unknown cause

29	Birds	<i>Circus cyaneus</i>	northern harrier	NL	rare, vulnerable/declining habitat; habitat loss; depend on large habitat
30	Birds	<i>Cistothorus platensis</i>	sedge wren	NL	Minnesota population represents significant portion of their North American breeding or wintering population
31	Birds	<i>Coccothraustes vespertina</i>	evening grosbeak	NL	extensive surveys indicate a decline of unknown cause
32	Birds	<i>Coccyzus americanus</i>	yellow-billed cuckoo	NL	statistically valid decline documented
33	Birds	<i>Coccyzus erythrophthalmus</i>	black-billed cuckoo	NL	statistically valid decline documented; depend on ecological process no longer within NRV
34	Birds	<i>Contopus cooperi</i>	olive-sided flycatcher	NL	statistically valid decline documented
35	Birds	<i>Coturnicops noveboracensis</i>	yellow rail	SPC	rare, vulnerable/declining habitat; habitat loss
36	Birds	<i>Cygnus buccinator</i>	trumpeter swan	SPC	Minnesota population represents significant portion of their North American breeding or wintering population
37	Birds	<i>Dolichonyx oryzivorus</i>	bobolink	NL	statistically valid decline documented; rare, vulnerable/declining habitat; habitat loss; Minnesota population represents significant portion of their North American breeding or wintering population
38	Birds	<i>Empidonax virescens</i>	Acadian flycatcher	SPC	rare, vulnerable/declining habitat; habitat degradation
39	Birds	<i>Falci pennis canadensis</i>	spruce grouse	NL	habitat loss; habitat fragmentation
40	Birds	<i>Falco peregrinus</i>	peregrine falcon	SPC	statistically valid decline documented; limited ability to recover (low reproductive rate)
41	Birds	<i>Falco sparverius</i>	American kestrel	NL	statistically valid decline documented
42	Birds	<i>Gallinula galeata</i>	common gallinule	SPC	habitat loss
43	Birds	<i>Gavia immer</i>	common loon	NL	contaminants
44	Birds	<i>Haemorhous purpureus</i>	purple finch	NL	statistically valid decline documented
45	Birds	<i>Hylocichla mustelina</i>	wood thrush	NL	habitat loss; habitat degradation
46	Birds	<i>Ixobrychus exilis</i>	least bittern	NL	rare, vulnerable/declining habitat; habitat loss; habitat degradation
47	Birds	<i>Lanius ludovicianus</i>	loggerhead shrike	END	rare, vulnerable/declining habitat; extensive surveys indicate a decline of unknown cause
48	Birds	<i>Leucophaeus pipixcan</i>	Franklin's gull	SPC	habitat loss; aggregate their populations
49	Birds	<i>Limnodromus griseus</i>	short-billed dowitcher	NL	migrating populations congregating in Minnesota represent a significant portion of the North American population
50	Birds	<i>Limosa fedoa</i>	marbled godwit	SPC	rare, vulnerable/declining habitat; depend on large habitat; depend on ecological process no longer within NRV
51	Birds	<i>Limosa haemastica</i>	Hudsonian godwit	NL	migrating populations congregating in Minnesota represent a significant portion of the North American population
52	Birds	<i>Megaceryle alcyon</i>	belted kingfisher	NL	statistically valid decline documented
53	Birds	<i>Melanerpes erythrocephalus</i>	red-headed woodpecker	NL	statistically valid decline documented
54	Birds	<i>Mergus merganser</i>	common merganser	NL	migrating populations congregating in Minnesota represent a significant portion of the North American population
55	Birds	<i>Nycticorax nycticorax</i>	black-crowned night-heron	NL	rare, vulnerable/declining habitat; aggregate their populations
56	Birds	<i>Oporornis agilis</i>	Connecticut warbler	NL	statistically valid decline documented; habitat loss; habitat fragmentation
57	Birds	<i>Parkesia motacilla</i>	Louisiana water-thrush	SPC	rare, vulnerable/declining habitat; habitat degradation; requires large home ranges/multiple habitats

58	Birds	<i>Pelecanus erythrorhynchos</i>	American white pelican	SPC	Minnesota population represents significant portion of their North American breeding or wintering population; aggregate their populations
59	Birds	<i>Phalaropus tricolor</i>	Wilson's phalarope	THR	rare, vulnerable/declining habitat; habitat loss
60	Birds	<i>Picoides arcticus</i>	black-backed woodpecker	NL	habitat loss; habitat fragmentation; depend on ecological process no longer within NRV
61	Birds	<i>Pipilo erythrophthalmus</i>	eastern towhee	NL	statistically valid decline documented; depend on ecological process no longer within NRV
62	Birds	<i>Podiceps auritus</i>	horned grebe	END	rare, vulnerable/declining habitat; habitat loss
63	Birds	<i>Podiceps grisegena</i>	red-necked grebe	NL	rare, vulnerable/declining habitat
64	Birds	<i>Podiceps nigricollis</i>	eared grebe	NL	rare, vulnerable/declining habitat; aggregate their populations
65	Birds	<i>Poecile hudsonicus</i>	boreal chickadee	NL	habitat loss; habitat degradation; habitat fragmentation
66	Birds	<i>Progne subis</i>	purple martin	SPC	statistically valid decline documented; contaminants; aggregate their populations
67	Birds	<i>Protonotaria citrea</i>	prothonotary warbler	NL	habitat loss; habitat degradation; invasive species
68	Birds	<i>Rallus elegans</i>	king rail	END	rare, vulnerable/declining habitat; habitat loss
69	Birds	<i>Rallus limicola</i>	Virginia rail	NL	rare, vulnerable/declining habitat
70	Birds	<i>Scolopax minor</i>	American woodcock	NL	statistically valid decline documented
71	Birds	<i>Setophaga caerulescens</i>	black-throated blue warbler	NL	rare, vulnerable/declining habitat; habitat fragmentation
72	Birds	<i>Setophaga castanea</i>	bay-breasted warbler	NL	habitat loss; need special resources (narrow thermal preferences)
73	Birds	<i>Setophaga cerulea</i>	cerulean warbler	SPC	rare, vulnerable/declining habitat; habitat degradation
74	Birds	<i>Setophaga citrina</i>	hooded warbler	SPC	habitat loss; highly localized/restricted distribution
75	Birds	<i>Setophaga tigrina</i>	Cape May Warbler	NL	habitat loss; need special resources (narrow thermal preferences)
76	Birds	<i>Spiza americana</i>	dickcissel	NL	statistically valid decline documented
77	Birds	<i>Spizella pusilla</i>	field sparrow	NL	statistically valid decline documented; rare, vulnerable/declining habitat
78	Birds	<i>Stelgidopteryx serripennis</i>	northern rough-winged swallow	NL	statistically valid decline documented
79	Birds	<i>Sterna forsteri</i>	Forster's tern	SPC	rare, vulnerable/declining habitat; habitat loss; aggregate their populations
80	Birds	<i>Sterna hirundo</i>	common tern	THR	aggregate their populations
81	Birds	<i>Sturnella magna</i>	eastern meadowlark	NL	rare, vulnerable/declining habitat; habitat loss
82	Birds	<i>Sturnella neglecta</i>	western meadowlark	NL	statistically valid decline documented; rare, vulnerable/declining habitat; habitat loss
83	Birds	<i>Toxostoma rufum</i>	brown thrasher	NL	statistically valid decline documented
84	Birds	<i>Tringa melanoleuca</i>	greater yellowlegs	NL	migrating populations congregating in Minnesota represent a significant portion of the North American population
85	Birds	<i>Troglodytes hiemalis</i>	winter wren	NL	habitat loss
86	Birds	<i>Tympanuchus cupido</i>	greater prairie-chicken	SPC	rare, vulnerable/declining habitat
87	Birds	<i>Tympanuchus phasianellus</i>	sharp-tailed grouse	NL	rare, vulnerable/declining habitat; aggregate their populations
88	Birds	<i>Tyrannus verticalis</i>	western kingbird	NL	statistically valid decline documented; rare, vulnerable/declining habitat; depend on large habitat
89	Birds	<i>Vermivora chrysoptera</i>	golden-winged warbler	NL	Minnesota population represents significant portion of their North American breeding or wintering population; populations in Minnesota stable but have declined or are declining in a substantial part of range

90	Birds	<i>Vireo bellii</i>	Bell's vireo	SPC		rare, vulnerable/declining habitat; extensive surveys indicate a decline of unknown cause
91	Birds	<i>Vireo philadelphicus</i>	Philadelphia vireo	NL		rare, vulnerable/declining habitat; extensive surveys indicate a decline of unknown cause
92	Birds	<i>Xanthocephalus xanthocephalus</i>	yellow-headed blackbird	NL		statistically valid decline documented; rare, vulnerable/declining habitat

Amphibians

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Amphibians	<i>Acris blanchardi</i>	Blanchard's cricket frog	END		habitat loss; habitat degradation; need special resources (narrow thermal preferences); highly localized/restricted distribution
2	Amphibians	<i>Ambystoma maculatum</i>	spotted salamander	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; requires large home ranges/multiple habitats; highly localized/restricted distribution; aggregate their populations
3	Amphibians	<i>Anaxyrus cognatus</i>	Great Plains toad	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; requires large home ranges/multiple habitats; aggregate their populations
4	Amphibians	<i>Hemidactylium scutatum</i>	four-toed salamander	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; requires large home ranges/multiple habitats; limited ability to recover (low dispersal ability); highly localized/restricted distribution
5	Amphibians	<i>Lithobates palustris</i>	pickerel frog	NL		rare, vulnerable/declining habitat; habitat loss; habitat degradation; requires large home ranges/multiple habitats; highly localized/restricted distribution; aggregate their populations
6	Amphibians	<i>Necturus maculosus</i>	mudpuppy	SPC		habitat degradation; habitat fragmentation; over-exploitation; disease
7	Amphibians	<i>Notophthalmus viridescens</i>	eastern newt	NL		rare, vulnerable/declining habitat; habitat degradation; habitat fragmentation; requires large home ranges/multiple habitats
8	Amphibians	<i>Plethodon cinereus</i>	eastern red-backed salamander	NL		habitat degradation; habitat fragmentation

Reptiles

1	Reptiles	<i>Apalone mutica</i>	smooth softshell	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; predation beyond normal levels; highly localized/restricted distribution; aggregate their populations
2	Reptiles	<i>Aspidoscelis sexlineata</i>	six-lined racerunner	NL		rare, vulnerable/declining habitat; habitat degradation; highly localized/restricted distribution
3	Reptiles	<i>Coluber constrictor</i>	North American racer	SPC		rare, vulnerable/declining habitat; habitat loss; highly localized/restricted distribution; aggregate their populations
4	Reptiles	<i>Crotalus horridus</i>	timber rattlesnake	THR		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; overexploitation; disease; deliberate killing; limited ability to recover (low reproductive rate); highly localized/restricted distribution; aggregate their populations
5	Reptiles	<i>Diadophis punctatus edwardsii</i> (northern subspecies)	northern ring-necked snake	NL		highly localized/restricted distribution
6	Reptiles	<i>Emydoidea blandingii</i>	Blanding's turtle	THR		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; requires large home ranges/multiple habitats; depend on large habitat; limited ability to recover (low reproductive rate)
7	Reptiles	<i>Glyptemys insculpta</i>	wood turtle	THR		statistically valid decline documented; rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; requires large home ranges/multiple habitats; depend on large habitat; limited ability to recover (low reproductive rate); aggregate their populations

8	Reptiles	<i>Heterodon nasicus</i>	plains hog-nosed snake	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; overexploitation
9	Reptiles	<i>Heterodon platirhinos</i>	eastern hog-nosed snake	NL		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation
10	Reptiles	<i>Opheodrys vernalis</i>	smooth greensnake	NL		habitat loss; habitat degradation; habitat fragmentation; contaminants
11	Reptiles	<i>Pantherophis obsoletus</i>	western ratsnake	THR		habitat degradation; disease; highly localized/restricted distribution; aggregate their populations
12	Reptiles	<i>Pituophis catenifer</i>	gophersnake	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; overexploitation; deliberate killing; requires large home ranges/multiple habitats; depend on large habitat
13	Reptiles	<i>Plestiodon fasciatus</i>	common five-lined skink	SPC		rare, vulnerable/declining habitat; habitat degradation; highly localized/restricted distribution
14	Reptiles	<i>Sistrurus catenatus</i>	massasauga	END	C	rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; disease; deliberate killing; need special resources (narrow thermal preferences); depend on ecological process no longer within NRV; limited ability to recover (low reproductive rate); highly localized/restricted distribution; extensive surveys indicate a decline of unknown cause
15	Reptiles	<i>Tropidoclonion lineatum</i>	lined snake	SPC		habitat loss; habitat fragmentation; highly localized/restricted distribution

Fish

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Fish	<i>Acipenser fulvescens</i>	lake sturgeon	SPC		habitat fragmentation; requires large home ranges/multiple habitats; depend on large habitats; depend on ecological process no longer within NRV
2	Fish	<i>Alosa chrysochloris</i>	skipjack herring	END		habitat fragmentation; depend on ecological process no longer within NRV; highly localized/restricted distribution
3	Fish	<i>Ammocrypta clara</i>	western sand darter	NL		habitat degradation; depend on ecological process no longer within NRV
4	Fish	<i>Anguilla rostrata</i>	American eel	SPC		habitat fragmentation; depend on ecological process no longer within NRV
5	Fish	<i>Aphredoderus sayanus</i>	pirate perch	SPC		habitat degradation; highly localized/restricted distribution
6	Fish	<i>Catostomus catostomus</i>	longnose sucker	NL		extensive surveys indicate a decline of unknown cause
7	Fish	<i>Clinostomus elongatus</i>	reidside dace	SPC		habitat degradation; invasive species; need special resources (narrow thermal preferences)
8	Fish	<i>Coregonus kiyi</i>	kiyi	SPC		overexploitation; depend on ecological process no longer within NRV
9	Fish	<i>Coregonus nipigon</i>	Nipigon cisco	SPC		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences); highly localized/restricted distribution
10	Fish	<i>Coregonus zenithicus</i>	shortjaw cisco	SPC		overexploitation
11	Fish	<i>Cottus ricei</i>	spoonhead sculpin	NL		highly localized/restricted distribution
12	Fish	<i>Couesius plumbeus</i>	lake chub	SPC		highly localized/restricted distribution
13	Fish	<i>Crystallaria asprella</i>	crystal darter	END		habitat degradation; depend on ecological process no longer within NRV
14	Fish	<i>Cycleptus elongatus</i>	blue sucker	SPC		habitat degradation; habitat fragmentation; depend on ecological process no longer within NRV
15	Fish	<i>Erimystax x-punctata</i>	gravel chub	THR		habitat degradation; depend on ecological process no longer within NRV; highly localized/restricted distribution

16	Fish	<i>Etheostoma chlorosoma</i>	bluntnose darter	SPC		highly localized/restricted distribution
17	Fish	<i>Etheostoma microperca</i>	least darter	SPC		state listed; no additional criteria identified
18	Fish	<i>Fundulus sciadicus</i>	plains topminnow	THR		rare, vulnerable/declining habitat; habitat degradation; highly localized/restricted distribution
19	Fish	<i>Hybognathus nuchalis</i>	Mississippi silvery minnow	SPC		habitat fragmentation; depend on ecological process no longer within NRV; highly localized/restricted distribution
20	Fish	<i>Hybopsis amnis</i>	pallid shiner	END		extensive surveys indicate a decline of unknown cause
21	Fish	<i>Ichthyomyzon fossor</i>	northern brook lamprey	SPC		state listed; no additional criteria identified
22	Fish	<i>Ichthyomyzon gagei</i>	southern brook lamprey	SPC		state listed; no additional criteria identified
23	Fish	<i>Ictiobus niger</i>	black buffalo	THR		habitat degradation; habitat fragmentation; depend on ecological process no longer within NRV
24	Fish	<i>Lepomis gulosus</i>	warmouth	SPC		habitat degradation; highly localized/restricted distribution
25	Fish	<i>Lepomis peltastes</i>	northern longear sunfish	SPC		habitat loss; habitat degradation
26	Fish	<i>Lythrurus umbratilis</i>	redfin shiner	SPC		extensive surveys indicate a decline of unknown cause
27	Fish	<i>Morone mississippiensis</i>	yellow bass	SPC		state listed; no additional criteria identified
28	Fish	<i>Moxostoma duquesnei</i>	black redhorse	SPC		habitat degradation; highly localized/restricted distribution
29	Fish	<i>Myoxocephalus thompsoni</i>	deepwater sculpin	NL		highly localized/restricted distribution
30	Fish	<i>Nocomis biguttatus</i>	hornyhead chub	NL		habitat degradation; over-exploitation; extensive surveys indicate a decline of unknown cause
31	Fish	<i>Notropis anogenus</i>	pugnose shiner	THR		habitat loss; habitat degradation
32	Fish	<i>Notropis nubilus</i>	Ozark minnow	SPC		highly localized/restricted distribution
33	Fish	<i>Notropis texanus</i>	weed shiner	NL		highly localized/restricted distribution
34	Fish	<i>Notropis topeka</i>	Topeka shiner	SPC	E	Minnesota population represents significant portion of their North American breeding or wintering population
35	Fish	<i>Noturus exilis</i>	slender madtom	END		highly localized/restricted distribution
36	Fish	<i>Opsopoeodus emiliae</i>	pugnose minnow	NL		habitat degradation; habitat fragmentation; populations in Minnesota stable but have declined or are declining in a substantial part of range
37	Fish	<i>Percina evides</i>	gilt darter	SPC		habitat degradation; highly localized/restricted distribution
38	Fish	<i>Phenacobius mirabilis</i>	suckermouth minnow	SPC		extensive surveys indicate a decline of unknown cause
39	Fish	<i>Platygobio gracilis</i>	flathead chub	SPC		state listed; no additional criteria identified
40	Fish	<i>Polyodon spathula</i>	paddlefish	THR		invasive species; depend on ecological process no longer within NRV
41	Fish	<i>Prosopium coulterii</i>	pygmy whitefish	SPC		highly localized/restricted distribution
42	Fish	<i>Salvelinus fontinalis</i>	coaster brook trout	NL		statistically valid decline documented
43	Fish	<i>Salvelinus fontinalis</i>	brook trout SE Minnesota heritage strain	NL		highly localized/restricted distribution; Minnesota population represents significant portion of their North American breeding or wintering population

Mussels

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Mussels	<i>Actinonaias ligamentina</i>	mucket	THR		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants
2	Mussels	<i>Alasmidonta marginata</i>	elktoe	THR		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; need special resources (host species); highly localized/restricted distribution
3	Mussels	<i>Anodonta suborbiculata</i>	flat floater	SPC		contaminants; highly localized/restricted distribution
4	Mussels	<i>Arcidens confragosus</i>	rock pocketbook	END		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants
5	Mussels	<i>Cumberlandia monodonta</i>	spectaclecase	END	E	statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; limited ability to recover (low dispersal ability); highly localized/restricted distribution; aggregate their populations; Minnesota population represents significant portion of their North American breeding or wintering population
6	Mussels	<i>Cyclonaias tuberculata</i>	purple wartyback	END		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; need special resources (host species)
7	Mussels	<i>Ellipsaria lineolata</i>	butterfly	THR		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; need special resources (host species)
8	Mussels	<i>Elliptio complanata</i>	eastern elliptio	SPC		invasive species; highly localized/restricted distribution
9	Mussels	<i>Elliptio crassidens</i>	elephant-ear	END		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; need special resources (host species)
10	Mussels	<i>Elliptio dilatata</i>	spike	THR		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants
11	Mussels	<i>Epioblasma triquetra</i>	snuffbox	END	E	statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; need special resources (host species); Minnesota population represents significant portion of their North American breeding or wintering population
12	Mussels	<i>Fusconaia ebena</i>	ebonyshell	END		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; need special resources (host species)
13	Mussels	<i>Lampsilis higginsii</i>	Higgins eye	END	E	statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants
14	Mussels	<i>Lampsilis teres</i>	yellow sandshell	END		statistically valid decline documented; invasive species; contaminants; need special resources (host species); extensive surveys indicate a decline of unknown cause
15	Mussels	<i>Lasmigona compressa</i>	creek heelsplitter	SPC		habitat degradation; contaminants
16	Mussels	<i>Lasmigona costata</i>	fluted-shell	THR		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants
17	Mussels	<i>Ligumia recta</i>	black sandshell	SPC		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants
18	Mussels	<i>Ligumia subrostrata</i>	pondmussel	THR		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; contaminants; highly localized/restricted distribution

19	Mussels	<i>Megaloniais nervosa</i>	washboard	END		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; over-exploitation; invasive species; contaminants
20	Mussels	<i>Obovaria olivaria</i>	hickorynut	NL		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; need special resources (host species)
21	Mussels	<i>Plethobasus cyphus</i>	sheepnose	END	E	statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants
22	Mussels	<i>Pleurobema sintoxia</i>	round pigtoe	SPC		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants
23	Mussels	<i>Potamilus capax</i>	fat pocketbook	NL		statistically valid decline documented; habitat fragmentation; need special resources (host species); extensive surveys indicate a decline of unknown cause. currently extirpated in Minnesota, there is a strong likelihood that this species will be reintroduced within the next 10 years
24	Mussels	<i>Quadrula fragosa</i>	winged mapleleaf	END	E	Statistically valid decline documented; Habitat loss; Habitat degradation; Habitat fragmentation; Invasive species; Contaminants; Need special resources (host species); MN population represents significant portion of their N. Am. breeding or wintering pop.
25	Mussels	<i>Quadrula metanevra</i>	monkeyface	THR		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants
26	Mussels	<i>Quadrula nodulata</i>	wartyback	THR		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; Minnesota population represents significant portion of their North American breeding or wintering population
27	Mussels	<i>Simpsonia ambigua</i>	salamander mussel	END		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; need special resources (host species); limited ability to recover (low dispersal ability); highly localized/restricted distribution; highly localized/restricted distribution; aggregate their populations
28	Mussels	<i>Tritogonia verrucosa</i>	pistolgrip	END		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; need special resources (host species)
29	Mussels	<i>Truncilla donaciformis</i>	fawnsfoot	THR		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; need special resources (host species); extensive surveys indicate a decline of unknown cause
30	Mussels	<i>Venustaconcha ellipsiformis</i>	ellipse	THR		statistically valid decline documented; habitat loss; habitat degradation; habitat fragmentation; invasive species; contaminants; limited ability to recover (low dispersal ability)

Snails

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Snails	<i>Gastrocopta rogersensis</i>	Rogers' snaggletooth snail	SPC		statistically valid decline documented; highly localized/restricted distribution
2	Snails	<i>Planogyra asteriscus</i>	eastern flat-whorl snail	SPC		rare, vulnerable/declining habitat; highly localized/restricted distribution
3	Snails	<i>Striatura ferrea</i>	black striate snail	SPC		highly localized/restricted distribution
4	Snails	<i>Vertigo meramecensis</i>	bluff vertigo	THR		rare, vulnerable/declining habitat; highly localized/restricted distribution
5	Snails	<i>Zonitoides limatulus</i>	dull gloss	SPC		highly localized/restricted distribution

Jumping Spiders

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Jumping spiders	<i>Habronattus calcaratus maddisoni</i>	A species of jumping spider	SPC		state listed; no additional criteria identified
2	Jumping spiders	<i>Habronattus texanus</i>	A species of jumping spider	SPC		rare, vulnerable/declining habitat; highly localized/restricted distribution
3	Jumping spiders	<i>Habronattus viridipes</i>	A species of jumping spider	SPC		rare, vulnerable/declining habitat; highly localized/restricted distribution
4	Jumping spiders	<i>Marpissa formosa</i>	A species of jumping spider	SPC		highly localized/restricted distribution
5	Jumping spiders	<i>Paradamoetas fontana</i>	A species of jumping spider	SPC		habitat loss; highly localized/restricted distribution
6	Jumping spiders	<i>Pelegrina arizonensis</i>	A species of jumping spider	SPC		rare, vulnerable/declining habitat; need special resources (host species); depend on ecological process no longer within NRV; highly localized/restricted distribution
7	Jumping spiders	<i>Phidippus apacheanus</i>	A species of jumping spider	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; highly localized/restricted distribution
8	Jumping spiders	<i>Phidippus pius</i>	A species of jumping spider	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; highly localized/restricted distribution
9	Jumping spiders	<i>Sassacus papenhoei</i>	A species of jumping spider	SPC		rare, vulnerable/declining habitat; highly localized/restricted distribution
10	Jumping spiders	<i>Tutelina formicaria</i>	A species of jumping spider	THR		rare, vulnerable/declining habitat; need special resources (host species); highly localized/restricted distribution

Leafhoppers

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Leafhoppers	<i>Aflexia rubranura</i>	red-tailed leafhopper	SPC		rare, vulnerable/declining habitat; need special resources (host species)
2	Leafhoppers	<i>Attenuipyga vanduzeei</i>	hill prairie shovelhead leafhopper	SPC		rare, vulnerable/declining habitat; highly localized/restricted distribution
3	Leafhoppers	<i>Macrosteles clavatus</i>	caped leafhopper	SPC		rare, vulnerable/declining habitat; highly localized/restricted distribution

Dragonflies & Damselflies

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Dragonflies & damselflies	<i>Aeshna sitchensis</i>	zigzag darner	SPC		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
2	Dragonflies & damselflies	<i>Aeshna subarctica</i>	subarctic darner	SPC		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
3	Dragonflies & damselflies	<i>Amphiagrion abbreviatum</i>	western red damsel	NL		rare, vulnerable/declining habitat; habitat loss; habitat degradation; need special resources (narrow thermal preferences)
4	Dragonflies & damselflies	<i>Argia plana</i>	springwater dancer	NL		highly localized/restricted distribution
5	Dragonflies & damselflies	<i>Boyeria grafiana</i>	ocellated darner	SPC		highly localized/restricted distribution
6	Dragonflies & damselflies	<i>Coenagrion angulatum</i>	prairie bluet	NL		rare, vulnerable/declining habitat; habitat loss
7	Dragonflies & damselflies	<i>Coenagrion interrogatum</i>	subarctic bluet	NL		habitat loss; habitat degradation
8	Dragonflies & damselflies	<i>Cordulegaster obliqua</i>	arrowhead spiketail	NL		habitat degradation
9	Dragonflies & damselflies	<i>Gomphus adelphus</i>	mustached clubtail	NL		habitat degradation; need special resources (narrow thermal preferences)
10	Dragonflies & damselflies	<i>Gomphus lineatifrons</i>	splendid clubtail	NL		habitat degradation; need special resources (narrow thermal preferences)

11	Dragonflies & damselflies	<i>Gomphus quadricolor</i>	rapids clubtail	NL		habitat degradation; need special resources (narrow thermal preferences)
12	Dragonflies & damselflies	<i>Gomphus ventricosus</i>	skillet clubtail	NL		habitat degradation; need special resources (narrow thermal preferences)
13	Dragonflies & damselflies	<i>Gomphus viridifrons</i>	green-faced clubtail	NL		habitat degradation; need special resources (narrow thermal preferences)
14	Dragonflies & damselflies	<i>Ischnura posita</i>	fragile forktail	NL		statistically valid decline documented
15	Dragonflies & damselflies	<i>Leucorrhinia glacialis</i>	crimson-ringed whiteface	NL		rare, vulnerable/declining habitat
16	Dragonflies & damselflies	<i>Nannothemis bella</i>	elfin skimmer	NL		rare, vulnerable/declining habitat
17	Dragonflies & damselflies	<i>Neurocordulia molesta</i>	smoky shadow-dragon	NL		habitat degradation
18	Dragonflies & damselflies	<i>Ophiogomphus anomalus</i>	extra-striped snaketail	SPC		habitat degradation; need special resources (narrow thermal preferences)
19	Dragonflies & damselflies	<i>Ophiogomphus carolus</i>	rifle snaketail	NL		habitat degradation; need special resources (narrow thermal preferences)
20	Dragonflies & damselflies	<i>Ophiogomphus colubrinus</i>	boreal snaketail	NL		habitat degradation; need special resources (narrow thermal preferences)
21	Dragonflies & damselflies	<i>Ophiogomphus howei</i>	pygmy snaketail	SPC		habitat degradation; need special resources (narrow thermal preferences)
22	Dragonflies & damselflies	<i>Ophiogomphus smithi</i>	Sioux snaketail	NL		habitat degradation; need special resources (narrow thermal preferences)
23	Dragonflies & damselflies	<i>Ophiogomphus susbehcha</i>	St. Croix snaketail	THR		habitat degradation; need special resources (narrow thermal preferences)
24	Dragonflies & damselflies	<i>Rhionaeschna multicolor</i>	blue-eyed darner	NL		habitat loss
25	Dragonflies & damselflies	<i>Rhionaeschna mutata</i>	spatterdock darner	NL		rare, vulnerable/declining habitat; habitat loss; need special resources (narrow thermal preferences); highly localized/restricted distribution
26	Dragonflies & damselflies	<i>Somatochlora brevicincta</i>	Quebec emerald	SPC		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
27	Dragonflies & damselflies	<i>Somatochlora cingulata</i>	lake emerald	NL		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
28	Dragonflies & damselflies	<i>Somatochlora elongata</i>	ski-tipped emerald	NL		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
29	Dragonflies & damselflies	<i>Somatochlora ensigera</i>	plains emerald	NL		habitat loss; habitat degradation
30	Dragonflies & damselflies	<i>Somatochlora forcipata</i>	forcipate emerald	SPC		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
31	Dragonflies & damselflies	<i>Somatochlora franklini</i>	delicate emerald	NL		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
32	Dragonflies & damselflies	<i>Somatochlora kennedyi</i>	Kennedy's emerald	NL		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
33	Dragonflies & damselflies	<i>Somatochlora minor</i>	ocellated emerald	NL		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
34	Dragonflies & damselflies	<i>Somatochlora walshii</i>	brush-tipped emerald	NL		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)
35	Dragonflies & damselflies	<i>Stylogomphus albistylus</i>	eastern least clubtail	NL		habitat degradation
36	Dragonflies & damselflies	<i>Stylurus amnicola</i>	riverine clubtail	NL		habitat degradation
37	Dragonflies & damselflies	<i>Stylurus plagiatus</i>	russet-tipped clubtail	NL		habitat degradation
38	Dragonflies & damselflies	<i>Stylurus scudderi</i>	zebra clubtail	NL		habitat degradation
39	Dragonflies & damselflies	<i>Sympetrum madidum</i>	red-veined meadowhawk	NL		highly localized/restricted distribution
40	Dragonflies & damselflies	<i>Williamsonia fletcheri</i>	ebony boghunter	NL		rare, vulnerable/declining habitat; need special resources (narrow thermal preferences)

Butterflies & Moths

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Butterflies & moths	<i>Aspitates aberrata</i>	A species of geometrid moth	NL		rare, vulnerable/declining habitat

2	Butterflies & moths	<i>Atrytone arogos iowa</i>	Arogos skipper	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation
3	Butterflies & moths	<i>Atrytonopsis hianna</i>	dusted skipper	NL		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species); depend on ecological process no longer within NRV; highly localized/restricted distribution
4	Butterflies & moths	<i>Boloria chariclea</i>	arctic fritillary	NL		habitat loss; habitat degradation; need special resources (host species)
5	Butterflies & moths	<i>Carmenta anthracipennis</i>	blazing star clear-wing moth	NL		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species)
6	Butterflies & moths	<i>Catocala abbreviatella</i>	abbreviated underwing	SPC		rare, vulnerable/declining habitat; habitat fragmentation; need special resources (host species)
7	Butterflies & moths	<i>Catocala whitneyi</i>	Whitney's underwing	SPC		rare, vulnerable/declining habitat; need special resources (host species)
8	Butterflies & moths	<i>Danaus plexippus</i>	monarch	NL		statistically valid decline documented; rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species); Minnesota population represents significant portion of their North American breeding or wintering population
9	Butterflies & moths	<i>Erebia mancinus</i>	Disa alpine	SPC		habitat loss; habitat degradation; need special resources (narrow thermal preferences); highly localized/restricted distribution
10	Butterflies & moths	<i>Erynnis martialis</i>	mottled dusky wing	NL		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species); depend on ecological process no longer within NRV
11	Butterflies & moths	<i>Erynnis persius persius</i>	Persius duskywing	END		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species); depend on ecological process no longer within NRV
12	Butterflies & moths	<i>Euchloe ausonides</i>	large marble	NL		depend on large habitat; need special resources (host species, narrow thermal preferences); depend on ecological process no longer within NRV; highly localized/restricted distribution
13	Butterflies & moths	<i>Euphyes binacula illinois</i>	two-spotted skipper	NL		rare, vulnerable/declining habitat; habitat loss; habitat degradation; need special resources (host species); depend on ecological process no longer within NRV
14	Butterflies & moths	<i>Hesperia assiniboia</i>	Assiniboia skipper	END		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species); depend on ecological process no longer within NRV
15	Butterflies & moths	<i>Hesperia dacotae</i>	Dakota skipper	END	T	rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; depend on ecological process no longer within NRV; extensive surveys indicate a decline of unknown cause; Minnesota population represents significant portion of their North American breeding or wintering population
16	Butterflies & moths	<i>Hesperia leonardus</i>	Leonard's skipper	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation
17	Butterflies & moths	<i>Hesperia ottoe</i>	Ottoe skipper	END		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; depend on ecological process no longer within NRV; highly localized/restricted distribution
18	Butterflies & moths	<i>Hesperia uncas</i>	Uncas skipper	END		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species); depend on ecological process no longer within NRV
19	Butterflies & moths	<i>Lasionycta secedens</i>	a species of owlet moth	NL		need special resources (narrow thermal preferences); highly localized/restricted distribution
20	Butterflies & moths	<i>Lasionycta taigata</i>	a species of owlet moth	NL		need special resources (narrow thermal preferences); highly localized/restricted distribution

21	Butterflies & moths	<i>Plebejus idas nabokovi</i>	Nabokov's blue	SPC		rare, vulnerable/declining habitat; habitat degradation; need special resources (host species); depend on ecological process no longer within NRV; highly localized/restricted distribution
22	Butterflies & moths	<i>Plebejus melissa samuelis</i>	Karner blue	END	E	rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species); depend on ecological process no longer within NRV
23	Butterflies & moths	<i>Oarisma garita</i>	Garita skipper	THR		rare, vulnerable/declining habitat; habitat degradation; depend on ecological process no longer within NRV; highly localized/restricted distribution
24	Butterflies & moths	<i>Oarisma poweshiek</i>	Poweshiek skipper	END	E	statistically valid decline documented; rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; depend on ecological process no longer within NRV; extensive surveys indicate a decline of unknown cause
25	Butterflies & moths	<i>Oeneis uhleri varuna</i>	Uhler's arctic	END		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation, highly localized/restricted distribution
26	Butterflies & moths	<i>Polygonia gracilis</i>	hoary comma	NL		highly localized/restricted distribution
27	Butterflies & moths	<i>Proserpina juanita</i>	Juanita sphinx moth	NL		rare, vulnerable/declining habitat; habitat loss; habitat degradation; depend on large habitat; habitat fragmentation; need special resources (host species); depend on ecological process no longer within NRV
28	Butterflies & moths	<i>Pyrgus centaureae freija</i>	grizzled skipper	SPC		state listed; no additional criteria identified
29	Butterflies & moths	<i>Schinia indiana</i>	phlox moth	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species)
30	Butterflies & moths	<i>Schinia lucens</i>	Leadplant Flower Moth	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species)
31	Butterflies & moths	<i>Schinia sanguinea</i>	blazing star flower moth	NL		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; need special resources (host species)
32	Butterflies & moths	<i>Speyeria idalia</i>	regal fritillary	SPC		rare, vulnerable/declining habitat; habitat loss; habitat degradation; habitat fragmentation; depend on large habitat; need special resources (host species); depend on ecological process no longer within NRV
33	Butterflies & moths	<i>Xestia mixta</i>	a species of owlet moth	NL		need special resources (host species); depend on ecological process no longer within NRV

Caddisflies

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Caddisflies	<i>Agapetus tomus</i>	A species of caddisfly	SPC		habitat degradation; need special resources (narrow thermal preferences); highly localized/restricted distribution
2	Caddisflies	<i>Anabolia ozburni</i>	A species of northern caddisfly	SPC		habitat loss; habitat degradation; extensive surveys indicate a decline of unknown cause
3	Caddisflies	<i>Chilostigma itascae</i>	headwaters Chilostigman caddisfly	THR		highly localized/restricted distribution; Minnesota population represents significant portion of their North American breeding or wintering population
4	Caddisflies	<i>Goera stylata</i>	A species of caddisfly	THR		need special resources (narrow thermal preferences); highly localized/restricted distribution
5	Caddisflies	<i>Hydroptila metoeca</i>	A species of purse casemaker caddisfly	SPC		state listed; no additional criteria identified
6	Caddisflies	<i>Hydroptila quinola</i>	A species of purse casemaker caddisfly	SPC		habitat degradation; highly localized/restricted distribution
7	Caddisflies	<i>Hydroptila rono</i>	A species of purse casemaker caddisfly	THR		habitat degradation; highly localized/restricted distribution
8	Caddisflies	<i>Hydroptila tortosa</i>	A species of purse casemaker caddisfly	SPC		state listed; no additional criteria identified

9	Caddisflies	<i>Hydroptila waskesia</i>	A species of purse casemaker caddisfly	END		habitat degradation; highly localized/restricted distribution
10	Caddisflies	<i>Ironoquia punctatissima</i>	A species of northern caddisfly	THR		rare, vulnerable/declining habitat; highly localized/restricted distribution
11	Caddisflies	<i>Lepidostoma libum</i>	A species of caddisfly	THR		habitat degradation; highly localized/restricted distribution
12	Caddisflies	<i>Limnephilus janus</i>	A species of northern caddisfly	END		habitat degradation; highly localized/restricted distribution
13	Caddisflies	<i>Limnephilus rossi</i>	A species of northern caddisfly	THR		habitat degradation; highly localized/restricted distribution
14	Caddisflies	<i>Limnephilus secludens</i>	A species of northern caddisfly	END		habitat degradation
15	Caddisflies	<i>Ochrotrichia spinosa</i>	A species of purse casemaker caddisfly	END		highly localized/restricted distribution; extensive surveys indicate a decline of unknown cause
16	Caddisflies	<i>Oecetis ditissa</i>	A species of long-horned caddisfly	THR		habitat degradation; highly localized/restricted distribution
17	Caddisflies	<i>Oxyethira ecornuta</i>	A species of purse casemaker caddisfly	THR		highly localized/restricted distribution
18	Caddisflies	<i>Oxyethira itascae</i>	A species of purse casemaker caddisfly	SPC		highly localized/restricted distribution; Minnesota population represents significant portion of their North American breeding or wintering population
19	Caddisflies	<i>Parapsyche apicalis</i>	A species of net-spinning caddisfly	THR		habitat degradation; highly localized/restricted distribution
20	Caddisflies	<i>Polycentropus glacialis</i>	A species of tube casemaker caddisfly	THR		highly localized/restricted distribution
21	Caddisflies	<i>Polycentropus milaca</i>	A species of tube casemaker caddisfly	END		highly localized/restricted distribution; Minnesota population represents significant portion of their North American breeding or wintering population
22	Caddisflies	<i>Protophila erotica</i>	A species of saddle casemaker caddisfly	SPC		highly localized/restricted distribution
23	Caddisflies	<i>Trienodes flavescens</i>	A species of long-horned caddisfly	SPC		highly localized/restricted distribution
24	Caddisflies	<i>Ylodes frontalis</i>	A species of long-horned caddisfly	THR		highly localized/restricted distribution

Tiger Beetles

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Tiger Beetles	<i>Cicindela cursitans</i>	ant-like tiger beetle	NL		highly localized/restricted distribution
2	Tiger Beetles	<i>Cicindela denikei</i>	Laurentian tiger beetle	SPC		highly localized/restricted distribution
3	Tiger Beetles	<i>Cicindela fulgida fulgida</i>	crimson saltflat tiger beetle, fulgida ssp.	END		rare, vulnerable/declining habitat; need special resources; highly localized/restricted distribution; depend on ecological process no longer within NRV
4	Tiger Beetles	<i>Cicindela fulgida westbournei</i>	crimson saltflat tiger beetle, westb. ssp.	THR		rare, vulnerable/declining habitat; need special resources; highly localized/restricted distribution
5	Tiger Beetles	<i>Cicindela hirticollis hirticollis</i> ssp.	hairy-necked tiger beetle	NL		habitat degradation
6	Tiger Beetles	<i>Cicindela hirticollis rhodensis</i> ssp.	hairy-necked tiger beetle	END		habitat degradation; highly localized/restricted distribution
7	Tiger Beetles	<i>Cicindela lepida</i>	ghost tiger beetle	THR		rare, vulnerable/declining habitat; highly localized/restricted distribution
8	Tiger Beetles	<i>Cicindela limbata nympha</i>	sandy tiger beetle	END		rare, vulnerable/declining habitat; highly localized/restricted distribution
9	Tiger Beetles	<i>Cicindela macra macra</i>	sandy stream tiger beetle	SPC		highly localized/restricted distribution
10	Tiger Beetles	<i>Cicindela patruela patruela</i>	northern barrens tiger beetle	SPC		rare, vulnerable/declining habitat; habitat loss
11	Tiger Beetles	<i>Cicindela splendida cyanocephalata</i>	splendid tiger beetle	SPC		need special resources; highly localized/restricted distribution

Bees

	Taxa	Scientific name	Common name	State status	Federal status	Criteria (stressors and life-history traits)
1	Bees	<i>Bombus affinis</i>	rusty patched bumble bee	NL		extensive surveys indicate a decline of unknown cause
2	Bees	<i>Bombus bohemicus</i>	Ashton cuckoo bumble bee	NL		need special resources (host species)
3	Bees	<i>Bombus terricola</i>	yellowbanded bumble bee	NL		extensive surveys indicate a decline of unknown cause
4	Bees	<i>Bombus fervidus</i>	golden northern bumble bee or yellow bumble bee	NL		extensive surveys indicate a decline of unknown cause
5	Bees	<i>Bombus pensylvanicus</i>	American bumble bee	NL		extensive surveys indicate a decline of unknown cause

Dakota County NRMSB Benchmarking – Survey Questions

1. **What are the total acres of parks and protected lands in your agency?**
2. **What are the numbers of parks (and protected lands)?**
3. **What are the acres of undeveloped and natural land?** (Percentage/estimate is okay. Alternatively, provide the acres of campgrounds and developed facilities so we can extract the number.)
4. **How many acres of undeveloped/natural acres are managed for natural resource quality (e.g., monitoring, controlling invasives, prescribed burns)?** (Percentage/estimate is okay).
5. **How many acres of the following land cover types are natural/undeveloped?**
(If other land cover classifications are available, please provide these with the acres so AES can convert to the classifications below.)
 - a. Wooded Lands:
 - b. Non-native Grassland:
 - c. Native or Planted Prairie:
 - d. Lakes and Ponds:
 - e. Non-forested Wetlands:
6. **What was the agency's total budget for natural resources management efforts (including restoration)?**
 - a. 2015:
 - b. 2014:
 - c. 2013:
7. **What are the percentages within natural resources management budget for the following categories?**
(If this takes time to extract, AES can extract number if link/file to a publicly available natural resource budget is provided.)
 - a. FTE staff %:
 - b. Contracts %:
 - c. Temporary staff %:
 - d. Equipment %:
 - e. Other %:
8. **What are the resource management budget sources 2014?**
 - a. Levy %:
 - b. Grants %:
 - c. Earned revenues %:
 - d. Other %:
9. **Staffing: How many Fulltime Equivalent Staff is employed in resource management efforts?** (This includes all staff permanently hired by the agency to work with natural resources in the office and field.)

10. Volunteers (fill in table below):

- a. *Does the agency have an active volunteer program? (Y/N):*
- b. *How many volunteer hours and volunteers has the agency used in the three most recent years?*
- c. *How many staff hours were used to coordinate volunteers (2013, 2014, 2015)?*

	2013	2014	2015
Volunteer hours			
Number of volunteers			
Staff hours			

11. Does your agency have natural resources management plans (Y/N)?

- a. If yes, please attach the file or provide link to this report (if available for the public).

12. Does your agency use partnerships to manage natural resources (Y/N)? (If this is project specific, please list the most common partnership)

Partner:	Type of Partnership:
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13. Privately Owned Lands

- a. *Does your agency have a conservation program to protect natural resources on privately owned lands? (Y/N):*
- b. *Does your agency provide technical assistance and/or financial support for natural resources management efforts? (Y/N):*
- c. *Please describe briefly:*

Thank you!

If you have any questions about the survey, please call or email:

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Appendix N. Technical Advisory Committee Meeting Summaries and Participants

TAC MEETING #1

NRMSP Technical Advisory Committee (TAC) Meeting Summary and Comments February 24, 2016

Participants:

Dakota County staff: Al Singer, Kurt Chatfield, Mike Lynn, Scott Hagen, Terry Vikla, Meghan Manhatton, and Rachel Crownhart

Consultants: Doug Mensing (AES), Stewart Crosby (SRF), Carolyn Dindorf (FCI) and Nancy Mulhern (FCI)

Technical Advisory Committee: Joe Beattie, Sue Betzler, Wendy Caldwell, Mae Davenport, Bob Fashingbauer, Lee Frelich, Larry Gillette, Mark Henry, Avery Hilebrand, Ron Meador, Tom Lewanski, Becca Nash, Adam Robbins, Wayne Sames, Dan Shaw, Nancy Schumacher, Steve Thomforde, Jennifer Vieth, Brad Becker

I. Welcome and Introductions

Dakota County (DC) staff--Joe Walton (JW) and Al Singer (AS)--opened the meeting. Consultant staff and DC staff introduced themselves, and then members of the technical advisory committee (TAC) did the same.

II. NRMSP Purpose and Goals

JW and Doug Mensing (DM) of Applied Ecological Services (AES) reviewed the purpose and goals of the project.

III. Findings to Date

A PowerPoint presentation was shown during the meeting that included the following:

DM discussed the preliminary results of the resource inventory and assessment. The inventory and assessment of County lands is completed. The identification of natural resource needs and priorities is underway. Slides with spreadsheets showing land cover classifications and park characteristics were shared with the TAC.

DM stated that 52% of public land is being managed, and 29% of private land is being managed. These are high values. Some examples of the County's management programs that were mentioned: buckthorn removal, creation of buffer zone, restoration work in the Tamarack swamp, and restoration of prairie areas.

DM responded to a question by affirming that most of this work was done by relying on existing data. A TAC member suggested using important bird databases as well.

The Communications Plan includes a NRMSP Fact Sheet, Web Page on the DC site, a listserv with 3,500 members and 3 open house events. Each phase of the NRMSP will include review by the Planning Commission and County Board.

DM noted that there would be a five-year implementation plan and a 20-year plan. The County plans to develop natural resource management plans for each of the County's parks based on templates prepared as part of the NRMSP process. DM also presented the preliminary results of the benchmarking. The agencies used to benchmark are: Three Rivers Park District, Anoka County, Washington County, DuPage County (Illinois), Polk County (IA), and Dane County (WI).

Carolyn Dindorf (CD) of Fortin Consulting (FCI) reported on the water resource information compiled so far. There are seven watersheds in the County. Most of the lakes and wetlands are in the northwest part of Dakota County. The inventory includes public waters, 56 lakes, and larger wetland basins and 55 stream reaches. AS reported that more than 90% of the wetlands in the County have been lost due to draining and development.

CD noted that water quality data was obtained from various sources such as the County, Minnesota Pollution Control Agency, Department of Natural Resources, cities and watershed organizations. Major issues facing the County's water resources are at the watershed level, such as mercury, and more site specific, such as aquatic invasive species, excessive vegetation, nutrient pollution, and sedimentation in shallow lakes. Warming temperatures in cold-water trout streams, ground water quantity and quality issues were also mentioned.

Stewart Crosby (SC) of SRF reviewed the survey results, highlighting the demographic changes expected, e.g. aging populations, greater diversity. Multiple surveys done by DC have been reviewed so that information can be combined for this project. SC reported that residents want access to parks and open space, including natural landscapes. SC mentioned that property values increase near open space and parks. Control of aquatic invasive species and restoration of native habitats were also highly favored by survey respondents.

IV. Input on Issues and Priorities

Four groups were formed to review and discuss the five questions prepared by DC and the consultants. The groups then gathered together after meeting as individual groups and highlights of their Comments were presented. Below are the highlights shared by each group during the meeting:

1. What would you emphasize as important natural resource restoration and management needs in County parks, greenways and easements?

Responses included: importance of connectivity, funding and staffing concerns, more support from the County through the easement program, communication of County activities, sustainability/climate change, respect for the natural evolution of landscapes, and seeking out the root causes of AIS in different locales.

2. How could the County establish and develop priorities for working on natural resource restoration and management in County parks, greenways and easements?

Responses included: resource-based priorities, recognition that priorities will be different for different County lands, evaluating the value of activities such as buckthorn removal, possibility of creating a "model" example to extend to other parks, make sure to get biggest bang for the buck, importance of completing a project/having long-term goals with activities, creation of corridors as stepping stones for wildlife protection, look for opportunities that accrue multiple public benefits.

3. Does the current system plan approach make sense? Any gaps?

Responses included: make sure all communities are reached to give input, use focus groups, reach those without a natural resource background and educate, look for grant funding, use additional data sets (such as those for birds), look for high quality land with the potential for acquisition, don't forget about the value of visual resources (viewsheds).

4. Any suggestions on the Communication Plan?

Responses included: target communication toward older residents and multicultural groups, placing both permanent and temporary interpretive signage, present to community groups, present at County and State Fair and to organizations such as the Master Gardener program, explain that natural areas still need to be managed, use specific species such as Monarch butterflies to generate interest, get legislators and township officials involved

5. Identify new ideas, techniques, results, research, successes and failures, etc. regarding management and restoration

Responses included: note that transitioning ecosystems can have downsides such as the example of losing grassland species when restoring Big Woods ecosystem and not gaining an equivalent number of replacement species or diversity, what can be used as a firebreak for AIS, use of grazing animals for management, emphasize partnerships such as with volunteers and non-government groups, biomass harvesting to drop nitrogen levels low enough to minimize invasives such as buckthorn

6. "What message about natural resource restoration and management do you want the County to hear today?"

Attendees noted that Kudos to County to bring together everyone

Long term financial commitment and how to achieve?

AS reported on new County Legacy fund, set aside money from landfill operations,

Minimum standard vs. gold standard—we will need to select options for 5-year plan

If there's a gap in info/data, go get it if it is vital

Education, website or flyer, good signage – should state what is ecologically significant about the area. "The more deeply you understand it, the more you appreciate it."

Get out "pride of place" attitude, this is what the County is doing

Other teachers (science) as a resource

V. Next Steps

A. Communicating Additional Information

B. Upcoming public meetings will be held on March 7 and 8

C. Summary of Next Project Phases- a quick summary of the next steps was provided. Principles, Vision and concept options will be underway during the April to August timeframe. The preferred plan options will be underway from August to December.

D. Next TAC meeting is expected to occur in May

Notes from Small Group Discussions

Question 1: What would you emphasize as important natural resource restoration and management needs in County parks, greenways and easements?

- Collecting data on vegetation and wildlife
- Connectivity
- Don't concentrate on only one species. Take a more comprehensive approach
- Buffer natural areas to reduce fragmentation
- Invasive species control/removal on land and in water
- Staffing and dedicated funding
- Volunteer and outreach
- Maintaining and creating new partnerships
- Connection to surface and groundwater resources
- Make sure we are connecting youth to nature
- Don't bite off more than we can chew
- Find gaps in our records. Data should be reconciled with existing datasets (e.g. Bird Atlas)
- Easements
 - ✓ Best practices for restoration using current science

- ✓ Examples of success
- ✓ “Perpetual enhancement” philosophy
- ✓ Connect landowners to resources
- ✓ The first step is overwhelming – fear of not having a successful project keeps landowners from beginning restoration
- Ensure long-term funding – Maintenance is the most important part.
- Communications about Restoration
 - ✓ Let the public know why we’re removing trees, etc.
 - ✓ Engage park users in the restoration
- Habitat Fragmentation is a big issue: We need to connect parcels and create larger tracts
- *Question:* To what level do we restore? *Answer:* To a “sustainable” level
- Invasive Species: determining why these species became invasive originally: shade tolerant, nitrogen reliant, past land use, etc.
- Is a project technically feasible? Affordable? Scientifically probable? Sustainable?
- Need to consider the effects of climate change in the long term: 20, 30, 40+ years in the future
- *Questions:* “Should these lands even be restored?” Are they the same as they were 200 years ago or are they changing/changed too much?
- Alternatively, we should work on establishing functional ecosystems even if it does not represent the historic native plant community.
- Need to make people aware of these restoration projects and encourage participation in natural resources
- Establishing partnerships with all agencies involved

Question 2: How could the County establish and develop priorities for working on natural resource restoration and management in County parks, greenways and easements? What are the most important factors that should be considered?

- Start with intact areas and expand outward
- Make sure there are specific long-term management goals
- Completing restorations in areas before moving on to the next
- Size of the site
- Focus on protected lands first
- Value as related to water resources
- Rare features and their corridors
- Have enough stepping stones
 - ✓ If you can’t restore or protect a vast corridor, make sure there are pockets of protected areas between
- Cost effectiveness/ability to apply for and receive grant funding
- Prioritize inventory
- Intrinsic, non-utilitarian value
- Rare species
 - #1 Globally imperiled
 - #2 Locally imperiled
- Have a plan and follow it
- Get the greatest bang for our buck
- What’s too critical to ignore? What issues will “blow up” if they aren’t managed in a timely manner
- Managing for diversity vs. a single important species (we don’t know the best approach)

- The priorities of each park will vary depending on the amenities the park offers the public
- Knowing what the public wants within each park
- Where will you reach the most people and how do we establish more buy-in from the communities around the park.
- Are we going to lose a native landscape forever? If so, that should be the focus
- Can we really control buckthorn? Is it worth the money and time involved?
- Where can our money be the most beneficial?
- Let's "showcase" places in the County and promote these high quality areas with the message that the rest of our parks can look this good and be this healthy.
- Connect with people who normally do not familiarize themselves with natural resources by creating more opportunities for "ownership" and engagement. Will the next generation be as "into" Natural Resources as the current one? We need to make sure they are.

Question 3: Does the current Plan approach make sense? Any gaps?

- Look for multiple benefits/water quality
- Strive for diversity in plant community to create foundation for wildlife diversity
- Providing wildlife corridors along roads
- Make sure all (native) communities are addressed
- Establish focus groups
- Make sure there is secured funding for NR management
- Grant approaches
- Private lands and neighboring lands (easements)
 - ✓ More resources/support needed
 - ✓ Easement owners want to see models of success on other easements
 - ✓ Restoration cost-sharing
- Prioritize lands that aren't easements that are high priority
 - ✓ ID these parcels
 - ✓ Move to protect them
- Existing datasets need to be incorporated (IBA, Breeding Bird Atlas)
- Service level across the County
 - ✓ Are all parts of the County being served (for example there is not a lot of parkland in the southwest part of County)
- More discussion as to the implications of climate change, not 5 years but 20 years and more.
- Are there any agency "turf wars" taking place for this plan?
- People need to be able to translate what they are seeing/experiencing in the County's natural areas and realize these practices can be applied to and related to the land they own and care for.
- Can these parks serve the public besides providing hiking/walking trails? (e.g. cattle grazing and using milk to make cheese, growing food, etc.)
- Don't forget protecting the visual attributes at the County parks (often underappreciated) Can trails be built to help share these views (Miesville)? (but do so in an environmentally friendly way)
- Keep coordinating with other agencies both horizontally and vertically and also with surrounding counties.

Question 4: Any suggestions on the Communication Plan?

- Take advantage of well-liked species (i.e. monarchs) to gain public support
- Use demonstration sites
- Let people know what they can do on their own land

- Let people know that natural lands need to be managed, not only restored
- Set expectations
- Make sure to reach out to non-park users
 - ✓ Find out why they're not using the park
- More outreach in the communities
 - ✓ Go to community groups and give presentations
 - ✓ Use partnerships in order to complete this task
- Use County Fair for outreach
- Use citizen ambassadors and lake associations to communicate with the public
- Use "Master" Naturalists and Gardeners Programs
- Survey park users when they are in the park
- Recognize that there are different land ethics from different cultural perspectives
- Face-to-face communication is effective (e.g., festivals)
- Marketing the good work that County does is almost as important as doing the work
- Schools and multilingual communications
- Avenues for communicating:
 - ✓ Online (but people without computers are put off by that)
 - ✓ On-site interpretive signage
 - More than just "Prairie restoration in progress." More in-depth. Angled interpretive panels when the project is completed.
 - ✓ Listserv is well-done
 - ✓ City newsletters might be a good way to communicate about projects
- Reach out to schools and people in the community and:
 - ✓ Educate people on "what am I seeing in this park".
 - ✓ Why is this work necessary?
 - ✓ How does it affect me and why does it matter.
- Local legislature needs to be involved along with township officials. Get these people to buy-in to this project and gain funding support

Question 5: Identify new ideas, techniques, results, research, successes and failures, etc. regarding management and restoration.

- Working together with other organizations to identify more vendors for grazing
- Larger partnerships
- After invasive removal has taken place, have a plan for the establishment of native vegetation
 - ✓ Know what native species compete with the invasives you are trying to control
- Never stop improving diversity
 - ✓ During a restoration, don't just seed in the beginning of the project. Make sure that you continue to take steps to create a highly diverse habitat
- Partnerships! They aren't just a good thing, they're needed if the work is going to get done
 - ✓ Volunteers
 - ✓ Professionals (Washington Conservation District, etc.)
- Identify new ideas, techniques, results, research, successes and failures, etc. regarding management and restoration.
- Receive the latest research coming out on ecosystems
- Research the impacts of haying on nitrogen replacement and nitrogen decrease in soils. Herbivores and plants are directly related and evolved together.

- Get goats/cows/bison/cattle....let's make cheese!
- From the Benchmarking cities; pick the best practices of what they are doing and what do they recommend we should be doing in our own county?

TAC MEETING #2

Participants:

- Lee Frelich
- Sue Betzler
- Travis Thiel
- Joe Walton
- Wayne Sames
- Meghan Manhattan
- Connie Fortin
- Becca Nash
- Avery Hildebrand
- Kit Elstad-Haveles
- Doug Mensing
- Sarah Foltz Jordan
- Jennifer Vieth
- Joe Beattie
- Scott Hagen
- Karen Schik
- Nancy Duncan
- Larry Gillette
- Terry Vikla
- Mac Cafferty
- Dan Shaw
- Nancy Schumacher
- Kurt Chatfield
- Steve Thomforde
- Carolyn Dindorf

Principles						
Responses	1	2	3	4	Score	Comments
Redundant	x		x		2	Combine 12 & 13. Combine 16 & 8.
Too many and some need to be deleted	x				1	Group 1 made a recommendation for retaining or deleting each of the principles (see notes).
They are right, but too many				x	1	Group 2 thought "overall, these are the right principles, but too many--cut to 10 or less".
Could condense	x		x		2	
They are just right	x				1	One person said this in group 1.
Need to be re-worded	x	x	x		3	#13 clarify connectivity for whom? Wildlife not humans. Change to "habitat connectivity".
Something wrong		x			1	It doesn't always work to have an "umbrella" plan for all parks and habitats--flexibility is important when dealing with rare species.
You are missing some	x	x	x	x	4	extirpation. Plasticity needs to be part of it--can adapt to change in ecosystem. Should be useful to make decisions all the way down to project level. Should drive management decisions. Vegetation, water, and wildlife are missing. Even if principles are good, we must seek commitment from elected officials; invest in long term maintenance; communication and education (action and outcome).
Should be re-organized		x			1	Start with four main categories and have sub points underneath these;
Other		x	x		2	responsible to preserve, protect, and conserve. Adjacent lands are not properly managed for wildlife corridors--creates "islands" but still need to protect. Should say pre-settlement "conditions" not "veg".

Vision						
Responses	1	2	3	4	Score	Comments
Liked Vision 1 best	x				1	This version implies that the County is already great, whereas #2 states what the County is trying to achieve.
Liked Vision 2 best		x	x	x	3	Good, but surprised by the word "cost". Is the word "all" the right word? Says "will manage" but not what will happen. Missing "long-term" commitment. Regionally outstanding does not mean much. Delete "eye on cost". "All" is an impossible task. Change "will lead" to say: "strives to lead by example" (both present and future).
Didn't like either vision					0	
Liked a hybrid of the visions	x				1	"In its stewardship of natural resources, Dakota County will lead by example and manage its parks, greenways, and easements, despite environmental change, so that water, vegetation, and wildlife are healthy, diverse, and resilient, and its effort are understood and supported by residents, and are a legacy for
Liked a different vision		x			1	Different wording: "Dak Co strives to be..."; resources in the County should be...."
Missing something	x	x			2	How will we manage: e.g., "we will manage by an ecological basis..."

Approaches						
Responses	1	2	3	4	Score	Comments
Just right					0	
Makes sense			x		1	
Need to be reworked or reworded	x	x	x		3	What does "buffer all shoreland" specifically mean? The goal should be the highest level, but has the ability to "fall back" on the Fundamental level at a minimum. Include "water quality" aspect under Fundamental. Use improvements as public ed opps. Better nat res interp.
Need to be scrapped and start over					0	
Need minor adjustments	x		x	x	3	Make sure basics are covered with Fundamental model. Include in Fundamental the resource most people use. Consider adding some of the overarching goals into the grid. Break down into mgt levels throughout all of the managed land (might be more cost effective than "second level" system wide).
Something wrong				x	1	This will work at a site specific level, not system wide. One size does not fit all.
Missing something	x		x	x	3	What data do we have on vegetation for non-natural systems? Triage, and make sure you "treat" higher level systems. What funding levels are attached to each model? Mention functioning ecosystem and food chains in the grid. "Keystone" ecosystems. Conservation easements--make sure they are accounted for. Tech support on private property. Put investment into eased areas. Needs examples to be understood completely (mapping?).
Didn't understand	x				1	What are we adding with each step up from Fundamental through Highest Quality? Will the three models be selectively applied to parks, greenways, and easements, so that the best fit occurs as between model and natural resource?
Comments	x		x		2	Is there different level of buy-in? Make clear to the CB: site based application of these funding levels; at a bare minimum, apply fundamental level to all parks.

Goals						
Responses	1	2	3	4	Score	Comments
Right on					0	
Missing something in general	x	x			2	ID priorities of protection in each park--recreation vs scenic views vs rare plants, etc. Have a specific goal involving scenary.
Missing something: Fundamental			x		1	Missing early detection of invasive species.
Missing something: Important		x	x		2	Add "floodplain" hydrology and move to Fundamental. Parthnerships will be important when working out or our
Missing something: HQ		x	x		2	Better define threshold level.
Needs clarification, reworking	x	x	x	x	4	The more people equals more stress on natural resources. Say this better: "haying"as a natural process. Remove the word "all" from all of the goals.
Needs to be scrapped					0	
New approach to consider				x	1	Sometimes you may want to just leave an area alone even though is is full of impactful invasive species because its not worth the fight, it might be better to focus more intently on another area.

TAC MEETING #3

Participants:

Avery Hilebrand	Conservation Minnesota
Wayne Sames	DNR, retired
Jen Veith	Carpenter Nature Center
Mark Henry	DCAS
Joe Beattie	Hastings High School
Larry Gillette	TRPD, retired
Lee Frelich	U of MN
Travis Thiel	Vermillion River JPO and Dakota County
Tom Lewanski	FMR
Nancy Duncan	NPS
Kurt Chatfield	Dakota County
Mary Jackson	Dakota County
John Stelzner	Dak Co SWCD
Bob Fashingbauer	MN DNR
Brad Becker	Dakota County
Curt Coudron	Dak Co SWCD
Steve Hobbs	The Conservation Fund
Paul Bockenstedt	Stantec
Ann Messerschmidt	City of Lakeville
Wiley Buck	Great River Greening
Becca Nash	Minnesota Aquatic Invasive Species Research Center

Natural Resource Management System Plan (NRMSP)

TAC Meeting Minutes

February 8, 2017 2:00 – 4:00 p.m.

Meeting Location: 14955 Galaxie Avenue, Apple Valley MN

Meeting Attendees:

- Dakota County staff- Al Singer, Mike Lynn, Joe Walton, Mary Jackson, Meghan Manhatton, Scott Hagen, Kurt Chatfield, Brad Becker, Travis Thiel, and Jessica Wyatt (intern)
- Consultants- Doug Mensing (AES), Carolyn Dindorf and Connie Fortin (FCI)
- TAC Members- 17 in attendance (see sign in sheet)

Welcome and Introductions 2:00 p.m.

Al Singer welcomed everyone to the meeting and everyone briefly introduced themselves.

Project Update

Joe Walton provided an update on the plan.

Walton – we are now in the preferred options phase of the NRMSP. He went through presettlement conditions vs. present. The plan covers three areas: parks, greenways and easements.

Walton summarized general conditions of parks.

Vegetation Findings: 46% predominantly non-native, 6% native, 26% mix of native and non-native and 22% open water or other. Land cover majority is forest, mostly oak which have a high restoration potential.

Water Resource Findings: a table identifying a number of different problems (e.g. AIS, sedimentation, water

quality), affected wildlife resources and amount affected were discussed and found in some or most surface waters in the parks

Wildlife Findings: a table identifying management issues (e.g. fragmentation, loss of pollinators), affected wildlife resources and amount affected was shown.

Easement Findings: 109 easements (Ag and Natural areas) on 9,302 acres-easements are valued and landowners are interested in management. ~ 30% of natural/open areas are managed by landowners now

Greenway Findings: three types: Urban, suburban, rural. Currently have 64 miles of greenway. Minimal maintenance is conducted

Parks Findings: 4700 natural/open space. 27% is managed now; ~75% will be managed in near future through 2022

Benchmarking- Walton presented a summary of the findings from the benchmarking study. Well-established programs are ahead of the County's. Dakota County program is young but catching up to other programs. Grant funds have increased available resources. The County's greenway system is the most extensive of all the other peer agencies. Easements on private lands are unique.

Walton handed meeting over to the project consultant, Doug Mensing from Applied Ecological Services

Mensing discussed Phase III: Principles, Vision, Goals and Approaches

Phase III includes vetting the principles, vision and goals for managing natural resources. The plan goals were established to set a path for reaching the vision.

The NRMSP project was integrated with the VSSOP (Visitor Services....) which was being conducted at the same time as this project. There are 5 shared principles between the two programs: 1. Balance, 2. Build appreciation, 3. Stewardship benefits, 4. Synergy, 5. Community engagement

NRMSP Principles

The NRMSP **Vision** went through several iterations. The final version was read to the group.

Management was broken down into **5 categories:** 1. Parks Vegetation, 2. Parks water, 3. Parks wildlife, 4. Conservation Easements and 5. Greenways.

Four **principles** for natural resource management were identified.

The **Vision** is: 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 regionally outstanding quality, now and for future generations.

Goals were established for each of the 5 categories. The goals also include monitoring to determine current condition and to measure progress, which can be used for adaptive management.

Potential Funding

A list of potential funding sources was presented. It included various sources such as grants and other agency partnerships. Dakota County has a large Environmental Legacy Fund (from landfill fees). Last year part of it was dedicated for environmental purposes.

Review of Preferred Approach and Implementation Plan

For each 5 categories, tables with tiered activities were created. These were developed based on goals (considering input from TAC) and discussion with the County Board. Mensing briefly summarized these activities within the two tiers.

Tier 1 – 1st 5 years of activities, area and rough cost. A 5 year period was chosen as it will be the basis for their 5 year CIP.

Tier2 – years 6 - 20

Pie charts of a projected vegetation management concept were presented for each tier. Under this concept, at the end of 20 years, about 74% of the land will be restored, 23% stabilized and only 2% not managed in the parks.

Tables presenting programs/activities, acres and costs were briefly shown by tier for each area: Vegetation, Water resources, and Wildlife management in the parks; Conservation easement and Greenway management.

Mensing briefly presented the big NRMSP five year summary table of the plan components, revenue estimates for restoration/improvements and maintenance. The estimated five year total rough cost was \$12.8 million (32% will be provided by County). Annualized, it would be 2.6 million per year.

Once they get the Natural Resource Management Plans (NRMPs) for each area, they can be more strategic in their work. A current lake study on Lebanon Hills Regional Park will help clarify water resource projects.

Mensing asked if there were questions:

There were a couple of questions.

Question 1: Why was less dedicated to Mesic forests considering climate change (more may be mesic in the future). Lee F. stated they should plant as many native species as they can. Later this year Lee will have some more information that may be helpful based on a study he is doing.

Question 2: Will there be a ranked list of projects (prioritized) so that if the County doesn't get all the money needed, they can use the list to pick priority projects?

Singer responded. The funding gap is expected to be filled by County funds. They've categorized projects so they do the "no brainer" projects first, where a Natural Resource Management Plan (NRMP) is not needed. After they develop the individual NRMPs those plans will include prioritized lists.

Small Group Discussions

Mensing introduced expectations for the small group discussions

Walton discussed some monitoring they are doing: Vegetation-Photo monitoring, releve', transects to use for baseline conditions.

Wildlife- targeting certain species they know are in the parks- turtles in Whitetail woods and Lebanon Hills, native bees in all but Thompson Park, cover boards for reptiles and amphibians, small mammal traps, trail cameras.

Communications and Engagement- they will be working with the County Communication Department. They meet monthly with them and coordinate volunteer events. Walton thinks they need to do a better job of communication about the new plans.

Volunteers- Meghan Manhatton does most of the volunteer organizing work for natural resource management. She summarized her work with volunteers. In 2016 they had 2600 volunteer hours. They provide two hour training. Approximately 70% of the work was done at Lebanon Hills Regional Park.

Easements- are monitored annually either by site visit or aerial

Greenways – no volunteer work or monitoring is done

The TAC broke into three groups for discussion of prepared questions. Each group met and discussed each of the three sets of questions. The three groups were:

1. Measuring Outcomes/Success- facilitated by Doug Mensing, AES
2. Volunteers- facilitated by Carolyn Dindorf, FCI
3. Communications/Engagement- Facilitated by Connie Fortin, FCI

County staff took notes of the TAC input. These summarizes are attached.

Following the breakout sessions, each facilitator reported back to the group on some highlights. TAC members were thanked for their input. Summaries of the input for each topic will be typed up and included as an attachment to the minutes.

Discussion

Mensing asked for any final questions.

Singer asked the group a couple of questions:

1. How can the work that the County did in creating this system plan be of benefit to you?
2. How would you judge that the plan is being implemented successfully in three years? What would that look like?

Several TAC members offered responses to question 2. What would success look like?

- Get the County Board to provide the resources needed (political will to move forward). Singer commented that he believed the Board is committed to this project.
- Getting grant funds- indicates that the funders believe this is worth investing in
- Other organizations coming to the County for advice
- Getting buy in from the public
- Volunteer hours increase dramatically

The County will share the templates with the cities. Maybe the cities can share equipment, staff, etc. The cities could include the templates in their comp plan. The comment was made that they would need them very soon to do this.

Singer thanked the TAC for their participation and input.

Wrap Up and Next Steps

Walton summarized the next steps

The plan will be completed and will go before the Planning Commission in February

The plan will go before the County Board in March

Public review will take place in March/April

Planning Commission again the second quarter of 2017

They hope for Board adoption in May 2017

The question was asked if the TAC should comment on the plan during the review. The answer was that any comments from their organizations would help.

The meeting ended at about 4:00 p.m.

Minutes prepared by Carolyn Dindorf, Fortin Consulting, Inc.

Small Group Summaries

Measuring Outcomes/Success

Group 1

What do you measure?

- General vegetation cover (% cover)
- Acres of restored areas
- Acres burned
- Bird species/wildlife
- Water clarity
- Chemical and biological water quality
- Relative quality of natural resources

How do you define/measure success?

- Look at presence/absence
- Look at what should be somewhere but isn't
- Look at surveys over many years in same location
- Visitor satisfaction (to a point)
- Look at aerial photography

Methods for recording data

- Consistency – record data the same way over many years in order to compare
- Photo plots
- Consistent methodology
- Use SWCD coding
- Ebird

Group 2

What do you measure?

- Grant demands
- Acres of invasive removal
- Remnant inventories
- Consistent bird surveys
- Quantify effort and track it
- Acres under management
- Dollars spent/acre
- Number of plants installed

- Legacy and LCCMR monitoring protocols (These are being developed)
- Good baseline data
- Prioritizing projects and goals
- Phosphorus, Nitrates, etc.
- Loading vs. concentration
- Permanent vegetation plots
- More smaller plots in woodlands and forests
- Pay special attention to specific species

How do you define/measure success?

- Quality and longevity
- Look at common indicator species

Methods for recording data

- Make sure you are describing what you did
- Have detailed metadata
- Keep paper records or at least scan them in to the computer
- Project management software

Group 3

What do you measure?

- Key indicator wildlife species
- Consistent monitoring
- Pre-treatment surveys
- Bald eagle contaminant surveys
- Frog and toad surveys
- Information sharing
 - Find out what other relevant surveys have been already conducted in the area
- Richness/Diversity/Abundance
- Survey for natural regeneration

How do you define/measure success?

- Diversity over time
- Progression from baseline data
- Look at cover class codes over multiple years
- Meander search

Methods for recording data

- Data sharing
- Data repositories

Volunteers

#1. Who uses volunteers?

4 of 7 Group 1

4 of 8 Group 2

4 of 4 Group 3

#2. Who has volunteer coordinators? Anyone contract out volunteer coordination to partners?

3 of 7, all FT, no partners

2.5 of 8, DNR FT, others as-needed in addition to other roles

Vermillion JPO contracts with FMR

GRG = 2 FTEs, 3 Rivers= 3FTEs

Activities

Inv spp mgmt.

Planting

Monitoring:

- FMR – protocol for orchids and monarchs

- AIS – monitoring/reporting (EDDMapS)

- wetlands – WHEP at Coldwater

- AIS – monitor success of treatments, some handpulling

- Breeding birds

Trail monitoring

Seed collection, trash cleanup, burning, all kinds, planting, phone calling for events, community conservation teams

Restoration – “deep engagement” (GRG) – planting, seeding. End result should look good, accomplishments should be visible

Research projects

Remote Parks (how to get volunteers out to remote parks)

Publicize what's special/unique

FMR has trouble getting DC residents out to remote parks (WWRP). They get a lot of people from the Cities who are ?seeking a more rural/unique/remote experience?

Consider amenities/facilities

Paul Bockensted – City of Roseville- Volunteer Stewardship Network:

- Decentralized

- Volunteers inform decision-making

- Veg mgmt. and Cit Sci (frogs and toads, bluebirds)

Get the word out – why is it amazing and why should vols care?

Provide transportation? Lunch/water – sponsors?

Give-aways – t-shirts

Provide a program at LHRP to tell people that we need help → build excitement

Keep them engaged throughout the process

Work through other nonprofit partners to reach – MRPR= birders, bike trail users

Link events to an all-day trip to make it 'worth the trip' – Sheldon Theater?

Recruit in Goodhue County – people don't care which county an event is in

Unique experience – big-picture/tie-in/cool plants

Find a local leader to help recruit rest of community

Social aspect – people will come to see their friends

Localized recognition – build community around specific parks

Different demographics want different things – seniors= lunch, families=short timeframe

Worked Well

Educational component

- People want to see and be part of the Big Picture

Wildlife surveys are a big draw
 Online and classroom training (AIS)
 Certifications
 Access to researchers
 Empower core groups – give them decision-making power, leads to increased buy-in and engagement
 T-shirts and other incentives
 Watershed Cleanup Day (Lakeville)
 -annual events
 -kid-friendly
 -fun, with giveaways
 Half day is better than all day events
 Learn from successes
 Planting events
 Volunteers like to see their results in 5 years
 Professional volunteers – job descriptions, etc
 Master Water Steward – higher levels of recognition
 Volunteer appreciation – dinner, passes for recreation, friendly competition
 People like “stuff” - Seed giveaway?
 Geocaching – leverage this community
 Say thank you often and in multiple ways
 Provide enrichment opportunities
 Build community
 Don't overlook people who live next to a park or use a greenway daily – engage them opportunistically to help get your work done
 GRG – offer different levels of engagement, don't burn out your super vols, Be clear with goals, measuring outcomes is difficult and anecdotal
 Reward with a lecture on a topic of interest – value added, “insider” knowledge

Didn't work

Too much repetition in tasks
 Adopt-a Pond – too much neighborhood turnover
 Non-glamorous jobs/things they've done a lot of
 Don't take on too much – project should be manageable for volunteers, lead to long term results

Volunteer Supervisors

NPS- Crew Leaders
 FMR- Super Volunteers
 Yes. Give them responsibility
 Based on abilities/age
 Vetted – i.e. Pass a test to do a bird survey
 GRG has 4 tiers: General volunteer, Supervisor, Site monitor, Site steward

Communication

Communication Methods to Inform the Public about Natural Resources
 Overall comment from facilitator- For public communication they all seemed to agree the more the better; you cannot over do your communication efforts.

Group 1

Organization Name	Works	Doesn't Work
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CNC	<ul style="list-style-type: none"> Don't get upset Postcards Weather – residential yard signs Site visits Quotes/advice from experts
Three-Rivers Park District	<ul style="list-style-type: none"> Semi-Annual newsletter (mail) Follow-up with localized
GRG	<ul style="list-style-type: none"> Email newsletter Social media (Facebook, Twitter, etc) No hard copy newsletter Press releases Fliers Prepared statements
Dakota SWCD	<ul style="list-style-type: none"> Electronic newsletter (1/4), fact sheets No hard copy Individual meetings Focused mailings (snail mail)
UMN, FLP, CLP (Loring Park)	<ul style="list-style-type: none"> Website, social media Semi-annual newsletter (paper, with great articles)

Group 2

Organization Name	Works	Doesn't Work
NPS	<ul style="list-style-type: none"> Social Media Newsletter via email 	<ul style="list-style-type: none"> Website News/press releases
Dakota SWCD	<ul style="list-style-type: none"> Facebook Cities *newsletters 	
MASRC	<ul style="list-style-type: none"> Videos and pictures Funny quizzes Social media (FB, Twitter) E-newsletter Lake associations = multi-generation (articles, newsletter – electronic) Open house at locations 	
FMR	<ul style="list-style-type: none"> Social Media* 	
Stantec	<ul style="list-style-type: none"> Social Media Newsletter via email Videos and pictures Funny quizzes Lake associations Open house at locations Next door, City websites and blogs 	

Door-knocking, leaving fliers

Hastings High School

Social media (Vine, Snapchat, Instagram IMAGES, Facebook, Twitter)

Group 3

<u>Organization Name</u>	<u>Works</u>	<u>Doesn't Work</u>
P. Easement	Human interest Pictures Local Newspaper Website (easily accessible)	Email Paper newsletters Phone calls
Legacy P&T Advisory (DNR, MC, G.MNP)	Brochure (4 pgs) includes funding summary -Offered at parks, front desk, etc -No mailings Little fact card (to website, etc)	
CMN	Positive messaging – what do you care about?! Targeted marketing – Twitter, Facebook, email (least effective)	
DNR	Website	
Lakeville	Videos or pictures Twitter, Facebook Newsletters Email those who have come before Word of mouth Handouts at events	
TCF	Make it personal (Website, blog, social media) Letters (email, paper)	

Public Engagement

Public Engagement Methods to Engage the Public in Natural Resource Activity

Overall comment from facilitator- From a public engagement perspective I heard much agreement on make the event successful, do not cancel it, make a plan B in case of weather and make plan B successful. Successful often meant they accomplished something meaningful and that they were thanked/felt appreciated.

Group 1

<u>Organization Name</u>	<u>Action</u>	<u>Methods that work:</u>
LP	Volunteer gardening days	Postcard
CNC	Buckthorn	One-on-one ask Food Champion * (university students) Volunteer swag (ex. t-shirt) Just posting
Dakota SWCD		Champion* Registration

GRG		Postcard One-on-one ask Food Champion * (university students) Volunteer swag (ex. t-shirt) Just posting Registration Celebration element (Ex. same day, thank you later, "Beers for Buckthorn") Visual satisfaction Meaningful
Ag. Society	Invasive Management on Easements	Levels of engagement Group partners (SWCD, 4H, Pheasants 4ever) Fair outreach
Three-Rivers Park District		Volunteer office Recognition

Group 2

Public Engagement Methods to Engage the Public in Natural Resource Activity

Organization Name	Action	Methods that Work:
Hastings High School	Restoration (prairie, wetland)	Extra credit Education * Alumni Word-of-mouth Connection to industry
Stantec	Restoration, Wildlife monitoring	Info/educational Food/swag (free appreciated)
MARSC	Lake Association Monitoring	Education Ownership Play on self-motivations
NES	Adopt-a-site	Core group of volunteers Hours = level of reward/prize Ranger out with them (connection to industry)

NEW IDEAS:

- Facebook, build a story
- Call to action – communicate alternative

Group 3

Public Engagement Methods to Engage the Public in Natural Resource Activity

Organization Name	Action	Methods that Work:
Conservation MN	LHRP	Being consistent Engage locally Get event feedback
CF	Family event, Bat Day	Big events, expect fun Don't cancel – have Plan B
Lakeville	Earth Day Clean-up	Fun, bug events, celebration Rewards (t-shirts)
	Buckthorn	Show photos (before & after project) Email, poster (Visual)
Pnv. Easement	Girl Scout Events/H4H	School = kids = parents Repeating calendar schedule (so people come to expect) Have a Plan B (no disappointment, don't let weather ruin event)

Appendix O

SUMMARY OF NRMSP PUBLIC MEETINGS

PUBLIC MEETING #1

Natural Resource Management System Plan

Public Meeting Summary

March 7 & 8, 2016

Meeting Locations: March 7 at Dakota Lodge in Thompson County Park
March 8 at the Western Service Center

- I. 6:00 pm – 6:30 pm **Displays and project information to view and receive public input**
- II. 6:30 pm -7:45 pm **Formal presentations describing the goals, outcomes, process, and schedule for the Natural Resource Management System Plan and the Visitor Services Plan**
- III. 7:45 pm – 8:30 pm **Displays and project information to view and receive public input and self-determined breakout sessions on focused topics and in-depth discussion**

March 7

Water Breakout Session (4 citizens' comments, concerns and questions)

- Is the County monitoring water in the parks? If so, compile all data and share with County residents.
- Promote water monitoring opportunities that exist for County citizens.
- Educate County residents about the value of natural areas as a beneficial way to improve and protect water quality within watersheds.
- How will the County balance an increase in visitors to the parks without impacting the natural resources?
- Do we really want more people in the parks interfering with the natural resources and animals? Lebanon Hills, for example, may be evolving into an urban park. This means an increase of people and a decline of animals, water, and vegetation. There needs to be a balance.
- Some park activities impact the natural resources more than others.
- Park activities have negative consequences on animals, water and vegetation.
- Too much promotion could be a bad thing.
- People aren't used to being in a "wild" setting anymore, so it is important to expose County residents to their natural areas in order to increase support and protection for these areas.
- Citizens don't know the difference between a "park reserve" and a "regional park." How is each classification used by County and the public?
- A County resident would like Lake Jensen to be returned to the healthy state that existed 25 years ago.

Vegetation Breakout Session (3 citizen's comments, concerns and questions)

- The questions in the APS presentation asked about "restoring" and "expanding", but not about "maintaining", so it was a bit misleading. Staff should add the term "maintaining" to the question.
- What is the County going to do about Emerald Ash Borer?

- The County should prioritize spending on improving vegetation and water resources instead of more infrastructure (like asphalt trail, buildings, etc.)
- Reasons why people are not visiting County parks:
 - There are many other good city or other parks to use within and near the County
 - There are many areas in the County with more rural land use and the majority of open spaces tend to be private ownership. In the future, as these rural areas increase in population and develop, there will be a great need for natural areas to be preserved—they will become “gems”.
- General support for native plant community restoration, but other uses such as the “*Edible Gardens*” around Schaar’s Bluff are good and can draw people to the park/site also.
- Pine Plantations Issues
 - One person would rather see the prairie be restored, in spite of the pines (OK with removing them in places where they do not belong or make management difficult).
 - Another person would rather see it more nuanced—leave some pines where they are significant, but remove on the rest from the site, where they are not significant.
 - Leave them if it’s a “good use” for the site (e.g., Camper Cabins at WWRP).
- Are there new or cutting edge methods being tried to control invasive plant species in the County?
 - The County should maximize partnerships to maximize efficiency of management.
 - Potential partners are U of M and other research institutions
- We need to focus on pollinators and other biota through vegetation management.
- Most park users are not human!
- This Plan is good public relations and public engagement, too.
- Monarchs need about 30 milkweeds to complete their life cycles. However, the stems can be distributed widely— just one milkweed stem per square mile. This density pertains more to farmers and ag land than to developed land. However, if each homeowner and business owner in urban areas would just plant one or two milkweeds in their yard, that would also work. This is doable if we have the will!

March 8

Water Breakout Session (10 citizens’ comments, concerns and questions)

- How about rain gardens instead of mowed areas for Greenways?
- Make sure no runoff leaves the parks
- Repair erosion and runoff problems in the parks.
- Minimize the inflow of runoff into the parks. Can we intercept water flowing into the parks and clean it?
- Maximize the infiltration in the parks.
- Manage lands to handle increased runoff due climate change (more intense rain events).
- County needs to manage their resources for water quality. Pay attention to this as visitor services grows.
- Keep good water quality in Holland Lake
- Water quality assessment should be made before any development is done in parks. Predict the water quality impact that new developments will have.
- The County should advocate at state level for higher quality water in the County. Work with watershed councils, Met Council or other groups and be a louder advocate for clean water in the County.
- City of Burnsville offers rain gardens to residents when resurfacing streets. The County could encourage more of this in other cities.
- City of Inver Grove Heights won an award for total infiltration in the city. County can learn from this.
- Wetland Health Evaluation Program has their best quality reference wetland in Lebanon Hills Regional Park. This wetland should be protected.
- All parks should be good examples for water buffers. Teach the citizens how to do it. Add some interpretive signs to explain it.

- Send out buffer information to those who do not use the parks. Explain the benefits and tell them to come to the parks to observe buffers.
- Water quality in Lebanon Hills seems good. Water quality in Lake Byllesby is not good. Need to improve Lake Byllesby if you want more people to go there.
- County should “lean” on the DNR or whoever permits wells to limit consumption by big users.
- Likes the results the Lebanon Hills invasive plant control program
- Help farmers establish buffers along water
- City of Burnsville has a big push to get rid of buckthorn and they are having a native plant sale. Maybe a native plant sale can occur at Lebanon Hills.
- Trout Unlimited is clearing buckthorn near Vermillion River and planting prairie grasses to control erosion. County could set up discussion between cities on this issue to make some sort of uniform standards for invasive plant control. (If one place removes them and the other does not, they will just spread)
- Want a place to report invasive plant problems
- Invasive plants should be treated like hazardous waste. Have collection sites.
- Paths
 - Keep parks natural, not paved
 - Make sure paths do not add to erosion or water quality problems
 - Do not salt paths
- Put meeting notice for public input in “Sun Current” more than once and do a better job of advertising these meetings. Several people only heard about it that day.
- Involve public in all stages of this project
- An Egan resident offer volunteered assistance on water quality issues
- Dakota County “Forever Wild” is a good thing

Vegetation Breakout Session (6 citizen’s comments, concerns and questions)

- Vegetation along the greenways
 - Expansive plans for greenways
 - Who is managing buffers along the trails long-term?
 - Where are the maintenance costs coming from?
 - Will it compete with maintenance that needs to be done on park land restoration sites? We need to determine a plan to account for all this in a fair way that addresses the needs of all the sites in the system.
 - When in the process of formulating the greenways within new developments, can developers be required to build buffers wide enough to be ecologically effective as wildlife corridors? Could a mechanism be established to achieve this? If so, how would that mechanism work?
 - There is a lot of habitat “edge”, and it will be hard to control for invasive species, etc.
 - Is the greenway ecologically effective for movement of wildlife if it contains a paved trail with narrow buffers alongside the trail?
 - Will the greenways be a corridor for invasive species?
 - Will they be effective wildlife corridors, or just glorified bike trails?
- Want more volunteer opportunities or doing hands-on work, not just going on tours. There is a pent up need to do positive things in the parks (especially, Lebanon)
- Take care of what we have first before acquiring new land
- Listen to the public and volunteers!
- What can the County do to assist conservation on the public’s own private land? If there was a program to help, it could be used to buffer parkland (adjacent landowners) and also to create semi-natural corridors for wildlife (especially pollinators).

- More funds from County for natural resource management and restoration follow-up should be a priority
- Establish long-term restoration goals. How do you pay for long-term maintenance?
- Consider funding from park users such as dedicated parking passes (like they have in Cincinnati, or state parks)
- Make sure restoration is done right. An example was cited from ten years ago when buckthorn was cut in LHRP, but the stumps were not treated and no follow up was done resulting in more re-sprouts and seedlings. It was frustrating for people to watch that happen and it felt like there was no way for them to express their frustrations and concerns and that nobody from the County was listening to them.
- Make sure there is dedicated funding for follow-up management, once the initial phases have been implemented.
- Suggestions for next meeting:
 - Include a time after the presentation for questions and answers from the large group, before it breaks into smaller groups for focused discussions.
 - Check APS clickers beforehand, to make sure they are all working properly
 - Before small groups break out, announce that we will reconvene to the full group, after the breakout Sessions
 - Try the billboards or “sandwich boards” at Lebanon Hills Visitor Center in May or June to promote the next round of meetings

PUBLIC MEETING #2

Natural Resource Management System Plan (NRMSP)

Public Meeting #2 Notes

June 13, 2016, 6:00 – 8:30pm

Meeting Location: Dakota County Western Service Center
14955 Galaxie Avenue, Apple Valley MN

Meeting Attendees:

- Dakota County staff: Al Singer, Mike Lynn, Joe Walton, Terry Vikla, Mary Jackson, Meghan Manhatton, and Ben Humlie
- Consultants: Doug Mensing (AES), Carolyn Dindorf (FCI)
- Public: 21 in attendance (see sign-in sheet)

Viewing of Displays 6:00 – 6:30 The atrium was set up with posters with photos and graphics of various park, easement and greenway related projects, maps and photos for the public to view. Dakota County staff and FCI staff were present to answer questions.

Meeting 6:30 – 8:30

Joe W. welcomed everyone to the meeting and introduced Doug M. (Applied Ecological Services (AES)) who presented the information to the public. Using a PowerPoint presentation, Mensing provided some background information about the NRMSP and introduced the Vision & Concepts phase of the project.

The County is requesting input on the following:

1. System plan principles
2. Vision
3. Goals
4. Approaches

A handout was provided that listed the draft principles, vision, goals and approaches (a copy of the handout is available as a separate document).

Principles

Doug M. provided an introduction and stated the draft principles. Following this, Mary J. (Dakota County) led the group through an Audience Participation Survey (APS). The public was given questions on the 9 System plan principles. Most of the questions provided input on the value of the principles (how important they believed each principle was). A copy of the APS survey results is available as a separate document. Following the questions, participants were given the opportunity to comment. The following are comments listed by principle.

Comments:

- Overall. Areas can be over-managed. Sometimes we need to let nature take its course somewhat.

Principles:

- 1. No comments
- **2. Commitment-** Doesn't like the word "long-term" as it infers there is an end. Replace with "perpetual" or "ongoing".

- 3. No comments
- **4. Adaptive management-** Keep the public involved in the process as things change.
- **5. Pre-settlement vegetation as guide-**Concern about how climate change may affect the lands. It may not be possible for these species to survive. Need to consider birds and animals and what habitat will affect them. Joe W. stated it should be more of a guide than a prescription.
- **6. Address endangered, threatened, special concern wildlife-** Also concerned about vegetation, not just wildlife.
- **7. Public values and perceptions addressed-** Concerned about people that voice opinions that have never visited the parks. Feels their opinions are not as important. What's important for wildlife and habitat may not match public values and perceptions. Al S. asked participants if they have suggestions to help the County balance the public values and perceptions with natural resource protection. The suggestion was made to add a caveat statement such as "intrinsic values cannot be overridden by public values and perceptions". Public values may be more positive in the future if they have a better understanding of natural areas and management. Unless we keep the public educated on all the actions and consequences, then we need to use best management practices with regard to natural resources. The County needs to communicate (signs, other) their management plans/actions.
 - An additional principle was suggested "Don't duplicate what City parks offer."
 - Al S. provided an example for discussion: pine plantations in Lebanon Hills are valued by the public but are not native to the area. Without management, the pines will go away.
- **8. Private land management benefit-** I think this important because I would like to have the County provide me with ideas on how to better manage my own land.
- 9. No comments
- Al S. summarized and asked the group if they agreed that the principles the County has drafted are generally considered very important. The group appeared to agree with this statement.

Vision

Mensing defined vision and read the draft vision statement. Comments on the vision statement were solicited.

Comments:

- 67% liked the vision (see APS results)
- It is way too long and wordy. Make it two sentences.
- Troubled by the first statement, "lead by example". Doesn't think that "paving bike trails" is leading by example.
- "Lead by example"- what example? If for intrinsic values- ok, if for visitor services, not ok.
- Remove the word "strategically".
- The vision statement has no joy.
- The vision feels like a huge departure from the past. Al S. commented that it is a new beginning for the County. The Board has provided more resources and staff have more knowledge to do more. The County needs the public's help to make the vision more joyful and inspirational.
- Add the word "commitment" or "committed" to the statement.
- Strike the sentence "Natural resources will be resilient in the face of environmental and cultural change". It is not needed, not sure what it means.
- Commit to County's "forever wild" slogan. Natural resources are the primary purpose. The County parks could be an example of natural parks that no other counties in the area have. Dakota County should be the "go to" County for how to manage natural resources.

Measureable Goals

Mensing provided some introductory information and went through the draft goals. Mary J. then led the group through APS questions. The following are comments on the goals, listed by goal.

Comments:

- General reaction to the goals was mixed on the APS (see surveys results)
- Goal 1. This is too low of a bar. Need to raise the bar.
- Goal 7. Concerned about building trails through habitat which she sees as dividing up habitat, not connecting. A concern was expressed about work creating bare soil which allows growth of invasive species. Sides of trails need to be improved for habitat.
- Al S. commented that the County needs to manage expectation. Restoration will take 3 to 5 years to become established.
- Goal 9. Doesn't like the term "defined end point". It infers an end to management. Management should be ongoing. Doug M. explained that this referred to performance goals. Al S. added that the County wants to follow a road map.
- There are no goals that address regular plant communities, such as control of invasive species.

Approaches

Doug M. introduced the 3 approaches being considered: 1. Maintain current status, 2. Stabilize, 3. Restore/Enhance. Rough costs were presented. Al S. asked if in general the approach model makes sense to people. It appeared they agreed it made sense. All in the group were interested in seeing increased funding for natural resource management. Mary J. again led the group in APS questions.

Comments:

- 100% felt the County should focus on restoration and enhancement.
- APS Question "Rank the relative importance of the following:
 - a. Restore/enhance with an emphasis on natural resources
 - b. Restore/enhance with an emphasis on recreation
 - c. Restore/enhance with an emphasis on a mix of natural resources and recreation

Ranked: a, c, b = 17 responses

c, a, b = 2 responses

b, c, a = 1 response

- **3. Focus of NR approach.** Stabilizing is not acceptable- need to restore/enhance
- **Support for removing trees and shrubs.** One participant stated she observes more wildlife in prairie and savanna than in woods
- **Support for removing pine plantations.** Concerned about focusing on big projects (questions 5 and 6). County would get a big push-back from the public if removing forests. Start with smaller projects.
- Terry Vikla (Dakota County) suggested they let conifer forests grow to a climax forest and naturally die off gradually and then transition to the native community.

Final Comments Doug M. asked for any final comments.

- Someone stated that the 1st goal (not allowing further degradation) is too low of a bar, it shouldn't be a goal. Take the high curve (referring to the Restore/Enhance approach on graph that compares the 3 approaches).
- How will the County prioritize recreation vs. restoration, which can have conflicting goals? Doug M. commented that this would likely be addressed in the individual park plans.
- Want to see natural resources get a higher priority. Al S. commented that historically natural resources haven't been given a high priority. The goal is to put natural resources on the same balance as cultural values. This plan is to give a voice to natural resources. Individual park plans will address the specifics.
- Some attendees commented that the financial investment is much lower for planning for natural resources vs. other uses, referring specifically to this plan vs. the Visitor Park Services Plan.

- Another commented that they were happy to see this plan, but the County needs to regain trust from the public that natural resources will really be given priority. They need to put money towards them.
- Comments were made regarding communication about the meetings. It was hard for some attendees to find out when the meetings were being held. The County needs to communicate better about when the meetings are being held. Work with the communications department. Make sue of press releases, community bulletin boards, social media, City web sites, etc.

Minutes prepared by Carolyn Dindorf, Fortin Consulting, Inc.

PUBLIC MEETING #3

Meeting was held in the Northern Service Center on Monday, November 14, 2016.

Approximately 15 people attended the meeting.

VSSOP and NRMSP presented jointly.

NRMSP showed the five service areas from the two Tiers that were developed, to see how it would be received. We did not present any cost estimates at this time. It was received generally quite well. Most comments we received were positive. Some people had a difficult time understanding what the initiatives would accomplish. Therefore, we took that feedback and refined and clarified the initiatives for the report and for subsequent meetings.

PUBLIC MEETING #4

Thursday, April 13, from 6:00 to 8:30 pm at the Visitor Center in Lebanon Hills Regional Park

ATTENDANCE

50-60 public attendees

Two Board Commissioners (Mike Slavik and Thomas Egan), and at least two Planning Commissioners (Barry Graham and Tony Nelson).

Two reporters: 1) Egan TV, 2) WCCO TV.

PUBLIC COMMENTS

- Happy to see such a great focus on natural resources;
- Glad that we are going to spend so much on natural resources, when it seems like in the past there was little spent on it; plan seems too generic—where are the specifics
- Funding—what happens if the state funding does not materialize, or is less than expected? Will the County be willing to cover the gap? Wants to see a formal statement from County Board regarding this.
- We are “raping the park (Lebanon)” by proposing to put paved trails through it—no apparent evidence that anyone supports this
- Shouldn’t parks be left alone? No need to manage natural resources—they will do fine on their own. Too much meddling will lead to too much government control
- Easements represent an over-reaching on the part of government into private lands— not good—too much government control
- Why include recreation areas and high-use areas in restoration? Very broad term. How do you define recreation areas?
- Not sure how this plan translates into implementation?
- How do the natural resource issues and the recreational issues relate and interact in the plan? Is there a process for this? Is it described? If a conflict comes up, how will it be resolved? Will natural resources be subordinated to other needs in the parks?
- Restoration should aim to achieve a higher forb diversity for pollinators and butterflies; very glad to see the county is ramping up NR program and spending more on NR—want to make sure that the County follows through on its commitments in this plan
- Very glad to see the County is increasing NR program and spending more money on NR improvements, and not just infrastructure improvements in the parks. Want to make sure that the County follows through on those commitments, for example during CIP development.
- “We are all counting on you to do the right thing, regarding protection and management of natural resources!”
- Disappointed that the route of the paved trail that will be going through Lebanon did not take into consideration the species of greatest conservation need that are present in the park and stand to be impacted by the trail.
- Hopeful that the implementation of the NRMSP will help to bring natural resources to the forefront of the decision making process for future projects such as the trail.
- Very interested and happy to hear how much monitoring (vegetation and wildlife) the County is doing and want to make sure that scientific methods are used so the data can be truly useful.
- Want more edible plants in the park; loves our parks overall.

- Interested in the big picture of creating conservation corridors and connecting green spaces to provide better habitat for wildlife.
- Unhappy about the “highway width paved trails” going through parks.
- Great it is to see the County investing in the long term maintenance of natural resources restorations. People would be after us if we didn’t take care of areas restored with grants once the grant period ended, and that it is so fantastic that the county is committing to that maintenance.
- Very excited to hear about how we are using goats and wondering when we would get them in Lebanon Hills!
- What do goats like to eat and how many goats do we have working
- How do we keep them from destroying the native species we want to keep
- Complementary of our effort and acknowledged that we had reached out early in the planning process for input
- Fire should be used more in place of herbicide.
- Erosion on trails needs to be addressed
- Better communication when major changes will be coming (Sumac getting mowed down, for example)
- It still appears that there is more recreational development taking place in the park than natural resource management.

WRITTEN COMMENTS FROM THE NIGHT OF THE EVENT:

VEGETATION

- I like the idea of having the goats eat two of the problematic invasive species. Environmentally friendly. Less use of poison.
- This is a huge improvement. Goal needs to be 100%. Buckthorn and others have had a good start and the efforts to date has had a noticeable impact. Make the goal for restoration 100%.
- I am thrilled to see goats being used. They are the most efficient and environmentally friendly solution to buckthorn and garlic mustard (and other invasives) I can think of. Better than volunteer hand work, mechanical means or herbicides. I say use more of them.
- Earthen paths through prairie, bog, and woodland are wonderful in this park. We come down from Minneapolis to enjoy the relative quiet and diversity of species in this park. An area to wipe off shoes before walking on the paths could cut down on invasive species carried in on shoes. We had a shoe mat and educational sign at popular entrances of the BWCA when I was a wilderness ranger. It proves to be a helpful tool. Than you.
- The basis for my comments is on-the-ground observations, not theories. My mantra is "a hike in the park is a sense experience". Enhance the experience and more people will come.
 - My hikes in the parks go back as far as 1978.
 - I don't think any of the things I would like to see in the parks requires a big program with a dedicated budget.
 - Flowers -- you can't have too many of them. My wife and daughter often gush over especially fine examples. marsh marigold -- as we discussed, the south shore of Jensen

Lake would make a fine place to establish these cheerful early spring blossoms, right next to the most popular trail in LHRP. bull thistles -- they are a favorite nectar flower for monarch butterflies in July. Canada thistle -- this one also attracts butterflies, esp. the very colorful (and uncommon) great spangled fritillary. sunflowers -- there are a number of native sunflowers which are almost entirely absent from LHRP; they can be quite colorful and cheerful in mid- and late summer. native wild roses -- there are a few, but more of these fragrant June bloomers is better.

- Non-native flowers. Yes, I know that this violates certain dogmas, but some colorful ones have established themselves. If we hafta tolerate garlic mustard, why not welcome these? With a little planting, interesting views would be created. white daisies (see attached) -- this one is already present in several areas (the pic was taken in the central section of LHRP). If given only modest encouragement it can make dense stands, quite attractive to visitors. purple rocket -- this flower garden escapee is an early bloomer and offers nectar to skipper butterflies in June. It doesn't seem to be very dominant, and is shade-tolerant. It is already present in a few places. You can see it many places around the area.
- I commend the attack upon buckthorn. One aspect of its dense stands in the understory is that a midsummer hike has a "closed in" feeling; one can't see more than 10-15 ft off the trail. The trail south of Jensen lake has a lot of buckthorn between the trail and the water, including some of near-sawtimber size.
- Prairie restorations. My favorite is the one just west of the visitor center at Schaar's bluff. It has little or no big bluestem. It gets lots of butterflies when the purple coneflowers bloom, and then again in autumn when the asters bloom. The asters are in such profusion that they make a very colorful September display. This seems to persist year-to-year without much intervention. The burning etc. has not prevented the growth of young cottonwood trees in the area, and if nothing is done it will be forest again in another 20 years.
- My "bad example" prairie restoration is the "star pond" tract near the horse parking lot. The big bluestem has out-competed all other plants, even preventing the establishment of goldenrod. The only survivor forb from the planting is spiderwort which adds a colorful blue in June. (Butterflies don't nectar at spiderwort.) There is false prairie indigo at the rate of a few plants per acre, which seems to be holding its own. Another example worth a look is the DNR prairie restoration at Pine Bend Bluff. Here goldenrod has become the dominant plant, although it was probably not in the seed mix.
- Is it necessary to make up a seed mix of 100 flowers (many in very low concentrations) and hope for the best? Might it be better to make up two seed mixes with 50 varieties each and plant them in different areas. The latter might offer more insight into what grows best.
- View points. As you enter the Parks offices there are 6 framed photos of scenes in the parks. 5 of them are water views. This tells you something. You can't have too many water views, and such water view points can close up rapidly as trees grow. I think the water views have a lot to do with the popularity of the Jensen lake trail. I would recommend that Parks designate certain points as view points and keep them clear. My biggest complaint on this score is at Schaar's bluff. It offers some truly spectacular vantage points for viewing the river. But the paved path along the bluff edge has grown up so much with trees that there really isn't any wide-angle view of the river now. (I have hiked here 35+ years back, and can recall when the views were much

better.) Some eager photographers climb across the fences and shoot from the brink of the cliff, photo enthusiasm getting the better of caution. You can see this from beaten-down grass. There is in fact a designated view point with a sign here but a rather limited view, and I think it would be a fine thing to clear away the trees and brush for a truly wide-angle view. In the age of cellphone cameras a charming view will be emailed and bring more visitors.

WATER

- Concerned with any use of salt on paved trail by McDonough Lake. Not compatible with water quality in our parks.
- Most important – County-wide. Balanced usage – people vs business vs Ag. Establish “peak water” – maximum usage allowed for everyone.
- The cities of Eagan and Apple Valley need to curtail the use of salt for ice and replace with sand. Our water and land is permanently damaged by the salt.

WILDLIFE

- To retain and attract wildlife that the land needs to be as open and left alone as possible. E.g., putting paved trail through the middle of a park disrupts the movement of wildlife. It also leaves less contiguous natural habitat.
- Great work. I appreciate all that the County is doing to restore our parks.
- Butterflies. I see that many skippers are on the list of threatened species. I don't think I've seen any of the ones mentioned, although field identification of skippers can be difficult. Most of them have just one brood, emerging in June. I might see more of them if I walked in grassy areas, but then I would pick up ticks.

GREENWAYS

- Very important – main focus is recreational. Will be used for commuting too. As much nature around the trails as possible. Good signage for directions, but also for historical and natural interpretation. Need adequate rest stops. Maintain the 80% natural area goal. Get cities to pitch in on costs and volunteers to maintain.

CONSERVATION EASEMENTS

- Great idea – must be maintained (owner or County). Farm areas – landowner involvement is a must. Get help from Pheasants Forever, Trout Unlimited, Local Organizations (free). County run – dedicated funding – use volunteers to save money. Preserve important areas before developed.

PLAN IN GENERAL

- I noticed that the monies for the 5-year phase of the plan is 78% non-county and 22% county. I spoke with Joe who mentioned that the non-County monies were coming from the Lessard-Sams Act (grants from there). When I asked what might happen when/if these grants didn't appear (more grant app. Competition, roll-back on some aspects by Republican-controlled MN Congress), he said no one had asked that question so it wasn't addressed in the Draft plan. (He did mention that the County might use ELF money for some/all of the Non-County monies.) Please consider addressing alternate or "Plan B" plans if not everything to do with payment of the NRMSP works according to your plan.
- I have come to the parks often the past 5-6 years from Minneapolis to ski and hike. I am in full support of making the parks accessible to all, but I am hoping middle ground can be found, as discussed in previous meetings. Limiting the paved trails will protect the natural rugged beauty of the parks while opening the parks to more people.
- I am opposed to paving any part of Lebanon Hills park. We have plenty of paved trails to meet the needs of all citizens of the state of Minnesota. We need to think conservation especially in light of the anti-environment administration we currently have. The citizens of Apple Valley and Eagan do not want Lebanon paved and the idea was pushed through by Chris Gerlach and associates against the vast majority of citizens who oppose paving in Lebanon.
- Appreciate the strong focus on restoration of natural resources. Thanks to the staff for all of their work on this project. Would want to make sure they have all of the resources they need to do this restoration, including financial resources, especially if grants somehow don't come through. Also believe in outreach! Communication about restoration and preservation will be important to keep the community in the loop. If people have better understanding of restoration as it proceeds, they are very likely to be highly supportive. Natural resource management should be viewed as the priority of our parks. All other areas need to be sure they are working in harmony with natural resources. Strongly encourage natural resources to be a foundational voice in any additional plans for park or services. Great open house! Thanks!
- It's come a long way. Still processing I all but its great to see the focus on restoration to native flora and fauna. I'm glad to see focus on water in Tier 1. I am concerned about how the trails around McDonough will be maintained. They are very close to water and should not be salted. They board walk can't be salted so don't jeopardize the water for dead ends. Keep the goats hard at work! It's a great creative solution.
I notice much of the funding is exterior sources. I want to be sure that if there is a challenge or issue with external funding, that the plan will be implemented.
Natural resources are the foundation of the park system and should be prioritized. The management Plan for natural resources should not be compromised by other plans like visitor services. They should be done together to recognize their similarities and conflicts. Inventories of the parks like the water survey and surveying plants and wildlife. The staff has done an excellent job of funding the tamarack community and getting the restoration up and running successfully. This is what the parks are about.
- Think of what projects are an ongoing liability to maintain then anything built, paved, or not natural needs more dollars (tax payer) new and in the future to keep up and repair. Get creative. Multiple uses are good but keep things natural as possible and maintenance free. Anyone can spend money and build and pave trails, crisscrossing property. Distinguish yourself from every other county in MN. Keep things natural. The experience of walking on dirt is more is more of a wilderness experience. Coordinate design of what we already have we don't need bike trails 1500 feet from each other. It takes more brains and creativity to integrate with

nature than spending money on building pavement and other things that could be designed another way.

- Good job! I think the plan is excellent and it is gratifying to see the progress we are making currently and to see the promise in this plan for future progress in natural resource stewardship.
- I think the draft Natural Resources System Plan provides a great blueprint for future restoration and management of county parks and other natural and open space areas. The tier approach is a logical way to prioritize resources and focus on areas of greatest need and impact. This plan may provide a good example for other counties to follow.

I am also very impressed by the restoration activities underway in Lebanon Hills Regional Park. The removal of buckthorn and other invasives has opened up the park and revealed topography and vistas that were previously hidden. Well done!

- Love the goats and effort to counter the threat of buckthorn. Like the plan and can already see the difference. Good job.
- The plan has made great strides in the direction of restoration, water quality, and maintenance than the initial proposal. I think we need to really address funding issues so maintenance and operation of the parks is less dependent on external sources. We have a great park; it deserves respect and adequate funding.
- Paved trails. I sometimes encounter purists in the parks, who are against any paved trail on principle. They are usually startled when I tell them "I'm all for it, and when you reach your 70s you will be too." I have this vision of mom, dad, and kids on bikes or trikes. Conversations over the years with park visitors tell me that quite a few city people view park dirt trails as sort of risky. A paved trail with "wild" views might well bring in visitors who would otherwise not come.
- Open areas. LHRP has only a few designated foot trails passing through open areas. The best "prairie" trails are the horse trails. A nice pat on the back for the new trail between Schaar's and Fahey Ave.

WRITTEN COMMENTS SUBMITTED VIA EMAIL:

1. Dakota County Soil & Water Conservation District



April 20, 2017

Joe Walton
Dakota County
Parks, Natural
Resources
14955 Galaxie
Avenue
Apple Valley, MN 55124

RE: Dakota County Draft NRMSP Report

Dear Mr. Walton,

Thank you for the opportunity to comment on the Draft Natural Resources Management Systems Plan. The Dakota County Soil and Water Conservation District (SWCD) supports Dakota County's efforts to protect, manage, and restore natural resources throughout the county.

Overall, the plan is well prepared and reflects the County's high level of commitment to proactively manage and protect its natural resources.

We offer the following comments for your consideration:

11.3.1.7. Implementing the Natural Resource Management System Plan - Develop a New Private Sector Funding Program

There are several cities, watersheds, and the SWCD that have established private sector funding programs in place. Collaboration with other organizations could reduce the need to develop an independent policy, criteria and process for a funding program. Coordination with existing and established programs has been emphasized throughout the Technical Advisory Committee meetings as a need to accomplish plan goals.

11.3.2.3. Implementing the Natural Resource Management System Plan - Work with Partners to Protect and Manage Areas Outside of Parks that Benefit Park Waters.

Similar to ongoing efforts within the Trout Brook watershed, cities, watershed management organizations, and the SWCD continue to conduct planning efforts, complete targeted sub-watershed analyses, and implement natural resource projects in areas that encompass or contribute runoff to County properties. Continued incorporation of these efforts throughout the county and appropriate adjustment through the adaptive management process will be needed to incorporate the ongoing efforts that affect County properties.

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| www.dakotacountyswcd.org

PARTNERS IN LAND AND WATER CONSERVATION

*11.3.2.4. Implementing the Natural Resource Management System Plan - Water Management
- Collect Baseline and Trend Data*

Coordination with entities within the county (cities, watershed management organizations, SWCD) that implement existing monitoring programs is highly encouraged to properly identify the monitoring needs, maintain consistency in the type and quality of the data collected, and ensure that proper standards and protocol are used.

We look forward to supporting Dakota County's continued efforts to protect and enhance our natural resources.

Sincerely,



Curt Coudron, CPESC
Project Management Supervisor
Dakota County Soil and Water Conservation District

2. Robert Patton, Minnesota Department of Agriculture

I looked over the NRMSP, and it appears to be an excellent document. Congratulations. We have no comments.

Thanks and look forward to seeing you in the near future.

Bob

Robert Patton, AICP
Supervisor, Energy and Environment Section
Agricultural Marketing and Development Division
Minnesota Department of Agriculture
625 Robert Street North

Saint Paul, MN 55155-2538
Ph: 651-201-6226



3. Jason Naber, Emmons & Olivier Resources, Inc., Oakdale, MN

Good Morning Joe,

I really enjoyed reading the draft NRMSP document. There is a lot of great information and guidance that will help shape the future NRMPs and land stewardship actions. I know you put a lot of effort into this and should be commended for it.

I had a few suggestions to offer. I thought the draft was bland and dated from a style and format perspective. The figures were hard to read in many instances. I suspect this will be improved with the conversion to InDesign. Some of the statements in the document seemed like they would have a reference. The list of references was extensive but for some of the interesting points made in the document I was looking to find out where they came from. Again, in a good way, I am interested in finding out more info on the topic.

Take care,

Jason

4. Tara Harris, Minnesota Zoo

Joe,

Thank you very much for sending me your plan. It looks like quite an impressive amount of work went into it.

I just have one comment related to a sentence on page 64: "The rusty patched bumble bee was proposed for addition to the endangered species list, but this listing has been put on hold by the new federal Administration." The listing of the rusty patched bumble bee is no longer on hold. It has now gone through, and the species is listed as endangered. A good portion of Dakota County, including a small piece of the Minnesota Zoo, is considered high potential area for the bee.

You can find the Fish and Wildlife Service webpage for the rusty patched bumble bee at <https://www.fws.gov/midwest/endangered/insects/rpbb/> and their guidance website at <https://www.fws.gov/midwest/endangered/insects/rpbb/guidance.html>. I believe Zoo staff has been in touch with some Dakota County staff (possibly those associated with Lebanon Hills) about submitting some questions to our Twin Cities Fish and Wildlife Service field office, so that we can better understand how this listing impacts our management practices. Tam Smith (copied here) is our contact at that office, in case you have questions for her.

It would be great to talk turtles again sometime! We're starting to do some work with Carol Hall at the DNR.

Best regards,

Tara

Tara Harris, Ph.D.

Vice President for Conservation, Minnesota Zoo
AZA Tiger Species Survival Plan Coordinator
13000 Zoo Blvd, Apple Valley, MN 55124
952-431-9206; tara.harris@state.mn.us



The Minnesota Zoo connects people, animals, and the natural world to save wildlife.

5. Resident, Rosemount, MN

TO: Joe Walton, Senior Ecologist

Apple Valley Western service Center

FROM: A Rosemount Resident

Re: May 2017 Dakota County Natural Resources Management Systems Plan

We attended the last open house, Thursday, April 13, 2017. We read parts of the Plan, but haven't finished it yet. So far, the Plan is a more kindly, considerate, and ethical work than the 2014 LHRP controversial Plan

Below are our comments thus far.

1) #1 IMPORTANCE: NO SALT USE in our parks!

Last fall 2017 we spoke with geologist, Rosemount City Council Member Vanessa Demuth. She lives in Evermoor in Rosemount. When a pond was being tested for water quality near her home, she asked that they also include a SALT sample. Everyone was surprise how HIGH the salt content was. We have an EXCESS SALT problem virtually everywhere in Dakota County. Time to abstain.

If you can close the park trails for deer hunting purposes, you can close them when the trails (parking lots and sidewalks) are too icy to traverse.

Also, put a GATE across the new wooden BOARDWALK entrances so the boardwalk can be closed on ICY days. Wood is very slippery when wet and icy...possibly more so than concrete or asphalt (which are not far behind given the broken hips from streets and roads on icy days).

SAND (an alternative?) can give traction although it won't melt ice. But, sometimes sand is mixed with salt and can have a high salt content. Can you get low-salt sand?

2) #2 IMPORTANCE: TRAIL EROSION

In March a group of our family members (ages: mid-20's, 50's, 60's) walked a trail at Lebanon Hills from the Visitor's Center. The last couple days had gotten cold and the trail was a bit icy in spots. The ice wouldn't have mattered so much if the trails had been in better hiking condition. Tree roots stuck up, path graded at a slant, uneven ground (all most likely due to so much foot traffic over many years)...which made us exercise caution so we didn't slip. The BEST way to gain hikers of all ages is to have paths that are as easily hikeable as possible. The 20 and 50 year olds had less problems than we 60 year olds—it slowed us down. We don't want asphalt or concrete as both these surfaces are also difficult to walk on (leg strain). Dirt paths are actually easier to traverse even if they aren't perfect or perfectly even. If only an additional layer of dirt, perhaps with clay (so it would stick better?) could be spread over the top in some places and kept up being added regularly, the trails would be better walkable areas. Anyway, we recommend some sort of trail conditioning.

- 2 -

3) **#3 IMPORTANCE: TRAIL SIGNAGE**

When our group ABOVE was hiking, there came a fork in the trail. Some of our group were from out of state and had never been to Lebanon Hills before, and, actually, only one person in the group knew where the two paths went. One person wanted to try an alternate path, but was worried about its outcome so we all stuck together instead. We also wondered which way was quickest and which would be a nice, long scenic hike. Nothing there to offer that information. To encourage folks to utilize our trails and different routes, MORE SIGNAGE!

SIGNS should state where trails lead and how far in tenths of a mile. When there is a fork in the path, SIGNS for where each leads, how far, where it ends up, and perhaps state sites along the way, i.e. names of lakes...for "tourist" interest.

4) **#4 IMPORTANCE: BENCHES**

Along the trail of our Group hike, we finally saw a BENCH. If possible, without cutting down trees, more benches staggered along the trails would be nice. Because we were a group of 7, there was not room for all of us to sit. So...we forged on even though some could have used a minute's rest (but, if a few rested, the remaining had to just stand around). A couple four benches would be welcome at certain locations where room allowed to install. Something as simple as a few seating arrangements would go a long way to respectfully comfort passers-by.

5) **BOARDWALK**

The **NEW BOARDWALK** is a wonderful addition which we can't wait to utilize after completion. So very thankful for **NO** tree removal, nice buffer, and **NO** asphalt!

Boardwalks over wetlands protects wetlands from traffic. Boardwalks can continue a trail without having hikers pass through it.

6) **BALANCE RECREATION AND PRESERVATION**

It's important to balance recreation and preservation. Keep bicyclists away from hikers.

We need some easily accessible trails and some not so. There are sensitive areas that would be best off with low usage and limited traffic.

7) **ANIMALS AND INSECTS**

Take care of the water and vegetation and the animals and insects will flourish. But, we still need to expand **butterfly** and other **insect habitat** and pay special attention to **BATS**.

- 3 -

8) **BUCKTHORN AND OTHER INVASIVE SPECIES**

The best way to avoid high costs in the future is to **make sound investments now** to solve the major problems like **buckthorn** and other **invasive species**. Goats are good. We need as much mechanical weed removal as possible, less chemical as possible.

9) **PLANTING THE PRAIRIE**

One spring, years ago, I helped hand-plug a large front yard in St. Louis Park with prairie plants: forbs and grasses. For a couple years I went back and checked on it, and the prairie flowers bloomed prettily amongst the grasses. Then, five years later, I went to see how the "front lawn" was doing. It had been taken over by the tall grasses.

Our own yard has native grasses we planted years ago and we have planted some in other landscapes. These grasses are a dickens to keep from becoming the dominant species. It takes lots of work and upkeep.

The fall beauty of tall Big Bluestem, along with some goldenrod and other species mixed in, at the expansive area of the Lebanon Hills horse trail should be appreciated as the sea of grasses it is. These tall grasses waving in the wind have a **calming effect**. I wish this **feeling** would be promoted instead of the idea some people have stated that it is **just** old farmland. **Just the way it is** also has a purpose.

10) **IMPORTANT: STEPS OF PROGRESS ACCOUNTABILITY**

The **COUNTY BOARD OF COMMISSIONERS** (or their representative staff) **MUST**

HOLD periodic updates, open houses, meetings, etc. with the PUBLIC asking for THEIR INPUT so the PUBLIC can hold the County Board ACCOUNTABLE for the steps of progress made.

We would prefer these public updates and input to be Quarterly (that way, if a person had to miss one, the next one would be coming up soon).

This **Natural Resources Management Systems Plan** is a very attractive, positive, and nicely compiled booklet. But, if this is where the work-to-be-done ends...it is not functional.

6. Resident, Eagan, MN

Fantastic to see the efforts and commitment toward natural resources, and as I am not an expert, I thought the Plan was very informative and educational.

For the past two years, I felt the process in creating this Plan was very engaging. During public meetings, there was open discussion among staff, consultants, the public, and even County Board members -- which provided those in attendance with a better understanding and perspective on a number of points. At times, changes were made to the draft plan in response to those open discussions, which was rewarding to see and gave those who participated the understanding that their voices were heard. I do think the TAC meetings should have been open to the public (mainly to gain an even better understanding of different perspectives) -- but overall, thank you for a meaningful public process.

One suggestion for you to consider -- the Plan clearly recognizes the public's consistent and strong support for ongoing NR management, while at the same time notes that in general there is a lack of deeper understanding about managing landscapes. One way to help educate and inform people of the lengths the County is taking to actively manage resources would be to install permanent signage, or information kiosks, at various locations with details of restoration and benefits of ongoing management.

The System Plan provides an excellent overview, exciting goals, and an understanding that while things are off to a good start, there is a long way to go. I look forward to subsequent NRMPs for specific parks, greenways and easements, and providing more detailed input at that time.

Very much appreciate the new direction the County is taking to actively manage these valuable resources for now and in the future.

COMMENTS FROM THE PLANNING COMMISSION FROM THE 4-27-17 MEETING:

The Planning Commission expressed strong support for the updated NRMSP. Five commissioners commented that the Plan was comprehensive, looked great and commended staff and consultants for their hard work in producing an outstanding document.

Other comments included:

- It is not only a fine Plan, but it will be a great resource for educating other staff, public officials and the public about natural resources and their management in the County.
- In response to a question, staff emphasized the importance of documenting Plan outcomes on a regular basis, providing this information to the public and the County Board, and to use the results for updating and advancing the Plan from Tier 1 to Tier 2 priorities and activities.

The Planning Commission voted unanimously to recommend County Board approval of the NRMSP.

Appendix P. Quality Ranking Guidelines for Plant Communities and Ecosystems

Rank (General Quality)	Guidelines for Assigning Ranks
A (Excellent)	No evidence of ecologically disruptive disturbance or evidence of appropriate disturbance (e.g., single tree death, fire in fire-requiring ecosystem). Species richness is high for the type of ecosystem and species of mature vegetation conditions are present (e.g., uncommon species). Wetland systems experience little increase or drop in water level regardless of rainfall amount; generally the watershed has less than ten percent agricultural plus developed lands, or runoff is controlled to pre-development levels.
B (Good)	Some evidence of ecologically disruptive disturbance or some indication of appropriate disturbance. Species richness may be high for the type of ecosystem, but some weedy and invasive species are present and expected uncommon species are absent. Wetland systems experience some increase in water levels with less than 1 inch of rainfall; generally the watershed has 10-20 percent agricultural plus developed lands, or runoff is mostly controlled to pre-development levels.
C (Fair)	Evidence of ecologically disruptive disturbance is obvious, or little evidence of appropriate disturbance is seen. Species richness is moderate to low for the type, few uncommon species are present. Weedy and invasive plants are evident, but do not dominate any vegetation layer. Wetland systems experience a noticeable increase in water levels after less than 1 inch of rainfall; generally the watershed has more than 20 percent agricultural plus developed lands, or runoff is partially controlled to pre-development levels.
D (Poor)	Severely altered by ecologically disruptive disturbance or no evidence of appropriate disturbance. Species richness is low for the type of ecosystem and uncommon species are absent. Weedy and invasive species are a large part of the biomass in one or more vegetation layers (e.g., complete buckthorn coverage in the shrub layer). Wetland systems experience large rises and falls in water levels with less than one inch of rainfall; the watershed has more than 25 percent agricultural plus developed lands and runoff not controlled to pre-development levels.
NR (Not Ranked)	No rank is needed because the land cover is cultural (agricultural land, cool-season hay meadow and/or developed)

Note: Intermediate ranks can be assigned for a range of quality, e.g., A/B, C/D.