APPENDIX D

SEH LONE LAKE PARK BIOLOGICAL ASSESSMENT

Lone Lake Park
Biological Assessment

City of Minnetonka, Minnesota

MINNE 145810 | May 2018

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Biological Assessment

Lone Lake Park
Hennepin County
Minnetonka, Minnesota

SEH No. MINNE 145810

May 2018

I hereby certify that this Wetland Permit Application was prepared by me. The procedures and field methods used to delineation wetlands within the area of interest constitute an official wetland delineation in accordance with the 1987 U.S. Army Corps of Engineers *Wetlands Delineation Manual* and applicable *Regional Supplement*.

Prepared By: _____ Date: May 15, 2018
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Contents

List of Tables

Contents (continued)

List of Figures

List of Appendices

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Biological Assessment

Lone Lake Park

Prepared for City of Minnetonka

1 Executive Summary

The City of Minnetonka is considering the inclusion of mountain bike trails within Lone Lake Park. As part of this consideration, the City has requested an assessment of the biological resources present, and a discussion of how incorporation of trails within the park may impact these resources.

Lone Lake Park contains Lone Lake, South Fork of Ninemile Creek, and an abundance of oak-dominated woodlands on relatively steep topography. While not old-growth, the quality of the woods are high, with intact tracts, high diversity, and mature trees present. Invasive species coverage is light, in part due to extensive management by the City of Minnetonka

Wildlife use within the park is above average for a metro area, as it is largely intact, and supports high quality and diverse habitats. This habitat quality encourages the presence of typical urban wildlife species, but also may support some species that are less common and require the critical habitat that mature forests provide. Wildlife within Lone Lake Park may potentially include some federally listed species such as the long-eared bat, and the rusty patched bumblebee.

While the park contains approximately 1.6 miles of formal asphalt and crushed limestone trails, the hillsides and wooded portions of the park currently contain an abundance (more than three miles) of unofficial trails that have been formed over years of pedestrian use. These existing trails have had some impacts on the parks biota.

The inclusion of mountain biking within Lone Lake Park would potentially have some environmental impacts, and may include the following:

1. Removal of trees, shrubs, and herbaceous vegetation to establish trail routes, and loss of vegetation from frequent travel over routes
2. Spreading of invasive species
3. Soil erosion from bare soil, and compaction from frequent use
4. Disturbance to wildlife, particularly to woodland bird species
5. Impacts to sensitive species and/or encroachment into critical habitats
6. Increases in noise and dust generation compared to pedestrian users, and from a potential increase in the number of overall trail users
7. Disruption of solitude for other park users

The extent of potential impact is highly variable depending on the trail design and any implemented limitations for trail use. Inclusion of graded trails that could allow for multiple riders and grading of the hillslopes would likely have a significant impact. A less extensive design using "sustainable" and "low impact" techniques that limit grading, and establish narrow one-way paths could reduce impacts to negligible levels.

The following are considerations that may avoid or minimize impacts to the park's natural resources:

- Minimize the trail design to single-file, and one-way routes
- Minimize tree removal, and select smaller trees of less desirable species when removal cannot be avoided
- Limit routing or decrease trail density within sensitive or highest quality areas
- Minimize steep slopes to limit erosion by routing the trail along contours and keeping grades to 5% or less.
- Where gully crossings are required, consider boardwalks, elevated trails, or routing to maintain contours.
- Avoid all crossings of wetlands or areas where concentrated overland flow from rain or snowmelt may occur.
- Restrict seasonal use to avoid spring snowmelt and periods where muddy conditions are prevalent.
- Maintain a diligent invasive species control program to limit sources of material from within the park, and install bike wash stations to reduce import from off-site.
- Develop trail rules for mountain bikers, and post informational signage on trail etiquette for all users. This may include consideration limitations on use of trails by pets

1.1 Location

The project site is located at 5624 Shady Oak Drive, which is within Section 35 in Township 117 North, Range 32 West in Minnetonka, Hennepin County, Minnesota as shown on **Figure 1**. The park is accessible via Shady Oak Drive, where there are four areas where parking is allowed adjacent to the soccer fields, tennis courts, and playground. The trail system on the west side of the park is accessible from a smaller parking area located off of Rowland Road.

Although not formal, access to the park is also possible from several adjacent areas including trails from adjacent private residents and trailheads originating from the water tower.

2 Existing Features

Lone Lake Park is 146 acres in size, and is distinguished by Lone Lake as a central feature. South Fork of Ninemile Creek also flows through the park, but is separated from Lone Lake by a central wooded ridge. A portion of the park is utilized for soccer fields, tennis courts, and a small playground, but the main features are the steep slopes and oak woods that instill a sense of isolation for park users.

Both paved and crushed limestone trails are present, and offer 1.6 miles of walking and running paths in the summertime. These trails are not maintained in winter, and can be used for snowshoeing or walking depending on snow cover. These trails connect regionally to Bryant Lake Regional Park to the south, north to Shady Oak Beach along Shady Oak Road, and from the south parking lot to the Three Rivers Parks Minnesota River Bluffs LRT Trail.

2.1 Historic Conditions

Historically, Lone Lake Park was located within the central mixed hardwoods, and would have included a mixture of oak, maple, basswood, and prairie areas on the southern and western facing slopes.

With European settlement, much of the landscape was dramatically changed to support agricultural purposes. Trees and prairie were cleared to create fields and pastures. Lone Lake Park was considerably different in the 1930s, when the area was farmed, and the only wooded portions were located on the west side of Lone Lake and pockets on the slopes below the current water tower ridge.

Photo 1: 1937 aerial photograph of Lone Lake Park

With the reduction in agricultural use as the Minneapolis metropolitan area developed and Minnetonka because a suburban community, the trees within the park grew back, and the park began to progress toward the familiar conditions observed today.

As a rough midway point from the 1937 to 2018, we can observe the conditions in 1971, where agriculture use has ceased, and there is increasing development for residential homes.

In 1971, the wooded component of the park is returning, including expansion from the oldest trees on the western lake ridge southward, and on the slopes below the current water tower. Of

note is the cleared area on the water tower ridge, which was not vegetated at the time to allow for skiing and sledding, and a road on the western side that generally follows the current trail system, with the northern half abandoned.

Photo 2: 1971 aerial photograph of Lone Lake Park

The review of historic aerial photographs allows us to understand the former land use, and the types of stressors and land changes that have occurred to allow the current conditions to be present. It also allows us to determine the age of features, which is a significant component of establishing biological integrity. The maturity of a wooded landscape is critical to determining the status as old growth, versus regrowth, or ecologically primary features, versus later successional species.

Based on the historic aerial photography, the majority of the trees within Lone Lake Park are relatively young, with the majority being less than 50 years old.

3 Biological Resources

While a portion of the park is used for active sports (soccer, tennis, basketball, playground, open areas), the majority is preserved and managed as open space. The majority of the park is wooded, and the City of Minnetonka has spent considerable effort in managing the site for control of invasive species, encouraging a healthy and diverse cover type, and educating park users about the resources around them. The following sections will discuss these resources, and provide an opinion on the quality of these resources.

3.1 Trees, Shrubs, and Vegetation

The primary vegetative resources within the park are the extensive wooded hills that surround the lake. Overall, the wooded areas are dominated by red and white oaks throughout the park, although there are portions where co-dominate species are also present, such as pockets of bigtooth aspen, basswood, red maple, and red cedar. Overall plant diversity is high, and the community is developing into a mature stand with a closed canopy. A list if the observed species is presented in **Table 1**, based on a March 29 and May 2, 2018 field review by SEH.

Table 1: Observed Tree Species

Common Name	Scientific Name
Box elder	Acer negundo
Red maple	Acer rubrum
Buckeye	Aesculus glabra
River birch	Betula nigra
Paper birch	Betula papyrifera
Hackberry	Celtis Occidentalis
Hawthorn	Crataegus sp.
Black walnut	Juglans nigra
Red cedar	Juniperus virginiana
Ironwood	Ostrya virginiana
White pine	Pinus strobus
Cottonwood	Populus deltoides
Bigtooth aspen	Populus grandidentata
Quaking aspen	Populus tremuloides
Black cherry	Prunus serotina
White oak	Quercus alba
Northern pin oak	Quercus ellipsoidalis
Burr oak	Quercus macrocarpa
Red oak	Quercus rubra
Black locust	Robinia psuedoacacia
Black willow	Salix nigra
Basswood	Tilia americana
American elm	Ulmus americana

The wooded communities present are identified by the Minnesota Department of Natural Resources as a Southern Dry-Mesic Oak Forest. Mesic hardwood forest communities are present within the larger eastern broadleaf forest province where soils retain moisture, and wildfires are infrequent. These forests have continuous dense canopies of deciduous trees, with an understory of successively shorter strata composed of shade-adapted seedlings, shrubs, and herbaceous cover. Within Lone Lake Park, the dominant trees are red and white oak, although as is typical of mesic forests, other deciduous species such as maple, basswood, bigtooth aspen, ironwood, and black cherry trees are also present.

Photo 3: Typical oak-dominated woodland

Coniferous trees are less frequent, but are present; including a few large white pine trees, which were planted. Red cedar trees are also present in a few larger areas, where it is locally dominant; particularly along the ridge west of Lone Lake. The red cedar trees are also mature, and likely have been present for a long period of time. Red cedar can be controlled by fire, which has likely been suppressed since settlement. Red cedar tend to be more of a nuisance species within prairie ecosystems, but are not likely to be problematic in a mature forested community.

Photo 4: Red cedar trees within the forested portions of the park

Under the tree canopy, there is a moderately dense layer of native shrubs and vines. The invasive European buckthorn has been effectively controlled through extensive management, but can still be located in isolated areas of the park, such as the southeast corner, and where it is encroaching from adjacent areas. The shrub layer is healthy, and appropriate in composition for the mixed-oak woods that are present. Shrub density is controlled by the limits of light penetration, and is naturally low density with the full canopy present, particularly on the north and east facing slopes that naturally receive less sunlight. **Table 2** is a summary of the observed shrub species based on a field review by SEH on March 29 and May 2, 2018.

Table 2: Observed Shrub and Vine Species

Common Name	Scientific Name
Grey dogwood	Cornus racemosa
Red osier dogwood	Cornus sericea
Tatarian honeysuckle	Lonicera tatarica
Virginia creeper	Parthenocissus quinquefolia
Wild plum	Prunus americana
Common buckthorn	Rhamnus cathartica
Gooseberry	Ribes spp
Staghorn sumac	Rhus typhina
Riverbank grape	Vitis riparia
Prickly ash	Xanthoxylum americanum

Photo 5: Small stand of native shrubs in southeast portion of the park

Prairie and grassland habitat is a cover type in the western area of Lone Lake Park. Additionally, there is a larger area of non-native smooth brome grass on the southeast corner of the park where a south-facing slope is present. On the western side of the central ridge is small elevated

meadow, which may be a historic open area, but is not remnant. Vegetation within this small meadow area includes smooth brome grass, Canada goldenrod, and black raspberry. Box elder trees and shrubs are encroaching into this area. Overall, it is an open space, but is not high quality prairie.

Photo 4: Small elevated meadow in western portion of the park with encroaching vegetation

3.2 Invasive Species

Many of the woodlands in the metro area have been infested with a wide range of invasive species, including common buckthorn, garlic mustard, leafy spurge, and Tatarian honeysuckle. Through extensive efforts by the City of Minnetonka, Lone Lake Park is relatively free of these species, but this effort to manage for invasive species requires constant diligence to prevent reestablishment and spreading.

Wooded habitats do contain some occurrences of European buckthorn, but much of the park is managed periodically to ensure a low density, and limit the species to seedling that do not mature and bare fruits. Garlic mustard is an emerging concern, and is currently limited to more of the disturbed wooded edges than within the intact community. The City is currently completing garlic mustard management through herbicide applications to try and limit the spread of this species. Tatarian honeysuckle was observed, but only isolated individuals were located, and this does not seem to require active management to control.

The wet prairies are dominated by dense reed canary grass, and some occurrences of individual purple loosestrife, which are being actively managed in an effort to restore native vegetation to these areas. Plantings of native vegetation have occurred to promote a healthy a diverse shoreline and assist with discouraging establishment of invasive species.

Overall, the occurrences of invasive species is relatively low, which is a significant factor in the overall evaluation of habitat quality, and serves as an example of how continuous management can be successful in managing these species.

3.3 Aquatic Resources

Lone Lake is the primary aquatic feature within Lone Lake Park. Lone Lake is an approximately 17-acre kettle lake, formed by blocks of glacial ice which melted and formed the majority of shallow isolated lakes within the state. Lone Lake is relatively shallow, with a maximum depth of 27 feet based on Minnesota Department of Natural Resources data, although the majority of the lake is considerably shallower. Aquatic macrophytes are present, and form dense beds, including large areas of floating leaved vegetation dominated by a variety of lily pad species.

Publicly available fisheries data indicate that Lone Lake is dominated by warm water species, such as black bullhead, bluegill, and hybrid sunfish. Water clarity is moderate, with clarity ranging from 2 to 4 feet.

The Minnesota Pollution Control considers Lone Lake to be eutrophic, although for water clarity, it has been borderline mesotrophic, which indicates some nutrient enrichment, but generally a favorable assessment for a lake within a developed watershed. Good water quality is a benefit from the immediate watershed area being in a natural condition, and the lack of direct storm water discharge into the lake. The constructed rain gardens to treat parking lot runoff prior to discharge into the lake are certainly assisting with maintaining good water quality standards within the lake. Likely a result of the late ice-out conditions, there was some spring algal accumulations along the lake shoreline in May 2018,

The South Fork of Ninemile Creek is also present in the western portion of the park, where it flows from north to south, and is the reach between Minnetoga and Bryant Lakes. The stream is relatively small and shallow in this reach, and is not a significant fishery, with fathead minnows, central mudminnow, brook stickleback, and creek chub being the species observed by the Minnesota Pollution Control Agency (2003-2005 biological sampling).

Adjacent to the creek are areas of wet meadow, shallow marsh, shrub carr, and floodplain habitats. The creek and these associated wetland features dominate the western one fifth of the park, but are generally lower in quality with reed canary grass and hybrid cattails dominated the wetlands and creek watercourse.

In the central area of the park is a small wetland, which is bisected with an elevated trail. This isolated wetland is dominated by shallow open water, with a wet meadow fringe and several small trees. The vegetation within this wetland is dominated by reed canary grass, with some cattails and purple loosestrife observed. Trees within the wetland fringe include box elder, which are also lower in quality. While not a high quality assemblage of vegetative species, this central wetland contains no fish, and is a significant shallow area for amphibians such as frogs, toads, and salamanders to reproduce without predation.

Photo 6: Small wet meadow wetland south of Lone Lake

3.4 Wildlife

Lone Lake Park is of sufficient size that is likely supports a diverse mammal population, including white tailed deer, raccoons, squirrels, rabbits, skunks, woodchucks, and probably the occasional red fox or coyote. All of these species are common within the region, and would be attracted to the wooded slopes where they can find food, shelter, and habitat. The support of mammals is likely high, but not unusual for species that have adapted to living within an urban area.

Similarly, the presence of reptiles and amphibians would be supported by the quality of the habitat, which would be expected to support multiple frog and snake species. The wetlands being free of predatory fish is advantageous to amphibian reproduction, and the abundant habitat within the steep slopes, trees, and rocky would support several of the woodland favoring snakes, such as the common garter snake and brown snake. Turtles would be present within Lone Lake, and would utilize the sandy soils for ideal nesting habitat.

Of all the wildlife that may use the park, the ones with the greatest benefit may be the birds, sometimes referred to as avifauna. While common species such as cardinals, chickadees, blue jays, wild turkeys, and crows would be expected to use the wooded areas of the park, the large intact wooded areas are also an attraction to less common species. Evidence was observed that woodpeckers are common, including the common downy and hairy woodpeckers, but also the large and prominent pileated woodpecker. Owls are likely residents within the woods, as are hawks, with areas open for roosting, nesting and hunting. Seasonally, migratory birds would use the woods for resting, and would include the various warblers, vireos, and other songbirds that are temporary residents. Breeding birds which are less common, but utilize large, intact, mature woods for their primary habitat include the scarlet tanager, rose-breasted grosbeak, catbirds, pewees, and flycatchers.

The use of the park for wildlife overall is likely average for a park of this size, but is higher for many of the woodland bird species that require the larger areas of intact woods that Lone Lake Park provides.

3.5 Threatened and Endangered Species

In addition to species that may just be less common, or are unique to the habitat present, there is the potential for Lone Lake Park to harbor plant and animal species that are listed by the State of Minnesota or the federal government as legally protected.

In order to determine if any state or federally listed species have been documented within Lone Lake Park, a review of the Minnesota Department of Natural Resources (MNDNR) Natural Resources Information Systems (NHIS) database was completed. This database identifies the known locations of listed species, critical habitats, and other unique resources that have been positively identified. Because some species are mobile, a one-mile buffer was used to identify any species that has been documented within or adjacent to the park, to ensure that a sufficient area was included. The database review failed to identify any species of concern within or adjacent to the park. While this doesn't mean that a state listed species couldn't be present it is generally considered sufficient for meeting state requirements for sensitive species reviews.

Federally, Lone Lake Park is within the range of two listed species, the northern long-eared bat, and the more recently listed rusty patched bumble bee.

The northern long-eared bat utilizes wooded habitats during the summer, where it roosts under the bark of large trees, singly or in small colonies. Bat pups are also raised in these wooded habitats. During the winter, the bats congregate in hibernaculum, which usually consists of caves, structures, and sometimes large trees or wooded snags. The wooded habitat present within the park would generally by suitable to this species during the roosting and pupping period, and potentially could offer some areas of hibernaculum. Current guidelines by the U.S Fish and Wildlife Service discuss tree removal, and limiting activities during the roosting period. These resources also identify the townships in which roosting trees and hibernaculum have been positively identified. While one hibernaculum has been positively identified within Hennepin County, it is not within the area of the park. Under federal guidelines, there would be no restrictions on park amenities based on the known distribution of the bats, even though the habitat may be present.

The rusty patched bumble bee is a recently listed species, and was added following an alarming trend of declining populations of pollinator species. Like other bee species, the rusty patched bumble bee relies on pollen from flowering plants for sustenance, and has been harmed by a loss of prairies, grasslands, and other critical habitats; and potentially overuse of herbicides and insecticides. The bees nest underground, often using rodent burrows, but require relatively undisturbed conditions to flourish. The rusty patched bumble bee has been positively identified within Lone Lake Park, as reported to bee-tracking websites, utilizing the flowering plants in the rain gardens for nectar. Other have been positively confirmed in the area, and because they are mobile, are presumed to be present, although positive nesting is harder to document than foraging individuals.

3.6 Soils

Soils within Lone Lake Park include the loamy soils associated with the lake, South Fork of Ninemile Creek and the associated wetlands and the sandy loam soils that dominate the adjacent

hillsides. The dominant soil within the park is the Kingsley-Gotham Complex. The Kingsley component consists of very deep, well drained soils that formed in loamy glacial till on glacial moraines. These soils have moderate to moderately slow permeability, and slopes that range from 2 to 40 percent. The Gotham component consists of very deep, somewhat excessively drained soils formed in sandy glaciofluvial deposits on moraines, outwash plains, stream terraces, and glacial lake basins. Permeability is rapid, and slopes range from 0 to 35 percent.

The majority of the soils are stable, and provided there is not a sustained gradient, are relatively less prone to erosion than finer textured soils may be. Where sand content is high, trails are more prone to erosion from use, and may require the placement of a cap to prevent unintentional widening. Overall, however, the soils are suitable to support a trail, and there would be limited need to import any material.

3.7 Slopes and Topography

One of the unique features of Lone Lake Park are the frequent hills and steep slopes. Elevations within the park are highly variable, and range from approximately 900 feet at Lone Lake and along the South Fork of Ninemile Creek, to a high elevation of 1,060 feet in the southeast portion of the park. These hills are glacial features, and are composed of till material dominated by sand and sandy loam. The hills can be separated into the tallest peak in the southeast corner, the northern slope and ravines in the southeast portion north of the water tower, the central north-south aligned ridge west of the lake, and the isolated peak located west of the creek.

The City of Minnetonka has a bluff ordinance, which establishes criteria for steep slopes and setback requirements in relation to proximity to aquatic features. Large portions of the park are considered to be bluffs under the city definition, and would have limitations on land use.

Using LiDAR data, all slopes greater than 20% and 30% have been identified in **Figure 6**. A 20% slope averages a one foot change in elevation for every five foot change horizontally. The majority of the hillsides are 20% slope, and except for areas of wetland, flatter areas would require crossing steep slopes to reach them. Smaller areas are 30% slopes, which is very steep and would be difficult areas to traverse.

3.8 Unique Features

Within Lone Lake Park are several areas that have merit in discussion as separate features. These include areas of vegetation, features, or amenities that add value to the park, and make it unique.

- Basswood stand: Located in the southwest portion of the park, near the top of the highest point is a small stand of basswood trees within the dominant red oak slopes. These basswood trees are relatively young, and are not remnant old-growth specimens, but do provide for a diverse tree assemblage and are appropriate native species for this setting.
- Water tower ravine: North of the water tower is a small ravine that drains to the north. This ravine is the outlet for the water tower, and has been graded to include drain tile, tile inlet structures, and rock checks, which minimize the ability for surface water runoff to accumulate and therefore reduce erosion. The tile system was installed to minimize erosion, and it is not readily apparent that it is present without observing the inlet structures. The tile outlets into a constructed rain garden located south of the playground parking lot, before discharge into Lone Lake.

- Parking lot rain gardens have been installed in the playground parking lot. These have been designed to allow collection and treatment of parking lot runoff, and have been planted with a variety of native species. These, and the created rain garden south of the lot, provide for pollinator species while also protecting lake water quality.
- Revegetation has occurred within the park, and are noted as areas where active management is being completed. Most recent revegetation has occurred at the southern end of the wetland in the center of the site, along the western bluff where some prairie has developed, and along the southern shoreline of Lone Lake where aquatic plants have been planted to stabilize and diversify the vegetation present.
- There are several deer exclosures within the park, which were set up to observe differences in vegetation when deer are prevented from accessing areas and browse is prevented.

4 Mountain Bike Trail Impact Considerations

4.1 Potential Impacts

The inclusion of mountain bike trails within Lone Lake Park will have some impact on the park's resources. The exact impacts will depend on the trail design, route, and length, which will be identified as the process is finalized, and plans are prepared. Rather than quantifying the impacts, this assessment will discuss the types of impacts that can be anticipated, and a discussion of how they should be evaluated. The intent is not to quantify the impact, nor establish a level where the impact would be considered to be acceptable or unacceptable. Rather, it is to ensure consideration of all topics to ensure informed decision making.

4.2 Trees, Shrubs, and Vegetation

Routing a trail through a wooded area typically requires the removal of some trees to maintain a consistent corridor width, and to create a consistent surface. The number of trees removed is often dependent upon tree density, which is a consideration based on the age of the stand, and the composition of tree species present.

The wooded areas within Lone Lake Park are dominated by moderately dispersed mature species, which have a lower overall tree density, and more spacing between individual trees than would be present in a younger stand. The full canopy limits new trees from being established, and the understory shrub layer is present, but is similarly less dense than would be present in full sunlight.

Under a sustainable or low impact design, the alignment of the trail incorporates existing topography, and is intentionally variable in the lateral flow of movement. Depending on the technical difficulty, this may include very gradual shifts in alignment, or may be abrupt and more challenging. Under a moderate design, there may be a need to remove a limited number of trees to maintain the trail path. A more difficult alignment can incorporate the tight turns to potentially reduce the need for tree removal.

For this proposed project, tree removal is anticipated to a small quantity, but is unlikely to be completely avoidable. It is estimated that tree removal would be minimal, and would be limited to smaller trees. Removal of trees of sufficient size to alter the existing closed canopy would not be anticipated.

Although the direct removal of trees may be minimal, secondary impacts may occur from compaction of the soils, erosion which may expose and damage roots, and damage to trees from contact resulting in injury to trunk or branches. It is possible that these secondary impacts are a bigger consideration than the direct loss, although it is more difficult to quantify.

Shrubs would generally not be affected, provided dense stands are avoided. This is an achievable goal, as there are few areas of concentrated shrub coverage. Shrubs would be removed along trail alignments, but would not be a significant reduction as the entire understory has some shrub coverage, but is well dispersed and is not dense.

Herbaceous vegetation will also be affected where it is directly removed for the trails. Within the wooded areas, the herbaceous cover is sparse due to light limitation, but does include patchy Pennsylvania sedge, and other woodland species that thrive is shady environments. Impacts to herbaceous vegetation, like shrubs, would be expected to be direct, but limited to the width of the disturbed corridor itself. Prairie areas are elevated, and depressional, and would be impacted with trails passing through them for direct vegetation loss.

4.3 Invasive Species

Invasive plants thrive in disturbed conditions, where they can take advantage of opportunities to get established and outcompete native species. Inclusion of mountain bike trails will disturb the soils, and create corridors by which invasive species may spread. This may be limited by a lack of source material from within the park, but direct transport of seeds and reproductive material can also occur from dirt trapped in tire treads, which can be transported from off-site locations.

It is likely that increasing the amount of soil disturbance will promote the spread and establishment of invasive species, as it will create conditions more favorable to them than native species. Transport from other locations is also a serious concern, as it may introduce species not currently a concern.

The concern with mountain bike trails is lessened when you consider the total area disturbed, which is a small percentage of the park area. If the trails in total will disturb less than a half-acre, it is not a large quantity of space for invasive species to establish. The concern however, is that the small area of disturbance is not isolated to one area, but is dispersed throughout a third to a half of the park. The ability to transport invasive species seeds and biological material throughout the park may exacerbate the problem, as you may see establishment wherever the trails may be located.

4.4 Wetlands and Aquatic Resources

The primary aquatic features in the park (Lone Lake and South Fork of Ninemile Creek) are not appropriate for mountain biking, and would likely not be directly affected by the inclusion of trails within the park. Should the South Fork of Ninemile Creek need to be crossed, it would require the use of an existing crossing, or a permit for a new crossing, as an in-water crossing would not be permitted

The large wetland located south of Lone Lake may need to be crossed to provide the desired length of bike trail, but that should be able to be achieved by routing the alignment far enough south to be outside of the wetland, utilize the existing crossing, or construct a new elevated crossing which eliminates any disturbance to the wetland.

Provided the wetlands can be avoided by routing the trail away or over them, there are no anticipated effects on aquatic resources.

4.5 Wildlife

Lone Lake Park has a diverse assemblage of native, mammal, bird, and reptile species. Most of these have persisted within the development of the area, and have accommodated to the presence of humans. While there are large areas of open space, there are existing trails and active areas that bisect the habitat. Few areas within the park exceed more than 500 feet from a trail, parking lot, or adjacent residence, and presumably the wildlife are accustomed to frequent encounters due to this proximity.

In consideration of wildlife impacts, you must determine the type of interaction, and the frequency of occurrence. Currently, the interaction of wildlife with walkers or joggers over a 2-mile trail route is infrequent, and likely predictable to the animal. With active bike trails, you have an increase in the frequency of interaction, as there would be a greater length of trails, and they would be more concentrated. It is expected that the trail users would be more likely to encounter a greater number of animals than a pedestrian, due to the greater distance traveled over a period of time.

Because of the speed of travel, the length of the trails, and concentration of the trails within desired areas, there is a greater opportunity for bike riders to be disruptive to wildlife. The full extent of this disruption is dependent on the number of riders, and how many participants are present on an average daily basis. For species that are highly adaptable and have thrived in the presence of humans, this is likely not a concern. For other animals, the frequent interaction may be sufficient for them to seek solitude in other areas.

It is challenging to determine when wildlife impacts from a park being “too busy” can be verified and quantified, but for some species the inclusion of bike trails may be sufficient for them to be displaced. This is most likely to occur with some of the nesting birds that prefer large intact tracts of woods, and prefer solitude.

Direct habitat loss is also a consideration, as bike trails physically remove vegetation, and could be considered a change in available habitat at the surface. Given the overall size of the park, the potential habitat loss is a relatively small fraction, but a five mile long trail, that is five feet in width would disturb approximately three acres. Because this is diffuse, and not in one area, it is probably negligible habitat loss, but it can be quantified. Fragmentation is also present, although the trail width is likely not sufficient to interrupt the complete canopy, and edge effects are likely not generated.

4.6 Threatened and Endangered Species

As previously discussed, there are no known state listed species within the park, however there are two federally listed species which warrant discussion.

Habitat for the northern long-eared bat is present, as these bats prefer wooded areas for roosting and pup rearing in the summertime. There are no confirmed occurrences, however, and the nearest hibernaculum, is located miles away. While it cannot be confirmed that the northern long-eared bat is not utilizing Lone Lake Park, the biggest concern for this species is tree removal, loss of hibernaculum, and spreading of the white nosed fungus. The inclusion of bike trails is not expected to remove a large number of trees, and would not impact hibernaculum or influence the spread of the white nosed fungus.

A United States Fish and Wildlife Service (USFWS) fact sheet on the long eared bat is presented in Appendix B.

The rusty patched bumble bee has been observed within the park, where it was utilizing flowering plants as a source of nectar. Nectar producing vegetation is generally absent from the wooded areas, as it is too shady for the primary nectar species to be present. Fringe areas may support more nectar species, as would some open areas, but overall the amount of nectar species is generally low within the park. It is unlikely that the inclusion of bike trails would decrease the availability of nectar plants. Direct habitat loss is possible, but given the limited direct area of disturbance, it is unlikely that a bumble bee nest would coincide with a trail.

While it cannot be definitively proven, it is unlikely that the inclusion of mountain bike trails within Lone Lake Park would have an effect on the northern long-eared bat or the rusty patched bumble bee.

A USFWS fact sheet on the rusty patched bumble bee is presented in Appendix C.

4.7 Erosion

Trails will disrupt the soil surface, and create areas devoid of vegetation. Bare soil is prone to erosion, but requires concentrated water movement and a gradient for it to be aggravated. Trails constructed on the contours, where slope is reduced, can be stable and control erosion. Trails that contain a slope or cross contours can encourage the channelization of water, which can form rills and exacerbate runoff until it is damaging and self-perpetuating. Once started, erosion can be very hard to control, and so it is important that it is prevented.

Currently, erosion does not seem to a significant issue within the park, although it is noted that some of the pedestrian trails that are present have some concentrated flows where slopes are present and water can accumulate. Particularly downslope from the water tower to the park, where pedestrians have aggravated the conditions through frequent use. This is also be a concern for mountain bike trails, which will similarly have bare earth base, and more potential to rut and compact the soils. Where trails will go with contours, and there is no sustained gradient, erosion potential is greatly reduced.

4.8 Water Quality

Water quality, in consideration of Lone Lake and the South Fork of Ninemile Creek, is not expected to be affected by the inclusion of mountain bike trails within Lone Lake Park. Water quality is a function of nutrient inputs, rates and volume of storm water, sediment discharge, and internal factors such as temperate, vegetation, and existing water quality conditions.

While there is a small risk of elevating erosion potential, it is not anticipated that water quality will be affected. Eroded material would likely be captured by the vegetation between the hills and the lake/creek, and not enter the waterbodies. This will also limit the introduction of nutrients, which are associated with sediment, or deposition of organic material such as leaf litter. While compaction of soils could occur on the trails, it would not be sufficient to be an impervious surface. Therefore, storm water volume and rates of discharge into Lone Lake or South Fork of Ninemile Creek would be unchanged.

4.9 Noise, Dust, and Visual Impacts

Mountain biking is louder than walking, but generally produces little noise other than the sounds of peddling, clicking of gears, and the wheels in contact with the trail. While this may introduce noises to areas of the park that are normally quiet, it is at low decibels, and limited to the area immediately adjacent to the rider. It is unlikely that noise will be perceived by other park patrons unless they are immediately adjacent to the rider, and will likely not exceed the noises currently present by park patrons during sporting events, playing at the park, or having a conversation will walking the existing trails. Noise is likely not necessarily a biological issue, although it may be disturbing to some wildlife.

Dust will be generated by bicycle tires on earthen trails, however it is expected to be limited to a very small area along the route. It is not anticipated that any park patron would be aware of dust generation by bicycles. In wet conditions mud will form, which can aggravate trail conditions, particularly if cyclists reroute and expand trails to avoid ponded or muddy locations. This is more of an erosion control issue than a biological condition, however.

Visually, the occurrence of a bike rider on the hills may alter their enjoyment of the park, as it may affect the perception of isolation that is currently enjoyed by many park users. In summer when the shrubs and understory are leaved out, this may be less of a factor than in spring or fall when the entire hillside is visible and anyone of the slope is readily apparent. Visual effects are an important consideration, but are more of a social concern than biological.

5 Assessment of Probable Impacts at Lone Lake Park

Based on the anticipated layout of the trail route, there is an opportunity to discuss with greater specificity the type and extent of impacts that are most probable within Lone Lake Park. It is assumed that a “sustainable” or “low impact” design will be selected, and that the trail route will have a distance of approximately 4.5 miles.

A sustainable design may require 5-6 feet of space during construction, which allows for access for construction equipment needed to grade the trail. This will have an initial disturbance of approximately 2.7 acres within the park. The perimeter of this disturbance is allowed to restore to natural conditions, however, and leave a central path that is typically 2.5 in width. After this disturbed area has been restored, the permanent impacts are estimated to be 1.4 acres, which will remain as bare soil for the mountain bike trail. This is approximately 1% of the park’s area.

The current tree density allows for a complete canopy, but has sufficient spacing that a trail system can navigate the slopes without the needs for extensive tree removal. Because the trail design should use areas with low slopes, there may be a need to remove individual trees, but this is a tradeoff with the risk of erosion if steeper slopes are allowed. Overall, the loss of trees, provided they are not concentrated in one area, is likely minimal and will not affect the overall health of the forest. Shrub loss is also expected to be minimal, and the herbaceous layer is already sparse and not likely to be affected significantly.

Invasive species will likely find opportunity in the newly disturbed areas, particularly garlic mustard, which thrives in wooded areas. Invasive species management will need to continue, and may require accelerated demand in the initial years following construction, as it will be much

easier to manage before it can get established in new areas. Buckthorn will probably be less likely to be spread specifically through a new trail, but overall continuation of the current management program will be helpful to ensure that current populations remain under control, and that the corridors do not become pathways for expansion.

Impacts to aquatic resources are not anticipated, provided they are avoided from direct impacts. Secondary impacts from erosion or water quality seem to be limited in risk, and probably cannot be quantified as existing stressors likely exceed any negative changes from the introduction of mountain bike trails into the watershed.

It is anticipated that the existing wildlife have likely accommodated to life in an urban setting. While there is habitat and relative isolation, there are adjacent residents, open spaces, and existing trails that prevent large areas from truly being intact and undisturbed. The primary risk to wildlife is displacement, if the frequency of disturbance exceeds an individual animal's tolerance threshold. For most species, this tolerance is high, as it is already a natural environment, but within a much larger developed area. It is plausible that some species will seek other areas for nesting that may provide less disturbance, but that is difficult to verify or quantify. Overall habitat loss is relatively small, but some fragmentation could occur in areas with dense trails. The habitat loss is probably negligible, and is less of a consideration than disturbance, which is already a stressor to some degree, but will be amplified with additional users.

Like wildlife overall, the two listed species that may be present are likely at low risk of direct loss, but have an increased risk in being disturbed and potentially displaced. Overall, the habitat for long-eared bats will remain, and is not expected to be significant. No impacts to the long earned bat are anticipated. The rusty patched bumble bee is harder to quantify, as there is less known about the species, and what is driving the decline. Much of the consensus is that habitat loss is a primary factor. The bee's ideal habitat is not present in great quantity, and the proposed trail will not impact any areas that support an abundance of nectar species. Nesting habitat could be affected, but the likelihood of a trail and a nest occurring in the same area is small. While it is impossible to say that no impacts will occur, the chances of occurrence are small enough that it would likely not have an impact on the rusty patched bumble bee.

Provided the design follows the lowest impact guidelines, there should be a crown or slope that will allow water to shed, and avoid pooling on the trail. This is typically along the entire trail, and avoids concentrated areas were flows can aggravate erosion. While erosion is always a concern, it can be limited, and repaired if it is detected quickly. Steep slopes will need to be avoided, and while the overall slopes within the wooded hills is steeper than 20%, a route with a lesser gradient can be located if it goes with the contours, and flat areas are used for turn arounds. From a design standpoint, the trail can be laid out to minimize erosion, and have very little impact.

While the park has many areas with unique features, and areas of active management, the alignment can avoid these, and not disrupt current efforts to improve the park's biota. There should be no impacts to the ongoing efforts to manage the park's resources.

6 Existing Informal Trails

Although not recognized as part of the park's trail system, there are currently an abundance of trails within the wooded slopes. These originate from within and outside of the park, and are extensive. City staff have mapped the informal trails, and have measured more than three miles of trail, ranging from cleared corridors, to more modest footpaths. Most of these informal trails are subtle, and not readily apparent to casual observation. However in traversing the hillsides, it is readily apparent that there are miles of informal trails that have developed over the years. While some of these may be older, many are still used, as during the field assessment, SEH staff encountered one child and one person walking their dog on these wooded paths. A recent wooden fort was observed where children had congregated. Footprints in the snow and discarded trash indicate that trail use is continuing and is perhaps more frequent than realized.

The majority of trails are small, and would be a foot or two in width with little disturbance, while others are several feet in width and are practically established paths. Almost all of them follow the contours, as there are few areas where the paths directly go up or down the hillside. A mountain bike path would likely be similar in many regards to these existing trails, in terms of width, extent, and how they traverse the hillsides along the contours; including incorporation of relatively shallow sloped turning areas to ease climbing up or down the hillside.

It is not possible to quantify the impacts from these existing trails, but they do provide a preview of what a mountain bike trail may look like, and may serve as preliminary routes to consider where there is already an alignment that can be utilized. Unfortunately, many of the informal trails are wider and steeper than the mountain bike trails that are proposed, and not all areas can be utilized for the proposed alignment.

Numerous studies have compared the impacts resulting from hiking and mountain bike trails, and have concluded that many of the concerns are shared, regarding erosion, compaction, disturbance to wildlife, and spread of invasive species[1][2][3]. The risks from mountain biking are slightly higher, but a well-traveled hiking trail is as likely to have as much, or even greater, environmental impacts as a well-designed bicycle route.

While the current discussion is based on the consideration of adding mountain biking trails within the park, some consideration may also be warranted to either promote or discourage unapproved hiking paths as well. Although not perceived, the damage from the existing trail system may exceed the damage from a proposed mountain bike trail, if properly designed and limited in extent.

---

[1] Pickering , Catherine Marina, et al. 2010. Comparing Hiking, Mountain Biking and Horse Riding Impacts on Vegetation and Soils in Australia and the United States of America, Journal of Environmental Management, vol 91.

[2] Chavez Deborah J., 1996. Mountain Biking: Issues and Actions for USDA Forest Service Managers. Research Paper PSW-RP-226-Web.

[3] Quinn, Michael and Chernoff, Greg. 2010. Mountain Biking: A Review of the Ecological Effects

Photo 7: An existing informal trail in the woods, which is well-used and residents keep the corridor maintained.

Photo 8: A steep sloped existing informal trail with significant erosion control concerns

7 Mitigation Opportunities and Challenges

Overall, impacts from the inclusion of mountain bike trails are anticipated, but quantification is dependent upon determining a route, selection of trail dimensions, and determining where it may be allowed or excluded. Under an aggressive approach, with extensive wide trails, impacts could be significant; with tree removal required, erosion likely, invasive species transport assured, and wildlife disturbance expected.

Using a sustainable or low impact approach, where trails widths are limited (such as single file, one-way routes), trees are more likely to be preserved, erosion is negligible, and transport of invasive species is discouraged, impacts are likely not significantly greater than what has already occurred with the informal hiking paths that have developed.

In consideration of potential impacts, the following have been identified as potential approaches to limit or mitigate for impacts:

- Establish a trail design that has the smallest footprint while achieving the desired goals
    - Consider low-impact designs, such as one-way and single file routes.
    - Establish routes that allow multiple distances, which can allow the options to spread the route out, or concentrate to a limited area
- Limit vegetation loss and damage
    - Select an alignment that avoids tree removal. If unavoidable, select for removal of trees that are less mature, or of lower quality species. For example, remove a smaller aspen tree and avoid encroachment on a mature oak tree.
    - Limit damage to tree limbs by pruning rather than breaking limbs
    - Consider transplanting herbaceous spring ephemerals if they are located along a trail route
- Avoid accessing areas with unique habitats or sensitive species
    - Buffer areas that are intended to be avoided
- Control erosion
    - Limit distances where trails cross contours and prevent the buildup of concentrated runoff. Vary routing so there are series of small hills and valleys, and slope trails so water can runoff and discourage formation of mud holes. Avoid flat ground where compaction and rutting can promote water collection and lead to mud holes, trail widening, bypass trail formation, and perpetuate erosion
    - Consider boardwalks over gullies and depressions, or elevate the trail to discourage accelerated runoff downslope.
    - Restrict seasonal use to avoid spring snowmelt and periods where muddy conditions are prevalent.
- Maintain invasive species control programs

    - Concentrate efforts of maintaining areas cleared of invasive species, and monitor for signs of spreading due to trails.
    - Install bike wash stations to reduce import of soils and weed seeds from off-site.
- Promote wildlife use
    - Increase plantings of native species, nectar species, and establish additional areas of prairie
    - Provide educational material on what individuals can do to promote bee habitat, plant and maintain nectar species, and support protection of pollinator species
    - Restrict or limit access to critical habitats for sensitive species
- Establish and enforce mountain bike user etiquette
    - Promote mountain bike users to be engaged in supporting volunteer programs to maintain the parks resources
- Locate, repair, and prevent future use of the highly eroded existing informal trails.

Figures

Lone Lake Park Property Boundary

Minnetonka Lake
Shady Oak Lake
Glen Lake
Ninemile Creek
Bryant Lake
Birch Island Lake
Armstead Lake
Indianhead Lake
HOPKINS
EDINA
EDEN PRAIRIE

Legend

Park Property Boundary

Hennepin County

City of Minnetonka

Project Location

0 0.25 0.5 Miles

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Project: MINNE 145810
Print Date: 4/30/2018

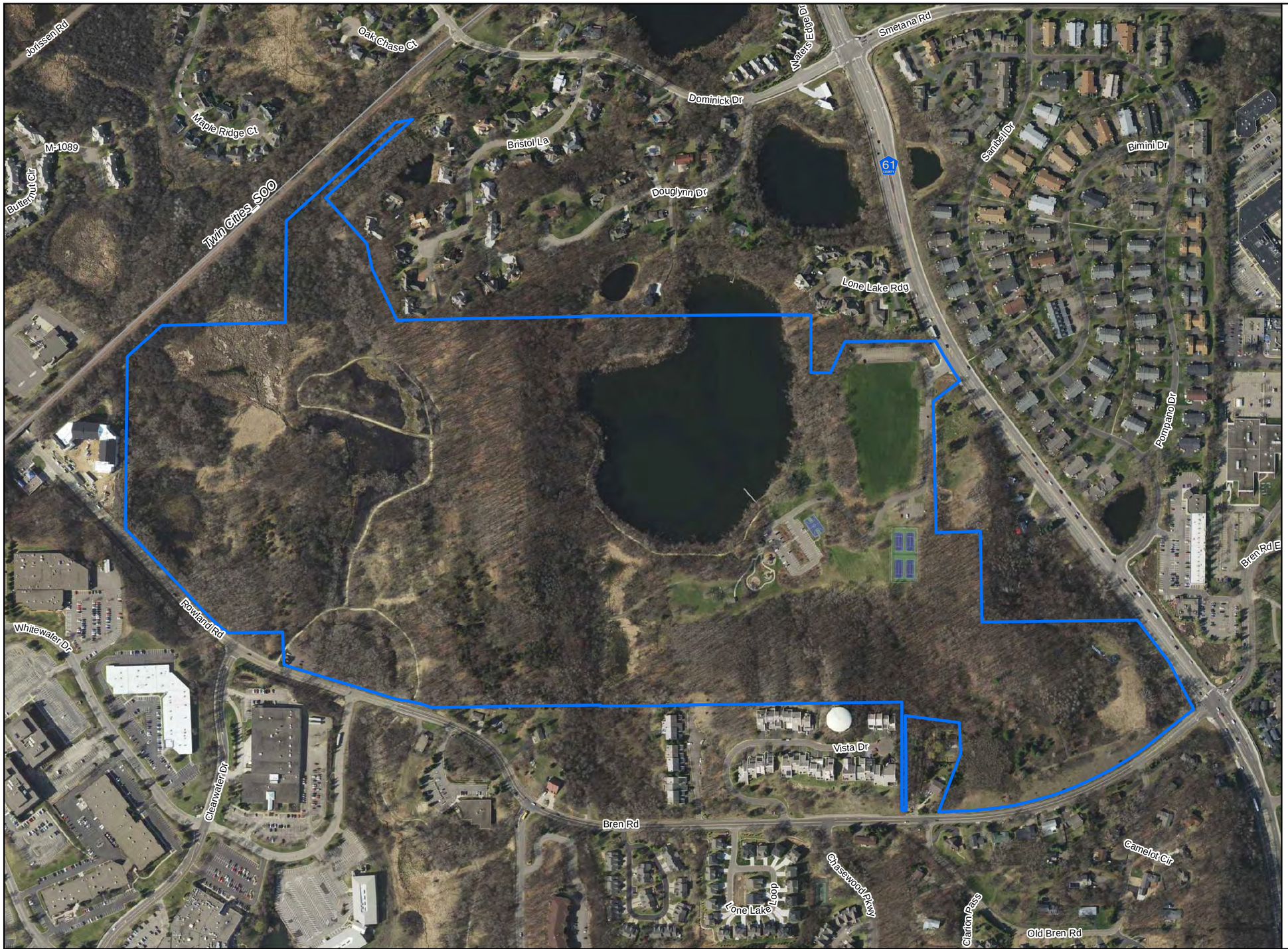
Map by: B. Tolcser
Projection: NAD83 UTM 15N
Source: MNDNR, SEHINC, City of Minnetonka
Background: USGS 24k Topographic

LONE LAKE PARK STUDY

Minnetonka, Minnesota

Site Location Map

Figure 1



Legend

Park Property Boundary

0 250 500 1,000 Feet

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Source: MNDNR, SEHINC, City of Minnetonka
Background: 2016 MNDNR

LONE LAKE PARK STUDY

Minnetonka, Minnesota

Aerial Photograph

Figure 2

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Legend

National Wetlands Inventory (2014)

- 1 - Seasonally Flooded Basin or Flat
- 3 - Shallow Marsh
- 4 - Deep Marsh
- 5 - Shallow Open Water
- 6 - Shrub Swamp
- 7 - Wooded Swamp

MNDNR Public Waters

- PWI Watercourses
- PWI Basins

0 250 500 1,000 Feet

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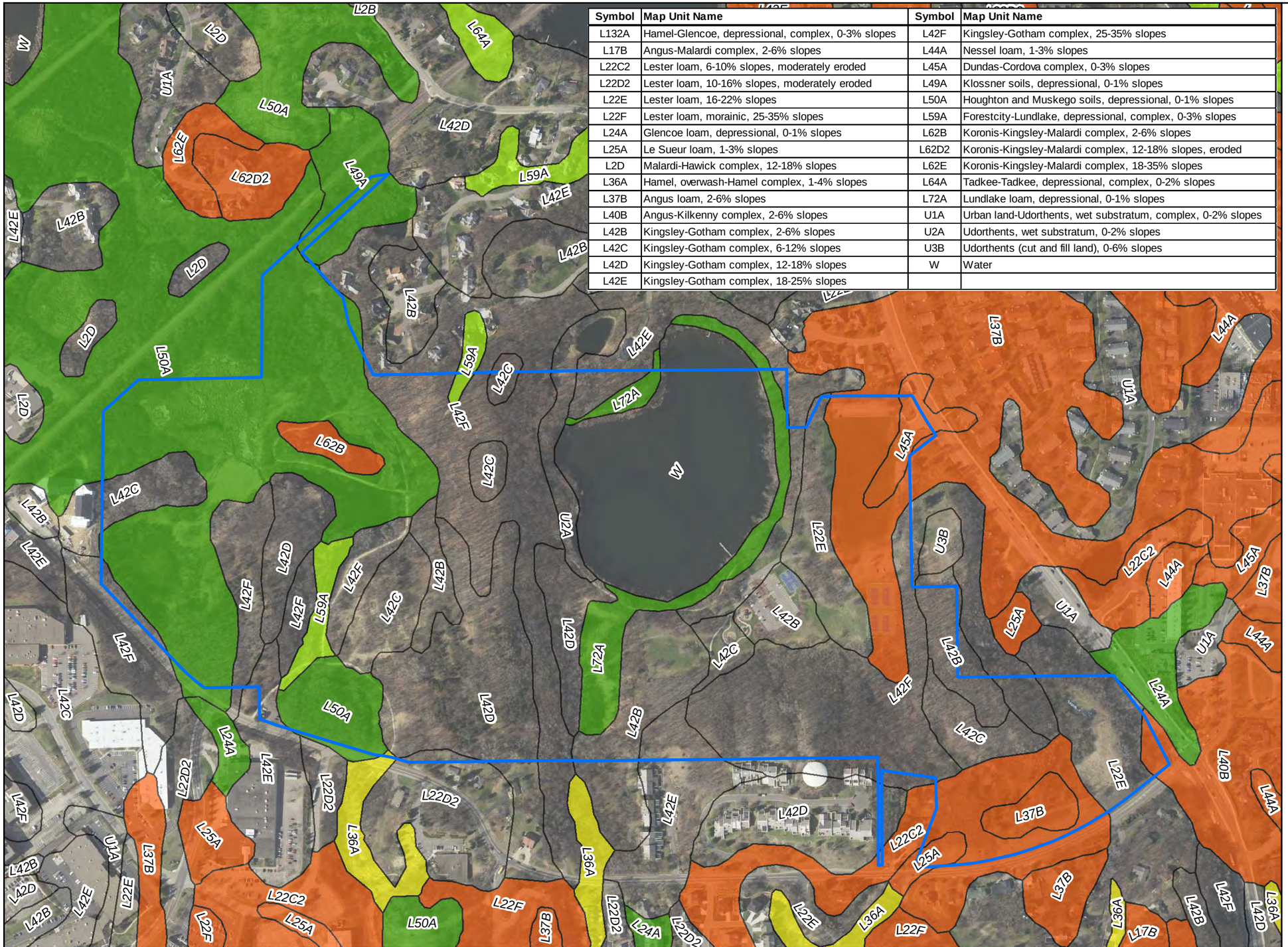
Projection: NAD83 UTM 15N
Source: MNDNR, SEHINC, City of Minnetonka
Background: 2016 MNDNR

LONE LAKE PARK STUDY

Minnetonka, Minnesota

Aquatic Resources

Figure 3



Symbol	Map Unit Name	Symbol	Map Unit Name
L132A	Hamel-Glencoe, depressional, complex, 0-3% slopes	L42F	Kingsley-Gotham complex, 25-35% slopes
L17B	Angus-Malardi complex, 2-6% slopes	L44A	Nessel loam, 1-3% slopes
L22C2	Lester loam, 6-10% slopes, moderately eroded	L45A	Dundas-Cordova complex, 0-3% slopes
L22D2	Lester loam, 10-16% slopes, moderately eroded	L49A	Klossner soils, depressional, 0-1% slopes
L22E	Lester loam, 16-22% slopes	L50A	Houghton and Muskego soils, depressional, 0-1% slopes
L22F	Lester loam, morainic, 25-35% slopes	L59A	Forestcity-Lundlake, depressional, complex, 0-3% slopes
L24A	Glencoe loam, depressional, 0-1% slopes	L62B	Koronis-Kingsley-Malardi complex, 2-6% slopes
L25A	Le Sueur loam, 1-3% slopes	L62D2	Koronis-Kingsley-Malardi complex, 12-18% slopes, eroded
L2D	Malardi-Hawick complex, 12-18% slopes	L62E	Koronis-Kingsley-Malardi complex, 18-35% slopes
L36A	Hamel, overwash-Hamel complex, 1-4% slopes	L64A	Tadkee-Tadkee, depressional, complex, 0-2% slopes
L37B	Angus loam, 2-6% slopes	L72A	Lundlake loam, depressional, 0-1% slopes
L40B	Angus-Kilkenny complex, 2-6% slopes	U1A	Urban land-Udorthents, wet substratum, complex, 0-2% slopes
L42B	Kingsley-Gotham complex, 2-6% slopes	U2A	Udorthents, wet substratum, 0-2% slopes
L42C	Kingsley-Gotham complex, 6-12% slopes	U3B	Udorthents (cut and fill land), 0-6% slopes
L42D	Kingsley-Gotham complex, 12-18% slopes	W	Water
L42E	Kingsley-Gotham complex, 18-25% slopes		

Legend

Soil Hydric Rating

- Hydric
- Predominantly Hydric
- Partial Hydric
- Predominantly Non-Hydric
- Non-Hydric

0 250 500 1,000 Feet

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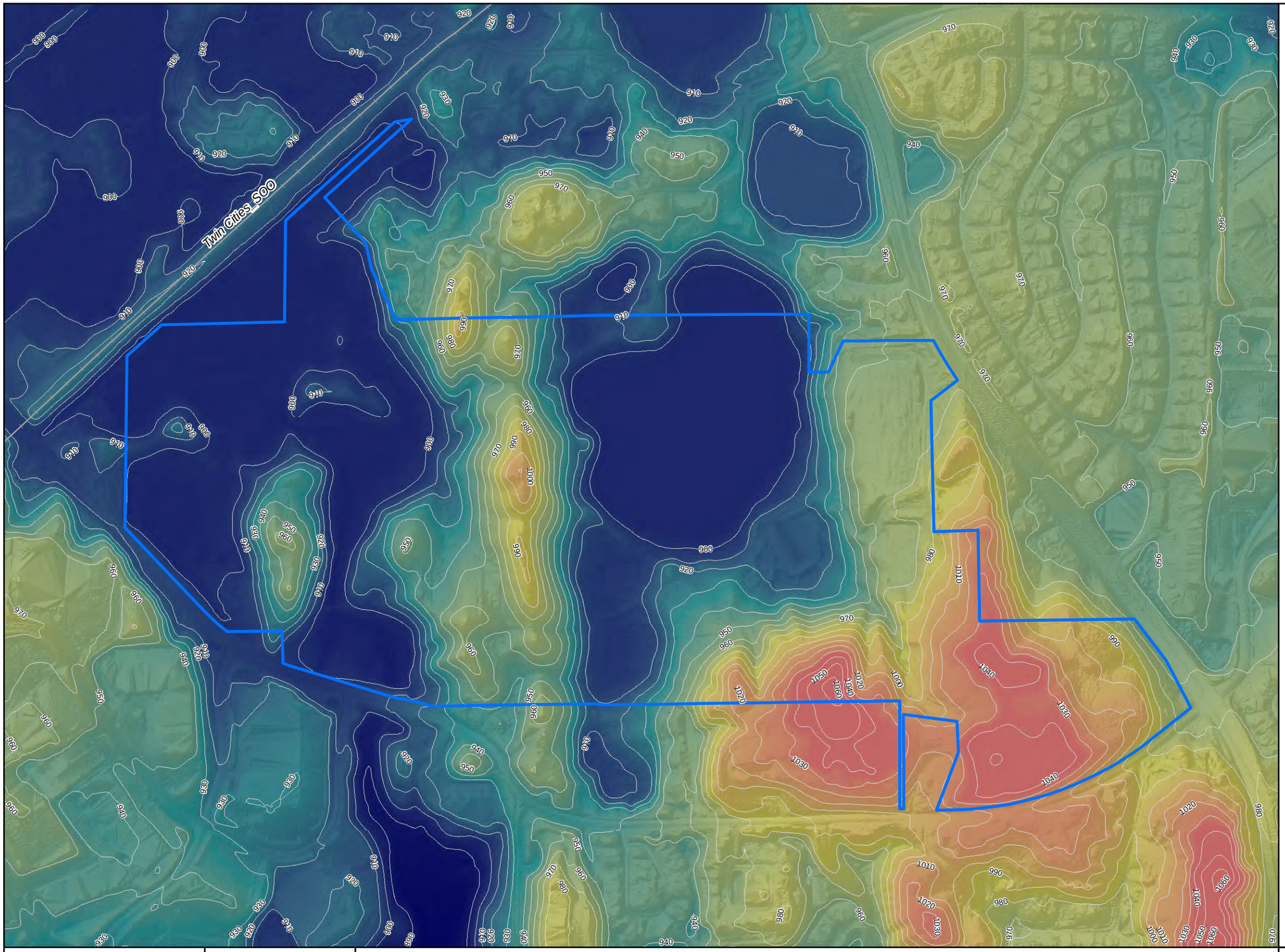
LONE LAKE PARK STUDY

Minnetonka, Minnesota

Soil Survey Map (SSURGO)

Figure 4



Legend

Park Property Boundary

Contour Lines (10')

Digital Elevation Model (ft)

High : 1,070'

Low : 880'

0 250 500 1,000 Feet

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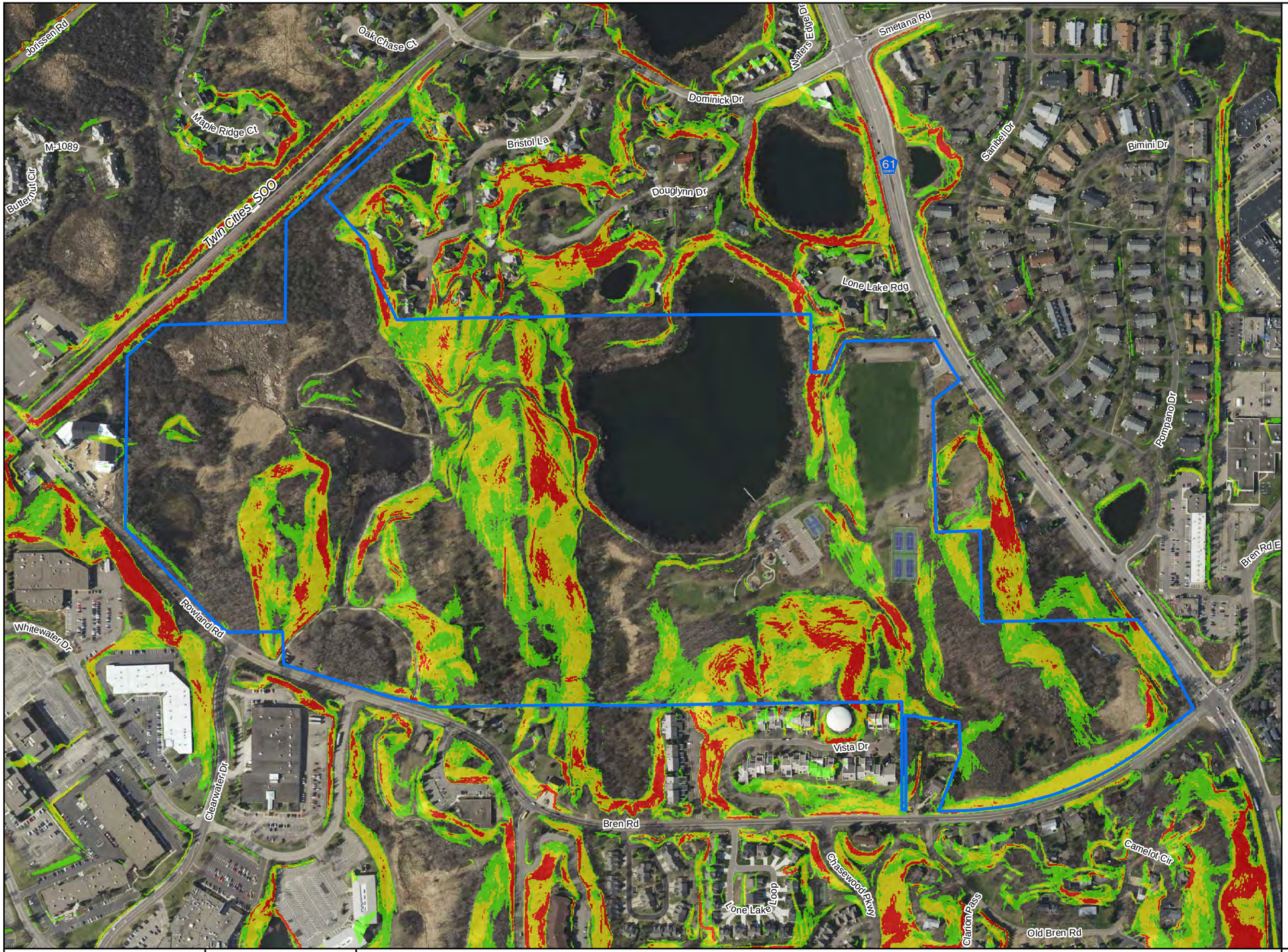
Background: 2016 MNDNR

LONE LAKE PARK STUDY

Minnetonka, Minnesota

Lidar Topography

Figure 5



Legend

Park Property Boundary

Site Slopes (No Width Req.)

- >45%
- 30-45%
- 20-30%

0 250 500 1,000 Feet

Path: S:\KO\M\Minne\145810\3-env-std\y-regs\GIS\fig06b_SteepSlopesGradient.mxd

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Projection: NAD83 UTM 15N
Source: MNDNR, SEHINC, City of Minnetonka
Background: 2016 MNDNR

LONE LAKE PARK STUDY

Minnetonka, Minnesota

Steep Slopes

Figure 6

Number	Code	Classification
13115	1.hh.CT.i10.cGL.	Long grasses and mixed trees with 4-10% impervious cover
13134	1.hh.CT.i50.cGS.	Short grasses and mixed trees with 26-50% impervious cover
13135	1.hh.CT.i50.cGL.	Long grasses and mixed trees with 26-50% impervious cover
13144	1.hh.CT.i75.cGS.	Short grasses and mixed trees with 51-75% impervious cover
14122	1.mv.BP.i99.cPV.	Pavement with 91-100% impervious cover
21114	2.tt.CC.pUS.cPC.	Coniferous trees on upland soils (nursery stock)
23111	2.ph.CT.pUS.cGS.	Short grasses with sparse tree cover on upland soils
23112	2.ph.CT.pUS.cGL.	Long grasses with sparse tree cover on upland soils
32112	3.de.UP.nOA.nOM.	Oak forest mesic subtype
42120	4.de.UP.nOW.	Oak woodland-brushland
42130	4.de.UP.nAT.	Altered/non-native deciduous woodland
61330	6.ge.WA.nAT.	Temporarily flooded altered/non-native dominated grassland
61530	6.ge.WC.nAT.	Seasonally flooded altered/non-native dominated emergent vegetation
61630	6.ge.WF.nAT.	Semipermanently flooded altered/non-native dominated vegetation
93300	9.ww.OW.	Palustrine open water

Legend

MLCCS Classifications (Outside Site)

0 250 500 1,000 Feet

Path: S:\KO\M\Minne\145810\3-env-stdy-regs\GIS\fig07_MLCCS.mxd

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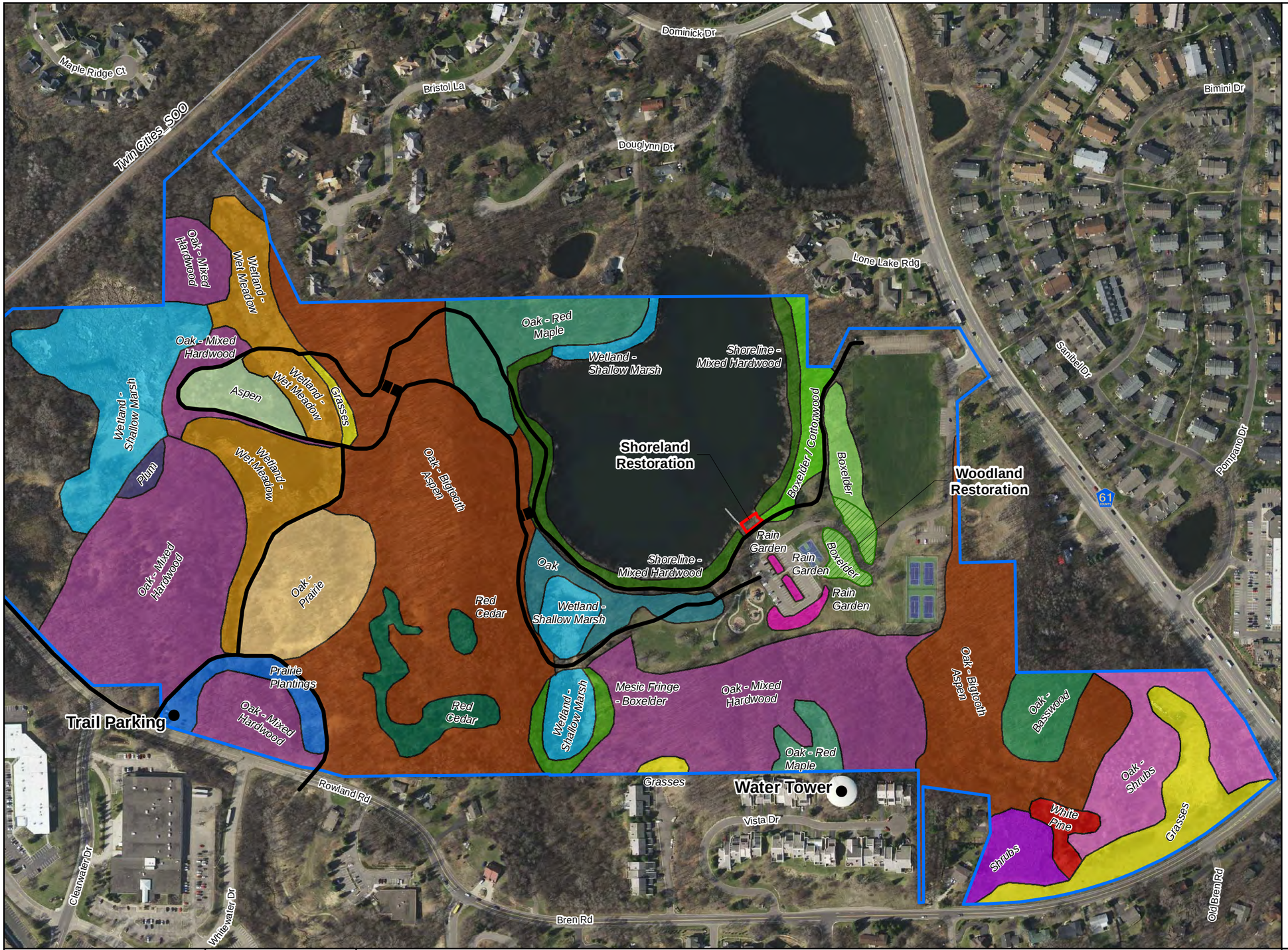
LONE LAKE PARK STUDY

Minnetonka, Minnesota

Minnesota Land Cover Classification System (MLCCS) Map

Figure 7



Legend

- Park Property Boundary
- Stairs
- Existing Trails
- Shoreland Restoration
- Woodland Restoration

Observed Plant Communities

- Aspen
- Boxelder
- Boxelder / Cottonwood
- Grasses
- Mesic Fringe - Boxelder
- Oak
- Oak - Basswood
- Oak - Bigtooth Aspen
- Oak - Mixed Hardwood
- Oak - Prairie
- Oak - Red Maple
- Oak - Shrubs
- Plum
- Prairie Plantings
- Rain Garden
- Red Cedar
- Shoreline - Mixed Hardwood
- Shrubs
- Wetland - Shallow Marsh
- Wetland - Wet Meadow
- White Pine

0 250 500 750 Feet

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Project: MINNE 145810
Print Date: 5/9/2018

Map by: B. Tolcser
Projection: NAD83 UTM 15N
Source: MNDNR, SEHINC, City of Minnetonka
Background: 2016 MNDNR

LONE LAKE PARK STUDY

Minnetonka, Minnesota

Land Coverage & Notable Features

Figure 8

Appendix A

Site Photographs

Site Photographs of Lone Lake Park from March 29 and May 1, 2018

Trailhead of informal trail near the tennis court

Oak-dominated woods on east side of park

Oak-dominated woods on east side of park

Oak-dominated woods on east side of park

Exposed rock and cobble at top of hill indicate glacial till soils

Informal trail through oak trees on east side of park

Planted white pine and sumac shrubs on east side of park

View west across ravine near water tower

Drain tile inlet and rock check in water tower ravine

Well worm footpath on water tower ridge

Common garter snake emerging hibernation in spring

Steep slopes on water tower ridge, view north towards playground

Informal trail through south side of the main north-south ridge west of Lone Lake

Deer exclosure on west side of park

Wet meadow associated with Ninemile Creek

Emerging marsh marigold in wet meadow

Oak-dominated woods on western shore of Lone Lake

West Branch of Ninemile Creek

Crushed limestone trail along western bank of Lone Lake

View of western shore of Lone Lake

Lone Lake, view from parking lot

Shoreland plantings on south shore of Lone Lake

Rain garden in playground parking lot

Vertical trail from water tower to playground, with sever erosion.

Wood anemone in bloom on eastern side of the park in spring-ephemeral rich area

Interrupted fern fiddleheads emerging in spring throughout the park

Appendix B

Long Eared Bat Fact Sheet

Northern Long-Eared Bat

Myotis septentrionalis

The northern long-eared bat is federally listed as a threatened species under the Endangered Species Act. ***Endangered*** species are animals and plants that are in danger of becoming extinct. ***Threatened*** species are animals and plants that are likely to become endangered in the foreseeable future. Identifying, protecting and restoring endangered and threatened species is the primary objective of the U.S. Fish and Wildlife Service's Endangered Species Program.

Photo by Steve Taylor, University of Illinois

This northern long-eared bat, observed during an Illinois mine survey, shows visible symptoms of white-nose syndrome.

What is the northern long-eared bat?

Appearance: The northern long-eared bat is a medium-sized bat with a body length of 3 to 3.7 inches and a wingspan of 9 to 10 inches. Their fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*.

Winter Habitat: Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. Within hibernacula, surveyors find them hibernating most often in small crevices or cracks, often with only the nose and ears visible.

Summer Habitat: During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. They rarely roost in human structures like barns and sheds.

Reproduction: Breeding begins in late summer or early fall when males begin to swarm near hibernacula. After copulation, females store sperm during hibernation until spring. In spring, females emerge from their hibernacula, ovulate and the stored sperm fertilizes an egg. This strategy is called delayed fertilization.

After fertilization, pregnant bats migrate to summer areas where they roost in small colonies and give birth to a single pup. Maternity colonies of females and young generally have 30 to 60 bats at the beginning of the summer, although larger maternity colonies have also been observed. Numbers of bats in roosts typically decrease from the time of pregnancy to post-lactation. Most bats within a maternity colony give birth around the same time, which may occur from late May or early June to late July, depending where the colony is located within the species' range. Young bats start flying by 18 to 21 days after birth. Maximum lifespan for the northern long-eared bat is estimated to be up to 18.5 years.

Feeding Habits: Like most bats, northern long-eared bats emerge at dusk to feed. They primarily fly through the understory of forested areas feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation or by gleaning motionless insects from vegetation.

Range: The northern long-eared bat's range includes much of the eastern and north central United States, and all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and eastern British Columbia. The species' range includes 37 States and the District of Columbia: Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming.

Why is the northern long-eared bat in trouble?

White-nose Syndrome: No other threat is as severe and immediate as

this. If this disease had not emerged, it is unlikely that northern long-eared bat populations would be experiencing such dramatic declines. Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly from the Northeast to the Midwest and Southeast; an area that includes the core of the northern long-eared bat's range, where it was most common before this disease. Numbers of northern long-eared bats (from hibernacula counts) have declined by up to 99 percent in the Northeast. Although there is uncertainty about the rate that white-nose syndrome will spread throughout the species' range, it is expected to continue to spread throughout the United States in the foreseeable future.

Other Sources of Mortality:
Although no significant population declines have been observed due to the sources of mortality listed below, they may now be important factors affecting this bat's viability until we find ways to address WNS.

Impacts to Hibernacula: Gates or other structures intended to exclude people from caves and mines not only restrict bat flight and movement, but also change airflow and microclimates. A change of even a few degrees can make a cave unsuitable for hibernating bats. Also, cave-dwelling bats are vulnerable to human disturbance while hibernating. Arousal during hibernation causes bats to use up their energy stores, which may lead to bats not surviving through winter.

Loss or Degradation of Summer Habitat: Highway construction, commercial development, surface mining, and wind facility construction permanently remove habitat and are activities prevalent in many areas of this bat's range. Many forest management activities benefit bats by keeping areas forested rather than converted to other uses. But, depending on type and timing, some forest management activities can cause mortality and temporarily remove or degrade roosting and foraging habitat.

Wind Farm Operation: Wind turbines kill bats, and, depending on the species, in very large numbers. Mortality from windmills has been documented for northern long-eared bats, although a small number have been found to date. However, there are many wind projects within a large portion of the bat's range and many more are planned.

What Is Being Done to Help the Northern Long-Eared Bat?

Disease Management: Actions have been taken to try to reduce or slow the spread of white-nose syndrome through human transmission of the fungus into caves (e.g. cave and mine closures and advisories; national decontamination protocols). A national plan was prepared by the Service and other state and federal agencies that details actions needed to investigate and manage white-nose syndrome. Many state and federal agencies, universities and non-governmental organizations are researching this disease to try to control its spread and address its affect. See www.whitenosesyndrome.org/ for more.

Addressing Wind Turbine Mortality: The Service and others are working to minimize bat mortality from wind turbines on several fronts. We fund and conduct research to determine why bats are susceptible to turbines, how to operate turbines to minimize mortality and where important bird and bat migration routes are located. The Service, state natural resource agencies, and the wind energy industry are developing a Midwest Wind Energy Habitat Conservation Plan, which will provide wind farms a mechanism to continue operating legally while minimizing and mitigating listed bat mortality.

Listing: The northern long-eared bat is listed as a threatened species under the federal Endangered Species Act. Listing a species affords it the protections of the Act and also increases the priority of the species for funds, grants, and recovery opportunities.

Hibernacula Protection: Many federal and state natural resource agencies and conservation organizations have protected caves and mines that are important hibernacula for cave-dwelling bats.

What Can I Do?

Do Not Disturb Hibernating Bats: To protect bats and their habitats, comply with all cave and mine closures, advisories, and regulations. In areas without a cave and mine closure policy, follow approved decontamination protocols (see http://whitenosesyndrome.org/topics/decontamination). Under no circumstances should clothing, footwear, or equipment that was used in a white-nose syndrome affected state or region be used in unaffected states or regions.

Leave Dead and Dying Trees Standing: Like most eastern bats, the northern long-eared bat roosts in trees during summer. Where possible and not a safety hazard, leave dead or dying trees on your property. Northern long-eared bats and many other animals use these trees.

Install a Bat Box: Dead and dying trees are usually not left standing, so trees suitable for roosting may be in short supply and bat boxes may provide additional roost sites. Bat boxes are especially needed from April to August when females look for safe and quiet places to give birth and raise their pups.

Support Sustainability: Support efforts in your community, county and state to ensure that sustainability is a development goal. Only through sustainable living will we provide rare and declining species, like the northern long-eared bat, the habitat and resources they need to survive alongside us.

Spread the Word: Understanding the important ecological role that bats play is a key to conserving the northern long-eared and other bats. Helping people learn more about the northern long-eared bat and other endangered species can lead to more effective recovery efforts. For more information, visit www.fws.gov/midwest/nleb and www.whitenosesyndrome.org

Join and Volunteer: Join a conservation group; many have local chapters. Volunteer at a local nature center, zoo, or national wildlife refuge. Many state natural resource agencies benefit greatly from citizen involvement in monitoring wildlife. Check your state agency websites and get involved in citizen science efforts in your area.

Appendix C

Rusty Patched Bumble Bee Fact Sheet

U.S. Fish & Wildlife Service

Rusty Patched Bumble Bee
Bombus affinis

The U.S. Fish and Wildlife Service listed the rusty patched bumble bee as endangered under the Endangered Species Act. Endangered species are animals and plants that are in danger of becoming extinct. Identifying, protecting and recovering endangered species is a primary objective of the U.S. Fish and Wildlife Service's endangered species program.

What is a rusty patched bumble bee?

Appearance: Rusty patched bumble bees live in colonies that include a single queen and female workers. The colony produces males and new queens in late summer. Queens are the largest bees in the colony, and workers are the smallest. All rusty patched bumble bees have entirely black heads, but only workers and males have a rusty reddish patch centrally located on the back.

Habitat: Rusty patched bumble bees once occupied grasslands and tallgrass prairies of the Upper Midwest and Northeast, but most grasslands and prairies have been lost, degraded, or fragmented by conversion to other uses. Bumble bees need areas that provide nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil).

Illustrations of a rusty patched bumble bee queen (left), worker (center), and male (right) by Elaine Evans, The Xerces Society.

Photo courtesy of Christy Stewart

Reproduction: Rusty patched bumble bee colonies have an annual cycle. In spring, solitary queens emerge and find nest sites, collect nectar and pollen from flowers and begin laying eggs, which are fertilized by sperm stored since mating the previous fall. Workers hatch from these first eggs and colonies grow as workers collect food, defend the colony, and care for young. Queens remain within the nests and continue laying eggs. In late summer, new queens and males also hatch from eggs. Males disperse to mate with new queens from other colonies. In fall, founding queens, workers and males die. Only new queens go into diapause (a form of hibernation) over winter - and the cycle begins again in spring.

Feeding Habits: Bumble bees gather pollen and nectar from a variety of flowering plants. The rusty patched emerges early in spring and is one of the last species to go into hibernation.

Why conserve rusty patched bumble bees?

As pollinators, rusty patched bumble bees contribute to our food security and the healthy functioning of our ecosystems. Bumble bees are keystone species in most ecosystems, necessary not only for native wildflower reproduction, but also for creating seeds and fruits that feed wildlife as diverse as songbirds and grizzly bears.

Bumble bees are among the most important pollinators of crops such as blueberries, cranberries, and clover and almost the only insect pollinators of tomatoes. Bumble bees are more effective pollinators than honey bees for some crops because of their ability to "buzz pollinate." The economic value of pollination services provided by native insects (mostly bees) is estimated at $3 billion per year in the United States.

It needs a constant supply and diversity of flowers blooming throughout the colony's long life, April through September.

Range: Historically, the rusty patched bumble bee was broadly distributed across the eastern United States and Upper Midwest, from Maine in the U.S. and southern Quebec and Ontario in Canada, south to the northeast corner of Georgia, reaching west to the eastern edges of North and South Dakota. Its range included 28 states, the District of Columbia and 2 provinces in Canada. Since 2000, this bumble bee has been reported from only 13 states and 1 province: Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Minnesota, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin – and Ontario, Canada.

Why is the rusty patched bumble bee declining?

Habitat loss and degradation: Most prairies and grasslands of the Upper Midwest and Northeast have been converted to monoculture farms or developed areas, such as cities and roads. Grasslands that remain tend to be small and isolated.

Intensive farming: Increases in farm size and technology advances improved the operating efficiency of farms but have led to practices that harm bumble bees: increased use of pesticides, loss of crop diversity resulting in flowering crops being available for only a short time, loss of hedgerows with flowering plants, and loss of legume pastures.

Disease: Pathogens and parasites may pose a threat, although their prevalence and effects in North American bumble bees are not well understood.

Pesticides: The rusty patched bumble bee may be vulnerable to pesticides. Pesticides are used widely on farms and in cities and have both lethal and sublethal toxic effects. Bumble bees can absorb toxins directly through their exoskeleton and through contaminated nectar and pollen. Rusty patched bumble bees nest in the ground and may be susceptible to pesticides that persist in agricultural soils, lawns and turf.

Global climate change: Climate changes that may harm bumble bees include increased temperature and precipitation extremes, increased drought, early snow melt and late frost events. These changes may lead to more exposure to or susceptibility to disease, fewer flowering plants, fewer places for queens to hibernate and nest, less time for foraging due to high temperatures, and asynchronous flowering plant and bumble bee spring emergence.

What is being done to conserve rusty patched bumble bees?

U.S. Fish and Wildlife Service: Several Service programs work to assess, protect, and restore pollinators and their habitats. Also, the Service works with partners to recover endangered and threatened pollinators and pollinator-dependent plants. Concern about pollinator declines prompted formation of the North American Pollinator Protection Campaign, a collaboration of people dedicated to pollinator conservation and education. The Service has a Memorandum of Understanding with the Pollinator Partnership to work together on those goals. The Service is a natural collaborator because our mission is to work with others to conserve, fish, wildlife, and plants and their habitats.

Other Efforts: Trusts, conservancies, restoration groups and partnerships are supporting pollinator initiatives and incorporating native plants that support bees and other pollinators into their current activities. For example, the USDA Natural Resource Conservation Service is working with landowners in Michigan, Minnesota, Montana, North Dakota, South Dakota, and Wisconsin to make bee-friendly conservation improvements to their land. Improvements include the practices of planting cover crops, wildflowers, or native grasses and improved management on grazing lands.

Research: Researchers are studying and monitoring the impacts of GMO crops and certain pesticides on pollinators. Efforts by citizen scientists and researchers to determine the status of declining bee species are underway throughout the United States.

What can I do to help conserve the rusty patched bumble bee?

Garden: Grow a garden or add a flowering tree or shrub to your yard. Even small areas or containers on patios can provide nectar and pollen for native bees.

Native plants: Use native plants in your yard such as lupines, asters, bee balm, native prairie plants and spring ephemerals. Don't forget spring blooming shrubs like ninebark and pussy willow! Avoid invasive non-native plants and remove them if they invade your yard. For more information on attracting native pollinators, visit www.fws.gov/pollinators/pdfs/PollinatorBookletFinalrevWeb.pdf.

Natural landscapes: Provide natural areas - many bumble bees build nests in undisturbed soil, abandoned rodent burrows or grasss clumps. Keep some unmowed, brushy areas and tolerate bumble bee nests if you find them. Reduce tilling soil and mowing where bumble bees might nest. Support natural areas in your community, county and state.

Minimize: Limit the use of pesticides and chemical fertilizer whenever possible or avoid them entirely. Pesticides cause lethal and sublethal effects to bees and other pollinators.

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