Natural Resource Management Plan

North Shore Trail Nature Area

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EXCUTIVE SUMMARY

Background

The North Shore Nature Areas is a 19.66-acre natural area located along Forest Lake's 3rd Lake or East basin within the city of Forest Lake, Washington County, MN. It is adjacent to the DNR's 3rd lake boat launch and is accessible off North Shore Trail. It represents one of the last natural areas along the highly developed Forest Lake. The Nature Area retains high quality floristic characteristics with a mature forest canopy and few invasive species in the understory. It is open to the public for day use recreation and offers access to both Forest Lake's 3rd basin and the channel that connects Forest and Cranberry Lakes. The property was purchased in 2022 as conservation, preservation, and restoration property.

Natural Resource Management Plan Recommendations

The Natural Resource Management Plan (NRMP) contains two distinct, but intertwined recommendations:

1. Protect and enhance the Nature Area for ecological biodiversity and health.
2. Establish and enhance public access opportunities for light recreation.

The North Shore Nature Area is one of the last natural areas along Forest Lake with floristic characteristics that approximate early / pre-development of the area. Actions should be taken to preserve and enhance this area for future generations to enjoy. This would include invasive species removal and management of the area for ecosystem resiliency. The latter includes the replacement of Ash tress that have been impacted by Emerald Ash Borer and enhancement of the diversity of the undestroyed component of the upland forest.

Access and recreation of the Natural Area could be improved with the establishment of a trail system with interpretive signs and lake / channel access points. An aspect of this would be the removal of any hazard trees within close proximity of the trails or gathering areas and extending the trail system to nearby resources – such as connecting to the DNR's 3rd lake launch. A summary of the steps in realizing these recommendations can be found in the Five-Year Work Plan detailed in this document. The Green River Green grant that was awarded in 2023 would be the funding mechanism for much of this work.

Five-Year Work Plan

A five-year work plan was developed to provide guidelines toward achieving the target communities shown in Table 5. This five-year work plan was developed to focus on the natural resource management and restoration priorities for protecting and improving the North Shore Trail Nature Area. Although a detailed work plan appears later in this document, a summary work plan table is also included in this Executive Summary to provide an up-front look at the restoration and management potential for the North Shore Trail Nature Area Property.

Table 1. Summary of five year work plan

Time period	Activity
Years 1-2	Hazard Tree Removal
Years 1-2	Debris Pile Removal – Burn Pile and Yard Waste pile
Years 1-2	Hiking Trail development

Years 1-2	Snowmobile Trail development
On going	Annual woody invasive removal
Years 3-5	Install interpretive signs
Years 3-5	Replanting the upland understory
Years 3-5	Tree replacement in the wetland forest
Years 3-5	Repair/replace pier as is needed

PLAN PURPOSE

The purpose of this manual is to establish a plan for natural resource management for the acquired property known as the North Shore Trail Nature Area in accordance with the guidelines provided in section 5920 of the Comfort Lake-Forest Lake Watershed District's (CLFLWD) 2020 Watershed Management Plan (WMP).

> *This category also encompasses the District's management of its fee and easement interests. At the time the District acquires such an interest, it will prepare a plan for natural resource management as well as general property management for public safety and risk protection purposes. Resource management may involve very little action or may involve demolition of existing structures, vegetation management or other actions to maintain or enhance both the financial and the natural resource value of the property. Spending for any action constituting a capital project would occur only pursuant to the process requirements of Minnesota Statutes chapter 103B and other applicable requirements (WMP 66b).*

Terms of this natural resource management plan reflect the District's consideration of the factors listed above. In the course of management operations, District representatives may deviate from these guidelines on the basis of judgments concerning expected hydrologic loads, flora and fauna considerations, hydraulic response and other relevant factors. The District will manage the Site in the best interest of affected watershed residents and businesses. However, this manual is for internal use only and does not create any right in any third party with respect to the manner in which the Site is managed. By adopting this manual, the District is not assuming any duty not otherwise imposed by law and reserves all immunities and other rights and protections it is afforded under law.

BACKGROUND AND SIGNIFICANCE OF THE SITE

Site Description & Land Use

The North Shore Nature Areas is a 19.66-acre natural area located along Forest Lake's 3rd Lake or East basin. It is adjacent to the DNR's 3rd lake boat launch and is accessible from North Shore Trail that forms much of the properties eastern boundary. Housing developments lie to the northwest and east of the property. The channel connecting Cranberry Lake and Forest Lake forms the properties western boundary. Access to Forest Lake is via this channel.

The property consists of two parcels (PID's 1203221330001 & 1203221330016) which represent one of the last natural areas along the highly developed shoreline of Forest Lake. There is no evidence of previous buildings or structures on the landscape (see Appendix A for historic images of the property) except for a City of Forest Lake Sewer pipeline that passes through the upland of the property. A shallow well (loosely capped) is present on the property that is believed to have serviced a camper or recreational camping use.

The previous owners maintained the property with annual moving and brush removal efforts. As such, the Nature Area retains high floristic quality characteristics with a mature forest canopy and few invasive species in the understory. Approximately 16 acres consists of wetlands and shallow open water, with the remainder consisting of upland mesic hardwood forest.

The North Shore Trail Nature Area is open to the public for day use recreation and offers access to Forest Lake's 3rd basin and the channel that connects Forest and Cranberry Lakes. The property was acquired with a Conservation Partners Legacy grant in January 2022 for preservation, restoration, and public access.

Topography, Geology, & Soils

Topography

The Site has relatively minor topographic relief, ranging in elevation from a maximum elevation of 913 feet near its eastern boundary with North Shore Trail to a minimum elevation of 903 feet at the wetland edge of Forest Lake. Much of the property is at or near the 903 foot elevation and is considered wetland habitat.

Geology

This region is characterized by buried sand aquifers and relatively extensive surficial sand plains, part of a thick layer of sediment deposited by glaciers overlying the bedrock. It is underlain by sedimentary bedrock with good aquifer properties.

The southeastern third of Minnesota has good bedrock aquifers comprising thick, laterally extensive sequences of sandstone, siltstone, and limestone and dolostone of sedimentary origin. Groundwater occurs in granular pore spaces, partings, joints, fractures, and dissolution features. Conditions vary locally, but these aquifers are generally capable of yielding sufficient quantities of groundwater for most purposes. No seeps, springs, or karst areas are known on this property.

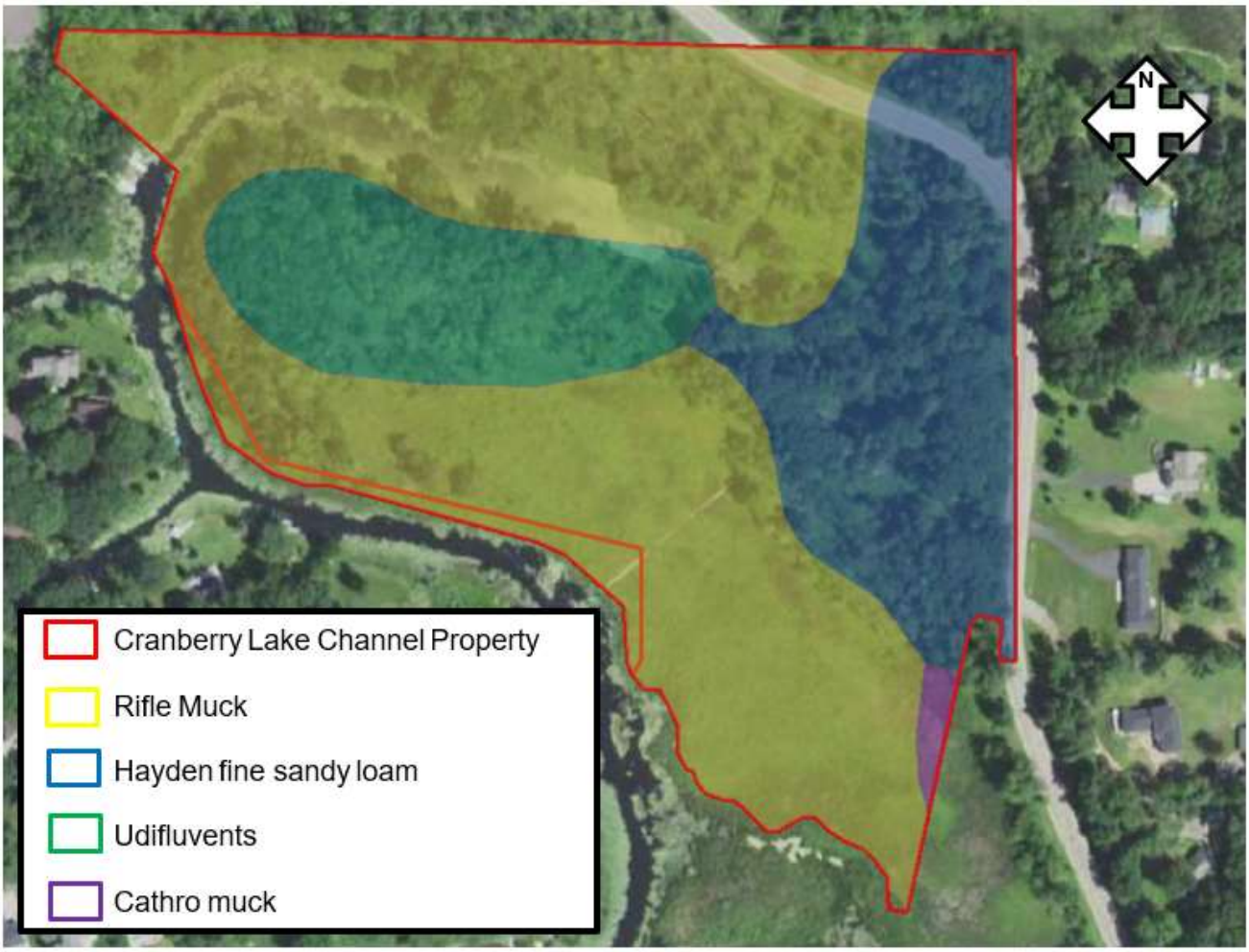
Soils

Soils on the property are mapped as either hydric or semi-hydric (wetland soils) or well-drained (upland sandy soils, Figure B). Rifle Muck and Udifluvents are the dominant soil types within the wetland areas (Table 1). Rifle Mucks are composed of very deep, poorly drained, muck/peat soils that are associated with the breakdown of herbaceous vegetation. The decomposition of vegetation from historic wetland likely resulted in the formation of the muck/peat soils that presently exist. The upland soils, in the eastern part of the property near North Shore Trail, are comprised of Hayden series sandy loams and are considered relatively well drained and capable of supporting a diverse assemblage of vegetation.

Table 2. Soils within property

Soil Type	Acres in Property	Percentage of Property
Rifle Muck	~12.0 acres	61%
Hayden fine sandy loam, 2 to 6 percent slopes	~4.5 acres	23%
Udifluvents	~3.0 acres	15%
Cathro muck	~0.15 acres	<1%

Figure A. Soils map of the North Shore Trail Nature Area.



Water Resources

The following section provides a hydrologic context for the Site and describes the existing water resources.

Watershed & Hydrology

The Site is located in the Lower St. Croix River Major Watershed (ID #37) and the Sunrise River Minor Watershed (ID #37052). The Site is also located within the Forest Lake Management District and has a local drainage area of XXX acres. The property contains extensive wetland resources as well as frontage on both Forest Lake's Third Basin and the channel connecting Cranberry and Forest Lakes. As such, the property drains directly to the Third basin of Forest Lake. All overland flow is interrupted and filtered by

an extensive riparian buffer and lake fringe wetland habitat.

Wetlands

The Site contains over 16 acres of wetland habitat (Figure B). National Wetland Inventory indicated several wetland types and complexes within the Site including lowland hardwood forest (9.8 acres), seasonally flooded emergent lake fringe wetland (5.6 acres), and a lacustrine shallow marsh-like open-water habitat (1.4 acres) in and along the channel connecting Cranberry Lake (Table 2). Forest Lake and the Cranberry Lake connecting channel are listed as MN DNR Public Waters.

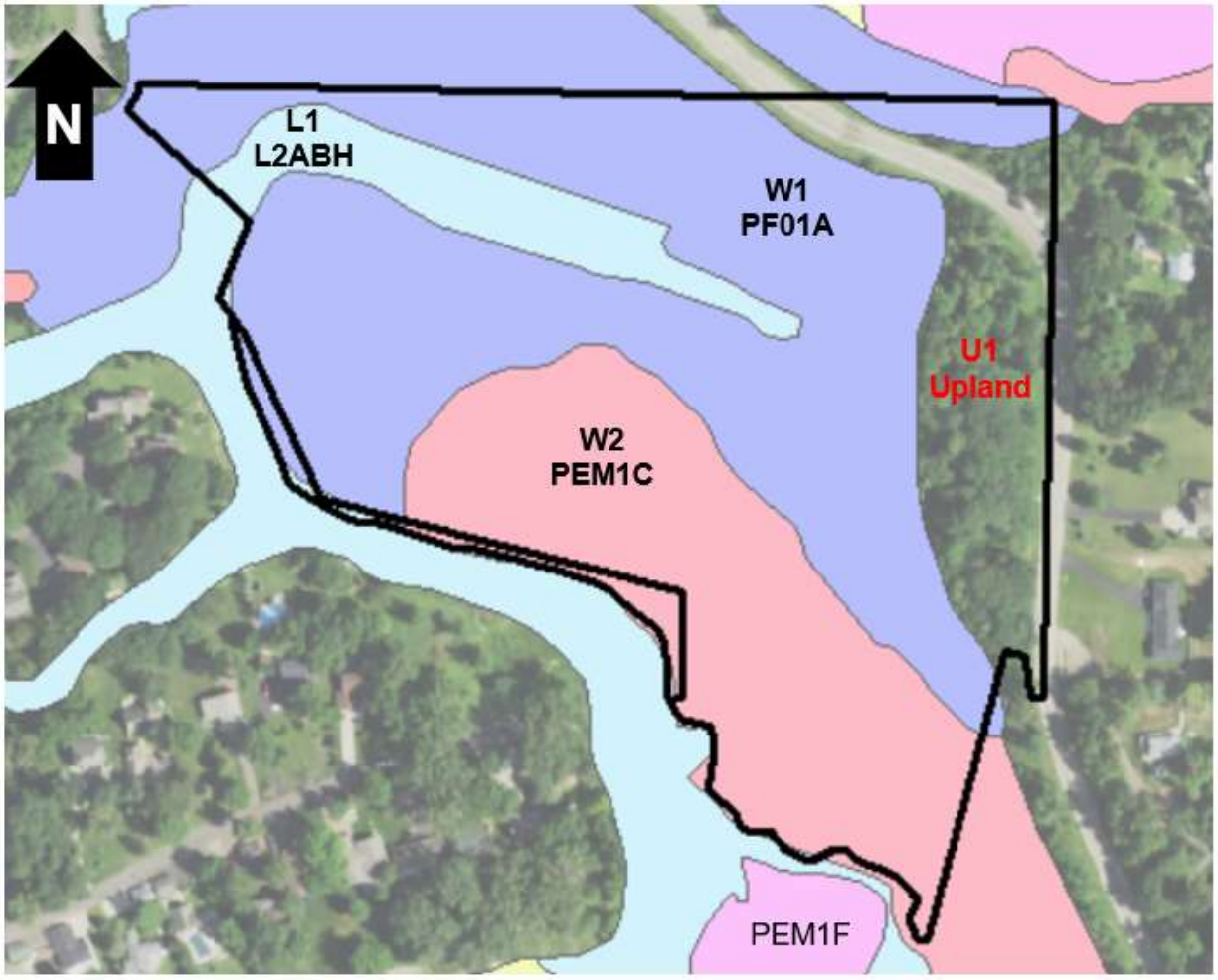


Figure B. Management Unit / Wetland Type Map. PF01A = Palustrine, Forested, Broad-Leaved Deciduous, Temporary Flooded. PEM1C = Palustrine, Emergent, Persistent, Seasonally Flooded. L2ABH = Lacustrine, Littoral, Aquatic Bed, Permanently Flooded. PEM1F= Palustrine, Emergent, Persistent, Semipermanent Flooded (not within property boundaries).

Table 3. Wetland types within or near the Site

Cowardin	Eggers & Reed	Circular 39
PFO1A	Freshwater Forested/Shrub Wetland	Type 7: Hardwood Wetland
PEM1C	Shallow Marsh	Type 2: Inland Fresh Meadow
L2ABH	Shallow, Open Water	Type 5: Inland Open Water
PEM1F	Deep Marsh	Type 3: Inland Shallow Marsh

Upland Resources

The 2.9-acre upland area (Figure XX) is a mix of oak, basswood, and maple, with other species characteristic of central or southern mesic hardwood forest. There are indications of recent restoration activity: the canopy is relatively open, there is a lack of a shrub layer, lack of woody invasive species, and large number of savannah grasses such as bottlebrush grass. The understory consists primarily of American elm and ironwood. There is a lack of trees in the stem or sapling stage, and evidence of heavy deer activity, indicating that deer browse may be a future challenge. There are areas of debris – leaf litter and a burn pile of branches and logs. This disturbed area is infested with several common invasive plant species; primarily Creeping Charlie and Reed Canary Grass.

The previous restoration activities at this site have created conditions that allow for this site to be pushed in one of two directions, both of which are suitable for the historical landcover of this area. The canopy gaps and presence of savannah vegetation, as well as a lack of a shrub layer, have created conditions suitable for transition to an oak savannah plant community. Absent the introduction of planned disturbances such as mowing or prescribed fire, this area will continue to develop as a mesic hardwoods forest type. The decision between these two types should be made with consideration of the cost of each management scenario, and future assessment of existing vegetation throughout the year.

Regardless of the future desired plant community, future stand conditions should consist of a mixed-age forest that maximizes the biodiversity of the small acreage, while providing robust educational opportunities.

Ecological Description & Inventory

Based on the MN DNR's ecological classification system, the Site is located within the Anoka Sand Plains Subsection of the Minnesota and NE Iowa Morainal Section, within the Eastern Broadleaf Forest Province of Minnesota. The following section describes the common plants observed, vegetation communities within the Site, and wildlife known or likely to utilize the Site.

The property was surveyed June 12, 2023 by CLFLWD staff. The following common native and invasive species were noted. A complete list of plants identified can be found in Appendix E.

Table 4. Common plant species found at the North Shore Trail Nature Area

Common Plant List			
Upland			
Bitternut hickory	hackberry	Wood rush	*Smooth brome*
Sugar maple	Red oak	Pennsylvania sedge	Poke milkweed
Basswood	White oak	Virginia creeper	Wood fern
Hop horn beam	Wood nettle	Gooseberry	Bottle brush grass

Forested Wetland			
Green Ash	Reed Canary grass	Canada Golden Rod	
Silver Maple	Wood nettle	Horse Tail	
Paper Birch	Wood rush	Swamp Milkweed	
Lake Fringe Wetland			
Lake Sedge	Marsh Mary Gold	Broadleaf Arrowhead	
Iris spp	Alder	Narrow Leaf Cattail	
Willow spp.	Marsh Fern		
Invasive Species Noted			
Reed Canary Grass	Common Buckthorn	Narrow Leaf Cattail	Creeping Charlie
Thistle spp.	Sweet Clover		

Note: of all the invasive species present, only Reed Canary Grass would be considered established in great abundance.

Vegetation Communities

Upland

The 2.9-acre upland area is a mix of oak, basswood, and maple, with other species characteristic of central or southern mesic hardwood forest. The understory consists primarily of American elm and ironwood with a sparse shrub layer. The ground cover contains large number of savannah grasses such as bottlebrush grass as well as other upland grasses and forbes. There is a lack of trees in the stem or sapling stage, and evidence of heavy deer browse than may be inhibiting natural regrown or replacement in this area.

Forested Wetland

The 9.8-acre forested wetland area is dominated by reed canary grass, silver maple, EAB infested green Ash, and several other species. The canopy is generally open with an understory limited to a few shrubs (red-osier dogwood and willow spp.). Reed Canary grass is the dominant ground cover.

Lake Fringe Wetland

The 5.6-acre lake fringe wetland is seasonally inundated by Forest Lake and contains a vast expanse of Lake Sedge dominated habitat. A few areas of cattail and shrubs (willow and Alder) exist on higher islands within the sedge meadow. Iris, marigold, Goldenrod and broadleaf arowhead are also present in lower abundances.

DISTRICT GOALS & MANAGEMENT OPPORTUNITIES

The following section outlines management opportunities for the Site within the context of applicable District Goals and Objectives identified in the 2022-2031Watershed Management Plan

Applicable District Goals and Objectives

3.4 Wetland

3.4.2 Goals

C. Increase type and habitat diversity of wetlands to support a broader range of wetland functions, values and ecological restoration objectives.

E. Preserve existing wetland buffers and encourage the establishment of buffers for water quality and habitat benefits.

3.4.3 Objectives

4. Conduct wetland restorations as guided by the Plan to support a broader range of wetland functions and values.

5. Evaluate wetlands that are suspected phosphorus sources as identified in this Plan and implement needed feasible restorations.

Upland Resources

3.4.4 Goals

B. Maintain and restore forests and grasslands both adjacent to and away from waterbodies to increase the biodiversity and area of native ecosystems and the quality and quantity of wildlife habitat.

C. Promote upland conservation and land protection strategies throughout the District.

3.4.5 Objectives

2. Encourage and implement improvements that enhance the beneficial use of upland areas for stormwater management through the Non-Point Source Pollution Abatement Grant Program.

4. Promote upland conservation and land protection through the Education & Outreach Progr

Priority and Approach

Though the North Shore Trail Nature Area has potential to meet many of the applicable District goals (above), the focus of this property will be on goals:

3.4.2 - C. Increase type and habitat diversity of wetlands to support a broader range of wetland functions, values and ecological restoration objectives.

and

3.4.4 - B. Maintain and restore forests and grasslands both adjacent to and away from waterbodies to increase the biodiversity and area of native ecosystems and the quality and quantity of wildlife habitat.

These goals most closely align to the potential of the property and the impending Green River Greening (LCMR) funding that is in the process of being secured. These dollars will be leveraged to improve the property by increasing biological diversity, ecological function, and achieving the vision of the property as a public day-use area. These funds will become available in July of 2023. The District will partner with Great River Greening to implement many of the projects on the property as are set forth in the five year work plan (below).

Table 5. Five Year Work Plan

Activity	Description	Timing	Estimated Cost
Hazard Tree Removal	Remove and dispose of hazard trees in and along the proposed trail area. Many of these trees are Green Ash that have been impacted by emerald ash borer (EAB).	Fall 2023	Tbd
Debris Pile Removal – burn pile	Hire Contractor to chip the debris piles on the property. Chips could be scattered on site or used to establish a primitive trail system. Burning of the pile is not advised.	Fall 2023	tbd
Trail development	Use the chips from the debris pile removal to establish a trial system within the property. Connect the adjacent DNR boat launch (parking area) to the property along the City of FL sewer pipeline to the property gates, pier, and access area to the Cranberry channel. *spp.*	Fall 2023 with the pile chipping	Tbd
Snowmobile Trail development	Designate a snowmobile trail and install signs/marker	Fall 2023	Tbd
Debris Pile Removal - Yard Dumping piles	Eliminate weed & seed base in the leaf piles by herbicide application and mulching. Then burn or disperse the leaf litter on the upland to add organics to the soils.	2024 - spring	tbd
Annual woody invasive removal	Hand or mechanical pulling of buckthorn and other undesirable shrubs	May and October, 2023-2028	tbd
Install interpretive signs	Design and install interpretive nature signs throughout the property as an education and outreach activity	2025	Tbd
Replanting the upland understory	Wildlife friendly understory vegetation could be added in the form of chokecherry, hazelnut, *vaccinium*, or other mast or fruit producing species that could provide forage	Spring or Fall, 2025	tbd
Tree replacement	Plant trees in the lowland areas to replace ash impacted by EAB.	Spring or Fall	Tbd

in the Wetland Forest	Replacement species could be tamarack, silver maple, or *populus spp.*	2026-2028	
Repair/replace pier	Repair or replace sections of the pier that allows access to Forest Lake. Install a fishing platform at the end of the pier.	2027 -28	tbd

A detailed version of the work plan is located below in appendix B.

Management Opportunities

Invasive Species Management

As mentioned earlier in this document, the North Shore Trail Nature Area has been relatively well maintained and as such, is relatively free of any large invasive species infestation. Several invasive species are present, but in low enough abundance that they can be effectively managed.

In general, invasive species management efforts should apply the following guidelines:

1. Populations of invasive species should be inventoried and delineated to help identify priority areas.
2. Prioritize areas in early stages of invasion, areas adjacent to higher quality communities, and epicenters of establishment.
3. Conduct regular inspections and annual removal efforts (hand pulling and localized herbicide application.)
4. Treated areas should be reseeded or replanted with native plants appropriate for each community. Seeds and plants should be sourced from a certified native plant provider within the same ecoregion. The MN DNR recommends sourcing native seed from within 30 miles if possible.

Invasive species management within wetland and upland areas could improve water quality, would greatly improve the herbaceous and woody understory, would allow for long-term survival and recruitment of native tree and forb species, as well as have multiple benefits for wildlife.

Forest Health and Resiliency

No major invasive species issues have been identified in the upland area. Woody invasives including common buckthorn (*Rhamnus cathartica)* and Tatarian honeysuckle (*Lonicera tatarica)* were identified in small numbers and will need to be monitored and/or removed regularly as indicated in the above section. The abundance of these invasive species is such that staff could conduct annual pulling or localized herbicide treatments that should sufficiently control these species. The anticipated annual staff time commitment would be approximately 24 hours (three staff for one full day of removal).

The current condition of the site allows for management that would result in two distinct habitat types – Oak Savana or Mesic Hardwood Forest. Both ecosystems would be considered suitable for the historical landcover of this area. If left alone, and in the absence of a regular disturbance regime (such as mowing or prescribed fire), the property would likely move to the Mesic Hardwood Forest ecotype. Based on current staffing and available forest management equipment, it seems most realistic that the property be managed in the least intensive manner and be guided toward a mixed-age hardwood forest that maximizes the biodiversity of the small acreage, while providing robust recreation and educational opportunities.

Part of the hardwood forest management strategy would be the promotion of biodiversity and forest resiliency. This could take the form of understory enhancement and canopy replacement and augmentation. As mentioned elsewhere in this document, the understory is mostly void of shrubs and trees in the stem or sapling stage and there is considerable die back in the Ash component of the canopy due to emerald ash borer (EAB). Bare root shrubs and trees can be purchased for less than $2.00 per plant and could be planted by staff or volunteers as needed to add diversity to the understory of the upland and trees could be added near the upland wetland fringe to replace the dying Ash component of the canopy. These planting will increase diversity and build in resiliency to future climate change.

Understory planting species could include chokecherry, hazelnut, *vaccinium*, or other mast or fruit producing species that could provide wildlife forage (see the shrub guide in the appendix for additional recommendations). Ash replacement species are discussed in the wetland enhancement section below, but trees could be added to the upland to both replace any Ash on the wetland fringe, and further enhance the biodiversity and future resiliency of this area. Tree species appropriate for the area may include basswood, northern red oak, sugar maple, paper birch, and red maple (see the information sources section of this document for additional tree guidance). Bare root plants can often be purchased through spring plants sales by conservation districts, the DNR, or purchased directly from a grower/nursery (usually 100 plant/species minimum order).

Wetland Enhancement

The wetland area of the property have been mostly untouched with little direct management. The lake shoreline wetland is robust and healthy with a dominant lake sedge component. The forested wetland areas contains many green ash that have been impacted by emerald ash borer and patches of reed canary grass. Hybrid cattail can also be found within the wetlands. Though the reed canary grass and hybrid cattail are undesired species, they are found in only moderate abundance and generally not treated unless they become a nuisance. This is, in part, due to the difficulty and expense associated with their control or eradication. As such, it is the recommendation of this document to monitor these species and limit their spread through the enhancement of native vegetation that may be able to compete for resources with them and thus offer some competitive control.

Ash die-off due to EAB is a major concern for our region as well as for the North Shore Trail Nature area. All green ash on the property have been exposed to EAB and many trees have experience die-back or have succumb to the infestation. As such there are many standing dead snags. To maintain the forest wetland ecotype, this area should be replanted with appropriate wetland replacement tree species. These may include tamarack, silver maple, or populus spp. Bare root trees are recommended due to cost and availability (as mentioned above). Replacement trees should be as locally sources as possible and should be planted on higher ground within the wetland or adjacent to dying ash trees as this will offer the best chance of survival. Survival of 50% after year 1 and 25% after year 5 should be expected. As such, several years of staff lead planting efforts are recommended (100-200 trees per year for 3-5 years, focusing on one or two species per year).

Standing dead ash should be left as standing snags primarily for the benefit to wildlife species that require these features as part of their lifecycle or for foraging opportunities – such as secondary cavity-nesting species. The exception to this

recommendation is near the nature area trail system or in heavy use areas such as the primary Cranberry channel access. Standing snags should be considered hazard trees in these areas and removed for public safety.

Hydrology Restoration

The channel connecting Cranberry Lake and Forest Lake has been highly altered – as is indicated in the Historic photos found in Appendix A. A natural channel appears to have been present in these early photos, but in a different location and at a much narrower width than is current present on the landscape. Evidence of the dredging and widening of this channel is also present in the spoils berms located along the length of the channel. These spoil berms are effectively confining the channel, limiting lateral flow of water, and disconnecting the channel from its natural wetland floodplain. As the area is relatively flat and the elevation of the channel is controlled by the elevation of Forest Lake, this disconnection from the floodplain would not have the negative impacts associated with such confinement on a more traditional riverine system – increasing sheer stress and bank erosion. As such, the major consequence of the berms is the interruption of the hydrology of the area and associated impacts on the ecological function of the wetlands. If deemed a priority, the berms could be notched or completely removed to reestablish the wetland / floodplain connectivity. This work would be best accomplished during frozen conditions and the spoils could be spread in the upland areas of the property and incorporated into other upland restoration actions. Modeling should be conducted to determine the cost /benefit of the berm removal and to justify the need for this work. As of now, this work has not been proposed for the 5-year work plan.

One hydrology related management obligation is the conveyance of the Cranberry Lake Channel. During negotiations to purchase the property from the former owner (who resides on Cranberry Lake), the District informally agreed to keep the channel free of debris plugs that might back up water into Cranberry Lake and cause flooding issues. As such, the Cranberry channel and culvert under North Shore Trail should be inspected annually for debris plugs. Any culvert plugging should be reported to the City of Forest Lake, as this maintenance would fall under their per view. The channel is relatively wide and unlikely to become plugged / impede water flow from a few fallen trees or the subsequent collection of debris. However, beaver could accomplish such a feat with their natural dam construction skills. As such, the Cranberry channel should be surveyed annually for beaver sign and activity. If beaver dams are found, several management options should be considered to prevent unwanted flooding on Cranberry Lake.

Beaver

Beaver are a natural pat of the ecosystem and unless their actions are causing unwanted flooding on Cranberry Lake, they should be left alone. If their dams are causing flooding, passive solutions should be first implemented – such as the installation of a “Beaver Deceiver” type water equalizer structure that could be custom made by staff (see the CLFLWD Edell project). These devices can be made for a few hundred dollars and may offer the needed relief in the hydraulic system. If the beaver remain a concern, trapping and beaver dam breaching by hand or with machinery may be needed. This should be considered as the last option due to expense and ethical concerns for any living species as well as the beneficial ecological services that beaver can provide.

Public Access

The North Shore Trail Nature Area was acquired in 2022 using DNR Conservation Partners Legacy funds. A condition of these funds is that the property must be open to the public as a recreation opportunity – ideally including hunting and fishing. The property is within the city limits of Forest Lake, and therefor is subject to city ordinances that prohibit firearm use (including archery) within the city. Additional limitations on access to the property have been imposed on the property by the CLFLWD as to limit disturbance on the landscape and maintaining the natural character of the property – such as no use of motorized vehicles and no camping.

The North Shore Trail Nature Area shall be operated as a low-impact day-use recreational area with a primitive trail system and opportunities for hiking, wildlife viewing, foraging, and access to the Forest Lake / Cranberry channel for fishing and non-motorized personal watercraft use. Public Access signage indicating the acceptable and prohibited uses of the property have been installed at the gated entrances (installed during the summer 2022) to the property. The property will be open to the public year-round with the exception being limited or no use during the spring as there are concerns of erosion of the trails under saturated conditions.

Winter Access / Snowmobile Trail

Forest Lake and the surrounding area is heavily used by snowmobile enthusiasts and as such, the landscape is crossed with a dense network of trails. One of these trails has traditionally crossed the North Shore Trail Nature Area in the wetlands along the Cranberry Lake channel, connecting to the right-of-way along the North Shore Trail roadway.

While no motorized vehicles are allowed within the Nature Area, snowmobiles shall be allowed to cross the property in a designated area defined by staff. Signs shall be installed to mark this trail area as well as indicate that no access outside of the designated area shall be tolerated. If conflicts arise with the public not adhering to these guidelines, the trail crossing shall be decommissioned, and no trespassing / no motorized vehicle signs will replace the trail designation signs. Snowmobile access signs can sometimes be procured from the MN DNR; if available.

Operation, Monitoring, Maintenance

Operations, Monitoring, and Maintenance (OMM) will be important in facilitating successful restoration and management of the Site. It is recommended that field visits to conduct inspections occur once or twice a year depending on conditions.

Operation

The North Shore Nature Area was purchased through DNR Legacy Partner grant funds for the intended purpose of restoration, protection, preservation, and as an outdoor recreation opportunity for the public. The property should be restored / enhanced with these goals in mind. The property shall be operated as "park-like" space and stand out as an example of good land stewardship and riparian / lakeshore ecology at its best. It shall symbolize what the historic condition of the Forest Lake shoreline may have been prior to full development.

Monitoring

Monitoring should include, at minimum, an annual review of:

Table 6. Monitoring, Inspection, & Inventory Guide

Item	Inspection Description	Inspection Frequency
Invasive species	Inspect and inventory the property for targeted invasive species: buckthorn, creeping Charlie, Tartarian honeysuckle. Develop annual removal plan.	Once a year in spring or fall
Hazard trees	Inspect trail system or highly used areas for presence of hazard trees. Inventory and Mark hazard trees in need of removal. Arrange for removal if any hazard trees identified.	Once a year in spring
Pier	Inspect the pier for damage. Develop maintenance plan if repairs needed.	Once a year in summer
Litter and debris	Inspect heavy use areas of the property for litter and debris. Remove any litter or debris found.	Twice a year in summer and fall
Infrastructure	Inspect gates and signs and trails. Repair and replace as is needed.	Twice a year in spring and fall
Tree and understory	Inspect all revegetation/restoration plantings for survival.	Every other year.
Cranberry Channel	Inspect the Cranberry channel and culvert for debris plugs and beaver activity that may cause a back up of water in Cranberry Lake and associated flooding. Alert City if culvert plugged, arrange for channel debris removal if needed.	Annual inspection

Maintenance

As indicated in the table above, monitoring of the North Shore Trial Nature Area will determine the level of maintenance needed for the property. The smaller items, such as invasive species removal, litter pick up, and gate and sign repair can be completed by District staff with little cost. An annual budget of $1,000 - $5,000 should be sufficient for the general annual upkeep of the property. Larger maintenance needs, such as hazard tree removal or pier repair or replacement may need to be planned and budgeted for in the next fiscal year – depending on estimated maintenance costs. Foresight and coordination with budgeting staff will be essential in these circumstances to avoid long periods of disrepair.

Table 7. Maintenance Guide

Item	Description	Maintenance Frequency	Estimated Cost
Invasive species removal	Annual hand or mechanical removal of invasive species by staff.	Once a year in spring or fall	$1,000 in staff time / yr
Hazard trees removal	Arrange for contractor removal of hazard trees identified in spring.	As needed.	$500 to $1,000 per tree

Pier	Replace pier structures/sections as is needed.	As needed	tbd
Litter and debris pick up	Removal of litter.	Twice a year in summer and fall	$1,000 in staff time / yr
Infrastructure repair	Repair and replace signs and gates as is needed.	As needed based on monitoring.	$1,000 to $1,500 / yr
Replanting	Replant tree or understory species as needed if survival dips below acceptable levels.	As needed in the spring or fall – based on monitoring.	$1,500 per species (100 bare root plants) if planted by staff

Public Safety & Risk Management

On October 13, 2021, as part of a Phase I Environmental Site Assessment (PIESA), EOR's Pat Conrad inspected the site to identify potential safety or risk concerns. The assessment also included a historical and environmental records search conducted by Environmental Data Resources, Inc. (EDR). The conclusion of the phase 1 assessment was that there were no recognized (hazardous) environmental conditions observed or identified. The full Environmental Site Assessment report (364 pages) can be found on the CLFLWD's electronic filing system (SharePoint).

District staff will conduct annual inspections of the site and will prepare and maintain inspection reports. The District Administrator will be alerted to any matters that may require attention.

Potential Safety Hazards

There are several potential hazards inherent to the North Shore Trail Nature Area based simply on is proximity to water resources. The property has access to Forest Lake, the Cranberry Lake channel connection to Forest Lake, and extensive wetland habitats. Each of these aquatic resources pose some degree of "natural" risk to the public. There is risk of drowning in the lake and channel and risk of becoming stuck in the wetlands and the artificially dredged Cranberry Lake channel. These habitats contain soft mucky substrates that can be difficult to walk through or remove yourself from if you happen to enter or fall into them.

In addition, many of the Ash trees that inhabit the property have been impacted by the Emerald Ash Borer. As such, there are many standing dead snags or hazard trees that could topple under high winds or disturbance by the public. Hazard trees should be inspected annually and any located within high public use areas should be removed for safety. Dead standing tress located away from high use areas should be left standing as they represent a beneficial habitat type for certain desirable wildlife species – such as secondary cavity-nesting birds.

Dumping and Contamination

During the site inspection, no signs of non-organic dumping (trash) or contamination were observed. This is consistent with the findings of the Phase I Environmental Site Assessment.

There is, however one area that appears to be a dumping site for organic yard debris. This area is

approximately 30 ft by 25 feet and is adjacent to the burn pile (burn pile is assumed to have originate from the property). The dumping site contains grass clippings and leaf litter, as well as a healthy weed seed bank – as is evident in the infestation of Creeping Charlie at this isolated location. This location should be treated with herbicide to prevent spread of the Creeping Charlie and then burned to dispose of the yard waste.

SUMMARY OF RECOMMENDATIONS

The two goals of the watershed management plan that most closely align with the North Shore Trail Nature Area are: 1) Increase the type and habitat diversity of wetlands to support a broader range of wetland functions, values and ecological restoration objectives, and 2) Maintain and restore forests and grasslands both adjacent to and away from waterbodies to increase the biodiversity and area of native ecosystems and the quality and quantity of wildlife habitat. In addition, another applicable goal is to promote upland conservation and land protection through the Education & Outreach Program. With proper management, the North Shore Trail Nature Area can fulfill all these goals.

To accomplish these goals, this NRMP contains two distinct, but intertwined recommendations:

1. Protect and enhance the Nature Area for ecological biodiversity and health.
2. Establish and enhance public access opportunities for light recreation.

The North Shore Trail Nature Area is one of the last natural areas along Forest Lake with floristic characteristics that approximate early / pre-development of the area. Actions should be taken to preserve and enhance this area for future generations to enjoy. This would include control of invasive species – specifically buckthorn and Tartarian honeysuckle. This could be accomplished by annual hand pulling by staff at a minimal cost. In addition, the forested areas should be interplanted to ensure both forest resiliency in the face of climate change, but also to enhance understory for wildlife habitat and wildlife foraging opportunities. Planting of Silver Maple, Tamarack, Basswood, Paper Birch, or similar species will help to replenish the forested wetland where Green Ash has been decimated by EAB. Similarly, the understory of the upland forest could be augmented with chokecherry, hazelnut, vaccinium, or other mast or fruit producing species that could provide wildlife forage and habitat. These additions to the forested areas will help to ensure ecological biodiversity and complexity of the area in the future.

Access and recreation of the Natural Area could be improved with the establishment of a trail system with interpretive signs and lake / channel access points. Hazard trees within proximity of the trails or gathering areas should be removed and chipped – along with the large woody debris piles – to provide wood mulch for the establishment of the hiking trail system. The trail could form a loop linking the two main access points as well as leading to the pier, the cranberry lake channel, and connecting to the DNR's Third boat launch (a potential alternative parking location for the Nature Area.). Interpretive signs could be developed and placed throughout the trail system as an outreach and education opportunity. The Nature Area would be maintained as a day use

area for light recreation; no motorized vehicles or camping would be allowed. Hiking, fishing, wildlife viewing, and similar recreation activities are anticipated and will be promoted.

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Important Points of Contact

Name	Title/Organization	Phone	Email
Dave Adams (public Works)	City of Forest Lake	651-209-9736	Dave.Adams@ci.forest-lake.mn.us
Kyle Young (Park and Rec Coordinator)	City of Forest Lake Parks Department	651-209-9723	Kyle.young@ci.forest-lake.mn.us
Jo Anne House	Former owner / north neighbor on west side of Cranberry Lake		9340 North Shore Trail, FL, MN 55025
David Olson	MN DNR (Southwestern neighboring parcel)	651-259-5774	david.olsen@state.mn.us mndnr.gov 500 LAFAYETTE RD ST PAUL , MN 55155-4030
Peter and Melissa Malek	East /north-east neighbor		9384 NORTH SHORE TRL N FOREST LAKE, MN 55025
Rachel and Mason Pavel	East neighbor		9396 NORTH SHORE TRL N FOREST LAKE, MN 55025
Allen Swanson	East /south-east neighbor		9404 NORTH SHORE TRL N FOREST LAKE, MN 55025

FIGURES

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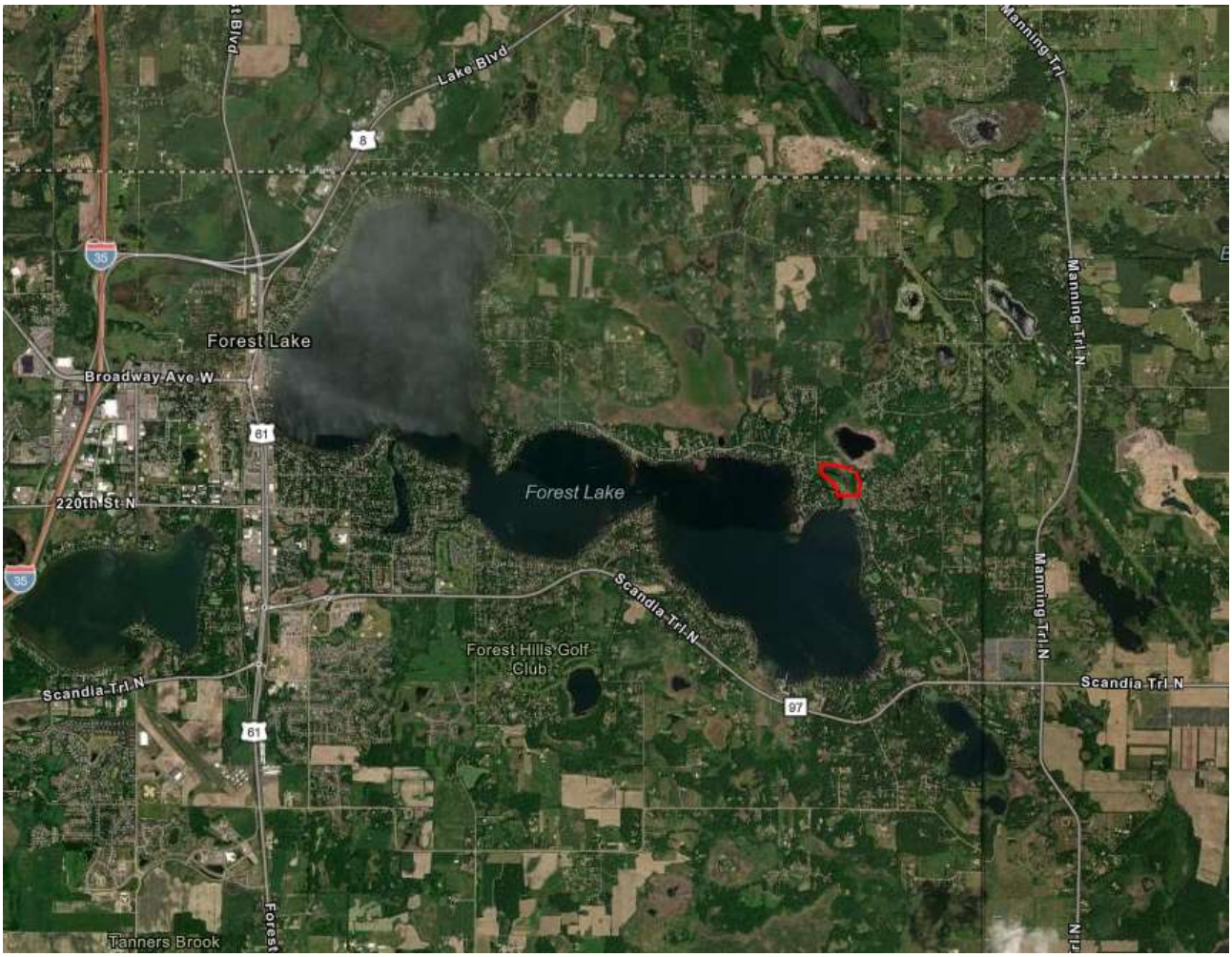


Figure C. Location. The red polygon indicates the general location of the Cranberry Lake Channel Parcel.

Figure D. Site Map. Map of the Property and major infrastructure. The yellow polygon indicated the property boundary.

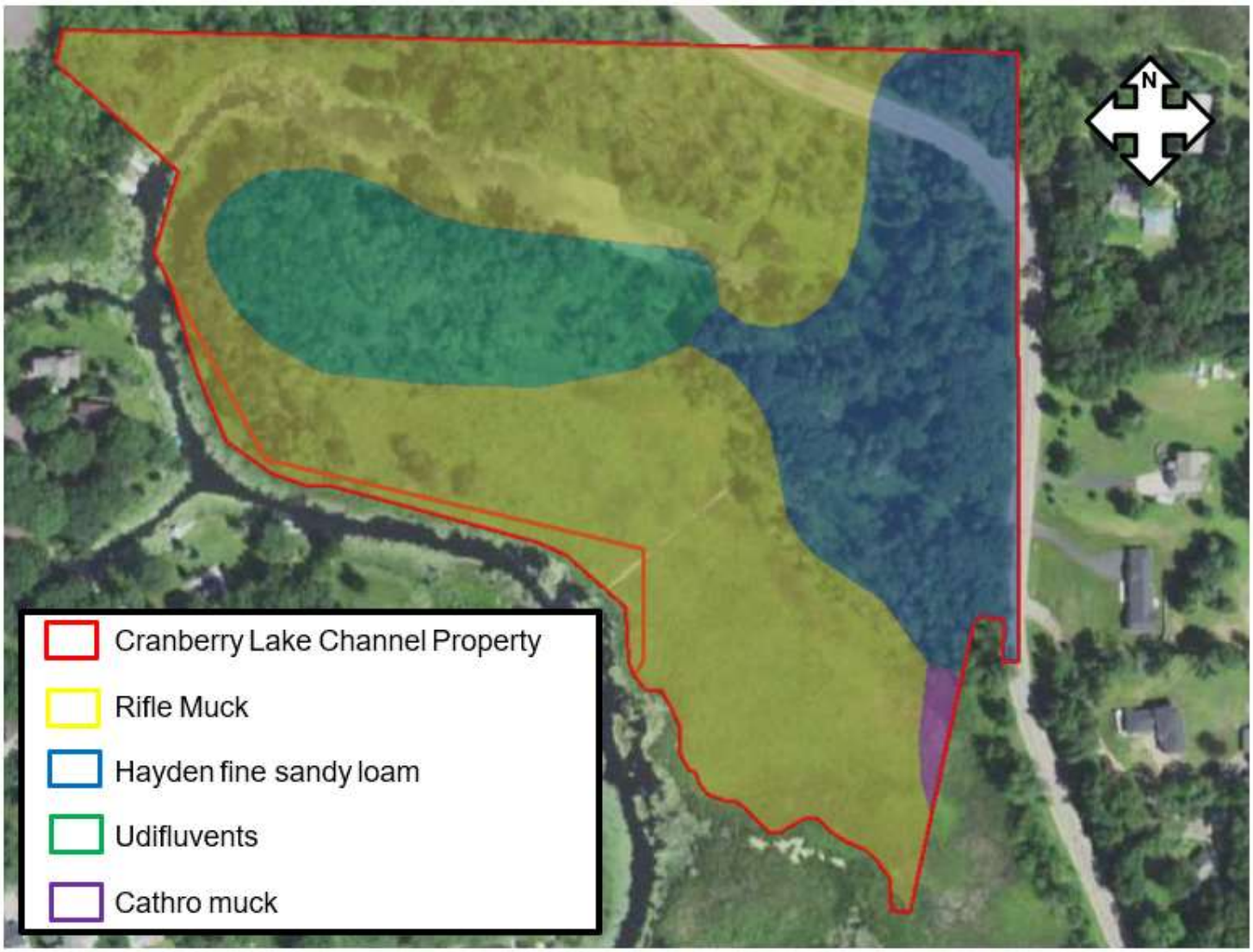


Figure E. Soils. NRCS soils map of the property.

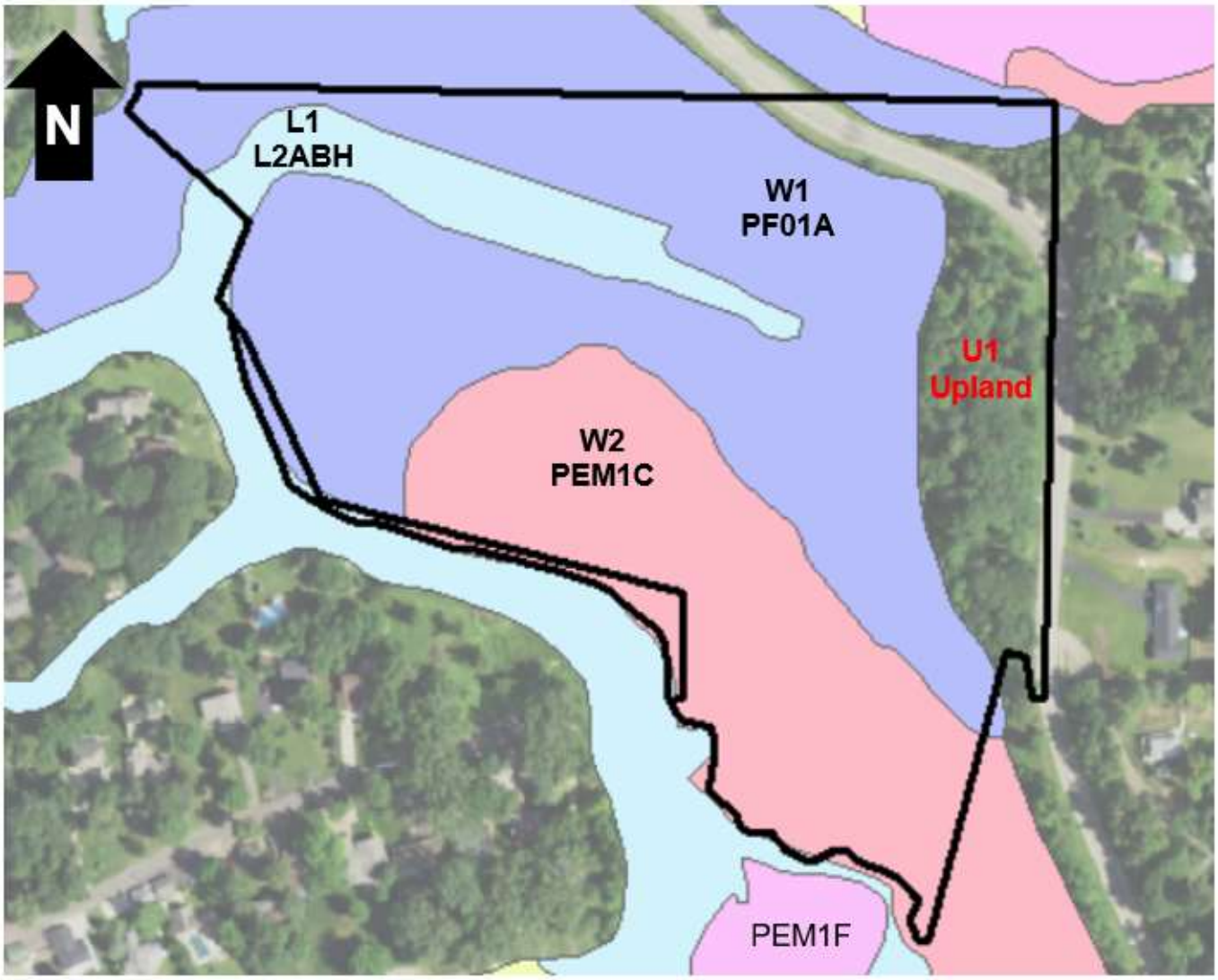


Figure F. Water Resources. Management Unit / Wetland Type Map. PF01A = Palustrine, Forested, Broad-Leaved Deciduous, Temporary Flooded. PEM1C = Palustrine, Emergent, Persistent, Seasonally Flooded. L2ABH = Lacustrine, Littoral, Aquatic Bed, Permanently Flooded. PEM1F= Palustrine, Emergent, Persistent, Semipermanent Flooded.

Appendix A: Photos

Historic Photos 1936-1964

1936 Historic Photo

1938 Historic Photo.

1945 Historic Photo

1953 Historic Photo.

1957 Historic Photo

1964 Historic Photo

Recent Photos

Main entrance /gate

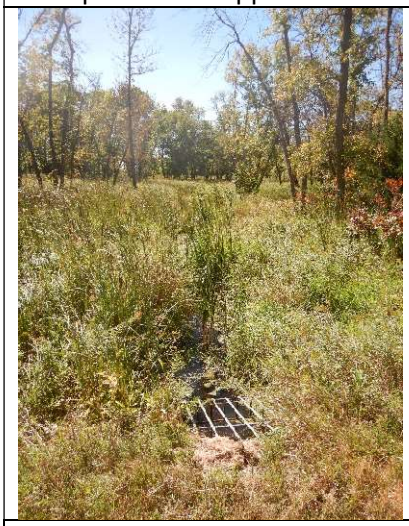
Secondary entrance /gate

Forested Wetland

Forested Upland with mature canopy of trees and sparse understory

Cranberry Channel connection to Forest Lake

Pier through the lake wetland fringe

	
View of Forest Lake from the end of the pier	View of lake wetland fringe and forested wetland riaparian area
	
Burn pile to be chipped	Creeping Charlie in the yard waste dump area
	
Culvert under North Shore Trail – flow from Cranberry Lake	City of FL sewer manhole

APPENDIX B - PLANNING TOOLS

Implementation Plan & Costs

Table 3 provides an idealized summary of potential management actions and suggested timing of implementation; it also provides conservative estimates of activity costs. Suggested timing within the 5 year period assumes funds to address activities are available; however, activities can be shifted to adjust for realities.

Table 8. Implementation Plan

Activity	Timing/Duration	Anticipated Cost per unit	Season	Year 1	Year 2	Year 3-5	Estimated Cost
Invasive Species Management							
Buchthorn - mechanical removal of small shrubs. Herbicide application on stumps if needed	annual	$500 of staff time per year	spring	$500	$500	$500	$2,500
Hand pulling Tartarian Honeysuckle, Canada Thistle, and other less common invasive spp.	annual	Staff time only (3-4hrs)	During already scheduled field visits	3-4hrs	3-4hrs	15-20hrs	21-28 hours of staff time – to occur during already scheduled field visits ~$2,000
Herbicide Treatment of Creeping Charlie and other invasive spp.	As needed for several years	$100 per acre	Spring and fall	$200	$200	$200	~$1,000
						Invasive Species Management Total Estimated Cost	**Up to $6,000**

Activity	Timing/Duration	Anticipated Cost per unit	Season	Year 1	Year 2	Year 3-5	Estimated Cost
Ash Swamp and Forest Resiliency (assuming about 3 acres of area and 100 trees to be removed and replanted)							

Ash Hazard tree removal	One time	$500/tree (hand removal)	Spring or fall	Removal of only hazard trees near the trail system	NA		$5,000 to $10,000
Tree planting	2 years – tree seedling success is typically around 50% so will require follow-up planting	$10 each for bare root sapling	NA	NA	NA	Up to $3,000	$3,000 – planting by staff
Native herbs seeding	First three years as needed	$100 per acre	Fall	$500	$500	$500 (completed year 3)	Up to $1,500
Planting of native shrubs	Years 3-5	$10-15 each	Fall	NA	NA	$1,000 -$1,500	Up to $1,500
Ash Swamp and Forest Resiliency Total Estimated Cost							**~$20,000**

Activity	Timing/Duration	Anticipated Cost per unit	Season	Year 1	Year 2	Year 3-5	Estimated Cost
Annual Inspections and Record Keeping							
Development monitoring plan and tracking system	Prior to any active management activity	Staff time only (1- 2hrs)		Staff time only (1- 2hrs)	NA	NA	Staff time only (1-2hrs)
Annual monitoring and management summary	Completed by December of each year -ongoing	Staff time only (5-16hrs / year – dependent upon how many activities were preformed)		Staff time only (5-16hrs – dependent upon how many activities were preformed)	Staff time only (5-16hrs – dependent upon how many activities were preformed)	Staff time only (15-48hrs / year – dependent upon how many activities were preformed)	Staff hours of monitoring likely to range from 25 – 80 hours over 5 years. Monitoring activities should be ongoing in perpetuity of the easement.

	Total Estimated Cost	**25-80 hours of staff time ~ $3,000**

Activity	Timing/Duration	Anticipated Cost per unit	Season	Year 1	Year 2	Year 3-5	Estimated Cost
Public Access							
Development trail system	One time with some annual maintenance	~2 per linear foot	Spring through fall	Design and implement in conjunction with wood chipping	NA	NA	~$8,000, if does as a volunteer event
Chipping of Woody Debris	One time	~$300/cubic yard	Spring through fall	One time			~$5,000 with mobilization
Interpretive Signs	One time	$150 per sign including staff design time	Spring through fall	design	Print and install	NA	~$2,500 with staff time
Lake / Channel Access Repair/improve pier and lake/channel access points	ongoing	unknown	summer			As needed and as time/funds allow	unknown
Snow Machine trail	one time	~$500 in signs	Fall	Design, print, and install signs	NA	NA	~$500
						Total Estimated Cost	**$15,000 +**

Appendix C – Property Legal Description

Governments Lots One (1) and Two (2), Section Eleven (11), and Government Lot One (1), Section Twelve (12), all in Township Thirty-two (32) North of Range Twenty-one (21) West, excepting those parts or portions of said Government Lots lying and being within the plat of Rogers Shadyland Point, as surveyed and platted and now on file and of record in the office of the Register of deeds within and for said Washington County, and EXCEPTING Lots A, B, C, D, E, F and G of Registered Land Survey No. 14; also EXCEPTING Tract "A" of Registered Land
Survey No. 43; and also EXCEPTING Registered Land Survey No. 48.

Also EXCEPTING a parcel of land lying and being in Government Lot One (1), Section Twelve (12), Township Thirty-two (32), Range Twenty-one (21), described as follows, to-wit: Beginning at the Northeast corner of that part of Chippewa Heights which extends into the Southeast Quarter of the Southwest Quarter (SE ¼ of SW ¼) of said Section Twelve (12) as per plat thereof on file, and of record in the office of the Register of Deeds of Washington County, Minnesota, thence North 6°1' East for 232 feet; thence North 89°48' West for 383 feet to a point on the west line of the County road and inside of Government Lot One (1) of said Section Twelve (12) and the point of
beginning of the tract hereby described; thence South 14°45' West for 350 feet, more or less, to the shore of Forest Lake; thence Westerly along said lakeshore to a point 50 feet from the previous course when measured at right angles thereto; thence North 14°45' East for 350 feet, more or less, to a point 50 feet westerly from the point of beginning when measured at right angles to described first course; thence continuing at North 14°45' East for 50 feet; thence Easterly at right angles for 50 feet, more or less, to the Westerly side of said County Road; thence Southerly along said road line for 50 feet to the point of beginning.

Also EXCEPTING all that part of Gov't. Lot 1, Section Twelve (12), Township Thirty-two (32) North, Range Twenty-one (21) West, lying southeasterly of the following described line: Commencing at the northeast corner of that part of the recorded plat of CHIPPEWA HEIGHTS which extends into the Southeast quarter of the Southwest quarter of said Section 12; thence N6°01' E, 332 feet, thence N89°48' W, 350 feet, more or less, to the center line of C.S.A.H. No. 2, which point is the point of beginning of the line to be described; thence continuing N89°4' W, 33 feet to the west line of said C.S.A.H. No. 2; thence S14°45' W, 350 feet, more or less, to the shoreline of Forest Lake and there terminating. Said tract contains 0.7 acres, more or less includes all riparian righter, and is subject to the existing right-of-way of said C.S.A.H. No. 2.
ALSO EXCEPTING the plat of ROGERS SHADYLAND POINT PLAT 2.
ALSO EXCEPTING the plat of ROGERS SHADYLAND POINT PLAT 3.
ALSO EXCEPTING Tract H, Registered Land Survey No. 14.
And
Outlot "D", ROGERS SHADYLAND POINT PLAT 2, according to the plat thereof on file and of record in the office of the Registrar of Titles in and for Washington County, Minnesota.
(Certificate of Title 21488) Torrens Property

Appendix D – Phase I Environmental Site Assessment

The full Environmental Site Assessment report is 364 pages. A copy stored on the CLFLWD's electronic filing system (SharePoint) and a copy can be obtained upon request. A summary of the report is provided below.

EOR conducted a Phase I Environmental Site Assessment (PIESA) for the Cranberry Lake Channel property in the City of Forest Lake in Washington County, Minnesota (Appendix 16.1).
The site is currently a vacant recreational lot. The surrounding properties are lakeshore residences, wetlands and other single-family residences. There are no buildings on the site but there is an old travel trailer. The site can be accessed from a gravel drive from North Shore Drive which generally forms the eastern and northern property boundaries.

A historical and environmental records search was conducted by Environmental Data Resources, Inc. (EDR). No

environmental records for the subject property were found. Seven records were found for properties within one mile of the subject property. However, none of these records represents a recognized environmental condition for the site.

Pat Conrad from EOR conducted a site reconnaissance on October 13, 2021. No recognized environmental conditions were observed.

The Property Owner indicated that the property has been vacant and there has never been a structure on the property. Interviews with the Property Owner (Mrs. Joanne House), the owner's son (Mr. Bill House) and the PIESA user (Mr. Nick Bancks) indicated no recognized environmental conditions.

Our conclusion is that there are no recognized environmental conditions on the subject property.

Appendix E – North Shore Natural Area Plant Inventory

June 12, 2023

Upland understory/ground

Wood rush	Wild geranium	Poke milkweed
Pennsylvania sedge	Bottle brush grass	Stinging nettle
Bittersweet nightshade	Virginia waterleaf	Zig-zag goldenrod
False Solomon seal	Large leaf trillium	Jerusalem artichoke
Bedstraw / gallium	Riverbank grape	Common milkweed – rare
Virginia creeper	Wood nettle	Prickly ash
Gooseberry	Riverbank grape	Canada violet
Wood fern	blackberry	
Burdock	*Thistle spp*	*Smooth brome*
Common Mullen	*Sweet clover - invasive*	*Creeping Charlie*

Upland tree spp

Hop horn beam	Eastern cottonwood	White oak
Bitternut hickory	Eastern red cedar	Quaking aspen
Sugar maple	hackberry	Boxelder
Basswood	Red oak	Common buckthorn

Riparian Forest

Green ash	Carex spp	Canada golden rod
Paper birch	May apple	Horse tail
Red oak	Reed canary grass	Swamp milkweed
Silver maple	Wood nettle	
	Wood rush	
	Joe pie weed	

Lake fringe wetland

Narrow leaf cattail	Canada golden rod	Broadleaf arrowhead
Lake sedge	Marsh marigold	
Iris spp	Alder spp	
Willow spp	Fern spp	

Appendix F – Additional Resources

Granting Resources

Below is a list of Grants that may be appropriate for the recommended management actions for this Site.

- MN DNR Conservation Partners legacy (L-SOHC)
- Environmental and Natural Resources Trust Fund (ENRTF)
- EPA Aquatic Ecosystem Restoration (CAP Section 206)
- North American Wetlands Conservation Act Grants Program
- Five-Star Restoration Program
- Native Plant Conservation Initiative
- Bring Back the Natives (BBN)
- Community-based Habitat Restoration Partnership

Methods for Controlling Exotic, Invasive Plant Species

A. Trees and Shrubs

Common Buckthorn, Tartarian Honeysuckle, Siberian Elm, and Black Locust are some of the most common woody species likely to invade native woodlands or prairies in Minnesota. Buckthorn and honeysuckle are European species that escaped urban landscapes and invaded woodlands in many parts of the country. They are exceedingly aggressive and, lacking natural disease and predators, can out-compete native species. Invasions result in a dense, impenetrable brush thicket that reduces native species diversity.

Siberian elm, native to eastern Asia, readily grows, especially in disturbed and low-nutrient soils with low moisture. Seed germination is high and seedlings establish quickly in sparse vegetation. It can invade and dominate disturbed areas in just a few years. Black locust is native to the southeastern United States and the very southeastern corner of Minnesota. It has been planted outside its natural range, and readily invades disturbed areas. It reproduces vigorously by root suckering and can form a monotypic stand.

1. Chemical Control

The most efficient way to remove woody plants that are half inch or more in diameter is to cut the stems close to the ground and treat the cut stumps with herbicide immediately after they are cut, when the stumps are fresh and the chemicals are most readily absorbed. Failure to treat the stumps will result in resprouting, creating much greater removal difficulty.

In non-freezing temperatures, a glyphosate herbicide such as Roundup can be used for most woody species. It is important to obtain the concentrated formula and dilute it with water to achieve 10% glyphosate concentration. Adding a marker dye can help to make treated stumps more visible. In winter months, an herbicide with the active ingredient triclopyr must be used. Garlon 4 is a common brand name and it must be mixed with a penetrating oil, such as diluent blue. Do not use diesel fuel, as it is much more toxic in the environment and for humans.

Brush removal work can be done at any time of year except during spring sap flow, but late fall is often ideal because buckthorn retains its leaves longer than other species and is more readily identified. Cutting can be accomplished with loppers or handsaws in many cases. Larger shrubs may require brush cutters and chainsaws, used only by properly trained professionals.

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

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

Undesirable trees and shrubs can also be destroyed without cutting them down. Girdling is a method suitable for small numbers of large trees. Bark is removed in a band around the tree, just to the outside of the wood. If girdled too deeply, the tree will respond by re-sprouting from the roots. Girdled trees die slowly over the course of one to two years. Girdling should be done in late spring to mid-summer when sap is flowing and the bark easily peels away from the sapwood. Herbicide can also be used in combination with girdling for a more effective treatment.

Basal bark herbicide treatment is another effective control method. A triclopyr herbicide such as 10% Garlon 4, mixed with a penetrating oil, is applied all around the base of the tree or shrub, taking care so that it does not run off. If the herbicide runs off it can kill other plants nearby. More herbicide is needed for effective treatment of plants that are four inches or more in diameter.

2. Mechanical Control

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

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

3. Stems, Seedlings and Re-sprouts

Prescribed burning is the most efficient, cost effective, and least harmful way to control very small stems, seedlings, and re-sprouts of all woody plants. It also restores an important natural process to fire-dependent natural communities (oak forests, for example). Burning can only be accomplished if adequate fuel (leaf litter) is present and can be done in late fall or early spring, depending on conditions at the Protected Property.
If burning is not feasible, critical cutting in the spring is also effective, though it can impact desirable herbaceous plants as well. Foliar (leaf) application of a bud-inhibitor herbicide (Krenite) during fall is also effective. This method can also affect non-target species, though most natives will be dormant by that time.

4. Disposal

The easiest and most cost-effective method to handle large amounts of brush is usually to stack it and burn it in winter. In areas where brush is not dense, it can be cut up into smaller pieces and left on the ground where it will decompose in one to three years. This method is especially useful on slopes to reduce erosion potential. Small

brush piles can also be left in the woods as wildlife cover. Where there is an abundance of larger trees, cut trees may be hauled and chipped and used for mulch or as a biofuel. Alternatively, the wood can be cut and used for firewood, if a recipient can be found.

B. Forbs

1. Canada Thistle

While native thistles are not generally problematic, exotics such as Canada thistle are clone-forming perennials that can greatly reduce species diversity in old fields and restoration areas (Hoffman and Kearns 1997). A combination of chemical and mechanical control methods may be needed at a Protected Property. Chemical control is most effective when the plants are in the rosette stage and least effective when the plants are flowering. A broadleaf herbicide such as 2,4-D is appropriate to minimize damage to native grasses. It is most effective when applied 10 to 14 days before the flowering stems bolt. It is applied at rate of two to four pounds per acre using a backpack or tractor-mounted sprayer or in granular form. Dicamba could also be used, with the advantages that it can be applied earlier in the spring at a rate of one pound per acre. Plants that do not respond to treatment or that are more widely dispersed could be controlled mechanically.

Mechanical control, involving several cuttings per year for three or four years, can reduce an infestation, if timed correctly. The best time to cut is when the plants are just beginning to bud because food reserves are at their lowest. If plants are cut after flowers have opened, the cut plants should be removed because the seed may be viable. Plants should be cut at least three times throughout the season. Late spring burns can also discourage this species, but early spring burns can encourage it. Burning may be more effective in an established prairie, where competition from other species is good, than in an old field, where vegetation may not be as dense.

2. Wild Parsnip

Treat wild parsnip similar to Canada thistle. These are the recommendations listed by MN DNR:

<u>Mechanical</u>

- Do nothing in healthy prairies, natives can sometimes outcompete the parsnip
- Hand pulling and removing of plants
- Cut the plant below the root crown before seeds set, and remove the cut plant
- Mow or cut the base of the flowering stem and remove

<u>Chemical</u>

- Use sparingly in quality habitats
- Spot application with glyphosate or selective metsulfuron after a prescribed burn; parsnip is one of the first plants to green up

This plant can be very irritating to the skin for some people. It contains a toxin that reacts with sunlight to produce welts on the skin, similar to poison ivy. The welts can itch and get infected. Use gloves and long sleeves when handling this plant.

3. Sweet Clover

White and yellow sweet clovers are very aggressive annual species that *increase* with fire. Sweet clover can be eliminated by using a treatment that eliminates smooth brome. However, it is a common plant in agricultural areas, so if restoration is implemented, the area should be surveyed for this species on an annual basis. Individual plants or small populations can be removed by hand-pulling. If seed production occurs, prodigious amounts of seed could be spread at the Protected Property.

C. Reed Canary Grass

These recommendations are taken from Reinhardt, C. H. and Galatowitsch, S. M. 2004. Best Management Practices for the Invasive Reed Canary Grass *(Phalaris arundinacea* L.) in Wetland Restorations.

1. General recommendations for Reed Canary Grass (RCG) control

Dense populations that currently exist on-a Protected Property will need to be removed for native species to establish. In addition to the existing vegetation, in areas where RCG has been established for multiple years the RCG seed bank may be as high as 1200 seeds per square meter. Because this density of the RCG seed bank presents competition for any planting of native species, it must be considered in the NRMP. Seeds near the surface will germinate when the RCG canopy is removed. Subsequent herbicide applications will remove these seedlings, and burning/ herbicide treatments will deplete the seed bank in this way. For the RCG seed bank to deplete to levels that will not prevent native species establishment, RCG control will likely need to take place over several growing seasons. Minimize disturbance of the soil to prevent turning up additional RCG seed in these areas. While areas are undergoing herbicide treatment, large areas of exposed soil will need to be stabilized, e.g. through the use of stabilization blankets.

Herbicide applications are a major part of the plan to control RCG. A glyphosate-based herbicide is recommended because 1) it is relatively non-toxic, 2) its effect on RCG has been demonstrated, and 3) it is widely available and easy to apply. To maximize glyphosate herbicide effectiveness, apply herbicide in the later season, after late August, to ensure translocation of the herbicide to rhizomes (and therefore inducing rhizome mortality). Apply glyphosate herbicide at the rate and concentration specified by the label for weedy perennial grasses; this will differ with respect to the glyphosate-based product chosen.

RCG -dominated areas will require herbicide control over several growing seasons. Removal of RCG will result in areas of temporarily exposed soil that are subject to erosion. Implementing control on selected management units separately through time will minimize erosion-related problems at a Protected Property. Further discoveries about best management practices may result from observing the implementation of this plan over time, and the plan may be modified according to lessons learned during the management process.

For RCG-dominated areas, a broad-scale herbicide application is recommended, as damage to non-target species within these management units does not need to be considered. Apply herbicide in late August and later as this application timing maximizes translocation of the herbicide to the rhizomes, ensuring maximum rhizome mortality, which is crucial to control of RCG. Two herbicide applications can be implemented during this window if necessary.

After the standing RCG vegetation is killed in the first year of treatment, a heavy layer of thatch will remain. A controlled burn will be applied to remove thatch and encourage germination of RCG from the seed bank in the interests of reducing RCG seed bank density. Subsequent herbicide applications will control this flush from the seed bank. A late fall burn is recommended to remove thatch (spring burns may encourage growth from rhizome-based shoots).

Even after two years of effective herbicide application, RCG will recolonize, largely from the seed bank and from incoming propagules, and outcompete new native vegetation from a restoration seeding. Therefore, three years of herbicide application are recommended.

For areas with native species cover, selective removal of RCG will be critical to the maintenance of these native populations. We recommend hand weeding of RCG seedlings in the early spring as soon as they reach an identifiable stage (removal will be easiest before the seedlings establish a network of rhizomes) and herbicide wicking of established RCG individuals in the fall (damage to non-target species will be lowest at this time when many native species have already senesced). Herbicide wicking is also an option in the early spring, but hand weeding is preferable, as herbicide applications during the early spring may not achieve complete mortality. Selective control of RCG in these areas can begin immediately and continue for as long as needed.

2. Areas with woody species cover

Some management units with woody species cover (shrub units) have been invaded by RCG, although other species exist in the understory. Similar to the areas with native species cover, selective removal of RCG rather than homogeneous treatment over a large-scale area, will be necessary. We recommend hand weeding of RCG seedlings in the early spring and herbicide wicking of established RCG individuals in the fall. Herbicide wicking is also an option in the early spring, but hand weeding is preferable, as herbicide applications during the early spring may not achieve complete mortality. Selective control of RCG in these areas can begin immediately and continue for as long as needed.

3. Reestablishment of native vegetation

Following control of RCG seeding with a native species restoration mix will be needed to stimulate reestablishment of native vegetation. If there are no high quality wetlands nearby to serve as propagule sources, and years of drainage have made the seed bank depauperate, it is highly unlikely that native vegetation will establish through natural means of propagule dispersal to a Protected Property.

Areas that have been treated with broad-scale herbicide applications must be seeded uniformly. Prepare the soil for seeding, by first performing a prescribed burn on the area (either in the previous fall or the early spring of that year) if necessary, to remove dead vegetation. The appropriate seeding rate will depend on the target community, but since RCG is most problematic in a wet but not saturated soil environment, it is not unlikely that the NRMP will target such a community as a wet meadow. In such a case, a wet meadow grass mixture will be seeded at 13 pounds per acre Pure Live Seed (PLS) or greater, and a wet meadow forb mixture will be seeded at four pounds per acres PLS or greater. The combined seeding rate of 17 pounds per acre PLS is an average seeding rate and increasing the rate will likely increase native species establishment.

For areas that have received selective removal of RCG (not broadcast herbicide application), inter-seeding is recommended for areas left open after RCG removal. Species-appropriate seedlings will be necessary, e.g. woodland forb species in the understory of areas with woody species cover, and aquatic species in a Seepage meadow/carr area. After seeding with native species, monitoring of RCG recruits will likely be necessary for as long as the Protected Property is exposed to an influx of new RCG (i.e., indefinitely in a riparian environment). As native species begin to establish, selective removal of new recruits of RCG is necessary as they emerge within the establishing native community, via hand-weeding or selective treatment with herbicide.

Suggested Native Shrubs for Replacing Common Buckthorn

Dry Upland Areas					
Common Name	Scientific Name	Height [feet]	Light	Wildlife Value	Comments
New Jersey tea	*Ceanothus americanus*	2 to 3	Full sun	High: butterflies and hummingbirds	Dry prairie –forms patches.
Gray dogwood	*Cornus racemosa*	9	Sun/shade	Very high	Used by over 40 species of wildlife. Spreads
American hazelnut	*Corylus americana*	6 to 12	Sun/part shade	highly valued by mammals and birds	Spreads, but slowly; forms very deep roots
Beaked hazelnut	*Corylus cornuta*	6 to 12	Sun/shade	high	Spreads, but slowly. More northern range than American hazelnut.
Eastern red cedar	*Juniperus virginiana*	20	Sun	high	Invades prairies in absence of fire. Important bird cover in winter and summer heat.
Pin cherry	*Prunus pensylvanica*	10 to 30	Sun	Excellent	Used by 81 species of wildlife
Smooth rose	*Rosa blanda*	4 to 6	Sun/part shade		
Silver buffaloberry	*Shepherdia argentea*	8 to 10	Full sun	High: birds	Thicket forming in prairies; silvery green foliage; red berries in late summer. Native to west edge Minnesota
Wolfberry	*Symphoricarpos occidentalis*	2 to 4	Full sun		Thicket forming in prairie; small pinkish flowers
Dry-Mesic Upland Areas					
Common Name	Scientific Name	Height [feet]	Light	Wildlife Value	Comments
Allegheny serviceberry	*Amelanchier laevis*	15 to 25	Sun/part shade	high	
Round-leaved dogwood	*Cornus rugosa*	8 to 12	Part sun/shade	Butterflies use flowers; birds eat berries	
Eastern wahoo	*Euonymus atropurpurea*	6 to 20	Sun/shade		Spreads
Common ninebark	*Physocarpus opulifolius*	8 to 10	Full sun	Bird food	Dense growth habit
American plum	*Prunus americana*	20 to 35	Sun	high	
Choke cherry	*Prunus virginiana*	20 to 30	Sun/part shade	Excellent	
Sambucus pubens	*Red-berried elder*	10 to12	Sun/part shade	High value: bird food	Cluster of white flowers; red berries in early summer.
smooth rose	*Rosa blanda*	4 to 6	Sun/part shade		
Red-berried elder	*Sambucus pubens*	6 to 12	Shade	Very high	Excellent massing, fast growing.
Bladdernut	*Staphylea trifolia*	8 to 15	Shade		Tolerates many soil conditions, disease resistant
Arrowwood viburnum	*Viburnum rafinesquianum*	5 to 8	Part shade/shade	high	Pretty foliage

Highbush cranberry	*Viburnum trilobum*	6 to 12	Sun/shade	High -Birds eat fruits.	Foliage open form in shade, dense in sun.
Wafer ash	*Ptelea trifoliata*	10 to15	Sun/shade	Larval host for swallowtail butterfly	Foliage open form in shade, dense in sun.
Flood Tolerant Areas					
Common Name	Scientific Name	Height	Light	Wildlife Value	Comments
American elder	*Sambucus canadensis*	8 to10	Full sun	High value: bird food	Very tolerant of soil conditions; blue-black fruit in late summer
False Indigo	*Amorpha fruticosa*	8 to10	Sun/part shade	Butterflies	Attractive flower
Black chokeberry	*Aronia melanocarpa*	5 to 8	Sun/shade	Bird food	
Buttonbush	*Cephalanthus occidentalis*	6 to 12	Full sun	Birds, butterflies	Round flower head; fragrant
Pagoda dogwood	*Cornus alternifolia*	15 to 20	Sun/shade		Beautiful growth form.
Silky dogwood	*Cornus amomum*	6 to 12	Full sun	Bird food	Blue fruit; reddish-purple bark
Red twig dogwood	*Cornus sericea*	6 to 12	Sun/part shade	Bird food	Red twigs, greenish-white fruit
Witch hazel	*Hamamelis virginiana*	20 to 30	Sun or shade	Late-season pollinators	Unique, spider-shaped yellow flowers that bloom late in the year.
St. John's Wort	*Hypericum kalmianum*	2 to 3	Sun/part shade	Pollinators	Masses of yellow flowers in summer
Winterberry	*Ilex verticillata*	6 to 8	Sun/light shade	Bird food	Showy red fruit in fall.
Black Currant	*Ribes americanum*	3 to 6	Sun/light shade	High value: birds and mammals	White flowers and black-purple fruit
Pussy willow	*Salix discolor*	20	Full sun	Soil stabilizer	Showy catkins and ornamental
Red willow	*Salix sericea*	6 to 8	Full sun	Bird food	Upright, rounded form; and reddish-brown twigs
Meadowsweet	*Spirea alba*	3 to 6	Full sun	Bird food	Of wet meadows. Erect branching; white flower spikes in July
Nannyberry	*Viburnum lentago*	16 to 20	Sun/part shade	high	Dense foliage
Highbush cranberry	*Viburnum trilobum*	6 to 12	Sun/part shade	High value: bird food	White flat-topped flower clusters; red fruit persists until spring; red color to foliage in autumn