



MARINE MILL PARK
FOREST STEWARDSHIP PLAN
2018

** This is not an official MN Forest Stewardship Plan due to not meeting the minimum acreage requirements – This document is to serve as a guide for the natural resources on the Minnesota Historical Society’s Marine Mill Park site.*



FOREST STEWARDSHIP PLAN

Prepared for:

*Marine Mill Park
121 Judd Street
Marine on St. Croix, MN 55047*

Aaron Novodvorsky

*Facilities Manager-Historic Properties
Minnesota Historical Society
345 Kellogg Boulevard West
St. Paul, MN 55102*

Property Location:

SWSW of Section 6 Township 31 Range 19
Washington County, MN
Stewardship Acres: 4.5
Total Parcel Acres: 4.5
Total Reviewed Acreage: 5.0

Prepared by:

Andy McGuire
MN DNR Metro Area Forester
1200 Warner Rd
St. Paul, MN 55106
651-259-5827

DATE

10/31/2018

Stewardship goals for this property area:

1. Promote the long-term health and growth of the known historical native woodland that is currently being re-established on the Marine Mill Park site
2. Increase the public's knowledge of how important this site is to Minnesota's history.
3. Guide the Minnesota Historical Society (MNHS) and the Marine Mill committee going into the future to prioritize short, mid and long-term goals of native and non-native species on site now and to implement in the future.
4. Establish and maintain scenic "windows" along the property's view shed of the St. Croix River to allow the public the ability to strengthen their sense of interpretive value of this historic site.

OVERVIEW OF THE PLAN

Forest management, in general, is providing a forest or woodland the proper care so that it remains healthy and vigorous to provide the amenities (wildlife habitat, clean air and water, recreation) and products (timber, firewood, non-timber) that you want for your property and community. Forest management involves developing a management plan that includes your long-term vision that is achieved through short-term and long-term goals, an inventory and assessment of your forest (what's there and what condition is it in), action plan (remove buckthorn, plant trees), and a monitoring schedule to make sure things are progressing towards your long-term vision.

LANDOWNER MANAGEMENT GOALS AND OBJECTIVES:

Long-term vision (50-100 years): Marine Mill was the first established commercial lumber mill in what is now known as the state of Minnesota. Due to the abundance of white pine in the area there was a large logging boom and the Marine Mill operated from 1839-1895. Understanding and preserving this history is incredibly important to a lot of people in this community. The MNHS and the Marine Mill Committee are committed to restoring this area to the pre-European settlement period so that the public can continue to learn and understand what this area once looked like. Over the last 10+ years these two groups have done an incredible job at beginning this process by working from their previous Stewardship Plan that was completed in 2000. These goals and practices will not be seen very well over the next 10 years but will be displayed tremendously in 100 years if the plan is continued to be followed.

Short-term goals (0-10 years):

- Continue to monitor for invasive, non-native and nuisance plant species. Going into the future these plants will always be present but the committee has done a remarkable job at getting them under control.
- Monitor and protect new plantings that have been done in the last few years. There is a well-established second generation of trees being established in the understory from natural volunteers and plantings. As saplings continue to grow, prune as necessary to promote upright stem growth as shown in chapter 5 of the Woodland Stewardship book.
- Develop a plan for the removal and replacement of ash trees in the over-story due to the threat of Emerald Ash Borer within the next 5 years.
- Based on findings of the plant survey that was completed in September of 2018 by the MN DNR Division of Ecological and Water Resources (Table 1), begin to follow the Native Plant Community for recommendations on understory ground and shrub species to plant and survey for on site. Due to the previous eradication of buckthorn much of the ground layer is at the beginning stages of re-establishment.

GENERAL PROPERTY DESCRIPTION:

“The property has 3 distinct parts – the upper bluff, the steep rocky cliffs and the river level floodplain. The upper bluff has a small grassy park and a pioneer type woods of mainly box elder and black locust. The floodplain has mostly silver maple, will and small elm. The large elm were removed in the late 1970’s after they died from Dutch elm disease. This stream provided the water power to the sawmill and is now one of the few trout streams left in the Twin Cities area. The steep rocky cliffs are deteriorating from the action of tree roots growing on them. Butternut canker is killing the few butternut trees found on site.”

(Westerberg, Larry. *Marine Millsite - Woodland Stewardship Plan*. 2000.)



The overall representation of the “3 distinct parts” has not drastically changed over the last 15+ years. The floodplain forest and rocky cliffs have remained very similar over the years, but the upland forest has been the focus of woodland management practices. Since 2010, Marine Mill Committee and community volunteers, as well as Sentence to Serve workers, have removed truckloads of black locust, buckthorn and other invasive species, as well as trees growing through the foundations of the historic buildings. They have planted more than 100 native trees and shrubs, protected by wire cages, to reforest the site. The site is seeing increased visitation due to the clean-up and improved access. It will continue to change as new challenges in forest management arise (e.g., impacts of Emerald Ash Borer and changing climate), but is heading in the right direction due to the management performed by the MNHS and Marine Mill Committee volunteers.

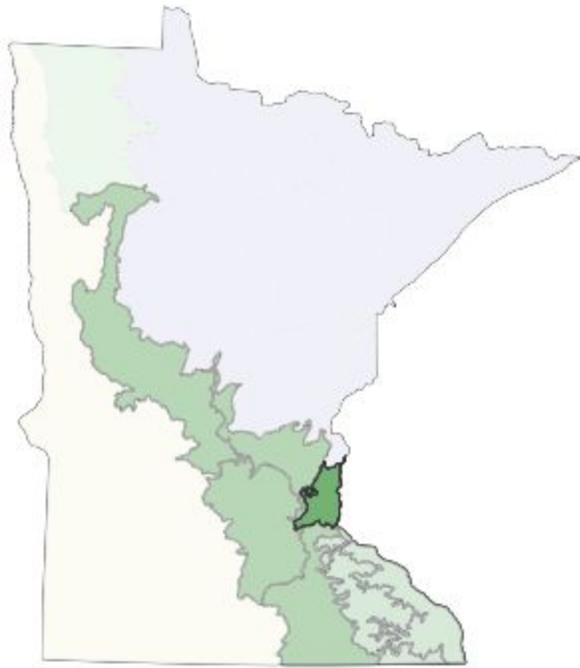
INTERACTION WITH NEARBY PROPERTIES:

This site resides in the heart of the small community of Marine on St. Croix. It is surrounded by historical buildings and businesses that reside along the St. Croix River, which is designated by the National Park Service as a National Wild and Scenic River. The site served as the first commercial sawmill in Minnesota, thus holds significant historical and aesthetic value that is well worth preserving and rehabilitating. The site is open to public use and allows access by foot to the St. Croix River. An observation deck overlooks the St. Croix River from the bluff, and wooden walkways and a deck provide access within the Mill Stream valley. The site is of value to residents of Marine on St. Croix, as well as to all Minnesotans and visitors from near and far.

Landscape Region: **Eastern Broadleaf Forest Province**

The enclosed Minnesota map shows our ecological landscape regions (or subsections). However, the actual boundaries are not as sharp as the lines might imply. In fact, islands of one landscape region can exist inside another, but the units have basic ecological differences between them.

Your land is located in the **St. Paul-Baldwin Plains and Moraines Subsection**.



The northern boundary of this subsection consists of a Superior Lobe end moraine complex (St. Croix Moraine). To the west, terraces associated with the Mississippi River separate the subsection from the Anoka Sand Plain subsection. The southern boundary coincides with the southern edge of the Rosemount Outwash Plain.

This subsection is small and continues into Wisconsin. Although it is topographically low in comparison to other areas in the state, the subsection is dominated by a large moraine and areas of outwash plain. The subsection encompasses part of the seven county metropolitan area and as a result is affected by urban development.

Landform

This subsection is dominated by a Superior lobe end moraine complex. South of this moraine is a series of outwash plains associated with the Superior lobe. There are some areas of loess plain over bedrock or till in the southeastern portion of the subsection. Topography is rolling to hummocky on the moraine (steep, short

complex slopes) and level to rolling on the outwash.

Bedrock geology

Glacial drift is generally less than 100 feet thick within the subsection, with maximum thickness of about 200 feet (Olsen and Mossler 1982). Ordovician and Devonian dolomite (some limestone, sandstone, and shale) is locally exposed, especially in the dissected stream valleys at the eastern edge of the subsection (Morey 1976, Olsen and Mossler 1982). Precambrian bedrock is exposed along the St. Croix River.

Soils

Soils in this subsection are primarily Alfisols (soils formed under forested vegetation). Areas of Mollisols (soils formed under prairie vegetation) are present on the outwash plains. Parent materials are mixed on the moraines (mixtures of clay loams, loams, sandy loams, and loamy sands). The outwash plains have sandy parent materials (Cummins and Grigal 1981).

Climate

Annual normal precipitation ranges from 28 inches in the north to 31 inches in the south, and growing season precipitation ranges from 12.5 to 13 inches. The average growing season length ranges from 146 to 156 days.

Hydrology

The drainage network is poorly developed throughout most of the subsection. This is due to the nature of the landforms. The Mississippi River cuts through the center of the subsection. There is a well-developed floodplain associated with the Mississippi. The end moraines in the northern third have an undeveloped drainage network. The St. Croix River forms the east boundary (as well as the boundary between Minnesota and Wisconsin). The river flows into the Mississippi southeast of the Twin Cities. There are many lakes in this subsection. Most are present on the moraines.



Presettlement vegetation

A mosaic of vegetation occurred in the subsection. Oak and aspen savanna were the primary communities, but areas of tallgrass prairie and maple-basswood forest were common. Tallgrass prairie was concentrated on level to gently rolling portions of the landscape. Bur oak savanna developed on rolling moraine ridges at the western edge of the subsection and in dissected ravines at the eastern edge. Maple-basswood forest was restricted to the portions of the landscape with the greatest fire protection, either in steep, dissected

ravines or where stream orientation reduced fire frequency or severity (Albert 1993).

Present vegetation and land use

Urban development is the primary land use. There are small areas of forest present in the eastern portion of the subsection, although these are becoming scarce as urban development continues. There is significant recreational activity along the Mississippi and St. Croix River corridors.

Natural disturbance

Fire is the most important disturbance within the subsection. Tornadoes and high wind events also created significant disturbances. Periodic flooding occurs in river and stream valleys.

Conservation Concerns

149 Species in Greatest Conservation Need (SGCN) are known or predicted to occur within the St. Paul Baldwin Plains and Moraines, the second most of all subsections in Minnesota. These SGCN include 74 species that are federal or state endangered, threatened, or of special concern. The table, SGCN by Taxonomic Group, displays by taxonomic group the number of SGCN that occur in the subsection, as well as the percentage of the total SGCN set represented by each taxon. For example, 8 mammal SGCN are known or predicted to occur in the St. Paul Baldwin Plains and Moraines, approximately 36% of all mammal SGCN in the state.

[Species in Greatest Conservation need for the St. Paul-Baldwin Plains and Moraines Subsection](#) PDF

Rare Plants, Animals and Communities

Within 1 square mile of the Marine Mill Site there are

- 58 rare, threatened or endangered invertebrate animal siting's
- 2 rare, threatened or endangered terrestrial communities identified
- 3 rare, threatened or endangered vascular plant siting's
- 3 rare, threatened or endangered vertebrate animal siting's

DESCRIPTIONS AND RECOMMENDATIONS OF COVER TYPE UNITS:

The following cover type units are associated with the property and discussed individually with specific recommendations for each type.

Cover Type A – Upland Forest

Cover Type acres: 1.6

Cover Type Description: The upland forest has seen the most amount of change to the overall landscape since the previous plan was written. The Marine Mill Committee has overseen projects including the removal of invasive and nuisance species, the reintroduction of native tree species and upkeep of the man-made features. Due to this work most of the wooded area is now seen as a young forest made up of pines, oaks, maples and many other species in the understory. The remaining overstory is made up of green ash and boxelder with a few other species on the edges near the old foundations and many large silver maples near the banks that lead down to the designated trout stream. The full species list can be found in Table 1 below.



Picture - https://en.wikipedia.org/wiki/Marine_Mill#/media/File:MarineMill.jpg

From this plant list and surrounding known sites in the near vicinity of Marine on St. Croix, it is our best estimation that this upper area was once historically related to FDs37 from the Field Guide to the Native Plant Communities of Minnesota. This plant and community guide can be found in Figure 1 below. Even though eastern white pine is not associated with this plant community, there is historical evidence that it was here and should be accounted for in any management strategies.

Management Objective:

- Maintain and monitor previously planted trees for growth, competition from non-desired plants (wild cucumber, wild grape, ash, etc.), deer rub and pressure from the public use on site.
- Plant new trees as needed to continue the development of a native and diverse overstory going into the future.
- Develop plan for ash replacement along Judd Street. With the threat of Emerald Ash Borer (EAB), the upland forest will see a great loss to its overstory, possibly within the next 10 years.
- Maintain the vegetative buffer along Judd Street that serves as wildlife habitat, a visual buffer, and a natural wall that encourages visitors to use the designated walking paths.
- Monitor any newly established invasive and nuisance plant populations.
- Continue to preserve historic features on site through vegetation management.

Recommendations: (Management timeline from start of plan)

- Use the Woodland Stewardship Book (<https://woodlandstewardship.org/>) to guide planting, spacing, pruning and maintenance of newly planted trees. **(0 - 3 years)**
- Evaluate ash trees to begin removing and replacing. Not every ash tree needs to be removed immediately – EAB EAB infestations take years. Remove select trees and replace with desired species. Pacing removal and replacement will spread the cost burden across several years. Decide on locations of gaps to create and immediately plant trees to fill in the holes. This process creates less competition for the seedlings growth (make sure to note species selection for shade tolerant and intolerant species depending on planting location). Native conifer species will allow for more diversification and keep the visual buffer along Judd street. White pine, red pine, white spruce and northern white cedar can be viable options for this type of planting. All of the identifiable ash trees over 3-4 inches DBH were tagged with a silver metal tag number 1 - 469. The tags were added on trees moving in a direction of south to north. Use an interval number system to remove these trees as shown in the table below. **(0 - 3 years)**

Year 1 - Remove Tags Numbered	Year 2 - Remove Trees Numbered	Year 3 - Remove Trees Numbered
1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46	2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44	3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45
*Using a system like this will prevent large gaps of ash being removed all at once. This is not a set system and can be fluid depending on tree removal budget and years of implementing, but this is the recommended method and timing.		

- Continue to work with and follow Prairie Restorations, Inc. plan to *Create a Native Landscape*. Due to the unique area with the building foundations, a professional approach to keeping deeply rooted plants away from this area serves the needs of the site. When the plan is completed (scheduled 2021) re-evaluate with the Site Manager to decide the next steps. **(0 - 3 years)**
- Overall the site has a lot of already established documents and plans associated with it. The committee has done an impressive job so far at following and implementing projects and has many great resources. Due to this, much of the site only needs to be monitored over the next 5-10 years to recover from the removal of invasive species that took place over the last 10 years. This monitoring should focus on invasive species management, current plantings health and residual tree health. **(3 - 7 years)**
- During this monitoring process, access planted and volunteer sapling for pruning opportunities to promote individual stem growth. By pruning these saplings now when they are young will promote strong stem growth when they would otherwise need to be professionally pruned in the future by a certified arborist. **(3 - 7 years)**
- Monitor ground cover vegetation. Currently the site may appear to be degraded, but the plant survey indicates it is in a relatively healthy state. It is still recovering from years of buckthorn infestation, but the amount and diversity of native species show that it is doing well for the situation and does not need to be drastically transformed. **(3 - 7 years)**
- Remove cages from larger trees and volunteers and install 2 or 3 “T” posts around each tree. This will free up cages to use for new trees and will help prevent deer rub damage (deer use the posts instead). **(7 - 10 years)**

- Before cutting anything larger than 6" DBH in size make sure to follow the Marine on St. Croix Zoning Codes for vegetation removal and management. Reference to codes affecting vegetation can be found in the Appendix at the end of this plan. **(Continuous)**

Additional Instruction and Information:

- Use the Minnesota Noxious Weeds booklet produced by the MN Department of Transportation as an identification and management guide for new and residual invasive species.
 - <https://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

Woodland Stewardship Book References

Chapter	Title	Page
Chapter 3	How Trees and Woodlands Grow	25
Chapter 4	Regenerating Woodland Stands	33
Chapter 5	Woodland Improvement Practices	45
Chapter 6	Managing Important Forest Types – Review species found on your site	80
Chapter 7	Forest Health	91
Chapter 11	Wildlife and Forest Management	127
Chapter 12	Noise and Visual Quality	139
Chapter 13	Recreational Trail Design	147

Cover Type B – Floodplain Forest

Cover Type Acres: 1.6

Cover Type Description: This cover type has great diversity due to the dramatic change in growing conditions within a very small space. The Mill Stream runs through the ravine, and over time has created a very steep bank to the south and a floodplain forest to the north. Water flow rates change throughout the year. Tree species adapted to such wet and varying conditions include cottonwoods, red and silver maples, ash, and willows. Along the south stream bank lie foundation ruins of lumber mill buildings. Along the north edge of the property is an earthen walk-way (formerly a road) that allows the public to access the St. Croix River and this area of the site. Along both sides of the trail, visible erosion is evident, most likely due to urban water runoff from the increased amount of impervious road and building surfaces above the site.



The floodplain forest floor was overwhelmed with buckthorn. Starting in 2010, volunteers cut and stacked the buckthorn into piles, which they then burned during the winter. A more open understory enabled visitors to access the stream and waterfall. In an effort to protect the fragile landscape, the Mill Site Committee built the current boardwalk and overlook deck to direct and consolidate foot-traffic. Access to the south stream bank is discouraged (there is no bridge or path accessing it), resulting in a healthy plant community (see survey). From the plant list and surrounding known sites in the near vicinity of Marine on St. Croix, it is our best estimation that this floodplain area is closely related to FFs68 from the Field Guide to the Native Plant Communities of Minnesota (Figure 2).

Cover Type Objectives:

- Monitor and manage invasive and nuisance plant populations.
- Monitor tree health, aging and potential damage and mortality due to impacts of climate change (drought, increased rainfall, erosion and flooding, and wind events).
- Limit public use to already designated areas.

Recommended Activities to Achieve Cover Type Objective:

- Be prepared for tree die off due to impacts of EAB and weather events. Select species adapted to floodplains, including cottonwood, Dutch elm resistant elms, silver maple, hackberry, black willow, peach-leaved willow, red willow, and river birch. Goals are to increase diversity, control bank erosion and sustain a forest into the future. Beware that floodplain conditions are challenging for plant survival, and establishing a forest may require many attempts. **(3 - 7 years)**
- Survey the site for invasive species annually. Due to the access of the river, there is an extremely high potential of species moving on to the site from far away areas. **(3 - 7 years)**

- Add signage to explain the importance of this area and how fragile a floodplain forest can be. **(0 - 3 years)**
- Work with the city and county to reduce stormwater runoff that is damaging the site. Runoff is flowing to site from uphill properties not owned by MNHS. Thus, only a coordinated plan will reduce stormwater runoff. **(7 - 10 years)**

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Cover Type C – Cliff

Cover Type Acres: **1.3**

Cover Type Description: The cliffs drop off directly to the St. Croix River on the east side of the property. They currently have basswood, northern pin oak, silver maple, green ash and bitternut hickory in the overstory, and a sparse understory of sugar maple, hackberry, butternut, box elder, and black locust. The vegetation on these cliffs, while difficult to manage, is crucially important, as it serves as the last step in the natural water filtration system before water enters the St. Croix River. Cliffs on the site are rocky and some have remnants of the old mill structure.

Cover Type Objectives:

- Maintain and improve stabilization of soils along the shoreline.
- Remove undesired vegetation around remnant structures.
- Monitor any newly established invasive and nuisance plant populations.

Recommended Activities to Achieve Cover Type Objective: (Management timeline from start of plan)

- Develop a plan for a mix of tree, shrub and ground layer plants that are shade tolerant to establish more root systems along the cover type. **(7 - 10 years)** Examples of potential species but not limited to:

Shade Tolerant Plants		
Trees	Shrubs	Ground Cover
basswood	American Bittersweet	bloodroot
eastern hemlock	beaked hazelnut (can be aggressive)	bunchberry
sugar maple	blue beech	Canada violet
white spruce	downy arrowwood	jack in the pulpit
yellow birch	pagoda dogwood	lady fern

- Girdle trees and shrubs around remnant structures to prevent herbicides affecting non-targeted species or reaching the river. Girdling also offers a safer and cheaper alternative to felling and herbicide option on the steep cliffs. Herbicides can be very effective as well if done by a trained individual. **(7 - 10 years)**

Table 1 - Marine Mill Site Plant List - Completed by MN DNR Div. Ecological and Water Resources

Upland- Area #1	Lowland-Area #2
<i>scientific name (common name)</i>	<i>scientific name (common name)</i>
<i>Juglans cinerea</i> (butternut) decaying	<i>Populus deltoides</i> (Eastern cottonwood)
<i>Pinus resinosa</i> (red/norway pine)	<i>Acer rubrum</i> (red maple)
<i>Pinus strobus</i> (white pine) protected	<i>Acer saccharinum</i> (silver maple)
<i>Fraxinus pennsylvanica</i> (green ash)	<i>Fraxinus pennsylvanica</i> (green ash)
<i>Fraxinus americana</i> (white ash)	<i>Salix</i> spp. (willow)
<i>Juglans nigra</i> (black walnut)	<i>Fraxinus nigra</i> (black ash)
<i>Celtis occidentalis</i> (hackberry) protected	<i>Ulmus rubra</i> (slippery elm)
<i>Prunus serotina</i> (black cherry)	<i>Tilia americana</i> (basswood)
<i>Acer negundo</i> (box elder)	<i>Smilax</i> spp. (carrion flower)
<i>Juniperus virginiana</i> (Eastern red cedar) protected	<i>Rhamnus cathartica</i> (common buckthorn)
<i>Quercus ellipsoidalis</i> (Northern pin oak) protected	<i>Parthenocissus</i> spp. (Virginia creeper)
<i>Quercus rubra</i> (red oak) protected	<i>Rudbeckia lacinata</i> (cut-leaf coneflower)
<i>Acer saccharum</i> (sugar maple) protected	<i>Lobelia cardinalis</i> (cardinal flower)
<i>Ulmus americana</i> (American elm)	<i>Vitis riparia</i> (wild grape)
<i>Tilia americana</i> (basswood) protected	<i>Ambrosia trifida</i> (giant ragweed)
<i>Acer ginnala</i> (amur maple)	<i>Lycopus</i> spp. (bugelweed)
<i>Cornus alternifolia</i> (pagoda dogwood) protected	<i>Viola</i> spp. (violet)
<i>Prunus virginiana</i> (chokecherry)	<i>Ageratina altissima</i> (white snakeroot)
<i>Ribes</i> spp. (prickly or Missouri gooseberry)	<i>Pilea</i> spp. (clearweed)
<i>Ribes</i> spp. (not prickly or Missouri)	<i>Gentiana</i> spp. (gentian)
<i>Rhamnus cathartica</i> (common buckthorn)not much- and it was small	<i>Laportea canadensis</i> (wood nettle)
<i>Sambucus</i> spp. (elderberry)	<i>Amphicarpaea bracteata</i> (hog peanut)
<i>Amelanchier</i> spp. (juneberry)	<i>Ranunculus</i> spp. (buttercup)
<i>Arisaema triphyllum</i> (jack-in-the-pulpit)	<i>Solidago</i> spp. (goldenrod)
<i>Ageratina altissima</i> (white snakeroot)	<i>Circaea lutetiana</i> (enchanter's nighshade)
<i>Impatiens cf. capensis</i> (spotted touch-me-not)	<i>Sanicula</i> spp. (black snakeroot)
<i>Solidago</i> spp. (goldenrod)	<i>Clematis virginiana</i> (virgin's bower)
<i>Pilea</i> spp. (clearweed)	<i>Menispermum canadense</i> (Canada moonseed)
<i>Matteuccia stuthiopteris</i> (Ostrich fern)*	<i>Echinocystis lobata</i> (wild cucumber)
<i>Clematis virginiana</i> (virgin's bower)	<i>Arisaema triphyllum</i> (jack-in-the-pulpit)
<i>Vitis riparia</i> (wild grape)	<i>Hackelia virginiana</i> (stickseed)
<i>Avens</i> spp. (rose)	<i>Impatiens</i> spp. (touch-me-not)
<i>Viola</i> spp. (violet)	<i>Rumex</i> spp. (sorrel)
<i>Hackelia virginiana</i> (stickseed)	<i>Elymus</i> spp. (rye)
<i>Phryma leptostachya</i> (American lopseed)	<i>Phalaris arundinacea</i> (reed canary grass)
<i>Cryptotaenia canadensis</i> (honestwort)**	<i>Leersia virginica</i> (whitegrass)
<i>Galium triflorum</i> (sweet-scented bedstraw)	
<i>Solidago flexicaulis</i> (zig-zag goldenrod)	
<i>Leonurus cardiaca</i> (motherwort)	
<i>Rudbeckia lacinata</i> (cut-leaf coneflower)	
<i>Glechoma hederacea</i> (creeping charlie)	
<i>Persicaria virginiana</i> (jumpseed)	
<i>Asarum canadense</i> (wild ginger)	
<i>Ambrosia trifida</i> (giant ragweed)	
<i>Corylus americana</i> (American hazelnut)	
<i>Botrychium virginianum</i> (rattlesnake fern)***	
<i>Athyrium felix-femina</i> (lady fern)***	
<i>Dryopteris cristata</i> (crested wood fern)***	
<i>Dryopteris intermedia</i> (evergreen woodfern)***	
<i>Cystopteris fragilis</i> (fragile fern)***	
<i>Cystopteris bulbifera</i> (bulblet fern)***	Invasive/Nuisance Plant
<i>Echinocystis lobata</i> (wild cucumber)	
*This was our best guess. The patch of ferns was in poor condition, but the leaf (frond) shape and fertile fronds looked like those of ostrich fern	
**Individual plant- in poor condition	
***Observed on site in the past by Marine Mill committee member	
These plant lists reflect the species present along a walk through the sites and are not exhaustive.	

PROPERTY-WIDE/MISCELLANEOUS PROJECTS

Walking Trails

Project Objective:

1. Maintain existing walking trails to provide educational and recreational access to the property.
2. Expand trail network, as appropriate, to reach other cover type areas and accessibility requirements.

Recommended Activities to Achieve Cover Type Objective:

- Reinforce and improve walking trails where erosion is occurring on steep slopes. **(Continuous)**
- Identify hazard trees along the edge of the trails on an ongoing basis for removal. **(Continuous)**
Guidelines for the identification of such trees will be developed for risk management purposes. These guidelines will also serve to keep many trees surrounding the trails from being removed unnecessarily. Use the International Society of Arboriculture (ISA) Tree Risk Assessment Best Management Practices (BMP's) Guide as a reference if you have access to the guide. (<https://www.isa-arbor.com/store/product/324>)

General Wildlife Habitat Recommendations

Project Objective:

1. Maximize overall habitat for wildlife.
2. Install bluebird boxes to encourage nesting.
3. Install bat boxes to promote beneficial mosquito-eating bats.

Recommended Activities to Achieve Cover Type Objective:

- Install bluebird boxes along the perimeter of the woods facing grassland area. Account for adequate spacing requirements – minimum spacing of boxes is 300 feet. **(0 - 7 years)**
 - Boxes are placed in pairs because tree swallows will usually occupy one of the boxes in a pair and bluebirds will occupy the other. Because both bluebirds and tree swallows are territorial with their own species, the paired arrangement increases the chances a pair of bluebirds will take up residence in one of them.
 - Paired boxes should be placed out of sight of another pair or at least 500 ft apart.
- Install bat boxes in appropriate areas. Location and direction may vary on choices of where and how you install them. **(0 - 7 years)**
- Mast-producing trees and shrubs attract many different species of wildlife. Plant only native species that are locally adapted to the soils and climate (as opposed to exotic, non-native species). Birds particularly favor shrubs and small trees like highbush cranberry (*Viburnum trilobum*), juneberry (*Amelanchier* sp.), elderberry (*Sambucus canadensis*), cherries (*Prunus* sp.), dogwood (*Cornus* sp.), hazelnut (*Corylus americana*), mountain ash (*Sorbus americana*), American plum (*Prunus americana*), hawthorn (*Crateagus* sp.) and nannyberry (*Viburnum lentago*). Desirable hardwood trees include oaks (*Quercus* sp.), hickories (*Carya* sp.), ash (*Fraxinus* sp.), and basswood (*Tilia americana*). **(Ongoing)**
- Ground-nesting birds are declining across Minnesota. Restraining household pets may help these birds. **(Ongoing)**
- A diversity of forest types and age classes benefits a diversity of species of wildlife. Thinning hardwood stands creates more structural diversity by having a variety of ages in the forest. Greater structural diversity provides habitat for more species of wildlife. Do, however, preserve old and

mature trees that are utilized by certain species of wildlife. Older trees contain cavities that are utilized by a myriad of wildlife (see below). Also preserve younger, brushy areas that provide habitat for a different suite of species, like common yellowthroat, flycatchers, and American woodcock. **(Ongoing)**

- Create brush piles and down woody debris during management operations. Many species of wildlife utilize brush piles for cover, including rabbits, chipmunks, woodchucks, coyotes, and songbirds. Brush piles can be an easy way to improve a stand's structural diversity. **(Ongoing)**
- Coarse Woody Debris – Logs and rotting material on the forest floor provide important micro-habitat for mosses, lichens and fungi, as well as cover for small mammals, reptiles, and amphibians. **(Ongoing)**
- Snags and Den Trees - Dead and dying trees are very important for woodpeckers, chickadees, nuthatches, bluebirds, squirrels, bats, wood ducks, furbearers, and many other animals. Leave most dead trees or cavity trees standing during a forestry operation, with a goal to have at least 3 per acre. Also reserve some live large-diameter trees for future snags. You can create snags by girdling (cutting through the bark all the way around the tree) undesirable trees in stands. **(Ongoing)**

Marine Mill Committee Objectives

- Review the goals of the Forest Stewardship Plan annually to update completed steps, current conditions, redefine desired future conditions, to address new opportunities and edit the management timeline as needed.
- Using the management timeline, develop an annual work plan for the property, which outlines the steps that will be taken the current year to meet one or more of the objectives outlined in the Forest Stewardship Plan.
- Appoint a committee member yearly to monitor and observe invasive species growth on site.

ADDITIONAL INFORMATION

Below is additional information for some of the recommendations in your plan. This is not all inclusive but provides things to consider as you proceed to implement your management plan and outdoor education activities.

ADA Requirements:

Consider ADA requirements when developing trails or other areas to be accessed for outdoor learning purposes.

Ash Management:

Emerald Ash Borer (EAB)

Emerald Ash Borer is a fairly new and serious pest to Minnesota's ash trees. It was found in St. Paul in 2009 and has been spreading continually since then. Emerald ash borer cannot currently be eradicated and is expected to have a significant impact on our boulevard, backyard, park, and natural ash tree resources, much like Dutch elm disease. Contact your DNR Forester if you suspect Emerald Ash Borer.

Hazard Trees:

Reference the USDA Forest Service publication "How to Recognize Hazardous Defects in Trees" at <http://www.treesaregood.com/treecare/hazards.aspx>. A "hazard tree" is a tree with structural defects likely to cause failure of all or part of the tree, which could strike a "target" that can be a **place** where people (students) gather such as an interpretive sign along a trail, designated learning area, garden or a **structure** such as a building, deck or fence for example. Monitor your trees and ask for assistance from your DNR Forester if you have any concerns.

Invasive Species Management:

Below is a list of non-native invasive plant species to keep an eye out for as they are commonly found across the state. Visit the MN DNR "Guide to Terrestrial Invasives" webpage for information on identification and management of these and other possible species: <http://www.dnr.state.mn.us/invasives/terrestrial/id.html>.

Amur Maple:

Amur maple is a small tree up to 20' high with a broad crown. The leaves are opposite, longer than wide and have three shallow lobes and double toothed edges, turning a brilliant red in fall making it easy to identify. It displaces native shrubs and understory trees in open woods, and shades out native grasses and herbaceous plants in savanna habitat. It is a prolific seed producer and re-sprouts easily from the cut stump.

For more information on Amur maple, reference the MN DNR webpage:

<http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/amurmaple.html>.

Buckthorn:

Buckthorn removal projects have occurred on the property and should continue to be implemented as time and resources allow. The first priority is to identify and remove female seed-producing plants. The second priority is to monitor previous removal sites for sprouting and/or seeding and continue to remove any regeneration. When removing buckthorn, make sure that no other invasive species are overlooked and left to further invade the area once the buckthorn is removed.

Reference the MN DNR publication “Buckthorn: What You Should Know. What You Should Do” at <http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/index.html> for more information on best methods to control and manage buckthorn as well as planting native replacement species.

NOTE: Buckthorn is the only green-leafed deciduous shrub/tree in the forest in November. Late-fall into early winter is an easy time to identify and control.

Garlic Mustard:

Garlic mustard is becoming more common throughout Minnesota. Identifying and removing garlic mustard is important to contain its spread. One pathway the tiny seeds take is through soil attached to footwear.

Garlic mustard is a significant ecological threat by spreading into high quality forests and woodlands, upland and floodplain forests, not just into disturbed areas. Invaded sites undergo a decline in native herbaceous cover within 10 years. Garlic mustard alters habitat suitability for native insects and thereby birds and mammals.

For more information on garlic mustard, reference the MN DNR webpage:

<http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/garlicmustard.html> for information on best methods to control and manage garlic mustard as well as planting native replacement species.

Honeysuckles:

Exotic honeysuckles replace native forest shrubs and herbaceous plants by their invasive nature and early leaf-out. They shade out herbaceous ground cover and deplete soil moisture. The seeds are readily dispersed by birds, making them very invasive. Some research suggests that the plant inhibits the growth of other plants in its vicinity. These species were introduced to North America as ornamental shrubs and beneficial to wildlife.

For more information on exotic honeysuckles, reference the MN DNR webpage:

<http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/exotichoneysuckles.html>

Reed Canary Grass:

Reed canary grass is a major threat to natural wetlands. It out competes most native species and presents a major challenge in wetland mitigation efforts. It forms large, single-species stands, with which other species cannot compete. If cut during the growing season a second growth spurt occurs in the fall. Invasion is associated with disturbances, such as ditch building, stream channeling sedimentation and intentional planting.

For more information on reed canary grass, reference the MN DNR webpage: [MN DNR Invasive Species webpage](#)

Oak Wilt:

Oak wilt is an aggressive disease that affects all species of oaks (*Quercus* spp.) found in Minnesota. It is caused by a [nonnative fungus](#) (*Ceratocystis fagacearum*) that invades the water vessels of oak trees and eventually kills most infected trees. In the United States, oak wilt is found in most northeastern states and in Texas. In Minnesota, oak wilt is typically found in the southern half of the state.

For more information on oak wilt in MN, reference the MN DNR webpage: [MN DNR tree care and forest health webpage](#)

Poison Ivy (native):

Western Poison Ivy is on the noxious weed list for Minnesota due to its toxic, rash-producing properties, as well as its propensity to form large colonies from underground rhizomes. It is a smallish, nonclimbing shrub usually about knee high, with a single stem and only a few stubby branches or no branches at all. The leaves can be relatively large but always with three leaflets that are shiny and are large-toothed along the edges. The sap contains a toxic oily compound (3-n-pentadecyl-catechol) that is found in the leaves, flowers, stems, and roots. If any portion of the plant is bruised or broken, the poison may exude onto the surface, which is how people typically come in contact with it.

You should not touch or burn poison ivy. For the best control method you should apply herbicide. You can pull plants if wearing gloves and protective arm and leg coverings. Restricting access is another way reduce contact.

FDs37 FIRE-DEPENDENT FOREST/WOODLAND SYSTEM
Southern Floristic Region

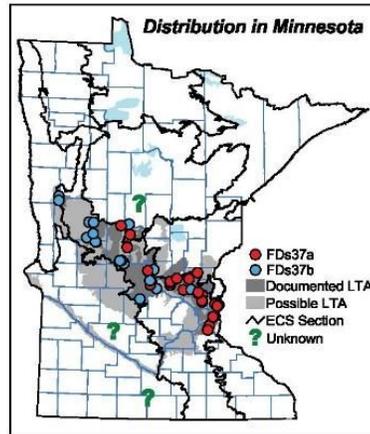
Southern Dry-Mesic Oak (Maple) Woodland

Dry-mesic hardwood forests on undulating sand flats, hummocky moraines, and river bluffs. Present mostly on fine sand or sand-gravel soils. Often on south- or west-facing slopes but common also on flat to undulating sandy lake plains. Historically, fires were common in this community, and many stands are on sites occupied by brushlands 100–150 years ago.

Vegetation Structure & Composition

Description is based on summary of vegetation data from 43 plots (relevés).

- **Ground-layer** cover is patchy to continuous (25–100%). Pointed-leaved tick trefoil (*Desmodium glutinosum*), Clayton’s sweet cicely (*Osmorhiza claytonii*), hog peanut (*Amphicarpaea bracteata*), Canada mayflower (*Maianthemum canadense*), and wild geranium (*Geranium maculatum*) are commonly present. Pennsylvania sedge (*Carex pennsylvanica*) is the most abundant graminoid. Dewey’s sedge (*Carex deweyana*) and starry sedge (*Carex rosea*) may also be present.
- **Shrub-layer** cover is patchy to continuous (25–100%). Common species include black cherry, red maple, chokecherry (*Prunus virginiana*), American hazelnut (*Corylus americana*), gray dogwood (*Cornus racemosa*), prickly ash (*Zanthoxylum americanum*), Virginia creeper (*Parthenocissus* spp.), and poison ivy (*Toxicodendron rydbergii*).
- **Subcanopy** cover is patchy to interrupted (25–75%). The most common species are black cherry, red maple, and bur oak.
- **Canopy** cover is usually interrupted to continuous (50–100%). Bur oak and northern pin oak are the most common species. Northern red oak, white oak, and red maple are occasionally present. Older trees are often open grown, indicating previously more open conditions on the site.
- **Note:** Red maple and white oak are generally absent from occurrences in the CGP.



Landscape Setting & Soils

- **Glacial lake plains**—Common. Present on undulating sand flats that were deposited in the shallow waters of Glacial Lake Grantsburg. Parent material is stoneless, well-sorted fine sand. It was initially calcareous, but soils are now leached of carbonates. Subsoil horizons capable of perching snowmelt are lacking, but general fine-sand texture and occasional bands of silt and gravel can help to retain some soil moisture. Densely cemented layers of sand that may reflect past positions of the water table occur at depth and can help hold water for deeply rooted plants. Soils are excessively drained and the soil-moisture regime is moderately dry. (Anoka Sand Plain in MIM)
- **Stagnation moraines**—Occasional. Present on hummocky moraines, often adjacent to fire-prone outwash plains and tunnel valleys that were occupied in the past by brushland or prairie. Parent material is a discontinuous cap of partially sorted gravelly sand over a base of denser till and is often complexly stratified. Parent material can be calcareous or noncalcareous; when calcareous, soils are leached of free carbonates to at least 30in (75cm). Although some clays have accumulated in the subsoil, clays are insufficient to perch snowmelt and rainfall. The complex stratification allows these sites to retain some rainfall, and water is available to deeply rooted plants just above the dense till. Where the sandy cap is thick, the soils are excessively drained, and the soil-moisture regime is moderately dry. Where the cap is thinner, the soils are well drained, and the soil-moisture regime is fresh. (St. Paul-Baldwin Plains and Hardwood Hills in MIM; locally in Pine Moraines and Outwash Plains in MDL; and Minnesota River Prairie in CGP)



• **River bluffs**—Common. Present on steep (20–50%) south- or west-facing slopes along the Minnesota River valley and other major streams. Soils are developed on eroded calcareous till or cut-faces of gravelly terraces well above modern alluvium. Free carbonates are present at or close to the surface and topsoil layers are thin because of surface erosion. Soils are somewhat excessively to excessively drained. Soil moisture regime is dry to moderately fresh. (Minnesota River Prairie in CGP)

Natural History

In the past, fires were very common throughout the range of FDs37. An analysis of Public Land Survey records indicates that the rotation of catastrophic fires was about 110 years, and the rotation of mild surface fires about 10 years.¹ The rotation of all fires combined is estimated to be 9 years. Windthrow was not common, with an estimated rotation exceeding 1,000 years. Based on the historic composition and age structure of these forests, FDs37 had two growth stages.

• **0–75 years**—Young forests recovering from fire, dominated by bur oak with some northern red oak or white oak. Quaking aspen, northern pin oak, and black cherry are minor components.

• **> 75 years**—Mature forests dominated by a mixture of bur oak, white oak, northern pin oak, and some northern red oak, with minor amounts of American elm. (In the past, sites now occupied by FDs37 typically supported more open communities, including brush-prairie or savanna. Air photos from the 1930s show these sites to have scattered oaks rather than forest canopies. With suppression of wildfires since the mid-1800s, these sites have developed denser tree canopies and herbs typical of mesic forests have become common in the understory. The examples of FDs37 used in this classification are best described by the mature forest growth stage.)

Similar Native Plant Community Classes

• **FDs36 Southern Dry-Mesic Oak-Aspen Forest**

FDs36 can be similar to FDs37, and the ranges of the two communities overlap in the central part of the Hardwood Hills Subsection in the MIM and adjacent parts of the RRV. FDs36 tends to occur on loamy rather than fine sand or sand-gravel soils.

FDs37 Indicator Species	(freq%)		FDs36 Indicator Species	(freq%)	
	FDs37	FDs36		FDs37	FDs36
Northern pin oak (C,U)	60	-	Canada goldenrod (<i>Solidago canadensis</i>)	2	32
Tall blackberries*	53	-	Tall coneflower (<i>Rudbeckia laciniata</i>)	2	28
Large-leaved aster (<i>Aster macrophyllus</i>)	51	-	Golden alexanders (<i>Zizia aurea</i>)	2	28
Wild geranium (<i>Geranium maculatum</i>)	71	4	Basswood (C)	4	40
Red maple (C,U)	67	4	American elm (C)	7	36
Lady fern (<i>Athyrium filix-femina</i>)	53	8	Large-flowered bellwort (<i>Uvularia grandiflora</i>)	20	88
Black cherry (C,U)	87	16	Lindley's aster (<i>Aster ciliolatus</i>)	16	64
Northern bedstraw (<i>Galium boreale</i>)	40	8	Bloodroot (<i>Sanguinaria canadensis</i>)	9	32

*Tall blackberries (*Rubus allegheniensis* and similar *Rubus* spp.)

• **MHc26 Central Dry-Mesic Oak-Aspen Forest**

MHc26 generally occurs to the north and east of FDs37, although the ranges of the two classes overlap along the border between the EBF and LMF Provinces. The presence of sugar maple, especially in the canopy, differentiates MHc26 from FDs37.

FDs37 Indicator Species	(freq%)		MHc26 Indicator Species	(freq%)	
	FDs37	MHc26		FDs37	MHc26
Box elder (U)	42	-	Fly honeysuckle (<i>Lonicera canadensis</i>)	-	32
Prickly ash (<i>Zanthoxylum americanum</i>)	67	4	Sugar maple (C,U)	4	71
Northern pin oak (C,U)	60	4	Large-flowered trillium (<i>Trillium grandiflorum</i>)	2	29
Black cherry (C)	29	3	Bluebead lily (<i>Clintonia borealis</i>)	2	27
Wild grape (<i>Vitis riparia</i>)	62	7	Basswood (C)	4	45
Giant Solomon's seal (<i>Polygonatum biflorum</i>)	27	4	Rose twistedstalk (<i>Streptopus roseus</i>)	7	54
Lopseed (<i>Phryma leptostachya</i>)	62	9	Round-lobed hepatica (<i>Anemone americana</i>)	7	47
Wild geranium (<i>Geranium maculatum</i>)	71	13	Pagoda dogwood (<i>Cornus alternifolia</i>)	13	61

¹Forested communities that extend into the prairie regions of Minnesota tend to have shorter rotations of disturbance from fire (and often wind) on the western edge of their range compared with the eastern part. This probably results from drier climate in the west and being surrounded by prairie vegetation that burns frequently. Because estimated rotations of disturbance for forested communities are calculated from PLS bearing-tree records across the range of the community, and records in the prairie regions are often much sparser than those to the east, disturbance rotations may be much shorter for forest stands in the prairie regions than those presented for the class as a whole.



• **FDC34 Central Dry-Mesic Pine-Hardwood Forest**

FDC34 generally occurs north of FDs37; the presence of conifers almost always distinguishes FDC34 from FDs37.

FDs37 Indicator Species	(freq%)		FDC34 Indicator Species	(freq%)	
	FDs37	FDC34		FDs37	FDC34
Prickly ash (<i>Zanthoxylum americanum</i>)	67	-	Red pine (C)	-	51
Box elder (U)	42	-	Bunchberry (<i>Cornus canadensis</i>)	-	39
Wild grape (<i>Vitis riparia</i>)	62	2	Bluebead lily (<i>Clintonia borealis</i>)	2	46
Lopseed (<i>Phryma leptostachya</i>)	62	2	Rose twistedstalk (<i>Streptopus roseus</i>)	7	68
Northern pin oak (C,U)	60	2	White pine (C,U)	4	41
Wild geranium (<i>Geranium maculatum</i>)	71	3	Paper birch (U)	7	51
Common enchanter's nightshade (<i>Circaea lutetiana</i>)	60	3	Round-lobed hepatica (<i>Anemone americana</i>)	7	39
Pointed-leaved tick trefoil (<i>Desmodium glutinosum</i>)	80	7	Lowbush blueberry (<i>Vaccinium angustifolium</i>)	13	61

• **MHC36 Central Mesic Hardwood Forest (Eastern)**

MHC36 can be similar to FDs37 when FDs37 is dominated by northern red oak (FDs37a). FDs37, however, generally lacks sugar maple, which is prominent in MHC36.

FDs37 Indicator Species	(freq%)		MHC36 Indicator Species	(freq%)	
	FDs37	MHC36		FDs37	MHC36
Northern pin oak (C,U)	50	2	Leatherwood (<i>Dirca palustris</i>)	-	38
Prickly or Smooth wild rose*	27	2	Zigzag goldenrod (<i>Solidago flexicaulis</i>)	4	79
Nannyberry (<i>Viburnum lentago</i>)	46	4	Long-stalked sedge (<i>Carex pedunculata</i>)	4	53
Black cherry (C)	38	4	Large-flowered trillium (<i>Trillium grandiflorum</i>)	4	52
Gray dogwood (<i>Cornus racemosa</i>)	62	7	Sugar maple (C,U)	8	91
Tall blackberries**	73	9	Basswood (C)	8	87
Wild grape (<i>Vitis riparia</i>)	69	10	Blue beech (U)	4	40
American hazelnut (<i>Corylus americana</i>)	85	12	Bloodroot (<i>Sanguinaria canadensis</i>)	8	58

*Prickly or Smooth wild rose (*Rosa acicularis* or *R. blanda*) **Tall blackberries (*Rubus allegheniensis* and similar *Rubus* spp.)

• **MHs37 Southern Dry-Mesic Oak Forest**

MHs37 can be similar to FDs37 but is more likely to occur on loamy soils (at least in the upper soil layers) than on fine sand or sand-gravel soils. MHs37 occurs on sites less affected by fire in the recent past and therefore generally lacks the open-grown canopy trees often present in FDs37.

FDs37 Indicator Species	(freq%)		MHs37 Indicator Species	(freq%)	
	FDs37	MHs37		FDs37	MHs37
Mountain rice grass (<i>Oryzopsis asperifolia</i>)	42	-	Maidenhair fern (<i>Adiantum pedatum</i>)	-	56
Large-leaved aster (<i>Aster macrophyllus</i>)	51	2	Spreading Jacob's ladder (<i>Polemonium reptans</i>)	-	47
Bush honeysuckle (<i>Diervilla lonicera</i>)	36	2	Gregarious black snakeroot (<i>Sanicula gregaria</i>)	4	58
Red maple (C,U)	67	7	Bitternut hickory (C,U)	4	56
Pale bellwort (<i>Uvularia sessilifolia</i>)	62	7	Sugar maple (C,U)	4	51
Quaking aspen (C,U)	29	5	White snakeroot (<i>Eupatorium rugosum</i>)	7	65
Spreading dogbane (<i>Apocynum androsaemifolium</i>)	40	7	Hackberry (C,U)	9	60
Northern pin oak (C,U)	60	23	Honewort (<i>Cryptotaenia canadensis</i>)	13	72

• **FDs27 Southern Dry-Mesic Pine-Oak Woodland**

The range of FDs27 occasionally overlaps with FDs37 in the area around the Twin Cities, where it occurs on deep sands that accumulate along valley walls of tributaries to the Mississippi River.

FDs37 Indicator Species	(freq%)		FDs27 Indicator Species	(freq%)	
	FDs37	FDs27		FDs37	FDs27
Red maple (C,U)	67	-	Flowering spurge (<i>Euphorbia corollata</i>)	-	62
Pale bellwort (<i>Uvularia sessilifolia</i>)	62	-	Heart-leaved aster (<i>Aster cordifolius</i>)	-	46
Large-leaved aster (<i>Aster macrophyllus</i>)	51	-	Downy rattlesnake plantain (<i>Goodyera pubescens</i>)	-	38
Mountain rice grass (<i>Oryzopsis asperifolia</i>)	42	-	Bitternut hickory (C,U)	4	62
Beaked hazelnut (<i>Corylus cornuta</i>)	24	-	Eastern red cedar (C,U)	4	62
Starflower (<i>Trientalis borealis</i>)	22	-	White pine (C,U)	4	54
Downy arrowwood (<i>Viburnum rafinesquianum</i>)	49	8	White snakeroot (<i>Eupatorium rugosum</i>)	7	69
Nannyberry (<i>Viburnum lentago</i>)	42	8	Black raspberry (<i>Rubus occidentalis</i>)	9	54

• **FDC25 Central Dry Oak-Aspen (Pine) Woodland**

The range of FDC25 overlaps with FDs37 in east-central Minnesota, where FDC25 occurs on level lake plains and on glacial river terraces. Species more commonly found in prairies are often present in FDC25 while generally absent from FDs37.



FDS37 Indicator Species	(freq%)		FDC25 Indicator Species	(freq%)	
	FDS37	FDC25		FDS37	FDC25
Box elder (U)	42	-	Wintergreen (<i>Gaultheria procumbens</i>)	-	47
Common enchanter's nightshade (<i>Circaea lutetiana</i>)	60	3	Wild bergamot (<i>Monarda fistulosa</i>)	-	37
Prickly ash (<i>Zanthoxylum americanum</i>)	67	7	Jack pine (C)	-	30
Lopseed (<i>Phytolacca leptostachya</i>)	62	7	Prairie willow (<i>Salix humilis</i>)	-	30
Black cherry (C)	29	3	Yarrow (<i>Achillea millefolium</i>)	2	43
Lady fern (<i>Athyrium filix-femina</i>)	53	7	Big-toothed aspen (U)	4	33
Missouri gooseberry (<i>Ribes missouriense</i>)	24	3	Lowbush blueberry (<i>Vaccinium angustifolium</i>)	13	93
Wild geranium (<i>Geranium maculatum</i>)	71	13	Veiny pea (<i>Lathyrus venosus</i>)	7	47

Native Plant Community Types in Class

● **FDS37a Oak - (Red Maple) Woodland**

Canopy is dominated by northern red oak, northern pin oak, and white oak with lesser amounts of bur oak and red maple. Red maple is also common in the subcanopy and shrub layers. Chokecherry, American hazelnut, gray dogwood, and prickly ash are common in the shrub layer. FDS37a is distinguished from FDS37b by the presence of northern red oak or white oak in the canopy or understory. Other species that can help to differentiate FDS37a from FDS37b include red maple, bush honeysuckle (*Diervilla lonicera*), lady fern (*Athyrium filix-femina*), interrupted fern (*Osmunda claytoniana*), and starflower (*Trientalis borealis*). FDS37a has been documented in the MIM and MDL; it is most common in the Anoka Sand Plain Subsection in the MIM. Description is based on summary of vegetation data from 26 plots.

● **FDS37b Pin Oak - Bur Oak Woodland**

Canopy has abundant northern pin oak and bur oak. The subcanopy is not well differentiated from the canopy; bur oak, black cherry, and green ash are the most common subcanopy species. The shrub layer is often dense, with prickly ash, chokecherry, American hazelnut, gray dogwood, prickly gooseberry (*Ribes cynosbati*), and downy arrowwood (*Viburnum rafinesquianum*) all common. FDS37b is distinguished from FDS37a by the greater dominance of northern pin oak and bur oak in the canopy. Other species that help to differentiate FDS37b from FDS37a when present include green ash, wild honeysuckle (*Lonicera dioica*), snowberry or wolfberry (*Symphoricarpos* spp.), giant Solomon's seal (*Polygonatum biflorum*), Lindley's aster (*Aster ciliolatus*), and side-flowering aster (*Aster lateriflorus*). FDS37b has been documented in the MIM and CGP, where it is most common in the Hardwood Hills Subsection with occasional occurrences in the Anoka Sand Plain and Minnesota River Prairie Subsections. (Occurrences in the Minnesota River Prairie Subsection and other parts of southwestern Minnesota are included on the basis of field observations; few samples from FD communities are available for this part of the state.) Description is based on summary of vegetation data from 18 plots.



photo by D.S. Wovcha MN DNR

Boot Lake Scientific and Natural Area, Anoka County, MN



FDS37 Southern Dry-Mesic Oak (Maple) Woodland — Species Frequency and Cover

	freq %	cover		freq %	cover		freq %	cover	
Forbs, Ferns & Fern Allies									
Clayton's sweet cicely (<i>Osmorhiza claytonii</i>)	78	••	Wild grape (<i>Vitis riparia</i>)						
Pointed-leaved tick trefoil (<i>Desmodium glutinosum</i>)	76	••	Low Shrubs						
Hog peanut (<i>Amphicarpaea bracteata</i>)	78	••	Red raspberry (<i>Rubus idaeus</i>)					64	
Canada mayflower (<i>Malinium canadense</i>)	73	••	Tall blackberries (<i>Rubus allegheniensis</i> and similar <i>Rubus</i> spp.)					47	
Wild geranium (<i>Geranium maculatum</i>)	69	••	Tall Shrubs						
Common enchanter's nightshade (<i>Circaea luteiflora</i>)	60	••	Chokecherry (<i>Prunus virginiana</i>)					82	
Wild sarsaparilla (<i>Aralia nudicaulis</i>)	60	••	American hazelnut (<i>Corylus americana</i>)					80	
Lopseed (<i>Phytolaba leptostachya</i>)	60	••	Gray dogwood (<i>Cornus racemosa</i>)					67	
Common false Solomon's seal (<i>Smilacina racemosa</i>)	60	••	Prickly ash (<i>Zanthoxylum americanum</i>)					67	
Pale bellwort (<i>Uvularia sessilifolia</i>)	60	••	Poison ivy (<i>Toxicodendron rydbergii</i>)					64	
Lady fern (<i>Athyrium filix-femina</i>)	51	••	Prickly gooseberry (<i>Ribes cynosbati</i>)					49	
Bracken (<i>Pteridium aquilinum</i>)	51	••	Downy arrowwood (<i>Viburnum rafinesquianum</i>)					49	
Sweet-scented bedstraw (<i>Gallium triflorum</i>)	49	••	Juneberries (<i>Amelanchier</i> spp.)					47	
Large-leaved aster (<i>Aster macrophyllus</i>)	49	••	Nannyberry (<i>Viburnum lentago</i>)					42	
Columbine (<i>Aquilegia canadensis</i>)	40	••	Bush honeysuckle (<i>Dierilla lonicera</i>)					33	
Northern bedstraw (<i>Gallium boreale</i>)	40	••	Missouri gooseberry (<i>Ribes missouriense</i>)					24	
Wood anemone (<i>Anemone quinquefolia</i>)	40	••	Beaked hazelnut (<i>Corylus cornuta</i>)					22	
Spreading dogbane (<i>Apocynum androsaemifolium</i>)	38	••	Snowberry or Wolfberry (<i>Symphoricarpos albus</i> or <i>S. occidentalis</i>)					20	
Maryland black snakeroot (<i>Sanicula marilandica</i>)	36	••	Red-berried elder (<i>Sambucus racemosa</i>)					20	
Early meadow-rue (<i>Thalictrum dioicum</i>)	31	••	Round-leaved dogwood (<i>Cornus rugosa</i>)					16	
Giant Solomon's seal (<i>Polygonatum biflorum</i>)	27	••	Trees						
Starry false Solomon's seal (<i>Smilacina stellata</i>)	22	••		freq %	Canopy cover	Subcanopy freq %	Subcanopy cover	Shrub Layer freq %	Shrub Layer cover
Starflower (<i>Trientalis borealis</i>)	20	••	Bur oak	67	••••	58	••	33	••
Interrupted fern (<i>Osmunda claytoniana</i>)	20	••	Northern pin oak	60	••••	33	••	38	••
Large-flowered bellwort (<i>Uvularia grandiflora</i>)	20	••	Northern red oak	33	••••	13	•••	22	••
Elliptic shinleaf (<i>Pyrola elliptica</i>)	20	••	White oak	29	••••	9	••	18	••
Tall-leaved aster (<i>Aster sagittifolius</i>)	18	••	Black cherry	29	••	58	••	69	••
Grasses & Sedges									
Pennsylvania sedge (<i>Carex pennsylvanica</i>)	84	••••	Quaking aspen	27	••	56	••••	53	••
Mountain rice grass (<i>Oryzopsis asperifolia</i>)	40	••	Red maple	27	••	••	••••	••	••
Nodding fescue (<i>Festuca subverticillata</i>)	11	••	Paper birch	20	••	••	••	••	••
Bottlebrush grass (<i>Elymus hystrix</i>)	11	••	Big-toothed aspen	11	••••	••	••	••	••
Woody Vines									
Virginia creeper (<i>Parthenocissus</i> spp.)	91	••	Green ash	9	••	••	••	31	••
			American elm	-	-	-	-	31	••
			Ironwood	-	-	29	••••	18	••



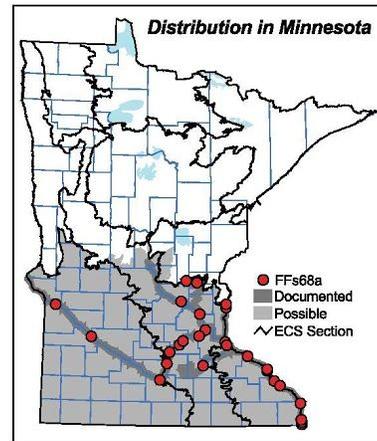
Southern Floodplain Forest

Deciduous riparian forests on sandy or silty alluvium on low, level, annually flooded sites along medium and large rivers in the southern half of Minnesota. Community is characterized by evidence of recent flooding such as rows and piles of debris, ice scars on trees, high-water channels, and freshly deposited silt and sand.

Vegetation Structure & Composition

Description is based on summary of vegetation data from 27 plots (relevés).

- Ground-layer** cover is generally very sparse during spring due to inundation and scouring by floodwaters, becoming variable by midsummer (5–50% cover) and characterized by annual or flood-tolerant perennial species. Important herbaceous species include false nettle (*Boehmeria cylindrica*), clearweeds (*Pilea* spp.), Ontario aster (*Aster ontarionis*), Virginia wild rye (*Elymus virginicus*), cut grasses (*Leersia virginica* and *L. oryzoides*), hop umbrella sedge (*Carex lupulina*), and cattail sedge (*C. typhina*). Wood nettle (*Laportea canadensis*) often forms dense patches. Species typical of wetland communities are also often present, including mad dog skullcap (*Scutellaria lateriflora*), southern blue flag (*Iris virginicus*), and beggarticks (*Bidens* spp.). The invasive species kidney-leaved buttercup (*Ranunculus abortivus*), creeping charlie, moneywort (*Lysimachia nummularia*), motherwort (*Leonurus cardiaca*), yellow wood sorrels (*Oxalis stricta* and *O. dillenii*), garlic mustard (*Alliaria petiolata*), and reed canary grass (*Phalaris arundinacea*) are present in many stands and sometimes abundant.
- Climbing plants and vines** are important in this community; characteristic are climbing poison ivy (*Toxicodendron radicans* var. *negundo*), wild grape (*Vitis riparia*), and moonseed (*Menispermum canadense*).
- Shrub layer and subcanopy** are mostly sparse (0–25% cover) and occasionally patchy (25–50% cover); silver maple, green ash, American elm, and hackberry are most common. Climbing poison ivy is occasionally present in the tall-shrub layer. Silver maple seedlings are often abundant.
- Canopy** is interrupted to continuous (50–100% cover), and strongly dominated by silver maple with occasional green ash, cottonwood, or American elm.



Landscape Setting & Soils

- Floodplains**—Common. Often the dominant vegetation on active floodplains of medium to large rivers in the deeply cut bedrock valleys of the Minnesota, lower St. Croix, and lower Mississippi rivers and their larger tributaries. Parent material is deep, complexly stratified sandy alluvium with a silty cap. The parent material may or may not have been calcareous originally, although free carbonates are rarely present now. Biogenic carbonates such as snail shells are occasionally present. Gray soil colors occur within 40in (100cm) of the surface and indicate permanently saturated conditions below. Annual flooding is typical. Soils are somewhat poorly or poorly drained. Soil-moisture regime is very moist. (PPL; Anoka Sand Plain, St. Paul Baldwin Plains, and Big Woods in MIM; Minnesota River Prairie in CGP)

Natural History

- 0–35 years**—Young forests recovering from severe flooding or wind and dominated by American elm mixed with red elm, green ash, and willows (*Salix amygdaloides* and



S. nigra). Cottonwood and silver maple are minor components during this stage.

- **35–155 years**—Mature forests consisting of mixtures of American elm, green ash, and silver maple. Willow is eliminated during this stage.
- **> 155 years**—Old forests dominated by American elm, mixed with silver maple and green ash. (True floodplain trees such as silver maple and cottonwood appear to be underrepresented in all growth stages in the historic records for this community. This could be due to difficulty in separating historic tree records for Southern Floodplain Forests from those for Southern Terrace Forests, which are less likely to have abundant silver maple or cottonwood and more likely to have abundant American elm. American elm probably was somewhat more important in true floodplain forests in the past but has largely been eliminated by Dutch elm disease. The composition of floodplain forests has also been affected by changes in river hydrology caused by dam construction along southern Minnesota’s major rivers.)

Similar Native Plant Community Classes

● **FFs59 Southern Terrace Forest**

FFs59 occurs along many of the same rivers as FFs68, and the two communities grade into one another. FFs59 is generally present on elevated riparian sites—such as terraces and levees—that flood only occasionally and usually for just a few days at most, while FFs68 is present on sites that are flooded every spring (and sometimes following heavy rain) for several days to several weeks and have regular deposition of silt and sand. Recently deposited sediment, windrowed debris, and ice scars on trees are all useful evidence for distinguishing active floodplain sites from sites where terrace forests occur. FFs59 is more likely to have basswood, bur oak, swamp white oak, hackberry, black ash, or black walnut in the canopy, with silver maple sometimes present but rarely dominant. FFs68 tends to be strongly dominated by silver maple.

● **FFn67 Northern Floodplain Forest**

FFs68 Indicator Species	(freq%)		FFs59 Indicator Species	(freq%)	
	FFs68	FFs59		FFs68	FFs59
Bur marigold and Beggarticks (<i>Bidens</i> spp.)	44	5	Missouri gooseberry (<i>Ribes missouriense</i>)	-	53
Hop umbrella sedge (<i>Carex lupulina</i>)	22	2	Aniseroot (<i>Osmorhiza longistylis</i>)	-	37
Mad dog skullcap (<i>Scutellaria lateriflora</i>)	56	7	False rue anemone (<i>Enemion biternatum</i>)	-	30
Wild cucumber (<i>Echinocystis lobata</i>)	19	2	Virginia waterleaf (<i>Hydrophyllum virginianum</i>)	4	70
Northern bugleweed (<i>Lycopus uniflorus</i>)	19	2	Cleavers (<i>Galium aparine</i>)	4	51
Rice cut grass (<i>Leersia oryzoides</i>)	30	7	White avens (<i>Geum canadense</i>)	4	40
False nettle (<i>Boehmeria cylindrica</i>)	26	7	Blue phlox (<i>Phlox divaricata</i>)	4	37
Narrow-leaved hedge nettle (<i>Stachys tenuifolia</i>)	33	9	Basswood (C,U)	4	37

FFn67 also occurs on annually flooded sites along medium to large rivers and is strongly dominated by silver maple but is restricted to northern Minnesota. The ranges of the two classes overlap in east-central and west-central Minnesota.

FFs68 Indicator Species	(freq%)		FFn67 Indicator Species	(freq%)	
	FFs68	FFn67		FFs68	FFn67
Hackberry (C,U)	41	-	Small or Three-cleft bedstraw*	-	53
Greenbrier (<i>Smilax tamnoides</i>)	33	-	Retrorsed sedge (<i>Carex retrorsa</i>)	-	53
Cottonwood (C)	30	-	Tuckerman’s sedge (<i>Carex tuckermanii</i>)	-	47
Rice cut grass (<i>Leersia oryzoides</i>)	30	-	Yellow loosestrife (<i>Lysimachia terrestris</i>)	-	32
Honewort (<i>Cryptotaenia canadensis</i>)	26	-	Northern blue flag (<i>Iris versicolor</i>)	4	42
Canada moonseed (<i>Menispermum canadense</i>)	56	5	Sensitive fern (<i>Onoclea sensibilis</i>)	7	58
Tall coneflower (<i>Rudbeckia laciniata</i>)	41	5	Black ash (C,U)	7	53
Poison ivy (<i>Toxicodendron rydbergii</i>)	33	5	Fringed loosestrife (<i>Lysimachia ciliata</i>)	7	47

*Small or Three-cleft bedstraw (*Galium tinctorium* or *G. trifidum*)

Native Plant Community Types in Class

● **FFs68a Silver Maple - (Virginia Creeper) Floodplain Forest**

FFs68a is the only type recognized in this class at present. Additional data collection, particularly focused on geographical differences or on wetter sites, may result in recognition of distinct types or subtypes.



photo by D.S. Wovcha, MN DNR



Sherburne County, MN



FFs68 Southern Floodplain Forest – Species Frequency & Cover

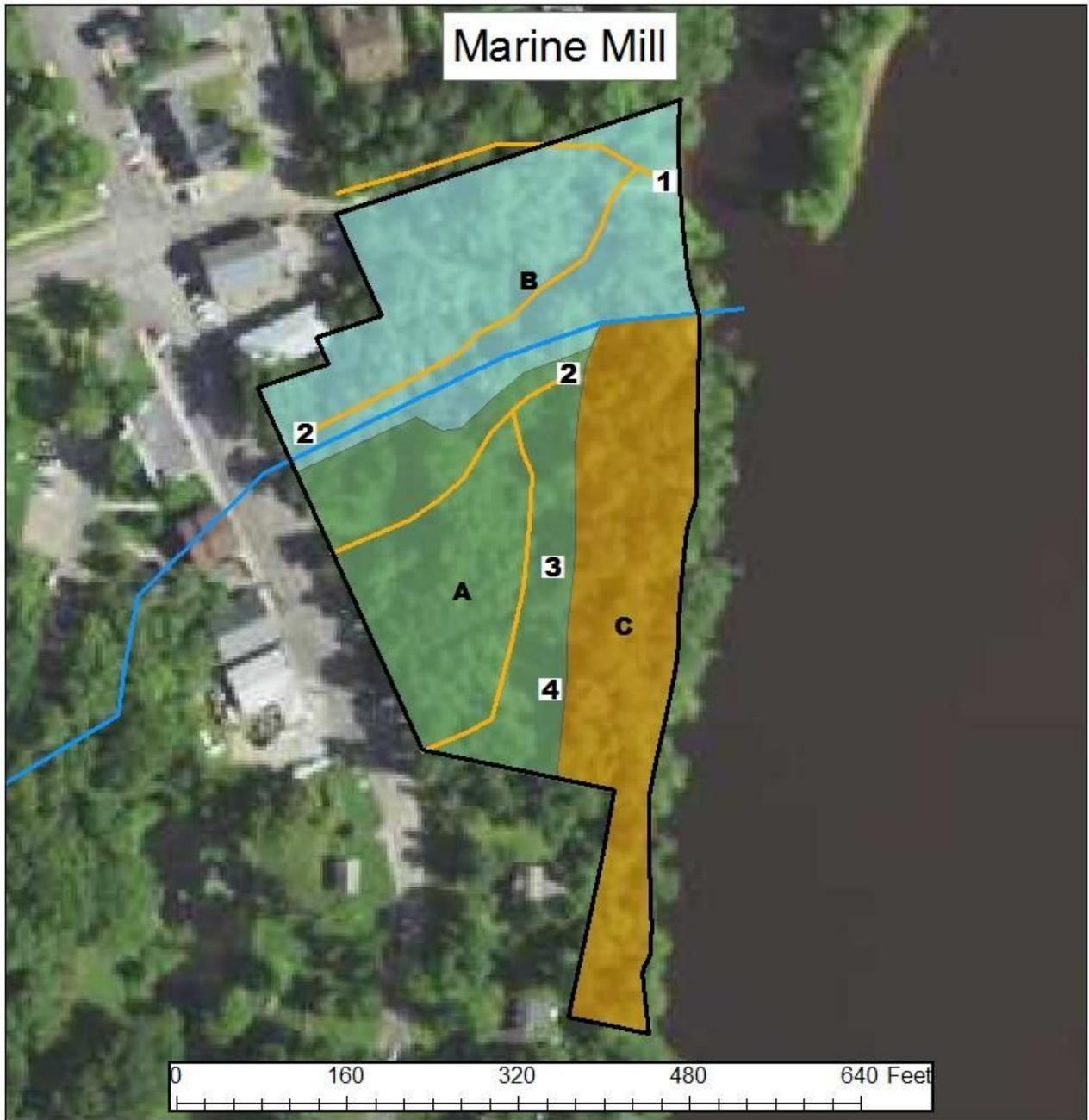
	freq% cover	freq% cover
Forbs, Ferns & Fern Allies		
Wood nettle (<i>Laportea canadensis</i>)	93	11
Ontario aster (<i>Aster ontariensis</i>)	56	52
Mad dog skullcap (<i>Scutellaria lateriflora</i>)	56	44
Cleanweed (<i>Pilea</i> spp.)	52	30
Bur marigold and Beggarticks (<i>Bidens</i> spp.)	44	22
Touch-me-not (<i>Impatiens</i> spp.)	41	15
Tall coneflower (<i>Rudbeckia laciniata</i>)	41	15
Stinging nettle (<i>Urtica dioica</i>)	37	15
Kidney-leaved buttercup (<i>Ranunculus abortivus</i>)	33	11
Narrow-leaved hedge nettle (<i>Stachys tenuifolia</i>)	33	11
Honewort (<i>Cryptotaenia canadensis</i>)	26	11
False nettle (<i>Boehmeria cylindrica</i>)	26	11
Wild cucumber (<i>Echinocystis lobata</i>)	19	81
Nodding or Virginia stickseed (<i>Hackelia deflexa</i> or <i>H. virginiana</i>)	19	56
Northern bugleweed (<i>Lycopus uniflorus</i>)	19	33
Side-flowering aster (<i>Aster lateriflorus</i>)	15	26
Dodder (<i>Cuscuta</i> spp.)	15	**
Tall bellflower (<i>Campanula americana</i>)	15	33
Virginia knotweed (<i>Polygonum virginianum</i>)	15	11
Germander (<i>Teucrium canadense</i>)	15	11
Bur cucumber (<i>Sicyos angulatus</i>)	15	11
Woundwort (<i>Stachys palustris</i>)	15	11
Cut-leaved bugleweed (<i>Lycopus americanus</i>)	15	11
Eastern panicled aster (<i>Aster lanceolatus</i>)	11	63
Green dragon (<i>Arisaema dracontium</i>)	11	74
White snakeroot (<i>Eupatorium rugosum</i>)	11	56
Stemless blue violets (<i>Viola sororia</i> and similar <i>Viola</i> spp.)	11	-
Erect, Smooth, or Illinois carrion-flower*	11	33
Common mint (<i>Mentha arvensis</i>)	11	22
Three-seeded mercury (<i>Acalypha rhomboides</i>)	11	-
		26
Grasses & Sedges		
Southern blue flag (<i>Iris virginica</i>)		11
Virginia wild rye (<i>Elymus virginicus</i>)		52
White grass (<i>Leersia virginica</i>)		44
Rice cut grass (<i>Leersia oryzoides</i>)		30
Hop umbrella sedge (<i>Carex lupulina</i>)		22
Cattail sedge (<i>Carex typhina</i>)		15
Ambiguous sedge (<i>Carex amphibola</i>)		15
Bladder sedge (<i>Carex intumescens</i>)		11
Stout woodreed (<i>Cinna arundinacea</i>)		11
Gray's sedge (<i>Carex grayi</i>)		11
Climbing Plants		
Wild grape (<i>Vitis riparia</i>)		81
Canada moonseed (<i>Menispermum canadense</i>)		56
Greenbrier (<i>Smilax tamnoides</i>)		33
Virginia creeper (<i>Parthenocissus</i> spp.)		26
Climbing poison ivy (<i>Toxicodendron rydbergii</i>)		**
Shrubs		
Climbing poison ivy (<i>Toxicodendron rydbergii</i>)		33
Black willow (<i>Salix nigra</i>)		11
Trees		
Silver maple	96	63
Green ash	67	74
American elm	41	56
Cottonwood	30	56
Hackberry	22	-
Box elder	11	33
Swamp white oak	11	22
Red elm	-	-
		26

* Erect, Smooth, or Illinois carrion-flower (*Smilax ecirrata*, *S. herbacea*, or *S. illinoensis*) **Climbing poison ivy is important in both the shrub and climbing plant layers, but all records from plot samples were universally assigned to the shrub layer.

STEWARDSHIP PROJECTS SUMMARY

Table 2 - Use this table in conjunction with recommendations for each cover type in the plan above.

Year	Cover Type	Map Label	Project Prescription	Acres
2018	All	A,B,C	Eradicate any invasive species that are still on site. During plant survey amur maple, common buckthorn, black locust and reed canary grass were found in areas around the site. Refer to each individual species for effective eradication procedures.	4.5
2018	Upland Forest	A	Create a plan for ash species replacement along Judd Street and the stand overstory. Work with forester to develop this plan by tagging trees with metal tags for removal starting in year 1 of the plan and so on into the future.	1.6
2019-2020	All Forested Cover Types	A, B, C	Work with neighboring entities to develop a plan regarding water runoff increases to the entire site.	4.5
2019-2028	Upland Forest	A	Begin removing tree cages from saplings trees that are over 8' tall and install the cages on younger seedlings for protection. When the cage is removed add 2-3 "T" posts around the tree to prevent deer rub and prune the tree to promote stem and height growth.	1.6
2019-2021	Upland Forest	A	Continue to work with Prairie Restorations, Inc. plan to Create a Native Landscape to preserve remnant foundations	1.6
2020-2025	All Forested Cover Types	A, B, C	Plant seedlings in the understory focusing on edges to improve erosion, diversity and fill in gaps in the understory. Choice of location and specie of the trees are very important to this process. Depending on the location use the recommendations from the cover type descriptions above for species selection.	4.5
2022-2024	Upland Forest	A	Create or install wildlife habitat features such as bird, bat, and butterfly houses as desired. After more management is completed. Assess each cover type and install infrastructure as necessary for wildlife promotion or deterrents. Consult with any forester or wildlife professionals for adequate suggestions.	1.6
On-going / Annual	All Forested Cover Types	A,B,C	Monitor for buckthorn and other invasive species, plan control as appropriate.	4.5
On-going / Annual	All Forested Cover Types	A,B,C	Monitor for future hazard trees and limbs to be removed for safety concerns. Follow ISA Hazard Tree Assessment BMP's	4.5
On-going / Annual	Upland Forest, Floodplain Forest	A,B	Evaluate trail, seating, decking and all constructed features for maintenance needs. Plan accordingly for completion. The Marine Mill Committee and MNHS will have to determine the feasibility of any additional site accessibility improvements and additions as needed by the MNHS.	3.2



Legend

- | | |
|----------------------------------|--------------------------|
| Property Boundary | Cover Type, Label |
| Features | Upland Forest, A |
| 1 Beach/Canoe Landing | Floodplain Forest, B |
| 2 Observation Deck | Cliff, C |
| 3 Planing Mill Foundation | |
| 4 Drying Shed Foundation | |
| Old Mill Stream | |
| Site Trails | |



Created by: Andy McGuire
MN DNR Metro Area Forester
09/2018



Appendix

From the "Landowner's Guide to the Lower St. Croix Riverway, page #20:

- *A local permit is needed to remove trees or shrubs within the St. Croix Riverway District. Contact your local zoning administrator for more information.*
- *A buffer of trees along the bank can provide privacy, enhance property values, and protect the shoreline. Vegetation protects buildings from wind in winter and strong sunlight in summer. The roots of native plants stabilize soil, prevent erosion, and improve water quality.*

From the Zoning Ordinance January 2018, page #4-9 & 4-10, 4-11, 4-19, 5-48 & 5-49:

Pages 4-9 & 4-10

404.3 Screening

- 1) *Where any commercial or industrial use or parking lot is adjacent to property zoned or developed for residential use the owner of such commercial or industrial premises shall provide screening along the boundary of the residential property. Screening shall also be provided where a commercial or industrial use or parking lot is located across the street from a residential zone, but not on that side of a business or industry considered to be the front.*
 - ***MNHS shall maintain "Green Belt" screening along its Judd Street property line where appropriate and feasible.***
- 2) *All open, off-street parking areas of four (4) or more spaces shall be screened from abutting or surrounding residential districts.*
- 3) *All exterior storage shall be screened. The exceptions are: (1) merchandise being displayed for sale; (2) materials and equipment presently being used for construction on the premises; (3) merchandise located on service station pump islands.*
- 4) *The screening shall be placed along property lines or in case of screening along a street, five (5) feet from the street right-of-way with landscaping between the screening and pavement.*
- 5) *All the screening specifically required by this Ordinance shall consist of either a fence or green belt planting strip as provided for below:*
 - a) *Green Belts. A green belt planting strip shall consist of evergreen trees and/or deciduous trees and large shrubs and shall be of sufficient width and density to provide an effective visual screen. This planting strip shall contain no structures. Such planting strips shall be designed to provide visual screening of at least eighty (80) percent opacity to a minimum height of six (6) feet. Earth mounding or berms may be used but shall not be used to achieve more than three (3) feet of the required screen. The planting plan and type of plantings shall require the approval of the Zoning Administration Staff.*
 - b) *Screen Fencing. A required screening fence shall be constructed of masonry, brick, wood or steel. Such fence shall provide a screening effect up to at least eighty (80) percent opacity and not exceed eight (8) feet in height or be less than six (6) feet in height. The design and materials used in constructing a required screening fence shall be subject to the approval of the Zoning Administration Staff.*

404.5 Landscaping

- 1) *In all urban districts, all developed uses shall provide a landscaped yard along all streets. This yard shall be kept clear of all structures, storage, and off-street parking. Except for driveways, the yard shall extend along the entire frontage of the lot, and along both streets in the case of a corner lot, such yard shall have a depth of at least ten (10) feet. In all districts, all structures and areas requiring landscaping and fences shall be maintained so as not to be unsightly or present harmful health or safety conditions. The area disturbed by construction or reconstruction shall be restored or landscaped within nine (9) months after issuance of an occupancy permit.*
 - **MNHS shall maintain "Green Belt" screening along its Judd Street property line where appropriate and feasible.**

405.7 Tree and Woodland Preservation

- 1) *The following restrictions shall apply to all residential development occurring in wooded areas:*
 - a) *Structures shall be located in such a manner that the maximum number of significant trees shall be preserved (see Section 202, Significant Trees).*
 - b) *Prior to the granting of a building permit, it shall be the duty of the person seeking the permit to demonstrate that there are no feasible or prudent alternatives to the cutting of significant trees on the site and that if trees are cut, the applicant will restore the density of trees to that which existed before development but in no case shall he be compelled to raise the density above ten (10) trees per acre.*
 - c) *Forestation, reforestation or landscaping shall utilize a variety of indigenous tree and shrub species and shall not utilize any species that is invasive or presently under disease epidemic. Species planted shall be hardy under local conditions and compatible with the local landscape.*
 - **MNHS shall develop and maintain the appropriate forestation, reforestation and landscaping plan within its Woodland Stewardship Plan.**
 - d) *Development including grading and contouring shall take place in such a manner that the root zone aeration stability of existing trees shall not be affected and shall provide existing trees with a watering equal to one-half the crown area.*
 - e) *Notwithstanding the above, the removal of trees seriously damaged by storms or other acts of God, or diseased trees shall not be prohibited.*
- 2) *Tree and Woodland Preservation Plans:*
 - a) *In the case of all single family subdivisions, business, and industrial developments, a tree preservation plan shall be submitted to the Planning Commission for review and then to the City Council for approval. The tree preservation plan shall include identification of significant trees and tree masses within the construction area, tree preservation measures to be implemented during building construction, and site grading to protect identified significant trees.*
 - **MNHS shall submit a copy of the 2018 revised Woodland Stewardship Plan for the Marine Mill Park Historic Site to the Marine on St. Croix Planning Commission when complete.**

510.6 District Requirements

The following standards and criteria shall apply to development within the Lower St. Croix River Overlay District.

- 1) *Site Preservation. The following standards and criteria are provided to preserve vegetative and topographical screening, and to retard runoff, soil erosion, and nutrient loss.*
 - a) *Vegetative Cutting. On land within 200 feet of the ordinary high water level in rural districts, 100 feet of the ordinary high water level in urban districts, and 40 feet landward of blufflines and on slopes greater than 12 percent in all districts, there shall be no vegetative cutting of live trees or shrubs without a vegetative cutting permit from the City's zoning administration staff. A permit may be issued only if:*
 - i) *The cutting, including topping:*
 - (1) *Involves trees less than 6 inches in diameter at breast height; and*
 - (2) *Involves vegetation which is not screening any structure from view from the river; and*
 - (3) *Preserves the essential character, quality, and density of existing growths; and*
 - (4) *Maintains continuous canopy cover or*
 - ii) *Diseased trees are to be removed and their removal is in the public interest; or*
 - iii) *The cutting is necessary for the maintenance of transportation or utility rights-of-way.*
 - b) *Vegetative Cutting Permit. A vegetative cutting permit is not required for the following provided the existing quality, character, density, and canopy is maintained as viewed from the river.*
 - i) *Clearing for a validly permitted structure, septic system, roadway, or parking area.*
 - ii) *Maintenance trimming or pruning on a particular parcel or in transportation or utility rights-of-way.*
 - c) *Grading and Filling. Grading, filling, excavating or otherwise changing the topography landward of the ordinary high level mark shall not be conducted without a grading permit from the City's Zoning Administration Staff. A grading permit may be issued only if:*
 - i) *Slopes greater than 12 percent (12 feet vertical rise in 100 horizontal feet) are preserved to the greatest extent possible.*
 - ii) *Earth moving, erosion, vegetative cutting, drainage, filling of wetlands, and the destruction of natural amenities is minimized,*
 - iii) *The smallest amount of ground is exposed for as short a time as feasible.*
 - iv) *During construction, temporary ground cover such as mulch is used and permanent ground cover such as sod is planted upon completion.*
 - v) *Methods to prevent erosion and trap sediment are employed and*
 - vi) *Fill is stabilized to accepted engineering standards.*
 - d) *A separate grading and filling permit is not required for grading, filling or excavating the minimum area necessary for a structure, sewage disposal system, private road or parking area undertaken pursuant to a validly issued building permit.*
- ***MNHS or its local Marine Mill Park Historic Site operating partner shall obtain any and all proper permits prior to any Vegetative Cutting operations that are beyond "Maintenance Trimming or Pruning".***