

# Forest Stewardship Plan



Prepared for City of Marquette, Presque Isle Park

by  
Caretaker Forestry

Plan Duration: 2019 to 2039



The Forest Stewardship Program is funded by the United States Forest Service  
and administered by the Michigan Department of Natural Resources.  
This plan also meets the requirements of the American Tree Farm System.  
This is an initial plan, not a renewal or revision of a prior Forest Stewardship Plan.

[www.Michigan.gov/ForestStewardship](http://www.Michigan.gov/ForestStewardship)

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<b>Property Information</b>			
Total Acres: 203	Forested Acres: 149	Acres in Plan: 149	Tax ID:
Town:48N	Range:25W	Section: 1 & 2	Township: County: Marquette
Property Legal Description (Quarter-Quarter Section, Quarter Section, Section, Town, Range, Township, County): T48N-R25W, sec 1 & 2, Govt lots 1 – 5.			
How to Find Property from Nearest Town: See map			
<b>Participation in Related Forestry Programs</b>			
<input type="checkbox"/> I intend to enroll this parcel in the Qualified Forest Program (QF).		<a href="http://www.Michigan.gov/QFP">www.Michigan.gov/QFP</a>	
<input type="checkbox"/> I intend to enroll this parcel in the Commercial Forest Program (CF).		<a href="http://www.Michigan.gov/CommercialForest">www.Michigan.gov/CommercialForest</a>	
<input checked="" type="checkbox"/> I intend to enroll this parcel in the American Tree Farm System.		<a href="http://www.TreeFarmSystem.org">www.TreeFarmSystem.org</a>	
<input type="checkbox"/> I intend to apply to the NRCS for financial assistance.		<a href="http://www.nrcs.usda.gov">www.nrcs.usda.gov</a>	
<b>Michigan's Stewardship Ethic</b>			
Stewardship is an ethic recognizing that the land and its natural inhabitants have an inherent worth. We acknowledge that we have a responsibility to consider the current and far distant future value of the land as we manage, protect, and enjoy the forest. Stewardship guides us to conduct our activities to the utmost of our abilities and to insure the future health, productivity, diversity, and well-being of the land, its natural communities and native species. Stewardship today provides opportunities to future generations to use and enjoy the land and its resources.			
<b>Signatures of Approval from Landowner, Plan Writer, and DNR Service Forester</b>			
This plan describes my goals and objectives for my forest. Participation in the Forest Stewardship Program is voluntary and only indicates my intent to practice sustainable forest management. I understand that enrolling forest land into separate property tax programs like the Commercial Forest program or the Qualified Forest program requires my compliance with an approved forest management plan in exchange for the reduction in property taxes.			
Landowner:		Date:	
Plan Writer:		Date:	
DNR Service Forester:		Date:	
After review and signed approval by the Landowner, the Plan Writer submits the entire Plan to the nearest DNR Service Forester for their review. <b>Electronic submission of the Plan is encouraged by emailing a Word document or pdf file to the Service Forester.</b> The DNR Service Forester will return a hard copy or pdf of the signature page and plan to the Plan Writer after approval.			

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## Introduction

### Forest Stewardship Program

Presque Isle Park, as the City website declares it is, “Marquette’s recreation crown jewel.” This plan is a joint effort funded in part by the Forest Stewardship Outreach and Education Program to assist the City with long range planning for this highly prized recreation facility. The Outreach and Education Grant is a component of the Forest Stewardship Program that allows municipal forest owners and other groups to design and implement educational programs on their forest land. Under the Forest Stewardship Program, the U.S. Forest Service (USFS) supplies funding and partners with each State Forester to provide professional planning and technical assistance to private landowners in their state. The Department of Natural Resources (DNR) administers the Forest Stewardship Program in Michigan. See [www.michigan.gov/foreststewardship](http://www.michigan.gov/foreststewardship) for more information.

Forest stewardship includes concepts of sustainability. A widely used definition of sustainability is, “*The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems.*”<sup>1</sup> This definition recognizes the need to balance the three supporting pillars of ecological, economic and social priorities. The concept of balancing competing values is inherent in the process of developing this management plan.

### General Property Description & History

Presque Isle Park is a 200-acre peninsula in Lake Superior on the north side of the City of Marquette. The “island” as locals call it, is famous for its natural beauty and easy accessibility. It has been used by humans since long before European settlers arrived. It is believed that pre-historic peoples as long ago as 7,000 years ago frequented the place. It was originally reserved for a government light house station but was deeded to the City in the late 1800’s.<sup>2</sup> The “island” has long been a favorite place to enjoy the scenic beauty of the lake shore and the wooded inland; a place to relax and enjoy family picnics or peaceful solitude. Except for a timber sale about 30 years ago to clean up storm damage no other timber harvesting is known to have occurred on the island.

A few important previous works about the park must be mentioned here. First, Fredrick Olmsted’s letter to the City of Marquette dated May 18, 1896 is an early benchmark describing the unique scenic and recreational value of the Park.<sup>3</sup> Second, the Presque Isle Park Advisory Committee (PIPAC) formed in November 1993 completed a management plan for the Park in August 1997<sup>4</sup>. And finally, John Anderton published an

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<sup>1</sup> Wikipedia, [https://en.wikipedia.org/wiki/Sustainable\\_forest\\_management](https://en.wikipedia.org/wiki/Sustainable_forest_management). See also “What is Forest Sustainability?” <https://www.fs.fed.us/research/sustain/what-is-sustainability.php>

<sup>2</sup> City of Marquette website, accessed Apr 3, 2019. <https://www.marquettemi.gov/departments/community-services/parks-and-recreation/presque-isle-rentals/>

<sup>3</sup> Quoted in entirety in “A management Plan for Presque Isle Park”, Presque Isle Advisory Committee, August 1997.

<sup>4</sup> Ibid

environmental history of the Park in 2009.<sup>5</sup> This work describes the geologic and human history. All of these previous reviews describe Presque Isle as a unique and valuable treasure. The consensus has been for well over a century that Presque Isle is indeed Marquette's Crown Jewel.

## Landowner's Goals

"Preserve it, treasure it as little altered as may be for all time..."<sup>6</sup> The words of Fredrick Olmsted from 1896 still ring true describing the City's objective for the Park. It is a popular destination for hiking, picnicking, swimming and paddling. However, the City is also concerned about maintaining the health of the forest. Much of the recreational use is concentrated on the lake shore perimeter of the island but there is a well-developed network of hiking trails that traverse the interior as well. Fire prevention is a chief concern.

## Planning Process

Jon Swenson, Community Services Director for the City of Marquette expressed a desire to develop a plan to help the city manage the island. We discussed the FSP Outreach and Education grant program and agreed to take the project on. In January 2019 the grant was approved, and the planning process began.

## Stand Assessment Method

Using online sources of aerial imagery (Google, Bing and ESRI satellite) and QGIS<sup>7</sup> software a preliminary map was produced prior to field work. In March 2019, we established multiple transects collecting information about the land and timber on 58 systematically located sample plots distributed throughout the park. The data was then used to refine the cover type maps and to develop management recommendations. Basal area (BA)<sup>8</sup> by species and average diameter was recorded at each point. At the same time map details and GPS<sup>9</sup> locations were noted to determine stand boundaries and other features of interest. Table 2 below provides the summary list of stands. Soils information included in this plan was generated by Web Soil Survey, <http://websoilsurvey.nrcs.usda.gov/>.

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<sup>5</sup> John Anderton, *The Jewel in the Crown: An Environmental History of Presque Isle Park, Marquette, MI*. 1993. Center for Upper Peninsula Studies, Northern Michigan University

<sup>6</sup> Fredrick Olmsted in "A management Plan for Presque Isle Park", Presque Isle Advisory Committee, August 1997

<sup>7</sup> [www.QGIS.org](http://www.QGIS.org)

<sup>8</sup> Basal area, a measure of stand density, is the sum of the cross-sectional area of all trees [measured at breast height, 4.5'] expressed as square feet per acre.

<sup>9</sup> Global positioning system

Figure 1. Location Map





Figure 2. Soils Map





## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
11C	Deer Park sand, 1 to 10 percent slopes	2.1	1.1%
19	Deford and Leafriver soils, 0 to 2 percent slopes	8.4	4.2%
24B	Munising fine sandy loam, 1 to 6 percent slopes	18.1	9.1%
24D	Munising fine sandy loam, 6 to 18 percent slopes	46.3	23.4%
66B	Udipsamments-Urban land complex, nearly level and gently sloping	17.2	8.7%
170B	Chocolay very cobbly fine sandy loam, 1 to 6 percent slopes, very stony	60.6	30.6%
172D	Buckroe-Rock outcrop complex, 6 to 25 percent slopes, very bouldery	18.0	9.1%
172F	Buckroe-Rock outcrop complex, 25 to 70 percent slopes, very bouldery	17.0	8.6%
207D	Dishno-Michigamme-Rock outcrop complex, 6 to 25 percent slopes, very bouldery	8.1	4.1%
<b>Totals for Area of Interest</b>		<b>197.9</b>	<b>100.0%</b>

## Soils Descriptions

Map Unit Symbol	Texture	Map Unit Name	Acres	Percent	Depth to Water Table	Drainage
11 C	Sand	Deer Park	2.1	1.1	80+''	Excessive
19	Muck/sand	Deford & Leaf River	8.4	4.2	6''	Poorly
24 B & D	Fine sandy loam	Munising	64.4	32.5	12''	Mod well
66 B	N/A	Urban land complex	17.2	8.7	80+''	Excessive
170 B	Cobbly fine sandy loam	Chocolay	60.6	30.6	12''	Mod well
172 D & F	Very channery <sup>10</sup> loamy sand	Buckroe-Rock outcrop	35	17.7	80+''	Excessive
207 D	Cobbly silt loam	Dishno-Michigamme	8.1	4.1	12''	Mod well

<sup>10</sup> More than 15% flat fragments of sandstone, shale etc.

The two soils that cover the majority of the island are Munising fine sandy loam and Chocolay, cobbly fine sandy loam. These two soils make up 63% of the area, dominating the mid-section. The other soils characterize the steep sections around the perimeter, the developed areas including the parking lots and picnic grounds, the beaches and the marsh. With the exception of the marsh area all other soils are moderately well to excessively drained. These soils characteristics are the controlling factors for two significant natural disturbance factors – wind and fire. These factors will be discussed below in the Forest Health section.

## Water and wetlands



Lake Superior, surrounding the peninsula on three sides is without question the dominant water feature of the Park and the magnet that draws people to it. Within the interior the only other feature is the emergent wetland found on the south western edge of the Park. This is a 10-acre wetland mitigation area created in 2013<sup>11</sup>. The Moosewood Nature Center nearby uses this for many educational programs including the Haunted Bog Walk held on Halloween Day each year.

## Biological Diversity

Seventeen different tree species were recorded in the sample plots for this plan. These are the typical northern forest species found throughout the U.P. The field work was done in March with deep snow cover so ground flora was not visible. Upland forested sites include dry-mesic natural red and white pine, dry-mesic northern hardwoods and hemlock and a small amount of upland spruce-fir-cedar complex. Other noteworthy features are the sandstone lakeshore cliffs and the emergent wetland bog.

## Timber

Generally, the forest areas of the Park have not been managed for timber. The exception is an area in the middle section where there is evidence of timber harvesting sometime within the last 30 years. This harvest was to remove storm damaged timber. However, for the most part the rest of the timber has not been managed. Hazard trees have routinely been removed from the recreational use areas. Some areas of the interior are developing distinct old-growth characteristics. More detailed discussions about the timber will be included in the individual stand discussions below.

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<sup>11</sup> 2018 McClellan Avenue Extension Wetland Mitigation Report On-Site McClellan Avenue Wetland & Presque Isle Wetlands B & C. Marquette County Conservation District & City of Marquette. November 2018.

## Forest Health

Because the forest has not been actively managed other than for recreational interests for a long time much of the forest is overmature. Average tree size is large with many trees over 24" in diameter. There are also many dead trees both as standing snags and large woody debris on the ground. These are characteristics of old growth forest. Because overmature trees are at the end of their life cycle they do not grow rapidly and are subject to the common damaging agents such as insects, disease, fungi, wind and ice damage. Wind and ice influences are particularly evident since the park is surrounded by the open lake and experiences powerful storm effects.

### Wind

**Figure 3. Potential windthrow hazard**



Historically, wind has been the primary natural disturbance factor for the forests at Presque Isle. The probability for windthrow in Fig 3 is based on soil characteristics such as texture, depth to water table, depth to rock, etc. The large, red section in the middle is Munising fine sandy loam. This is a deep sandy soil. Trees grow well on this soil and are root firm under moderate conditions. But the island is frequently exposed to high winds off Lake Superior. Its location creates a higher likelihood of wind damage. There is ample evidence of this in the interior where large trees have blown over or been damaged by wind. This type of wind damage does not typically occur as large-scale, stand replacing events. Rather, individual trees or small groups of trees are usually blown over creating natural openings in the forest canopy. These openings provide ideal conditions for new seedlings to germinate and grow so the forest is perpetually renewing itself. The common species found here -

maple, hemlock and oak are well adapted to this type of disturbance pattern.

The small red area in the lower left corner is the marsh where tree cover is light. The soils are saturated, so trees do not have strong, deep root systems. There are not many trees here so the risk is lower than the map would indicate.

### Invasive species

Elise Desjarlais, Coordinator of Lake to Lake Cooperative Invasive Species Management Area monitors invasive species reported over a large part of the U.P. She reports that there are no records of the more serious invasive plant species such as garlic mustard or wild parsnip on the island but there are “healthy populations” of several lower priority species such as spotted knapweed, common St. John’s Wort and various clovers. These are considered lower priority

because they do not have serious ecological impacts<sup>12</sup>. This is good news but, because the park is so heavily used it will be important to monitor all areas for new introductions.

Other invasive pests that could pose a threat to the Park's forest include Emerald ash borer, Hemlock wooly adelgid and Asian long-horned beetle<sup>13</sup>. None of these are known to be in the Park now but they could be there in the future. Emerald ash borer, although a serious pest in other parts of the U.P. is not a serious threat on the island because ash trees are nearly non-existent. Hemlock wooly adelgid could be devastating to the majestic hemlocks but it is not known to occur in the U.P. at this time. Asian long-horned beetle is on the watchlist of pests that could pose a serious risk to Michigan forests, but it has not been detected in the state yet. These and many other pests are often spread inadvertently through the movement of firewood and other plant materials. Camp fires in the fire grills in the picnic areas are permitted at Presque Isle so it is possible that someone could bring infected firewood into the park. One way to protect against this is to follow the policy that the state parks have adopted – only firewood sold by the park or purchased from an “approved” source is allowed into the park. Another option would be to disallow fire wood altogether and require picnickers to use propane gas or charcoal for grilling.

## Recreation, Roads and Trails

There are approximately 4.3 miles of unpaved walking trails and 2 miles of paved road, a very popular walking loop. The paved road is not plowed in the winter beyond the breakwater point and the pavilion on the west side. The rest of the road is heavily used by walkers in winter as well as summer. There have been and continue to be conflicts between walkers and motorists because the pavement is quite narrow. Bicycles are not permitted at the Park except on paved surfaces. The City is currently working on revising the schedule for closing the road to vehicles to reduce these conflicts.

Some recreational activities are damaging trees - specifically, using hammocks and slacklining. Both these activities use ropes or web straps wrapped around trees and users frequently break branches off trees to clear a space for attaching the ropes. The City has already observed damage to young trees and even older trees with thick bark show wear from repeated use. The City Arborist, Paul Albert has observed, “... (the younger trees) suffer severe cambium damage after only one roping occurrence. Older trees with thick, corky bark can also be significantly abraded and incur similar damage after repeated instances of roping.”<sup>14</sup> Enforcement and user education programs would help reduce this problem.

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<sup>12</sup> Email dated Mar 25, 2019. Elise Desjarlais <l2lcisma@gmail.com>

<sup>13</sup> 2018 Forest Health Highlights, Michigan DNR.

[https://www.michigan.gov/documents/dnr/frsthlthghlights\\_513144\\_7.pdf](https://www.michigan.gov/documents/dnr/frsthlthghlights_513144_7.pdf)

<sup>14</sup> Personal communication from Andrew MacIver, Assistant Director of Community Services, May 9, 2019

## Wildlife Habitat

Wildlife habitat is generally enhanced where the forest includes a variety of tree and plant species arranged on the landscape in a variety of patterns. Thus, dense, mature, contiguous forests provide habitat values for some species while young, early successional forests and open lands provide others. Arranging these different types of forest on the landscape in a diverse pattern provide optimal wildlife habitat values for a wide number of species.

Mature northern hardwoods support many interior song birds as well as a variety of small mammals. "Forest floor dwellers common to northern hardwoods include white-footed mice, shrews, and chipmunks. Other species use the various levels of the overstory, understory, as well as the forest floor. For example, red-shouldered hawk, a state-threatened species, prefers to nest in the lower crotches of mature trees. Other uncommon or declining birds found in mesic hardwood forests include the northern goshawk, black-throated blue warbler, and--especially where hemlock is present--the blackburnian warbler. The American marten, fisher, elk, and gray wolf live here along with the barred owl, pileated woodpecker, broad-winged hawk, bald eagle, wood frog, chorus frog, and deer mouse. Other species include ruffed grouse, woodcock, cottontail rabbit, snowshoe hare, fox and eastern gray squirrel, wild turkey, white-tailed deer, bobcat, fox, coyote, raccoon, and black bear."<sup>15</sup> Although the island has representative examples of northern hardwood habitat the area is relatively small, the larger landscape is almost all water and human use is high. So, although the forest does provide habitat as described above the other factors reduce the value for many species.

The exception of course is deer. By some estimates the deer herd within the park ranges from 20 to 30+. This is equivalent to 90 – 137 deer per square mile. There are many different estimates of what constitutes a healthy deer population, but the numbers typically range between 15 and 30 deer/sq. mi. The population at Presque Isle is easily 3 to 4 times higher than that. This is far above the carrying capacity of the island and is only sustained through regular albeit, illegal artificial feeding. Seeing deer is one of the attractions of the park but the population is not sustainable and is impacting the vegetation of the island. A census of the deer population is recommended. Additionally, a well-developed educational campaign to inform users of the problems associated with artificial feeding and over population would likely reduce the problem.

## Threatened and Endangered Species.

A review of known occurrences of Threatened and Endangered (T&E) species was conducted by the MI DNR<sup>16</sup>. This review reported no findings of T&E species. However, two plant species of special concern were listed - satiny willow, *Salix pelita*, last observed in 1906 and butterwort, *Pinguicula vulgaris*, last observed in 2000. The Michigan Natural Features inventory (MNFI) does

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<sup>15</sup> Sargent, M.S and Carter, K.S., ed. 1999. Managing Michigan Wildlife: A Landowners Guide. Michigan United Conservation Clubs, East Lansing, MI. 297 pp.  
[https://www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/landowners\\_guide/Introduction/TOC.htm](https://www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/landowners_guide/Introduction/TOC.htm)

<sup>16</sup> Reviewed by Ernie Houghton, MDNR April 1, 2019



list a number of additional species in the vicinity but not specifically on the island. These include the following:

- *Amerorchis rotundifolia*, Small round-leaved orchis, last observed 1891, Endangered (Legally protected)
- *Rallus elegans*, King Rail, last observed 1969, Endangered (Legally protected)
- *Salix pellita*, Satiny willow, last observed 1906, Special Concern (Rare or status uncertain; not legally protected)
- *Tanacetum huronense*, Lake Huron tansy, last observed 1918, Threatened (Legally protected)
- *Juncus stygius*, Moor rush, last observed 1889, Threatened (Legally protected)
- *Myotis lucifugus*, Little brown bat, last observed 1980, Special Concern (Rare or status uncertain; not legally protected)
- *Falco peregrinus*, Peregrine falcon, last observed 2018, Endangered (Legally protected)
- *Gymnocarpium robertianum*, Limestone oak fern, last observed 2016, Threatened (Legally protected)
- *Carex atratiformis*, sedge, last observed 1914, Threatened (Legally protected)

In addition MNFI lists the sandstone lakeshore cliff as an ecological feature. This feature is classified as “vulnerable” at the global scale (G3) and “imperiled” at the State level (S2)<sup>17</sup>. This natural community is found almost exclusively along the shores of Lake Superior. Due to the thin, easily eroded soils it is vulnerable even to minor disturbances such as foot traffic. Trampling along walking paths removes all vegetation and exposes the thin soil to erosion. This is aggravated by the beautiful scenic value of these cliffs which make them highly attractive to visitors. This feature is found along most of the eastern edge of the Park within stands 2 and 7. The walking trails along the cliff tops are popular but foot traffic is a risk of further erosion. Bicycles are already prohibited in these highly sensitive sites. Enforcement and user education of the values and risks would help further the reduction of negative impacts.

## Cultural, historical and special sites.

Like the T&E review, MDNR also conducted a review of known historical or archaeological sites on the property. Multiple archaeological sites were reported including prehistoric camps and

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<sup>17</sup> Michigan Natural Features Inventory. <https://mnfi.anr.msu.edu/communities/description/10719/Sandstone-Lakeshore-Cliff>



villages and historic camp and mine locations. To protect these sites the following recommendations have been provided by the State Historic Preservation Office<sup>18</sup>.

- Prohibit metal detecting and artifact collecting park-wide.
- Any proposed ground disturbances, regardless of how minimal, should be assessed for potential impacts to archaeological resources.
- The appropriateness of professional archaeological survey should be considered ahead of any future ground disturbing projects.
- Any public interpretative signage should be carefully considered, should not mark precise site locations, and should be created collaboratively with tribal representatives and a professional archaeologist knowledgeable in the local prehistory and history.

## Bird Conservation

The U.S. Fish and Wildlife Service in cooperation with Partners in Flight and others has developed a list of priority birds. The birds on the list include birds that are of highest conservation value, are common species in steep decline or which are highly dependent on our region for their breeding habitat. Some of the habitats within the Park have been identified as favorable for some of these priority birds. As described above, the size of the park which limits the amount of habitat, the surrounding lake and the high recreational use all have an impact on the value of the habitat for these birds.

*Table 1. Priority Birds*

Habitat <sup>19</sup>	Priority bird species
Mesic hardwoods/hemlock	Least Flycatcher, Wood Thrush, Evening Grosbeak, Broad-winged Hawk, Yellow-bellied Sapsucker, Ovenbird, Nashville Warbler, Blackburnian Warbler, Chestnut-sided Warbler, Black-throated Blue Warbler, Black-throated Green warbler, Northern Goshawk, Swainson's Thrush

<sup>18</sup> Email 4/26/2019, from Stacy Tchorzynski, (MSHDA), TchorzynskiS@michigan.gov

<sup>19</sup> Habitat naming follows Dickman, Donald I., Michigan Forest Communities, Michigan State Extension, 2004

Dry-mesic pine	Eastern Whipoor-will, Connecticut Warbler, Evening Grosbeak, Broad-winged Hawk, Ovenbird, Nashville Warbler, Blackburnian Warbler, Black-throated Blue Warbler, Black-throated Green warbler, Northern Goshawk, Swainson's Thrush
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## Fire.

Prescribed fire is a management tool used to reduce hazardous fuels or unwanted understory plants. Prescribed fire should only be conducted by highly trained and properly insured professionals. All prescribed fires require a Burn Permit available from the DNR at [www.Michigan.gov/BurnPermit](http://www.Michigan.gov/BurnPermit). More information about prescribed fire is available on the Michigan Prescribed Fire Council website at [FireCouncil.org](http://FireCouncil.org). Use of prescribed burning at Presque Isle is not recommended.

*Figure 4. Potential for damage by fire*



Wildfire, i.e. uncontrolled fire does pose a limited amount of risk on the island. The soils report rates soils based on their potential for fire or windthrow. These ratings are based on soil characteristics like texture, depth to water table, depth to rock etc. Based on soil characteristics alone the red areas are high potential for fire. These soils are thin, sandy, stony soils over rock. They dry quickly, are on steep slopes and exposed to wind – ideal conditions for fire to spread quickly. This is primarily the ring of pine on the steep slopes that circle the island. Historically, the primary natural disturbance in this area would have been periodic fire. The pines are well adapted to dry site conditions and fire prone environments. The thick bark on the larger trees protects them from damage from light fires while these same light fires kill the competing vegetation that builds up in the understory. Once the competing vegetation is gone the large trees

scatter seeds to regenerate the forest. This is a natural process that has gone on for thousands of years. The green and yellow areas have a lower risk of fire occurring because the soils are more moist and the low vegetation is usually green and leafy. Thus, it does not ignite readily except under prolonged drought conditions or before leaf out in the spring and after leaf drop in the fall.

From a park management standpoint, the red areas are where the most attention should be given to fire protection. Wildfire would not be a welcome event in such a popular, public use area. However, fire protection comes with an unintended consequence – the buildup of flashy fuels. In the absence of periodic low fires balsam fir has grown up in the understory and has



created “ladder fuels” (see images below). These are fuels low to the ground that can ignite from a groundfire, burn quickly and carry the fire up into the overstory. Under certain conditions this could become a crown fire which would be devastating to the pine. Under extremely dry conditions such a fire could threaten the hardwood/hemlock stands of the interior. The highest risk of a fire starting is from human activity. Campfires are prohibited, but this does not prevent them from occurring. An effort to educate the user public about the risk of fire could reduce the likelihood of human caused fire. In addition, a fire protection strategy should be developed in conjunction with the City fire department and the DNR fire staff.<sup>20</sup> This strategy should include preventative measures as well as defining which suppression tactics are appropriate for the park.

Figure 5 & 6. Examples of understory development in pine stands



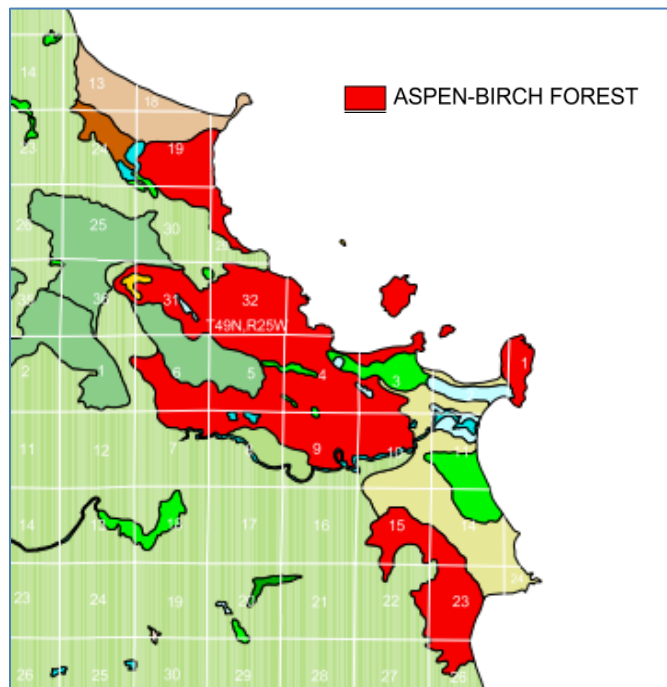
## Natural succession.

The circa 1800 forest type map for Presque Isle shows it to be entirely covered by aspen-birch forest. Aspen and birch are pioneer species that typically become established following major disturbance such as fire. It is likely that a large wildfire was the cause for the aspen-birch forest at that time. In the absence of fire over a long time period, the interior part of the island has developed the mesic-hardwood forest we see today.

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<sup>20</sup> Contact DNR fire staff at Marquette Incident Command Center, 906-249-1497

*Figure 7. Circa 1800 Forest Type Map*



## Carbon Cycle.

Carbon dioxide is removed from the atmosphere through photosynthesis and decomposition of organic matter into the soil. Carbon dioxide is released to the atmosphere through respiration, deforestation, and soil tillage. More than 63% of the terrestrial carbon stocks in Michigan's forests are in soil organic carbon and only 19% is in the above ground biomass (trunk, branches, leaves). Below ground biomass (roots), dead wood, and litter (dry leaves) make up the remaining 18% of the carbon stocks in Michigan's forests. Healthy forests clean the air and produce oxygen through photosynthesis. Therefore, forests in Michigan and around the world are very important ecosystems that remove carbon dioxide from the atmosphere and help to reduce the global impacts of climate change. More information about the forest carbon cycle is available at [www.fs.fed.us/ecosystemservices/carbon.shtml](http://www.fs.fed.us/ecosystemservices/carbon.shtml).

## Forests of Recognized Importance.

Forests of Recognized Importance (FORI) are defined as "globally, regionally and nationally significant large landscape areas of exceptional ecological, social, cultural or biological values. In Michigan, FORI on private forest land are mostly concerned with important wildlife habitat, rare forest types, corridors of special rivers, and Great Lakes coastlines. FORI occur at the landscape level, not the individual stand or ownership level." In the Lake States any forest within ½ mile of the Great Lakes is considered a Forest of Recognized Importance because it is rare globally.<sup>21</sup> Therefore, the whole island is a FORI.

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<sup>21</sup> MichiganSpecificGuidance\_FORI\_SpecialSites\_T&E\_updatedJuly2017.pdf, Michigan Tree Farm Committee – Updated July 2017



## Special Sites.

Special sites are defined as having “unique historical, archeological, cultural, geological, biological or ecological characteristics.” Special sites can be contained within a single property or stand.<sup>22</sup> By that definition much of Presque Isle is a special site. At a minimum Special Site status should be given to the Kawbawgam memorial site, any additional cultural/historical sites that are known and the sandstone lakeshore cliff.

## Educational Opportunities.

Presque Isle is already being used by several groups for educational purposes. Moosewood Nature Center, Northern Michigan University and others have used the park in the past. Several factors contribute to its suitability for an outdoor laboratory. First it is close to town, secondly access to the park is easy due to the roads and walking trails. And finally, it is useful for outdoor education because it has many environments/resources that can be observed or studied near one another. Lake Superior, emergent wetlands, rocky shores, pine, hemlock and hardwood forests in various stages of development, interesting geology, cultural history and more are all available within a very small area.

The Park’s rich educational potential create an ideal opportunity to participate in Tree Farm Field Days. These are local events that showcase landowners’ forestry activities and share learnings with others. The Presque Isle could play an important role in this education by extension. These can be arranged through the local Conservation District Forester, Matt Watkeys, (906) 226-2461, ext 128, [Matt.Watkeys@mi.nacdnet.net](mailto:Matt.Watkeys@mi.nacdnet.net); Mike Smalligan, Tree Farm coordinator for the DNR, (517) 284-5884, [SmalliganM@michigan.gov](mailto:SmalliganM@michigan.gov) or Caretaker Forestry (see contact information on pg 1.)

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<sup>22</sup> Ibid.

## Resource Descriptions and Individual Stand Discussion

Figure 8. Cover Type Map



Table 2. Stand list

Std num	Cover type	Plots	Acres	Tot live ba*	Dead ba *
1	M9	17	43.21	111.76	11.18
2	M9	3	12.61	126.67	30.00
3	F6/C6	0	4.69		
4	M5	2	11.43	45.00	5.00
5	P9	6	11.65	173.33	8.33
6	M9	11	17.86	118.18	13.64
7	H9	17	32.52	114.12	22.35
8	P9	2	7.19	165.00	15.00
9	Lake shore	0	3.43		
10	Lake shore	0	4.52		
11	Recreation	0	43.83		
12	Wetland	0	9.96		
		58	192.94		

Stands 1, 2 & 6, Well stocked, large northern hardwood (M9)

**Description.** These stands comprising 74 acres are mature northern hardwood with 56% northern hardwood (sugar and red maple, white and yellow birch), 16 % oak, 12% spruce and balsam and 8% hemlock. This cover type is classified as Northern Mesic Hardwood<sup>23</sup> and typically includes hemlock especially in the western U.P. The occasional pine, other deciduous species and aspen make the remaining percentage. Large trees dominate with 51% of the basal area in trees between 12” and 20” in diameter and 23% in trees over 20”. The understories are well stocked with poles and saplings, mostly maple. Large woody debris is common from overmature trees dying of old age and windthrow. Large, standing snags are also abundant.

**History.** There are no records of past activities in these stands, but a few observations and anecdotal points should be made. There is clear evidence of more recent logging. Mostly in stand 4 but to a lesser extent in stands 1 and 6 it appears that some harvesting was done. Wheel tracks from skidder use can be seen at multiple sites, thick regeneration, absence of most mature trees and evidence of stumps indicate a harvest. Based on a tree age taken in this area it appears that the harvest may have occurred about 30 years ago. Anecdotal information from a local resident supports this. Apparently, there was a significant wind storm in 1988 which was followed by salvage removal of some of the damaged trees. This coincides with the age of the tree observed.

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\* Basal area

<sup>23</sup> Donald J. Dickman, Michigan Forest Communities MSU Extension Bulletin E-3000



**Forest Health.** This is a mature to overmature hardwood stand with many of the trees past their prime and in declining health. As this natural process progresses the stand will become more and more characterized by old growth conditions – large, over mature trees, large woody debris with patches of young growth interspersed. This is not a forest health concern. The only real forest health concern is the potential introduction of invasive plants or insect. Garlic mustard would be a threat to watch for. The whole island should be monitored regularly for the possibility of an introduction.



**Desired Future Condition.** These stands are on their way to becoming old growth. In the context of the park this is the ideal future condition presenting

visitors a small example of large, old trees in a setting readily available. Old growth northern



hardwoods in the U.P. are relatively scarce. Federally managed areas such as the Sylvania and McCormick tracts managed by the U.S. Forest Service are much larger and more advanced in

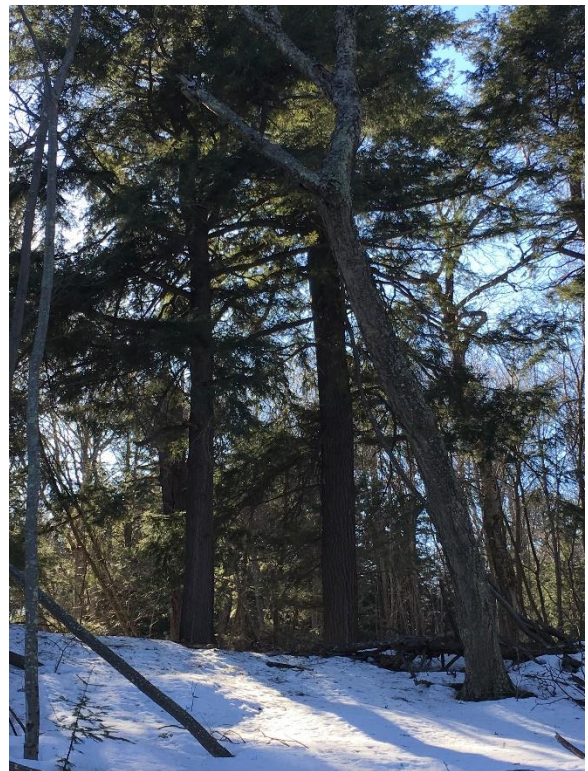


succession but are not nearly as accessible to the general public. The developing old growth characteristics of some of the stands at Presque Isle provide an accessible educational opportunity not readily available elsewhere.

**Management recommendations.** As active management for timber production is not an objective of the City these stands should be left to develop in an unmanaged, old forest condition.

*Stand 7, Well stocked, large hemlock (H9)*

**Description.** Stand 7 is a good example of a mature hemlock stand. These stands are not typically pure hemlock, rather they are a mixture of hemlock and hardwoods. They are



classified along with the maple dominated types described above as Northern Mesic Hardwood.<sup>24</sup> This stand is about 36% hemlock, 36% northern hardwood species with oak spruce and balsam fir making up most of the rest. Large trees overwhelmingly dominate with 45% of the basal area in trees between 12" and 20" and 38% over 20". Large hemlock and sugar maple trees make up the bulk of these.

**Forest Health.** Like the hardwoods this stand is also characterized by large, overmature trees. Large woody debris on the ground is common as are large standing snags. Again, these are not forest health concerns, merely indicators of an old stand nearing a climax condition. Hemlock

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<sup>24</sup> Ibid



wooly adelgid is a non-native insect that has been found in lower Michigan. It is a serious, often lethal pest on hemlock. The DNR forest health section monitors for it regularly across the U.P. and so far, none have been found. However, if it did become established in the U.P. these types of old hemlock stands would likely be killed.

**Desired Future Condition.** Like the hardwood stands this stand is approaching climax or old growth condition. In the context of the park this is the ideal future condition presenting visitors an example of large, old trees in a setting readily available.

**Management recommendations.** As active management for timber production is not an objective of the City this stand should be left to develop old forest characteristics without intervention.

#### *Stand 4, Medium stocked, northern hardwood, pole size (M5)*

**Description.** This stand is likely the result of a harvest 30 + years ago. It is distinctly different from its neighbors as it is characterized by thick maple saplings with a moderate stocking of scattered pole-size trees. There are still a fair number of large trees, 18% over 20". Stumps are common, and the abundance of small trees indicates a large regeneration pulse began after the logging disturbance.



**Forest Health.** No forest health problems in this stand. As this is a relatively young stand, it is healthy and vigorous.

**Desired Future Condition.** The desired future condition is a well-stocked, northern hardwood stand. It will be a long time before this stand develops the old growth characteristics of its neighbors.

**Management recommendations.** As active management for timber production is not an objective of the City this stand should be left to develop without intervention.

**Stands 5 & 8, Well stocked red and white pine, large trees (P9)**

**Description.** These two mature red and white pine stands are home to the majestic pines on the steep ridge forming the west rim of the park. These stands are classified as Northern Dry Pine.<sup>25</sup> Characteristic of this type of stand and the forest on the island in general, large trees dominate with 38% of the basal area in trees over 20". The understories are overstocked with small balsam fir but not continuously throughout the stands. Large snags are evident but not as frequent as in the hardwood and hemlock stands.



**Forest Health.** No external indicators of declining tree health were observed. However, attempting to determine tree ages on the pine I bored three large trees with an increment borer. In all three trees I found rotten wood in the centers of the trees. I was not able to get a complete boring in any of the trees. Rotten centers ranged from 40% to 60% of the tree diameters. Tree ages derived from the sound cores ranged from 113 to 136 years. These trees are much older than this, but due to the rot, accurate ages could not be determined. Based on this observation it is likely that many of the large pines are 150 – 200 years old. It is also likely that many are infected with a heart rot fungus. As such these trees are mature to overmature<sup>26</sup>,

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<sup>25</sup> Ibid

<sup>26</sup> "...red pine is a long-lived species, providing opportunities to grow stands for 200 years and individual trees to even greater ages." [http://woodlandstewardship.org/wp-content/uploads/ch6/types/ch6\\_types\\_redpine.html](http://woodlandstewardship.org/wp-content/uploads/ch6/types/ch6_types_redpine.html)



<sup>27</sup> and will be more susceptible to wind, insects and other damaging agents in the future. As described previously in the section on fire the most significant risk factor for these stands is accidental fire.

**Desired Future Condition.** Old growth natural red and white pine stand.

**Management recommendations.** As majestic as these pines are, they will not survive forever. Pines are not a climax species, that is in the absence of natural fire disturbance they will ultimately be replaced by the more shade tolerant oak and hardwoods. Without fire to stimulate pine regeneration oak and maples will become established where individual pine trees die or are blown over. In time the pines will be remnants within a hardwood stand. One can see this process in places like the Estivant Pines in the Keweenaw or Hartwick Pines near Grayling. The only way to mitigate this process is to impose some treatment that mimics the natural fire history. Patch cutting followed by planting could be done but it is operationally impractical on such a small scale and on such steep terrain. Alternatively, prescribed fire is also risky, expensive and impractical. If a lightning strike were to ignite a fire here the City could



decide ahead of time whether or not they would like to apply only limited suppression to protect people and structures. This would require close consultation with qualified fire experts including the DNR and the City fire department. To reduce the risk of a major fire it is

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<sup>27</sup> "It has been recorded that the white eastern pine can live to 450 years old, but usually lives to be 200 years old."  
<https://www.bellarmine.edu/faculty/drobinson/EasternWhitePine.asp>

recommended that a fuels reduction program is developed. There is an abundance of dead spruce and balsam fir in the understory. In addition, the live conifer understory should be reduced. To accomplish this hand crews would be needed, perhaps utilizing crews from the Superior Watershed Partnership Great Lakes Conservation Corp program. It is also possible that removing the thick understory vegetation would allow more pine seedlings to become established.

### **Stands 9 & 10, Lakeshore**

**Description.** These are rocky lakeshore areas with few trees, essentially non-forested areas. This includes the popular Black Rocks area and the western shore between Sunset Point and the picnic area at the pavilion.

### **Stand 11, Recreation area**

**Description.** This is the large developed recreation area between the pavilion and the breakwater point. It includes the picnic shelter, Superior Watershed Partnership offices and the Moosewood Nature Center. It is a large, day use park area with scattered pines and oaks.

### **Stand 12, Emergent Wetland**

**Description.** This area known as the Bog, is dominated by wetland plants such as cattails, sweet gale and tag alder. The bog is part of a wetland mitigation project under a permit from the Michigan Department of Environmental Quality (DEQ). It is closely monitored every year to assure that the objectives of the mitigation project are being met.<sup>28</sup> These objectives include establishment of more trees to ultimately establish this as a forested wetland and to control the encroachment of invasive plants. There is an interpretive boardwalk through the bog to educate guests about the features and functions of the wetland.

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<sup>28</sup> 2018 McClellan Avenue Extension Wetland Mitigation Report On-Site McClellan Avenue Wetland & Presque Isle Wetlands B & C. Marquette County Conservation District & City of Marquette. November 2018.

## Recommendations

### Park Management issues

1. Minimize damage from recreational users. This includes enforcing the ban of bicycles off paved surfaces, enforcement of restrictions of any practice that causes damage to trees, particularly the use of hammocks and slack lines
2. Adopt a policy to prohibit the collection or disturbance of cultural and historical resources. This would include a ban on the use of metal detectors.
3. Develop interpretive materials to educate the public about the unique features of the island. This would include information about the unique geology, cultural history and forest succession.
4. Develop a fire prevention/suppression policy. This should include fuel reduction projects in the pine stands and a policy limiting cooking fires to the use of charcoal in designated grill areas.
5. Designate special sites which should include but not be limited to the Kawbawgam Memorial site, Black Rocks, the Cove and Sunset Point.

### Join the American Tree Farm System

The City should consider joining the American Tree Farm System ([www.TreeFarmSystem.org](http://www.TreeFarmSystem.org)) to certify that the forest is sustainably managed. Certification documents the public goods that “Tree Farmers” provide to society including wood, water, recreation and wildlife. Certified forests are assessed by a third party to show society that both the American Tree Farm System and forest landowners are complying with their “Standards of Sustainability.” The minimum requirements to join Tree Farm are ten acres of forest, a current forest management plan, compliance with the “Standards of Sustainability” (listed below), and a free inspection by a Tree Farm Inspector. There is no additional cost for the landowner after developing this Forest Stewardship Plan.

This Forest Stewardship Plan complies with the Farm System’s eight Standards of Sustainability. See [www.TreeFarmSystem.org](http://www.TreeFarmSystem.org) for information about the Tree Farm program, forest certification, and the full Standards of Sustainability. In addition to recognition for good forest management local publicly owned forests bring additional value to the Tree Farm System.

1. **Commitment to Practicing Sustainable Forestry.** Forest owner demonstrates commitment to forest vitality by developing and implementing a sustainable forest management plan.
2. **Compliance with Laws.** Forest management activities comply with all relevant federal, state and local laws, regulations and ordinances.
3. **Reforestation and Afforestation.** Forest owner completes timely restocking of desired species of trees on harvested sites and non-stocked areas where tree growing is consistent with land use practices and the forest owner’s management objectives.
4. **Air, Water, and Soil Protection.** Forest management practices maintain or enhance the environment and ecosystems, including air, water, soil and site quality.



5. **Fish, Wildlife and Biodiversity.** Forest management activities contribute to the conservation of biodiversity.
6. **Forest Aesthetics.** Forest management plans and management activities recognize the value of forest aesthetics.
7. **Protect Special Sites.** Special sites are managed in ways that recognize their unique historical, archeological, cultural, geological, biological or ecological characteristics.
8. **Forest Product Harvests and Other Activities.** Forest product harvests and other management activities are conducted in accordance with the management plan and consider other forest values.

### Monitoring

The successful implementation of this Forest Stewardship Plan is dependent upon frequent monitoring by the landowner. The landowner or their agent (consulting forester) should walk the entire forest at periodically to inspect the forest for changes and to evaluate the success of earlier management activities. Monitoring for forest health issues should occur at least annually to look for signs and symptoms of insects or disease. Since the Park is easily accessible, casual observations can be made by employees during the normal course of business. All Forest Stewardship Plans should also be adaptable and flexible enough to accommodate changes in landowner goals or forest resources over the ten to twenty-year planning period. Please use the table at the end of this plan to record notes and make modifications to this plan as needed. Forest management plans for the American Tree Farm System do not have an expiration date but must be kept current to reflect the conditions of the forest and the goals of the landowner. The Michigan Tree Farm Committee provides a short Addendum that helps landowners keep their plan current with the Standards of Sustainability that are updated every five years.

Notes, Records, Updates or Modifications

[illegible]

## Appendix 1 – General Forestry Information and Related Programs

### Federal and State Laws Related to Forest Management

- USA - Federal Insecticide, Fungicide, and Rodenticide Act, 1947
- USA - National Historic Preservation Act, 1966
- USA - Clean Water Act, 1948 and 1972
- USA - Endangered Species Act, 1973
- MI - Michigan Pesticide Control Act, Public Act 171 of 1976
- MI - Natural Resources and Environmental Protection Act, Public Act 451 of 1994
- MI - Right to Forest Act, Public Act 676 of 2002

### Best Management Practices

Best Management Practices (BMPs) are guidelines published by the State of Michigan to protect Michigan's water resources from non-point source pollution and erosion while working on forest land. BMPs are now called "Michigan forestry Best Management Practices for Soil and Water Quality" and the document is online at [Michigan Forestry BMP's](#). BMPs include proper location and construction of logging roads, the use of riparian management zones, installation of culverts and other stream crossings, proper use of pesticides and other chemicals, and site preparation for planting. BMPs also include the proper seasonal timing of activities to minimize the spread of insects or disease. Any forest management activities should minimize soil erosion near wetlands and surface water. Tree Farm certification requires compliance with best management practices.

### Forest Health

The DNR publishes the annual "Forest Health Highlights" that has information about the forest insect and disease problems in Michigan. See [www.Michigan.gov/ForestHealth](http://www.Michigan.gov/ForestHealth) for a pdf of the most recent edition. To report an unusual insect or disease in your forest, please email several photos to [DNR-FRD-Forest-Health@Michigan.gov](mailto:DNR-FRD-Forest-Health@Michigan.gov).

DNR Forest Health - [www.Michigan.gov/ForestHealth](http://www.Michigan.gov/ForestHealth)

DNR Invasive Species Info - [www.Michigan.gov/InvasiveSpecies](http://www.Michigan.gov/InvasiveSpecies)

MDARD Exotic Forest Pests – [www.Michigan.gov/ExoticPests](http://www.Michigan.gov/ExoticPests)

USFS Forest Health - <http://fhm.fs.fed.us/>

### Wildlife Habitat

The DNR Wildlife Division has an excellent publication on managing wildlife habitat at [www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/Landowners\\_Guide/index.htm](http://www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/index.htm).

DNR Wildlife Division – [www.Michigan.gov/Wildlife](http://www.Michigan.gov/Wildlife)  
Michigan United Conservation Clubs - <https://mucc.org>  
Quality Deer Management Association – [www.qdma.com](http://www.qdma.com)  
Audubon Society - [www.MichiganAudubon.org](http://www.MichiganAudubon.org)  
Foresters for the Birds – <http://vt.audubon.org/foresters-birds>  
Ruffed Grouse Society - [www.RuffedGrouseSociety.org](http://www.RuffedGrouseSociety.org)  
National Wild Turkey Federation - [www.nwtf.org](http://www.nwtf.org)  
Michigan Trout Unlimited – [www.MichiganTU.org](http://www.MichiganTU.org)  
US Fish and Wildlife Service - [www.fws.gov/partners](http://www.fws.gov/partners)



# Glossary of Common Forestry Terms

The following glossary is adapted from [www.dnr.state.md.us/forests/gloss.html](http://www.dnr.state.md.us/forests/gloss.html).

- Agroforestry** - a land-use system that combines both agriculture and forestry in one location.
- Alley Cropping** - widely spaced rows of trees with annual crops growing in between the rows.
- Basal Area (Tree)** - cross sectional area of a tree at 4.5 feet off ground in units of square feet (ft<sup>2</sup>).
- Basal Area (Forest)** - basal area of all trees per acre summed up, in units of ft<sup>2</sup>/acre; measure of density.
- Biomass** – harvesting and using whole trees or parts of trees for energy production
- Board Foot** – a measure of volume 1 foot by 1 foot by 1 inch or 144 cubic inches of wood.
- Bolt** – 8 foot long log
- Browse** - parts of woody plants, including twigs, shoots, and leaves, eaten by forest animals.
- Carbon Cycle** – the biogeochemical cycle to exchange carbon between the biosphere and atmosphere by means of photosynthesis, respiration and combustion.
- Clearcut** - the harvest of all the trees in an area to reproduce trees that require full sunlight.
- Cord** - a unit of wood cut for fuel that is equal to a stack 4 x 4 by 8 feet or 128 cubic feet
- Cordwood** - small diameter or low quality wood suitable for firewood, pulp, or chips.
- Crop Tree** - a young tree of a desirable species with certain desired characteristics.
- Crown** - the uppermost branches and foliage of a tree.
- Cruise** - a forest survey used to obtain inventory information and develop a management plan.
- Cull** - a sawtimber size tree that has no timber value as a result of poor shape or damage.
- Diameter at Breast Height (DBH)** - diameter of a tree trunk taken at 4 1/2 feet off the ground.
- Diameter-Limit Sale** - a timber sale in which all trees over a specified DBH may be cut. Diameter-limit sales often result in high grading and is a very poor forestry practice.
- Endangered Species** – a species in danger of extinction.
- Even-Aged Stand** - stand with age difference between oldest and youngest trees is minimal (<10 years).
- Forestland** – land at least one acre in size that is at least 10 percent stocked with trees.
- Forest Farming** - cultivating high value specialty crops in the shade of natural forests.
- Forest Stand Improvement (FSI)** - any practice that increases the health, composition, value or rate of growth in a stand. Also called Timber Stand Improvement when focused on timber.
- Group Selection** - harvesting groups of trees to open the canopy and encourage uneven aged stands.
- Habitat** - the ecosystem in which a plant or animal lives and obtains food and water.
- Hardwoods** - a general term encompassing broadleaf, deciduous trees.
- High Grading** - to remove all good quality trees from a stand and leave only inferior trees.
- Intolerance** - characteristic of certain tree species that does not permit them to survive in the shade.
- Landing** - cleared area where logs are processed, piled, and loaded for transport to a sawmill.
- Log Rule** - a method for calculating wood volume in a tree or log by using its diameter and length. Scribner, Doyle and the International 1/4-inch rule are common log rules.
- Lump-Sum Sale** - a timber sale in which an agreed-on price for marked standing trees is set before the wood is removed (as opposed to a mill tally or unit sale).
- Mast** - nuts and seeds such as acorns, beechnuts, and chestnuts that serve as food for wildlife.
- Over-mature** - trees that have declined in growth rate because of old age and loss of vigor.
- Overstocked** - trees are so closely spaced that they do not reach full growth potential.
- Pole Timber** - trees 4 to 10 inches DBH.
- Pre-Commercial Operations** - cutting to remove wood too small to be sold.
- Prescribed Fire** – an intentional and controlled fire used as a management tool used to reduce hazardous fuels or unwanted understory plants (invasive, undesirable species, etc.).
- Pulpwood** - wood suitable for use in paper manufacturing.

**Range** - cattle grazing in natural landscapes.

**Regeneration** - the process by which a forest is reseeded and renewed.

**Riparian Forest Buffers** - strips of land along stream banks where trees, shrubs and other vegetation are planted and managed to capture erosion from agricultural fields.

**Salvage Cut** - the removal of dead, damaged, or diseased trees to recover value.

**Sapling** - a tree at least 4 1/2 feet tall and between 1 inch and 4 inches in diameter.

**Sawlog** - log large enough to be sawed economically, usually >10" diameter and 16' long.

**Sawtimber stand** - a stand of trees whose average DBH is greater than 11 inches.

**Sealed-Bid Sale** - a timber sale in which buyers submit secret bids.

**Seed-Tree Harvest** - felling all trees except for a few desirable trees that provide seed for the next forest.

**Selection Harvest** – harvesting single trees or groups at regular intervals to maintain uneven-aged forest.

**Shelterwood Harvest** – harvesting all mature trees in two or more cuts, leaving trees to protect seedlings.

**Silvopasture** - growing trees and improved forages to provide suitable pasture for grazing livestock.

**Silviculture** - the art and science of growing forest trees.

**Site Index** - measure of quality of a site based on the height of a dominate tree species at 50 years old.

**Site Preparation** - treatment of an area prior to reestablishment of a forest stand.

**Skidder** - a rubber-tired machine with a cable winch or grapple to drag logs out of the forest.

**Slash** - branches and other woody material left on a site after logging.

**Snag** - a dead tree that is still standing and provide food and cover for a variety of wildlife species.

**Softwood** - any gymnosperm tree including pines, hemlocks, larches, spruces, firs, and junipers.

**Species of Special Concern** – not threatened or endangered yet, but has low or declining populations.

**Stand** - a group of forest trees of sufficiently uniform species composition, age, and condition to be considered a homogeneous unit for management purposes.

**Stand Density** - the quantity of trees per unit area, evaluated in basal area, crown cover or stocking.

**Stocking** - the number and density of trees in a forest stand. Classified as under-, over-, or well-stocked.

**Stumpage Price** - the price paid for standing forest trees and paid prior to harvest.

**Succession** - the replacement of one plant community by another over time in the absence of disturbance.

**Sustained Yield** - ideal forest management where growth equals or exceeds removals and mortality.

**Thinning** - partial cut in an immature, overstocked stand of trees to increase the stand's value and growth.

**Threatened Species** - a species whose population is so small that it may become endangered.

**Timberland** - forest capable of producing 20 ft<sup>3</sup> of timber per acre per year.

**Tolerance** – the capacity of a tree species to grow in shade

**Under-stocked** - trees so widely spaced, that even with full growth, crown closure will not occur.

**Understory** - the level of forest vegetation beneath the canopy.

**Uneven-Aged Stand** - three or more age classes of trees represented in a single stand.

**Unit Sale** - a timber sale in which the buyer makes regular payments based on mill tally and receipts.

**Veneer Log** - a high-quality log of a desirable species suitable for conversion to veneer.

**Well-Stocked** – stands where growing space is effectively occupied but there is still room for growth.

**Windbreaks** - rows of trees to provide shelter for crops, animals or farm buildings.