

Michigan Forest Association Forest Management Plan

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Parcel No: 006-036-300-01 40 ac.

Legal Description: NW ¼ of SW ¼ Sec 36 T19N, R5W

Greenwood Twp., Clare Co., MI

Prepared March, 2016
by
Martell Forestry, Inc.



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plan duration: 2016-2031

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This plan has been reviewed and approved by:

Landowner

Forester

Date

Overview

The Michigan Forest Association (MFA) Clare County property is located southwest of Harrison, Michigan. This 40 acre block was previously owned by the Fred Prince, Jr., “Forests for the Future” Foundation and gifted to MFA in 2015. The property is bordered by two roads and is adjacent to residences. Its enrollment in the Commercial Forest Act allows for public use of the property for hunting and has been used by locals as such.

The property is primarily large, overmature aspen and oak sawlogs. The aspen is ready to be harvested in the next year (2017) to promote regeneration to improve food sources and habitat for wildlife such as deer, turkey, and grouse. The oak will require light thinning to prevent oak wilt disease from entering the stand. Reducing the density and subsequent stress on the oak will help keep the stand healthy.

The North part of the property appears to have been a homestead long ago. This is evidenced by large, open grown oak and pine trees, as well as fruit trees that would have been planted, in a grassy area. This area offers much as a transition zone for wildlife, as well as a source of food and habitat.

Prices used in the plan reflect prices at the time the plan was drafted in March of 2016. Timber prices are highly variable based on season, market demands, and buyer. Prices were rounded and are an estimate, not a guarantee of possible revenue to be generated from timber sales completed on this property.

Overall, this property is ready for some more intensive forest management in order to better serve the forest and the people that use it for hunting. This property can be an example to nearby landowners as to the benefits of proper forest management. Additionally, much can be learned about wildlife, habitat, food sources, forest pests and disease, forest management, and local historical uses of forestland.

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Landowner Objectives

The objectives of the Michigan Forest Association on the Clare County property are:

1. To maintain forest health to protect stands from invasive species, insects, and disease
2. To maintain forestland productivity through sustainable forest management
3. To maintain wildlife habitat for a variety of diverse species
4. To demonstrate proper forest management to the surrounding community and the state of Michigan as a whole.
5. To provide educational opportunities about forests and forest management.

General Information and Description

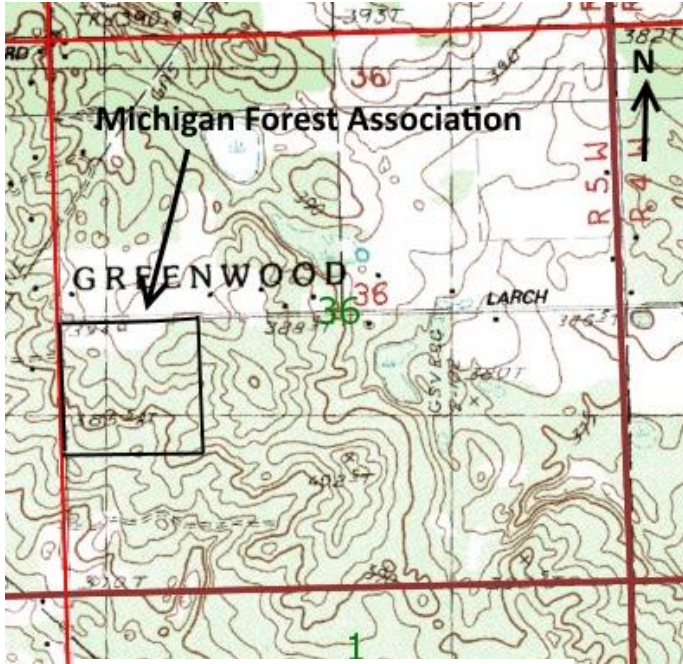
The Michigan Forest Association has been uniting the forestry community of foresters, loggers, and landowners alike since the 1970s. Throughout the decades, MFA has always stood for proper forest management. The Forest for the Future Foundation, created by Fred Prince, Jr., owned a variety properties throughout Michigan as demonstration forests. At the passing of Mr. Prince in 2014, the land was gifted to the Michigan Forest Association by the Forest for the Future Foundation. The Association plans to continue good forest management well into the future.

Location

The MFA property is located on the corner of Old State Rd and Larch Rd in Greenwood Township, Clare County, Michigan (*see Fig. 1*). The city of Harrison is located approximately 6 miles to the north and east of the property. Located approximately 2 miles north is M-61 and approximately 10 miles east is US-127. Lily Lake is about 1.5 miles to the west. The majority of the surrounding properties are residences.



Figure 1. Location Map



Topography

The topography of the Michigan Forest Association Property is gently sloping at 1300 feet above sea level at its highest point. The southwest corner slopes down to 1270 feet above sea level.

Figure 2. Topographic Map

Physiography

The regional landscape ecosystem classification for the Michigan Forest Association property is the Cadillac sub-subsection of the Highplains subsection of the Northern Lacustrine-influenced Lower Michigan section.

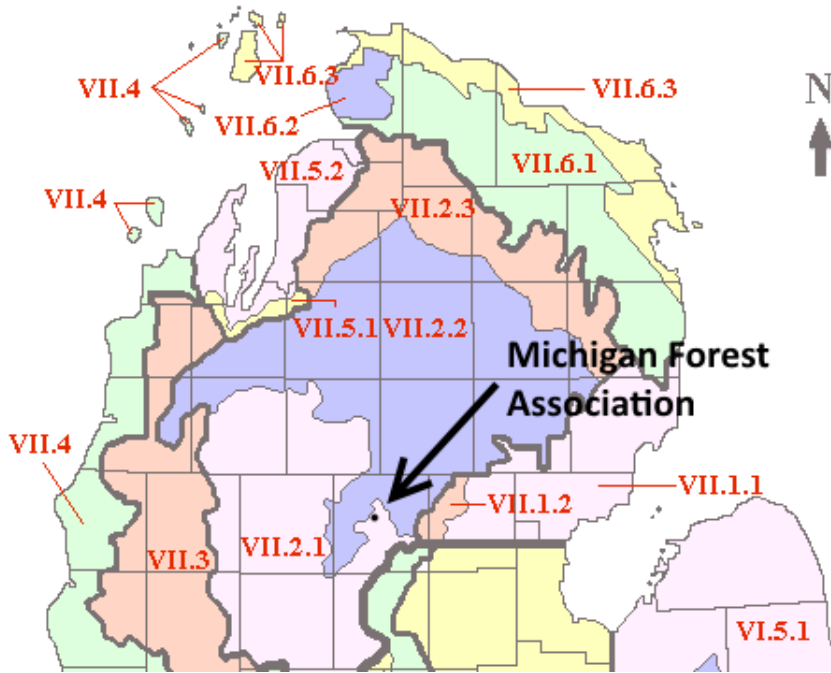


Figure 3. Landscape Ecosystem Type Location Map

SUB-SUBSECTION VII.2.1. Cadillac
Steep, sandy end moraines;
northern hardwood forest, white oak-red oak forest

DISCUSSION: Hilly topography characterizes this sub-subsection. Drainage is generally good in the hilly landscape; as a result, lakes and wetlands are not numerous.

BEDROCK GEOLOGY: Bedrock is not exposed; drift thicknesses are 500 to 1,000 feet, some of the thickest in the State (Akers 1938). This sub-subsection is underlain primarily by Paleozoic bedrock (primarily Pennsylvanian sandstone, shale, coal, and limestone) and Mesozoic bedrock (Jurassic red beds consisting mainly of sandstone, shale, and clay, with minor beds of limestone and gypsum) (Dorr and Eschman 1984, Milstein 1987).

LANDFORMS: Steep end-moraine ridges. The highest point in Lower Michigan (1,725 feet) is here, near Cadillac. The large sand ridges, 200 to 500 feet high, generally have well-drained soils. Most depressions between the moraine ridges do not contain wetlands because of the extreme thickness of the coarse, sandy till deposits. The ridges are moderate to steeply sloped; slopes of more than 12 percent are common, and the steepest slope class is 18 to 40 percent (Buchanan 1985).

Outwash channels, relatively common in the sub-subsection, occur as either narrow deposits between the moraines or as relatively broad plains. The larger outwash plains often consist of several terraces of rolling, excessively drained sand plain.

LAKES AND STREAMS: The Muskegon River occupies the largest outwash channel in the subsubsection; the present river occupies only a small part of the outwash channel, which is several miles wide. Other rivers are the Pine, Little Manistee, and the Little Muskegon. Modern rivers have typically cut deep gorges through the thick outwash deposits. Kettle lakes are not common within this subsubsection, when compared to other areas of end moraine, probably because many of the ice-block depressions are dry. The largest lakes, Mitchell, Cadillac, and Missaukee, are located on either outwash or small lake plains, rather than within the end-moraine topography.

Source: Source: Regional Landscape Ecosystems of Michigan, Minnesota, and Wisconsin-
USDA Forest Service

<http://www.nrs.fs.fed.us/pubs/gtr/other/gtr-nc178/s7-2-1.htm>

Climatic Information

The prevailing winds in Clare County are from the southwest. The total annual precipitation is reported to be 19.4 inches. The average seasonal snowfall is 51.3 inches. The average date of the last freezing temperature five years in ten is May 20th and the average first freezing temperature five years in ten is September 24th. Late spring frosts (as late as June 3) and late summer frosts (as early as September 9) can cause damage to planted seedlings and wildlife food crops. Occasionally, droughts will occur that may either damage or kill newly planted food plots, seedlings and younger saplings. Frost and an extreme temperature range from -48 degrees F to 107 degrees F will be the major climatic considerations affecting the growth and survival of any planted species on the property.

Source: <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>

Cultural Heritage Data

It appears as though the north end of the property was once used as a homesite. The field inventory did not reveal any evidence of prior aboriginal activity on the Michigan Forest Association property. It is likely, however, that this land had either been inhabited or used by Paleo-era native people, although no evidence of permanent settlements of these people are known to have been found nearby.

Threatened and Endangered Species

The field inventory did not reveal any threatened or endangered plants or animals on the Michigan Forest Association property. Management practices that could disturb or displace threatened or endangered species include: Forest Stand Improvement, Tree/Shrub Planting, Establishment of Forest Harvest Trails and Landings, Wildlife Food Plot Development, building roads, digging shallow-water wildlife ponds and any other activities that may alter or disrupt the soil or vegetation in or near where these plants or animals may be located. A careful check has been made to identify the presence of any birds of prey nests on the property and none were found. If any are located during implementation of this plan, then action will need to be taken to reduce or eliminate disturbance prior to undertaking the management activity. Specific recommendations for protecting any Threatened or endangered species as well as conservation and land use strategies to protect these species is available by contacting the Michigan Natural Features Inventory, (MNFI) located at the website: <http://web4.msue.msu.edu/mnfi>

Invasive Plant Species

No invasive species were noted during the field inventory. Planting of invasive species such as tatarian honeysuckle, Scots pine, autumn olive, buckthorn and Asian bittersweet on this property is not recommended as these species tend to spread disease and insects that damage native species and limit the growth of native vegetation. Once they become established, some non-native species such as these can become invasive, making them difficult to eradicate. Careful attention to restricting the planting of any non-native invasive plants on the property may help to maintain it free of invasive plants in the future.

Forest Health

Oak wilt disease (OWD- *Ceratocystus fagaceaserum*), a fungal pathogen, is likely to be present on or near the property. No trees in the oak component were positively identified to have OWD. No species of oak is known to be immune to this vascular disease, however, white oak seems to be somewhat resistant this disease as species of red oak get the disease more frequently and succumb more readily than white oak. Plantation-grown Chinese chestnuts can also be naturally infected by the oak wilt fungus. Moreover, inoculation experiments have demonstrated that over 35 native and exotic oaks are susceptible, as well as American and European chestnuts, species of chinkapin, tanoak, and several varieties of apple.

Symptoms in Red Oak

The main period of infection is in the spring, when new vessel wood is being formed. Symptoms in red oak occur as early as May. The leaves turn dull green or bronze, appear water-soaked, wilt, and then turn yellow or brown. Damage occurs from the tip and outer edges toward the midrib and base. Wilting leaves typically curl around the midrib and the line between the bronze and green tissues in individual leaves is very distinct. These symptoms quickly appear throughout the crown, often within a few weeks, and leaves at the ends of branches are shed (*See Fig. 4*).



Figure 4. Oak tree with OWD symptoms present in leaves.

Heavy defoliation accompanies leaf wilting and discoloration. Leaves fall in all stages of discoloration. Even entirely green leaves may fall from affected branches. Some affected branches hold green leaves longer than others, sometimes until autumn. Therefore, the crowns of trees with oak wilt are seldom as uniformly brown as those of non-diseased trees that have been poisoned, girdled, or killed by lightning. In dry years, the appearance of trees with oak wilt may be confused with that of trees with drought symptoms.

The disease progresses rapidly, and some trees die within 1 or 2 months after the onset of symptoms. Most trees die within a year. Sprouts frequently grow from the bole and larger branches during the year of defoliation or the following year.



Fungus mats (*See fig. 5*) are commonly associated with red oaks in some sections of the country, especially Wisconsin, Minnesota, Iowa, and Illinois. These mats, composed primarily of mycelium, form beneath the bark. Sometimes the mats raise and crack the bark giving off a fermenting odor that attracts insects. Discoloration of infected annual rings is seldom a symptom of oak wilt in the red oak group.

Figure 5. Fungal mats formed underneath the bark of an oak with OWD

Symptoms in White Oak

The disease symptoms are much more variable in white oaks, although the foliage symptoms are often the same. In a few, particularly bur oaks, symptoms are essentially the same as in the red oaks, and the tree may die within one growing season. Usually, however, white oaks die slowly. Only one or two branches may show symptoms and die in a year. If the fungus persists, a few branches are killed in a season; and over several years, the tree declines and may eventually die. **Some white oaks seem to recover from the disease, but may harbor the pathogen and serve as symptomless reservoirs.**

White oaks, unlike the red, frequently have discolored infected annual rings when diseased. Fungus mats seldom appear on white oaks.

Natural root grafts and insect vectors spread the oak wilt fungus from diseased to healthy trees. Healthy oaks growing next to infected ones become infected through their roots. Root grafts (*See fig. 6*) offer a path to transmit the fungus and are a major factor in the spread, especially in areas with deep, sandy soils and dense, pure stands of red oaks.

The fungus overwinters as mycelium in still-living, infested trees and as fungus pads on dead trees. The fungus can be spread more than a mile by at least two groups of insects: sap and bark-feeding beetles.



Figure 6. Root grafts between oaks



Figure 7- Bark crack from fungal mat



Figure 8- Sap feeding beetle

When the fungus mats enlarge and crack the bark (fig. 7), the emitted odor attracts insects such as sap-feeding beetles in the family Nitidulidae (fig. 8). When the beetles feed on the mats of the infected tree, fungus spores adhere to their bodies. As the beetles move from diseased trees to wounds on healthy oaks, the disease-causing spores are transmitted to a new host.

Oak bark beetles, *Pseudopityophihorus* spp., also transmit the fungus. They breed abundantly beneath the bark of oak wilt- infected trees . After egg laying, parents emerge carrying spores and feed on healthy oaks.

When the larvae hatch and develop into adults, they also carry infective spores and move to healthy trees. Those bark beetles that overwinter in infected trees can transmit

When transmitted, the pathogen spreads rapidly within xylem vessels.

Besides the bark beetles, a number of other contaminated insects have been collected from diseased trees. Whether or not they spread the pathogen has not been conclusively proven, however.

Control

Unfortunately, there is no known way to save an oak tree infected by the oak wilt fungus. The only way to maintain healthy trees is through prevention. Early detection and prompt removal of dead or dying trees and breaking root grafts between diseased and healthy trees are essential.

Mechanical and chemical barriers between diseased and healthy trees can halt the spread of the oak wilt fungus through root grafts. A trencher or vibrating plow can be used to cut or break the tree roots down to a depth of 2 to 4 feet (0.6 to 1.2 m). Soil fumigants can also be used to kill the connecting roots between trees.

Detailed procedures for constructing mechanical and chemical barriers are given in the referenced pamphlet on oak wilt by French and Stienstra. Promptness is important. The sooner the root grafts between diseased and healthy trees are destroyed, the better the chances for saving the trees nearby.

To suppress overland spread of the fungus, control must be aimed at destroying the source of inoculum - the diseased tree - at the proper time. All trees that die in any given year should be checked carefully for fungus mats and oak bark beetle colonization by April 1 of the following year. If the mats or beetles are present, the entire tree should be burned, chipped, or covered with plastic for 60 days. In the Eastern United States, about 50 percent of diseased trees contain beetles and about 25 percent produce mats; however, these figures may vary, depending on geographic location. Fresh pruning wounds may attract beetles contaminated with oak wilt fungus. Because of this, avoid unnecessary pruning and prune in winter whenever possible. Trees should not be pruned during April, May, or June or whenever the beetles are active.

Vegetation— Past and Present

PRESETTLEMENT VEGETATION: Government Land Office surveyors reported oak-pine forest and jack pine barrens, silver maple-dominated flood-plain forest, and hardwood-conifer and conifer swamps. The original vegetation on the end-moraine ridges was northern hardwood forest of beech, sugar maple, red oak, and hop hornbeam. Hemlocks were present, in low numbers in moister ravines and on northern-aspect slopes. White pines were scattered in low numbers throughout the hardwood forests. On the excessively drained sandy ridges, there were oak-pine forests, containing red and white pine; red, white, and black oak; red maple; and bigtooth aspen.

The original forests of the outwash were oak-pine forests containing red pine, white pine, red oak, white oak, black oak, red maple, and bigtooth aspen. The driest terraces of the outwash plains originally supported jack pine and northern pin oak; forest structure and dominance changed little in these dry barrens after logging.

Most of the outwash plain through which the Muskegon River flows supported either pine-oak forest or jack pine barrens, but extensive swamp forests and flood-plain forests occur within 2 to 3 miles of the river. The active flood plain is dominated by a forest of silver maple, red ash, and black ash; but the swamps farther away from the river are conifer or hardwood-conifer swamps on peat.

NATURAL DISTURBANCE: Windthrows are common on moraines, but were generally small. Fires also occurred, but these were also small.

PRESENT VEGETATION AND LAND USE: The present forests are oak dominated on outwash plains and beech-sugar maple dominated on moraines. Land is managed primarily for timber. White and red pines were cut in the 1870's to 1890's, and logs were transported by narrow-gauge railroads where river access was poor (Meek 1986, Koch 1979). Pine logging resulted in a major change in overstory dominance; post-logging forests are dominated by oaks, bigtooth aspen, and red maple. Hardwoods were logged later.

RARE PLANTS (Great Lakes Region): *Geum triflorum* (prairie-smoke).

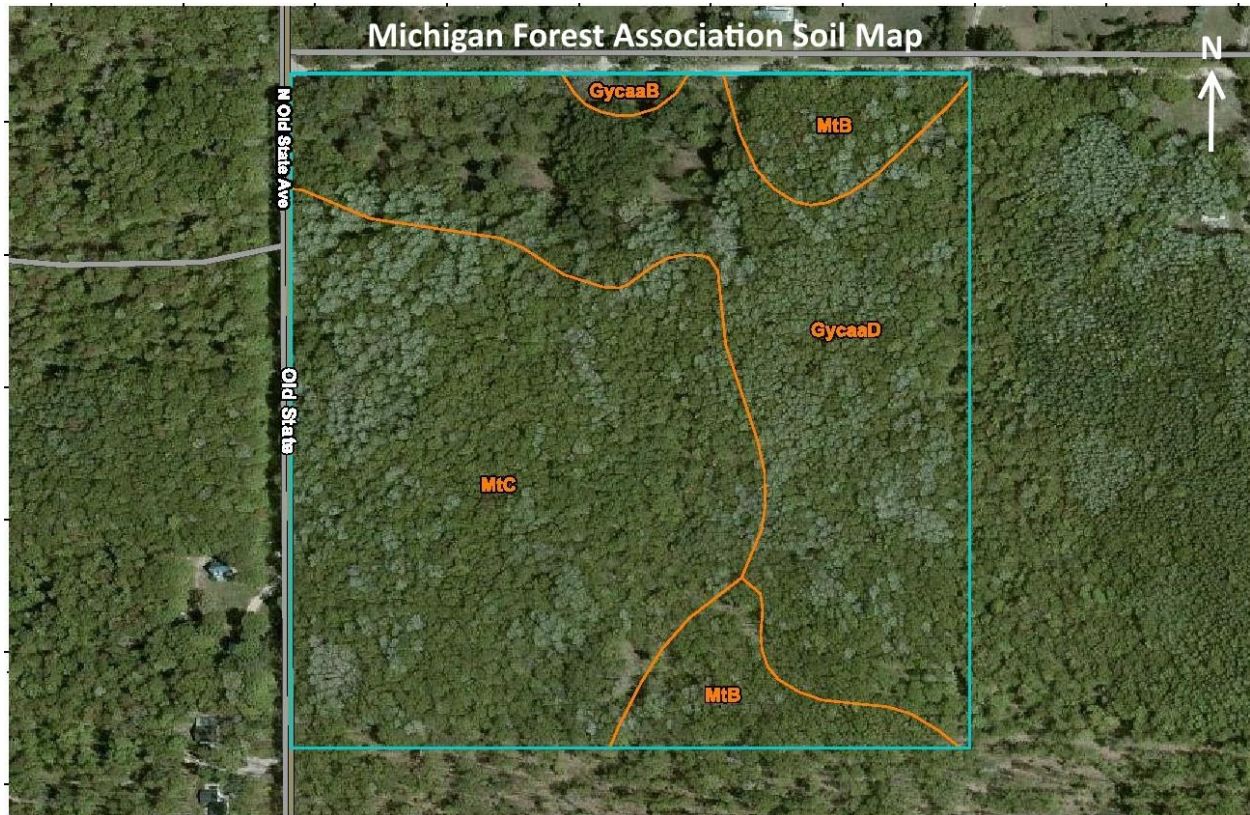
RARE ANIMALS (Great Lakes Region): *Haliaeetus leucocephalus* (bald eagle), *Pandion haliaetus* (osprey), and *Gavia immer* (common loon) are common on the larger lakes.

CONSERVATION CONCERNS: As a result of major changes in forest composition after logging, there are few Forest Service Research Natural Areas in this sub-subsection. The extensive hardwooddominated forests are probably important for song bird migration and successful nesting. The Muskegon River flood plain and associated wetlands form one of the more extensive wetland forest corridors in the State; it has not been adequately surveyed to determine its full biological significance.

Source: Regional Landscape Ecosystems of Michigan, Minnesota, and Wisconsin-USDA Forest Service

<http://www.nrs.fs.fed.us/pubs/gtr/other/gtr-nc178/s7-2-1.htm>

Soil Resources



Map Unit Legend

Clare County, Michigan (MI035)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GycaaB	Graycalm sand, 0 to 6 percent slopes	0.3	0.8%
GycaaD	Graycalm sand, 6 to 18 percent slopes	17.6	42.2%
MtB	Montcalm loamy sand, 0 to 6 percent slopes	4.3	10.3%
MtC	Montcalm loamy sand, 6 to 12 percent slopes	19.5	46.7%
Totals for Area of Interest		41.6	100.0%

Report—Equipment Limitations on Woodland (MI)

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the five most limiting features for any given soil. The soil may have additional limitations]

Equipment Limitations on Woodland (MI)—Clare County, Michigan							
Map symbol and soil name	Pct. of map unit	Suitability for use of harvesting equipment (MI)		Suitability for log landings (MI)		Suitability for haul roads (MI)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
GycaaB—Graycalm sand, 0 to 6 percent slopes							
Graycalm	94	Moderately suited		Moderately suited		Moderately suited	
		Too sandy	0.50	Too sandy	0.50	Sandiness	0.50
GycaaD—Graycalm sand, 6 to 18 percent slopes							
Graycalm	90	Moderately suited		Moderately suited		Moderately suited	
		Too sandy	0.50	Slope	0.50	Sandiness	0.50
				Too sandy	0.50		
MtB—Montcalm loamy sand, 0 to 6 percent slopes							
Montcalm	85	Well suited		Well suited		Well suited	
MtC—Montcalm loamy sand, 6 to 12 percent slopes							
Montcalm	90	Well suited		Moderately suited		Well suited	
				Slope	0.50		

Data Source Information

Soil Survey Area: Clare County, Michigan
 Survey Area Data: Version 13, Sep 18, 2015

Forestland Productivity

This table can help forestland owners or managers plan the use of soils for wood crops. It shows the potential productivity of the soils for wood crops.

Potential productivity of merchantable or *common trees* on a soil is expressed as a site index and as a volume number. The *site index* is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that forestland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. More detailed information regarding site index is available in the "National Forestry Manual," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

The *volume of wood fiber*, a number, is the yield likely to be produced by the most important tree species. This number, expressed as cubic feet per acre per year and calculated at the age of culmination of the mean annual increment (CMAI), indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Trees to manage are those that are preferred for planting, seeding, or natural regeneration and those that remain in the stand after thinning or partial harvest.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service, National Forestry Manual.

Report—Forestland Productivity

Forestland Productivity—Clare County, Michigan				
Map unit symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site Index	Volume of wood fiber	
			<i>Cu ft/ac</i>	
GycaaB—Graycalm sand, 0 to 6 percent slopes				
Graycalm	Bigtooth aspen	70	81.00	—
	Jack pine	54	80.00	
	Northern red oak	63	57.00	
	Quaking aspen	60	64.00	
	Red pine	60	92.00	

Forestland Productivity—Clare County, Michigan				
Map unit symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site Index	Volume of wood fiber	
			<i>Cu ft/ac</i>	
GycaaD—Graycalm sand, 6 to 18 percent slopes				
Graycalm	Bigtooth aspen	70	81.00	—
	Jack pine	54	80.00	
	Northern red oak	63	57.00	
	Quaking aspen	60	64.00	
	Red pine	60	92.00	
MtB—Montcalm loamy sand, 0 to 6 percent slopes				
Montcalm	Balsam fir	—	0.00	Eastern white pine, Red pine, White spruce
	Bigtooth aspen	—	0.00	
	Eastern white pine	—	0.00	
	Northern red oak	66	43.00	
	Paper birch	—	0.00	
	Quaking aspen	—	0.00	
	Red maple	—	0.00	
	Red pine	—	0.00	
	Sugar maple	61	43.00	
	Yellow birch	—	0.00	
MtC—Montcalm loamy sand, 6 to 12 percent slopes				
Montcalm	Balsam fir	—	0.00	Eastern white pine, Red pine, White spruce
	Bigtooth aspen	—	0.00	
	Eastern white pine	—	0.00	
	Northern red oak	66	43.00	
	Paper birch	—	0.00	
	Quaking aspen	—	0.00	
	Red maple	—	0.00	
	Red pine	—	0.00	
	Sugar maple	61	43.00	
	Yellow birch	—	0.00	

Data Source Information

Soil Survey Area: Clare County, Michigan
 Survey Area Data: Version 13, Sep 18, 2015

Report—Forestland Erosion and Windthrow Hazard (MI)

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the five most limiting features for any given soil. The soil may have additional limitations]

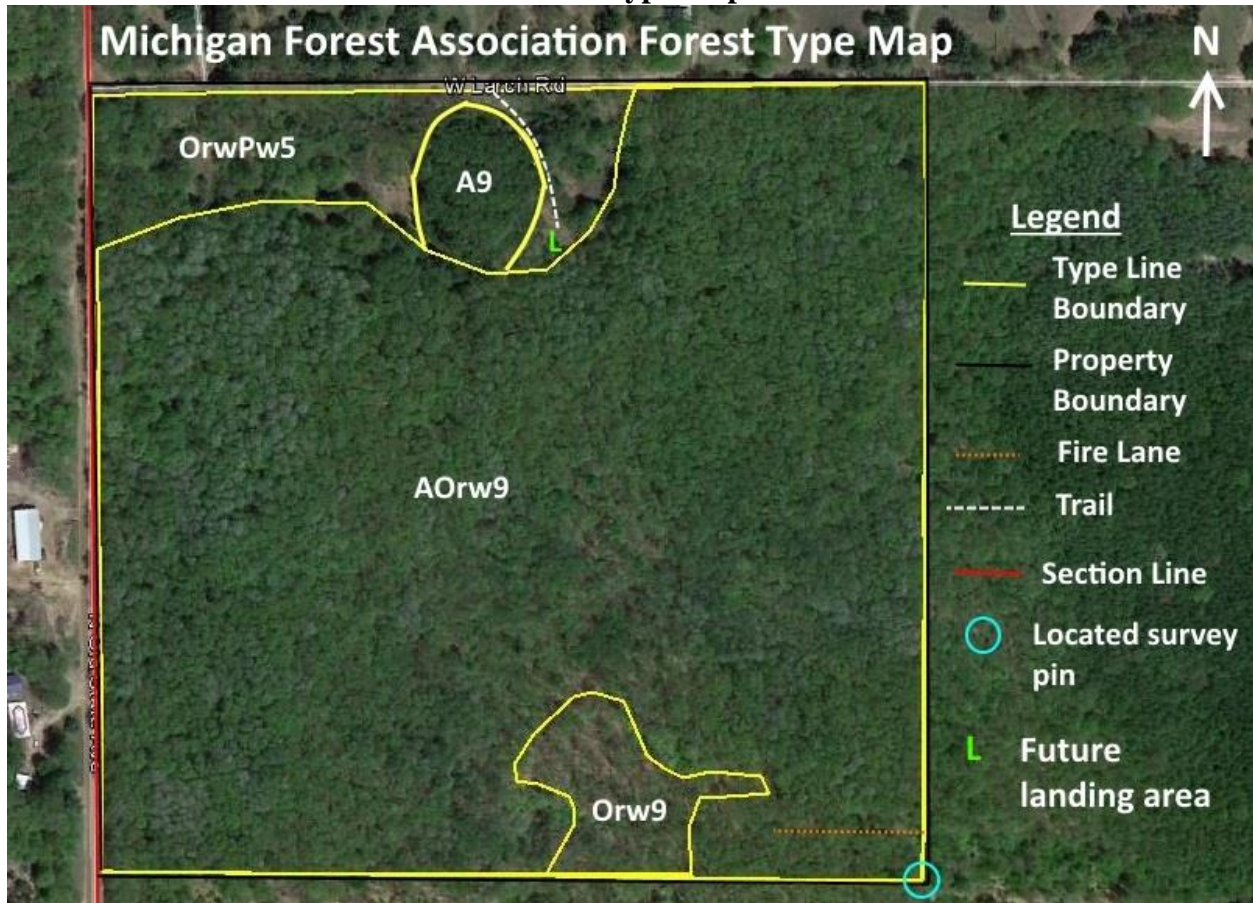
Forestland Erosion and Windthrow Hazard (MI)—Clare County, Michigan					
Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion (MI)		Windthrow hazard (MI)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
GycaaB—Graycalm sand, 0 to 6 percent slopes					
Graycalm	94	Slight		Slight	
		Slope/erodibility	0.04		

Forestland Erosion and Windthrow Hazard (MI)—Clare County, Michigan					
Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion (MI)		Windthrow hazard (MI)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
GycaaD—Graycalm sand, 6 to 18 percent slopes					
Graycalm	90	Slight		Slight	
		Slope/erodibility	0.20		
MtB—Montcalm loamy sand, 0 to 6 percent slopes					
Montcalm	85	Slight		Slight	
		Slope/erodibility	0.06		
MtC—Montcalm loamy sand, 6 to 12 percent slopes					
Montcalm	90	Slight		Slight	
		Slope/erodibility	0.18		

Data Source Information

Soil Survey Area: Clare County, Michigan
 Survey Area Data: Version 13, Sep 18, 2015

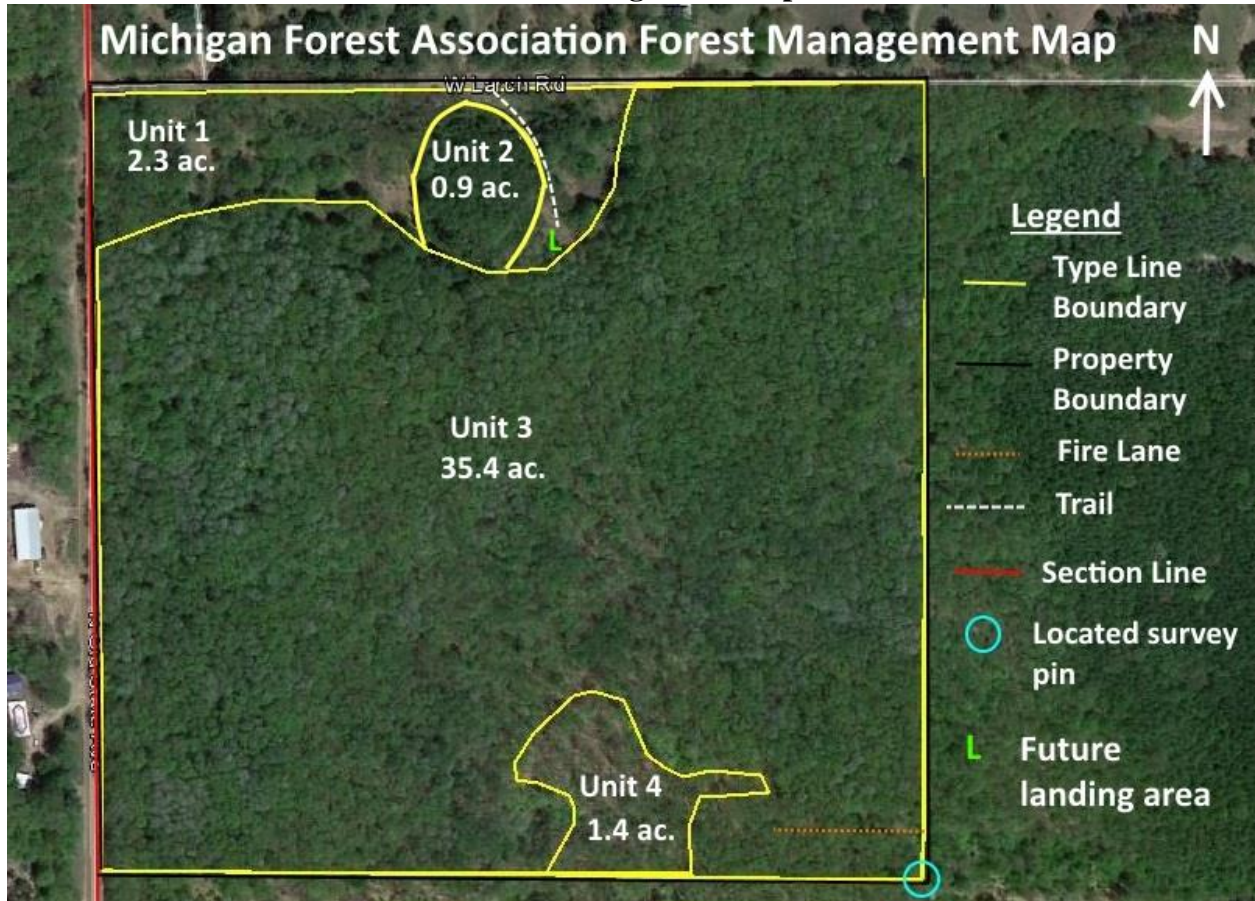
Forest Type Map



Forest Type Key

OrwPw5	Red and white oak and white pine poletimber, moderately stocked 40-69 sq.ft. BA/ac
A9	Aspen sawtimber, well stocked 70+ sq.ft. BA/ac
AOrw9	Aspen and red and white oak sawtimber, well stocked 70+ sq.ft. BA/ac
Orw9	Red and white oak sawtimber, well stocked 70+ sq.ft. BA/ac

Forest Management Map



Management Unit 1 (2.3 ac.)



Figure 9. Unit 1

Applicable landowner objectives:

1. To improve wildlife habitat for a variety of diverse species

Cover type:	Unit 1: Red and white oak and white pine poletimber
Total unit area:	2.3 ac
Stand age:	Unit 1: ~90 years old
Major soil type(s):	Unit 1: Graycalm sand, 6-18 percent slopes-GycaaD Graycalm sand 0-6 percent slopes-GycaaB
Site index*:	Unit 1: Northern red oak site index 60 (medium), 64 cu.ft/ac/yr on Graycalm
Current stand density:	Unit 1: moderately stocked poletimber, 50 sq. ft./ac BA

Estimated current volume/value†:

Unit 1:

Present Volume/Value		Unit Price	Volume	Value
2.6	MBF/ac sawtimber	\$ 300.00	6.0	\$1,796.88
2	cds/ ac boltwood	\$ 32.00	4.6	\$147.20
5.4	cds/ac pulpwood	\$ 14.00	12.4	\$173.75

Planned Management Activities:

This unit appears to be the location of a past homesite. There are a variety of very large oaks and white pine that appear to have been open grown along the roadside, as well as a number of apple trees and myrtle that were probably planted long ago. The majority of the unit is medium stocked poletimber approximately 6” DBH that has succeeded into the old openings. This unit functions well to provide a source of wildlife food and cover. A variety of food sources including red and white oak, apples, cherry, and smooth sumac (*Rhus glabra*) are present in this unit. All of these species provide a valuable food source to the wildlife that use this area. Deer, grouse, turkey, woodcock, bear, squirrel, chipmunk, neo-tropical songbirds, as well as other species can be expected to use this unit. A portion of this unit may be used as a landing for future harvesting operations. No harvesting will be needed here until approximately year 2031.

Upland Wildlife Habitat Management – Conservation Practice Code 645- Unit 1 (2.3 ac)- August 2016-2031 (as needed)

To maintain this opening, mow after August 1 as needed to control encroaching brush and trees. Take care to protect existing oak, apple trees, and sumac as these provide valuable hard and soft mast for wildlife.

No additional operation and management activities are required following installation of this practice. Cost-sharing may be available from the USDA-NRCS to implement this practice. If government cost sharing is anticipated, do not start this practice until approved by the appropriate program manager.

Management Unit 2 (0.9 ac.), 3 (35.4 ac), 4 (1.4 ac) Total 37.7 acres



(Figure 10. Unit 3)



(Figure 11. Unit 2)

Applicable landowner objectives:

1. To improve forest health to protect stands from invasive species, insects, and disease
2. To maximize forestland productivity through sustainable forest management
3. To improve wildlife habitat for a variety of diverse species
4. To demonstrate proper forest management to the surrounding community and the state of Michigan as a whole.

Cover type:

Unit 2: Aspen sawtimber

Unit 3: Aspen and red and white oak sawtimber

Unit 4: Red and white oak sawtimber

Total unit area:

Unit 2: 0.9 ac

Unit 3: 35.4 ac

Unit 4: 1.4 ac

Total: 37.7 ac

Stand age:

Unit 2: ~40 years old

Units 3 and 4: ~90 years old

Major soil type(s):

Units 2, 3, 4: Graycalm sand, 6-18 percent slopes-Gycaad
Montcalm loamy sand 6-12 percent slopes-MtC

Site index*:

Units 2, 3, 4: Bigtooth aspen index 70 (medium high), 81
cu.ft./ac/yr on Graycalm

Red oak site index 63 (medium high), 57 cu.ft./ac/yr on Graycalm

Current stand density:

Units 2 and 3: well stocked sawtimber, 160 sq. ft./ac BA

Unit 4: well stocked sawtimber, 90 sq. ft./ac BA

Post-harvest stand density (estimated): Units 2, 3, 4: moderately stocked sawtimber, 50 sq ft/ac BA with well stocked saplings, 700+ trees per acre

Estimated current and post-harvest volume/value:

Unit 2 (0.9 ac):

Aspen				
Present Volume/Value		Unit Price	Volume	Value
0.0	MBF/ac sawtimber	\$0.00	0.0	\$0.00
4.5	cds/ ac boltwood	\$32.00	4.1	\$129.60
62.7	cds/ac pulpwood	\$14.00	56.4	\$790.02

Post-harvest volume/value: None merchantable

Unit 3 (35.4 ac):

Aspen				
Present Volume/Value		Unit Price	Volume	Value
0.0	MBF/ac sawtimber	\$0.00	0.0	\$0.00
4.5	cds/ ac boltwood	\$32.00	159.8	\$5,112.00
29.1	cds/ac pulpwood	\$14.00	1033.1	\$14,462.70

Aspen Post-harvest volume/value: None merchantable

Red and White Oak			Spp	Spp
Present Volume/Value		Unit Price	Volume	Value
7.0	MBF/ac sawtimber	\$ 300.00	248.7	\$74,605.47
2	cds/ ac boltwood	\$ 32.00	71.0	\$2,272.00
14.5	cds/ac pulpwood	\$ 14.00	515.3	\$7,213.85
Future Volume/Value		Unit Price	Spp	Spp
2.5	MBF/ac sawtimber	\$300.00	90.4	\$27,114.97
1.8	cds/ ac boltwood	\$32.00	62.3	\$1,993.92
10.1	cds/ac pulpwood	\$14.00	358.5	\$5,018.91

Red Maple			Spp	Spp
Present Volume/Value		Unit Price	Volume	Value
1.5	MBF/ac sawtimber	\$ 300.00	54.5	\$16,363.28
2	cds/ ac boltwood	\$ 32.00	71.0	\$2,272.00
3.2	cds/ac pulpwood	\$ 14.00	113.0	\$1,582.22

Red Maple Post-harvest volume/value: None merchantable

Misc. (Red, white, jack pine, ironwood, birch)			Spp	Spp
Present Volume/Value		Unit Price	Volume	Value
0.4	MBF/ac sawtimber	\$ 300.00	15.7	\$4,714.84
2	cds/ ac boltwood	\$ 32.00	71.0	\$2,272.00
0.9	cds/ac pulpwood	\$ 14.00	32.6	\$455.89
			Spp	Spp
Future Volume/Value		Unit Price	Volume	Value
0.4	MBF/ac sawtimber	\$300.00	12.7	\$3,818.10
1.8	cds/ ac boltwood	\$32.00	62.3	\$1,993.92
1.0	cds/ac pulpwood	\$14.00	36.7	\$513.60

Unit 4 (1.4 ac):

Red and White Oak:

Red and White Oak			Spp	Spp
Present Volume/Value		Unit Price	Volume	Value
11.7	MBF/ac sawtimber	\$ 300.00	16.3	\$4,894.53
2	cds/ ac boltwood	\$ 32.00	2.8	\$89.60
24.1	cds/ac pulpwood	\$ 14.00	33.8	\$473.27
			Spp	Spp
Future Volume/Value		Unit Price	Volume	Value
4.1	MBF/ac sawtimber	\$300.00	5.7	\$1,720.10
1.8	cds/ ac boltwood	\$32.00	2.5	\$78.63
16.5	cds/ac pulpwood	\$14.00	23.1	\$323.78

Planned Management Activities:



Figure 12. Evidence of hunters

These units consist of over-mature aspen with red and white oak sawtimber mixed throughout. The aspen is good quality with an average of 7 sticks per tree. The oak stems are of good quality with a good market potential for grade sawlog and veneer products. This property has been used over the years for hunting by adjoining landowners gaining access through the Commercial Forest Act. The timber in these units can be improved by a harvest to adjust the density and spacing of the oak trees and as well as removal of the aspen to regenerate that component. Thin out any poor formed or unhealthy red oak to prevent any future mortality due to oak wilt disease. OWD is not currently noted on this property but could be infected from nearby outbreak pockets. Thinning of the oak will improve the forest health and regeneration of the aspen will provide additional food and cover for deer, turkey, grouse, woodcock, golden-winged warblers, as well as a host of other game and non-game species. There are no existing trails through these units. There is, however, an old fire trench stretched into the neighboring property that was

once dug long ago, likely to help control a wildland fire either on this property or adjacent properties.

Forest Stand Improvement – Conservation Practice Code 666 –Unit 2 (0.9 ac), 3 (35.4 ac) and 4 (1.4 ac) total 37.7 acres January 2017

Unit 2 is comprised of a mature aspen clone while Unit 4 contains mostly red and white oak sawtimber. Unit 3 is primarily comprised of aspen (~50%), red maple (~10%), and red and white oak (~35%), though there are a few stems of ironwood, white birch, and white, red, and jack pine scattered throughout that make up approximately 5% of the stand volume. The prescribed treatment throughout these units will be to remove all aspen and red maple, and thin the red oak while retaining all stems of white oak to reduce the threat of oak wilt disease. Oak wilt disease (OWD) is present on adjoining properties, although the field investigation did not reveal any evidence of it in the unit. Thinning should be focused on removal of diseased, damaged, deformed, and otherwise poor species from the stand (ironwood, red maple, white birch) down to a basal area of approximately 50 sq ft/ac. Harvest all aspen to produce stump sprouts to help feed wildlife. The aspen sprouts that will generate after harvesting will feed deer for approximately 5 years. Turkey, grouse and other game and non-game animals and birds will utilize these areas for feeding and nesting habitat.

Harvest all wood products in roundwood form with a wood processor between the months of October and March. All harvesting should be completed no later than April 1. All harvesting equipment should be cleaned and sanitized before entering the property and leaving the property to help reduce the possibility of the introduction of oak wilt disease. Harvesting during winter months when soil is frozen will reduce ground disturbance and damage to seedlings and ground cover. A qualified, experienced forester should be retained to administer the timber sale.

Cost-sharing may be available from the USDA-NRCS to implement this practice. If government cost sharing is anticipated, do not start this practice until approved by the appropriate program manager. Special care should be taken to observe proper felling practices as well as to wear protective eye, head, leg, and foot gear when working in the woods.

Methods and Procedures

Assessment Tools and Methods used for Undesirable plant productivity and Health and Excessive Plant Pest Pressure: Observational and Variable Point Sampling as described in plan.

Assessment Tools used for Habitat Degradation: Observational. Due to grass cover, there is a lack of available food for the desired wildlife species – deer, grouse, and turkey. MDNR Wildlife Biologists, as documented in “Managing Michigan’s Wildlife: Landowners’ Guide,” have determined that crabapples are a valuable food source for these species. Refer to the applicable species-specific chapters in Section VIII here for documentation of the wildlife species food usage: http://www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/index.htm.”

Mitigation Requirements: There are no additional mitigation methods necessary for the Forest Stand Improvement practices planned on this property.

***Site index:** An expression of site quality based on tree growth patterns; refers to the height of dominant /co-dominant trees in even-aged stands at some index age, usually 25, 50, or 100 years. Better sites produce taller trees for a given age and are indicative of more productive growing conditions for that species. (*Forestry Handbook*, John Wiley and Sons, 1984).

†1 MBF= 1000 Board Feet; Cord = (4’h x 8’ l x 4’w); ~ 2.2 cds per MBF
Boltwood, pulpwood, sawlog and stand density estimates were obtained through variable point sampling. Market values are based on average local current market prices being paid for those species and products of similar quality at the time of estimate. Due to potential defect, random and/or systematic sampling discrepancies, harvest chance, and stand variability, actual quality, volume, and value of all products listed may be greater or less than that stated above. Note: This is an **estimate and not a guarantee** of the volume and value of the wood products available to be harvested in the management unit(s) listed above.

Management Unit	Amount Planned	Date	Conservation Practice Code/Activity	Date completed
Unit 1	2.3 ac	8/2016-8/2031	<u>Upland Wildlife Habitat Management 645</u> – mow in August as needed.	
Unit 2 (0.9 ac) Unit 3 (35.4 ac) Unit 4 (1.4 ac)	37.7 ac	1/2017	<u>Forest Stand Improvement 666</u> - Harvest all aspen and red maple. Thin oak to 50 sq.ft. BA/ac.	

Glossary of Forestry Terms

BA (Basal area) – A unit measure of forest stand density. Derives from the number of trees in a representative plot of the stand.

Board foot (bd.ft.) - A unit of wood measuring 1-inch x 12 inches x 12-inches. Board foot volume is determined by length (feet) x width (inches) x thickness (inches) divided by 12. Often expressed in thousands of board feet (see MBF).

Boltwood- A tree 9” to 10” DBH

Clearcut - Removal of all merchantable trees, large or small, in a forested area during one cutting operation. Often done in aspen and red maple stands to promote natural regeneration.

Cord - A unit of measure of wood, bark, and air space measuring 4 feet wide by 4 feet high by 8 feet long. Used in the United States. One cord is 128 cubic feet. ~ 2.2 cds per MBF.

Cubic foot- A metric cube measurement 12in. high by 12in. wide by 12in. deep. One cubic foot is 0.0078 cords.

DBH (Diameter at breast height) - The diameter of a tree at “breast height” which is defined in the U.S.A. as 4.5 feet or, in Canada and Europe, 1.3 meters

FSI (Forest Stand Improvement) - A harvest that improves a stand of trees for an intended purpose: timber production, wildlife habitat development, recreation area improvement are examples.

Management Unit - area within a property or unit of land on which all recommended management practices are approximately the same

† **MBF** = 1000 Board Feet; measurement used for larger volumes of sawtimber

Merchantable- Trees or stands of a size and quality suitable for marketing and utilization.

Pulpwood – Defined as trees that are 3.5” to 9” DBH. Wood that is processed into paper products, particleboard, fiberboard, or used in cogeneration power production.

Roundwood- Rough logs, bolts, or other round sections cut from trees. Raw product that is turned into secondary products at the mill.

Sawlog – A tree 10” and up DBH that is a minimum of 8 feet long is used to create lumber products. Further broken into a variety of grades based on overall defect and quality.

***Site index** – The average total height of dominant /co-dominant (trees with wide crowns above the level of the forest canopy that receive sunlight from above and the sides) trees in pure, even-aged stands at age 50 years. Used for measures of suitability for species on a particular soil type.

Stand – Basic unit for forest management. A group of similar trees, normally the same species and age that are distinguishable from one another.

Stumpage price – The amount a wood producer (logger) pays a landowner for standing trees based on wood volume.

TPA (Trees per acre) - The number of trees found within a given acre

References

Clare County Soil Survey, published by the USDA-NRCS, 2015

Regional Landscape Ecosystems of Michigan, Minnesota, and Wisconsin

<http://www.nrs.fs.fed.us/pubs/gtr/other/gtr-nc178/s7-2-1.htm>

USDA Web Soil Survey <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>

Appendices

Forest Landowner's Guide to Internet Resources: <http://www.na.fs.fed.us> A complete listing of all forestry information available to the public through the Internet.

Forestry References on the Web a list of web sites for quick information on forests and forest management, K.R. Martell, CF, Consultant Forester

Minimizing Federal Income Tax for Forest Landowners, Karen Potter-Witter, Dept. of Forestry, Michigan State University

USDA, NRCS Conservation Sheet #645 – Upland Wildlife Habitat Management USDA-NRCS, East Lansing

USDA, NRCS Conservation Sheet #666 – Forest Stand Improvement, USDA-NRCS, East Lansing