

# DRAFT 1 FOREST STEWARDSHIP PLAN

Plan prepared for Farwell Area Schools  
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Natural Capital Forestry, LLC  
January 2019

Plan Duration: 2019 to 2038



**American Tree Farm System**  
*We grow stewardship from the roots.*

This Forest Stewardship Plan was developed with the generous support of the Michigan Department of Natural Resources Forest Stewardship Program and meets the certification requirements of the American Tree Farm System.

## Foreword



Monument to J.L. Littlefield outside of School Forest Park

*Thinking it would be a fine thing to get the boys and girls of our school interested in forestry, I made a proposition to give the school ten acres of land for this purpose. This land was located within one block of the school, so it would be quite convenient. A special election of the school district was held and the gift of land accepted. This project of starting a school forest project commenced in the Spring of 1929, during the year Mr. Barner was superintendent.*

-Autobiography of Josiah Loomis Littlefield

*DNR Forest Stewardship Program Signature Page*

Renewal or revision of a prior Forest Stewardship Plan? - NO

TO BE ADDED UPON APPROVAL

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## *Introduction*

### **School Forests are a Unique Community Asset**

The Village of Farwell is fortunate to be blessed with not just one but three school forests. These are priceless assets that few schools possess. Because Farwell was settled in large part due to the bountiful timber resources that surround it, it is fitting that the school acquired forestland. This forest stewardship plan is an important tool for Farwell Area Schools to utilize these forests for maximum benefit – for teaching & learning, income, recreation, wildlife habitat and aesthetic beauty – to students, teachers and the community.

Stewardship of school forests is also a high priority for the Michigan Department of Natural Resources, which covered the cost of this plan. The DNR designates significant financial resources for forest stewardship plans and other measures that promote the use of school forests as outdoor learning laboratories.

### **Some History**

The monument at the entrance to School Forest Park (see Page 2) illustrates how Farwell’s school forests reflect the community’s forest and timber heritage. School Forest Park was donated in 1929 by Josiah Loomis Littlefield, one of Farwell’s early settlers a fascinating personality who arrived to the area in the early 1870s. Littlefield was the first surveyor of Clare County, and helped to subdivide the county into townships. During his lifetime, served on the village council, as treasurer and on the school board for nearly 30 years.

When Littlefield arrived in Farwell, it was “new country, virgin forest for miles around” as he wrote in his autobiography (Littlefield J. L., 1932). He also owned a sawmill and profited from the region’s timber boom. At that time, before the DNR and the full

development of the discipline of Forestry, everyone thought that the forest resources were limitless.

Unfortunately, these resources were not limitless. Littlefield was among those who realized that it is incumbent on citizens to be good stewards of the land. After most of the timber was harvested, Littlefield's timber business declined significantly, and he lamented:

*And now, as I look back and think of those days, it gives me a feeling of loneliness as I look around and see not one of those splendid living creatures [trees] left. They have all been swept away. There are no more forest companions, and we are indeed lonely.*

This sense of loss prompted Littlefield to become an early proponent of reforestation in Michigan. Starting around 1911, he began to set aside preserves of trees as a conservation effort with the support of Dr. Filibert Roth, professor at the University of Michigan and member of the nascent Michigan Forestry Commission. School Forest Park was one of these reforestation projects, and the other two properties are primarily reforested areas, as well.

A [collection of J.L. Littlefield's family papers](#) (active link, also see Works Cited below), including his autobiography, letters, documents and photos - is available at the University of Michigan Bentley Historical Library.

### The Forest Stewardship Plan: Essential Tool for Landowners

One thing that nearly all forest landowners have in common is their stories about loggers showing up unannounced with offers of temptingly large sums of money for timber on their property. Landowners typically find themselves blindsided by these offers, not knowing if these offers are a good deal, if the agreed-to trees were harvested or if harvesting was performed correctly. In these situations, a forest is typically 'high graded', meaning that the very best trees – as well as their seed production - are stripped from the land and only diseased, stunted and other low-value trees remain. Another profitable harvest might not be viable again for decades.

To guard against unscrupulous actors, manage your forest sustainably and protect your interests – with an eye on the short-, medium- and long-term – a forest stewardship (management) plan (FSP) is an invaluable tool. This is especially important when public resources are concerned. An FSP developed by a trained forester also applies the most up-to-date forest management methods and scientific knowledge to the realization of one's management objectives. An FSP gives landowners:

- A vision for one's property for current and future generations
- A big-picture look at the land's capacity, available management options and their tradeoffs
- An informed strategy for optimizing and balancing forest resources and how they can provide a reliable, *long-term* income stream
- An 'admission ticket' into a wide range of public and private conservation programs

An FSP serves current generations by protecting the public's property today and leaves a responsible roadmap to those who will serve as stewards of the property long into the future.

Finally, for public entities like Farwell Area Schools, an FSP is a tool that enables leaders to make effective and informed strategic decisions while providing the transparency and essential information that the public deserves and expects.

### Forest Stewardship Program

The Forest Stewardship Program from the Michigan Department of Natural Resources (MDNR) supports private forest landowners in their efforts to manage, protect, and enjoy their land. This voluntary program connects family forest landowners with 150 professional foresters and 20 wildlife biologists in the private sector to develop and implement a Forest Stewardship Plan. The United States Forest Service (USFS) supplies funding and partners with the Michigan Department of Natural Resources (DNR) to provide assistance to private forest landowners. See <http://www.Michigan.gov/ForestStewardship> for more information. Since 1990, more than 5,700 landowners from every county in the State of Michigan have developed a Forest Stewardship/Management Plan to help them manage, protect, and *enjoy* their own forest properties.

### Landowner's Goals

Farwell Area Schools has several goals for its property that reflect their personal preferences and derive from the attributes of their forest and the desired future conditions for their land. These objectives are as follows:

Very important	<ul style="list-style-type: none"> <li>✓ Manage the resource in the public interest</li> <li>✓ Provide an outdoor laboratory where teachers and students can engage in meaningful learning in a range of subject areas</li> <li>✓ Enhance wildlife habitat and maintain properties as wildlife sanctuaries</li> <li>✓ Maintain beauty, scenery and aesthetics for stakeholders, including staff, students and the general public</li> <li>✓ Provide year-round recreation opportunities to the above stakeholders, including hiking/walking/jogging, enjoying nature and cross-country skiing</li> <li>✓ Maintain or enhance forest health</li> <li>✓ Protect unique natural features</li> <li>✓ Protect water quality &amp; soil resources</li> <li>✓ Maintain or improve biological diversity</li> <li>✓ Produce timber for harvest that generates revenue for the district</li> <li>✓ Protect threatened/endangered species</li> <li>✓ Protect/restore wetland areas</li> <li>✓ Maintain the resources in a clean, orderly condition to maintain public pride in ownership</li> </ul>
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## General Property Description

Farwell Area Schools owns three parcels of forest land – 40 acres, 39 acres and 12 acres = 91 acres total – in Surrey Township, Clare County, Michigan. These parcels are respectively located 2.6 miles from, 1.6 miles from and adjacent to the main school complex at 399 E. Michigan Street in the Village of Farwell.

The Farwell Area Schools forest contains a wide range of cover types, including red and white pine plantations, mixed hardwood-conifer forests, lowland (wetland) forests, different types of wetlands and grassy area, all of which are outlined in detail below. A *stand* is a forestry term – synonymous with the term “management unit” - for an area of land containing a similar grouping of trees according to species, age class, site conditions, or management practices. See Ownership Map on Page 7.

The wide range of forest cover types and age classes compose an excellent mosaic, which sum up to be excellent wildlife habitat for numerous species and also income opportunities from forest products.

## Planning Process

In Summer 2018, Acting Superintendent, Tom House, with approval from the Farwell Area Schools school board, approached the Clare County Conservation Forester, Nia Becker, about stewardship of the district’s three forest properties. Ms. Becker shared interested consulting forester contacts, including Natural Capital Forestry, LLC with Superintendent House. This led to a dialogue between Superintendent House and James Gray, Principal Consulting Forester for NatCap.

During Fall 2018, Superintendent House and discussed the district needs and developed these ideas into a proposal to the Michigan DNR for its Forest Stewardship Program Outreach and Education Projects Grant, which approved full payment of a Forest Stewardship Plan.

During December and January, the Forester returned to the property for a more comprehensive examination of the forest resources and data collection.

On February 1, 2019, the Plan was sent to Farwell Area Schools for review.

This FSP enabled Farwell Area Schools to enroll American Tree Farm System, a non-profit organization that offers non-commercial forest landowners both recognition for their sustainable resource management and a range of resources for assisting them toward this end. Farwell Area Schools will receive Tree Farm signs to post on its properties.

The Forester also visited the Bentley Historical Library at the University of Michigan to review the Josiah Loomis Littlefield Family Papers, which are available for viewing and reproduction by the general public.



## Forest Assessment Method

In preparation for the site visits, the Forester performed advance due diligence about the property to review ownership records, aerial photos and soil maps to obtain context for the on-site visits. Superintendent House provided the Forester with contracts for harvests that were performed under the guidance of Lakes States Forestry Consultants in 2000, 2009 and 2011.

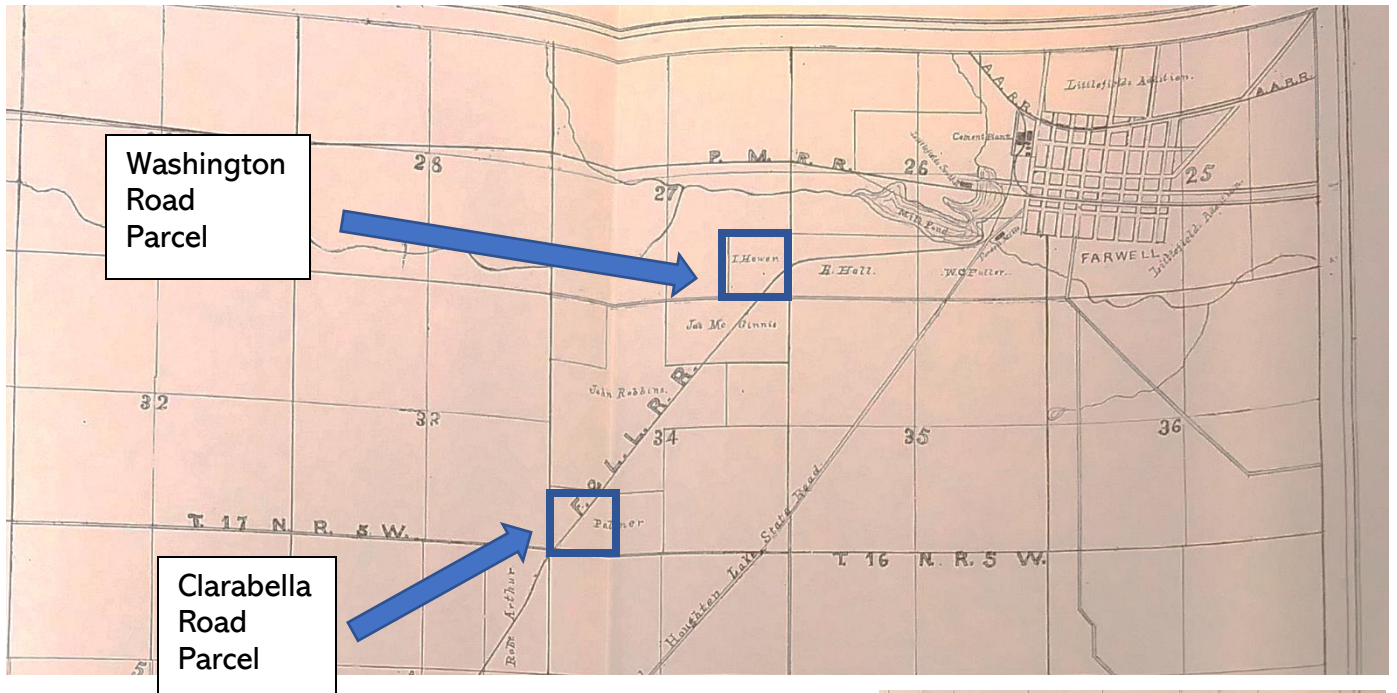
An FSP requires a general assessment of forest conditions and inventory. During his field visits, the Forester collected basic forest assessment data using two methods: 1.) visual survey, and 2.) a recognized forest inventory method called “point sampling”, of representative areas of the forest, or “plots”. This inventory provides a summary understanding of the forest density and the primary tree species occurring in the forest. Saplings and shrubs in the understory, wildlife habitat, and forest health issues were also noted throughout. This was not a formal inventory of the forest as this more intensive data collection and analysis can wait until preparing for a timber sale or other activity requiring more detailed data.

## Property Maps

**FIGURE 1: Overview Map of Three Forest Parcels Belonging to Farwell Area Schools (yellow pins)**



**FIGURE 2: Historic Plat Map from 1903**



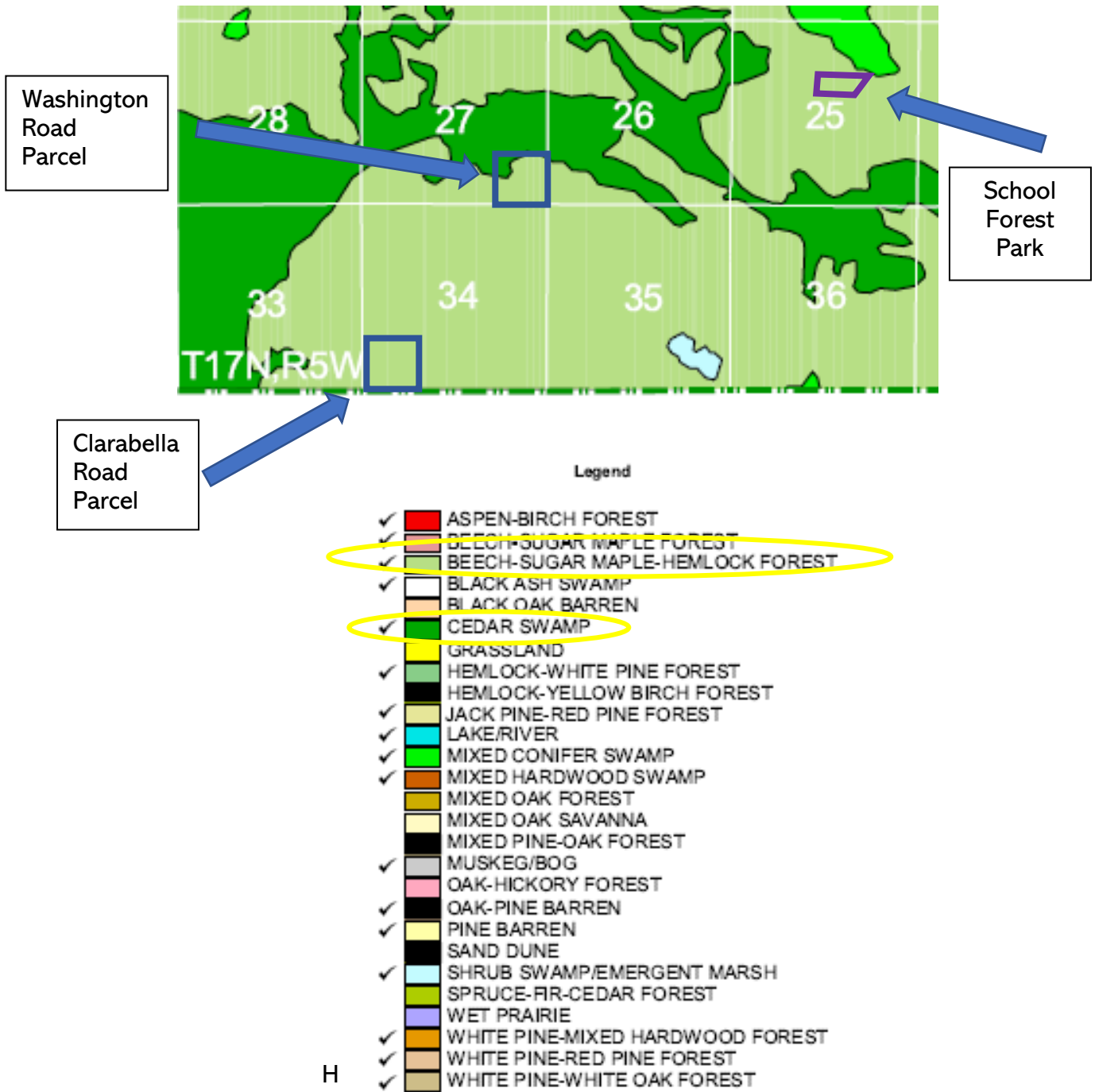
Excerpt of a 1903 map was part of a prospectus to build the Portland Cement Plant in Farwell.

Source: Littlefield Family Papers: 1834-1935 (Littlefield J. , 1834-1935)



**Historical interest.** This excerpt from a 1903 map was part of a prospectus to build the Portland Cement Plant in Farwell. It illustrates the property ownership from that time and the location of the Farwell & Littlefield Lake Railroad (F.&L.L.R.R.) line. The railroad line passed through both the Washington Road and Clarabella Road parcels, with the former owned at that time by "I. Hewer" and the latter by "Palmer". The old railroad grade is recognizable on these parcels today and could be an excellent foundation for new trails to be built on the property for recreational purposes.

**FIGURE 3: Vegetation map circa 1800 for T18N, R5W (Sections 25, 27, 28), Surrey Township, Clare County (boundaries, in purple, are approximate)**



Historic forest types: “Beech-Sugar Maple-Hemlock Forest” & “Cedar Swamp”  
 Source: Michigan Natural Features Inventory

Observing the current tree species and soil types, the Forester believes that “Mixed Oak Forest” or “White Pine-Mixed Hardwood Forest” is a more appropriate cover type for the Farwell forests.

### *Resource Descriptions*

#### Resources Common to the Entire Property

**Overview and species composition.** The 91-acre Farwell Area Schools property consists of five primary forest stands and four additional management units, as follows:

STAND #	STAND NAME	DNR IFMAP Classifications	APPROXIMATE AREA (ACRES)
<b>CLARABELLA ROAD PARCEL – 40 acres</b>			
1-1	<b>Red Pine Plantation Stand:</b> a well-stocked pole- to timber-sized stand of planted red pine	R42110-6	25 acres
1-2	<b>Non-forested Wetland:</b>	N6230	1 acre
1-3	<b>Mixed Hardwood Stand:</b> non-plantation mixed hardwood stand (variable)	UM4119-8	14 acres
<b>WASHINGTON ROAD PARCEL – 39 acres</b>			
2-1	<b>Red &amp; White Pine Plantation Stand:</b> a well-stocked pole- to timber-sized stand of planted red and white pine	R42110-9	27 acres
2-2	<b>Wetland Areas:</b> emergent wetland, shrub & lowland mixed hardwood-conifer forest wetlands	N6230, N6229, LM6119-8	6 acres
2-3	<b>Mixed Hardwood-Conifer Stand:</b> non-plantation stand (variable)	UM4119-8	3 acres
2-4	<b>Grassy Area:</b> non-forested grassy area, pipeline easement	G310-0	3 acres
<b>SCHOOL FOREST PARK PARCEL – 12 acres</b>			
2-1	<b>Red &amp; White Pine Plantation Stand:</b> a well-stocked pole- to timber-sized stand of planted red and white pine	R42110-9	12 acres
<b>TOTAL</b>			<b>91 acres</b>

The Farwell Area Schools forest contains a wide range of cover types, including red and white pine plantations, mixed hardwood and hardwood-conifer forests, lowland (wetland) forests, different types of wetlands and grassy areas, all of which are outlined in detail below.

The wide range of forest cover types and age classes compose an excellent mosaic, which sum up to be excellent wildlife habitat for numerous species and also income opportunities from forest products.

**Forests and climate regulation.** Forests are ecosystems that provide humanity with a wide range of ecosystem services, including aesthetics, the oxygen we breathe, regulation of the water cycle and erosion control, among others. In addition, forests remove and store carbon dioxide (CO<sub>2</sub>) that is accumulating in the atmosphere from the combustion of fossil fuels. This excess CO<sub>2</sub> is a primary cause of climate change. CO<sub>2</sub> is removed from the atmosphere when trees and plants perform photosynthesis because they use the carbon as a building block for their food sources and plant structures, e.g. leaves, wood, branches, etc. CO<sub>2</sub> is released back to the atmosphere when trees and plants die and decompose. Harvesting timber, focusing growth on the best crop trees and creating long-lived forest products are excellent long-term ways to keep CO<sub>2</sub> from returning to the atmosphere. Healthy forests therefore clean the air, produce oxygen and remove significant quantities of atmospheric carbon. 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).

**Desired Species.** Farwell Area Schools intends to utilize its forest for educational purposes and recreation. Farwell Area Schools has practiced forest management to date with support of foresters, maintaining different a range of forest types and age classes, resulting is a mosaic of different food sources and cover types for a wide range of wildlife. This mosaic should be maintained to promote a wide range of habitat niches for desired species such as birds, wild turkey, small mammals and deer.

A forest is a community of trees, other plants, animals and non-living elements that interact with each other continually. To have a healthy forest, a landowner should seek to maintain a healthy balance among all organisms that call the forest 'home'.

To provide food sources for deer, a cohort of red and white oak species should be retained for their acorn supply. The fruit of black cherry and nuts from American beech are also valuable for black bears, small mammals and birds. Deer also benefit from the trees and plants growing in younger forests and in grassy areas, which will be explored in the forthcoming discussions of each stand.

**Fire.** Fire was previously more common in this area of Michigan and is commonly associated with red pine- and oak-dominated areas. Also, fire can be used to maintain 'thicket level' vegetation and prevent it from growing to a closed-canopy mature forest. Utilizing controlled burning as a teaching and/or forest management tool would certainly be interesting but is by no means required.

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. However, more information about minimizing the risk of wildfire in Michigan can be found at [firewise.msu.edu](http://firewise.msu.edu).

**Forest Health & Invasive Species.** The Forester observed no major issues related to forest health (insects, disease, invasive plants) throughout the property, but a warm-season check would be useful. The Forester will perform this check and report to the Landowner at no additional charge. Specific findings are noted below regarding each respective property.

While the Forester has observed **oak wilt** on other properties in Clare County, it was not evident on the Farwell Area Schools property. Due to the prevalence of oak wilt and the severe damage it can cause to the high-quality oaks on the property, the landowners are very strongly advised to monitor for oak wilt. If any oaks (most commonly red oaks) experience rapid defoliation, samples of small branches should be sent to the should be sent to the MSU Diagnostic Services for testing. Instructions can be found [at this link](#).

Oak wilt is caused by a fungus that enters an oak tree – red oaks are more susceptible than white oaks – through a wound via nitidulid beetles or underground via the root systems. The fungus effectively blocks that cells that transport water (Sakalidis, 2018). When one tree in a group becomes infected and dies, the fungus spreads through the connected root systems, killing more trees and creating an *infection center* (USDA, 2017). Sandy soils (like those on the Farwell Area Schools property) are conducive to the formation of widespread and deep root systems, increasing the likelihood of root grafts occurring farther away from a diseased tree. Human transport of infected oak, especially firewood, facilitates the overland spread of oak wilt throughout a landscape. If it should be found positive, a number of practices can be implemented. For example, root grafts between the infection center and nearby trees can be severed. Also, infected trees can be removed according to specific protocols between late July and March. To prevent new infections, oaks should not be damaged or harvested between April 15 and July 15. The USDA publication *How to Identify, Prevent and Control Oak Wilt* goes into greater depth on these practices, and NRCS funds can be applied for to implement them.

Tree mortality of ash species from **emerald ash borer** is widespread and nearly complete, though numerous seedlings (too small to be infested) and a few saplings and poletimber sized trees remain alive in spite of the severe infestation. Farwell Area Schools should continue to keep these trees onsite, e.g. utilizing them as firewood to reduce spreading of the insect.

Otherwise, **autumn olive** (*Elaeagnus umbellate*) is present and of minor concern. It should be addressed if it begins to crowd out native plant species. This is a shrub native to Asia that was introduced into the U.S. back in the mid-1800s, was found on the property. It was commonly promoted for wildlife food and cover until its invasive traits were apparent. Its abundant fruit production is widely distributed by both mammals and birds, and like many non-native shrubs, it leafs out early and retains its leaves late in fall to the detriment of

desirable native species and reduces diversity of species. It thrives in both shady and sunny locations. Autumn olive is not a highly preferred food for deer.

**Deer browse** is an issue that affects forest health. Overbrowsing can negatively affect regeneration of seedlings and the growth of plants in the understory. The Forester found evidence of mild deer browse on seedlings, especially ash and cedar.

Some of the seedlings and plants as preferred by deer and are found in this region include (Ewert, 2016):

Plant/tree name	Preference as deer browse	Presence in forest
White pine	HIGH	Yes
Maple seedlings (red, sugar)	HIGH	Yes
Northern white cedar	HIGH	Yes
Wild grape	HIGH	Yes
Red maple (stump sprouts )	HIGH	Yes
Red oak (acorns)	MEDIUM	Yes
Ash seedlings	MEDIUM	Yes
Aspens	MEDIUM	Yes
White birch	MEDIUM	Yes
Witch hazel (fruit)	MEDIUM	Yes
Ferns	LOW	Yes
American beech	LOW	Yes

Recreation.

RECREATION RESOURCES – (Images taken November 2018)	
	<p>Hiking trail (Washington)</p>





Hiking trail  
(School  
Forest)

The Farwell Area Schools forest is important for providing a wide variety of recreational activities, such as deer and bird hunting and hiking/walking. A network trails, most of which can accommodate a vehicle, traverse the entire property.

Those responsible for these forests should also keep in mind that forests are dynamic systems that can present risks to visitors. Timber harvests can be used to remove or reduce these risks, but additional monitoring and risk reduction should be undertaken in all forests and addressed with assistance from a certified arborist. Activities in the forests should be avoided during periods of high winds due to the risk of falling branches, acorns, cones, etc.


**Roads & Trails.** The above-mentioned trail network facilitated previous timber harvests and remains in excellent condition due to maintenance by Farwell Area Schools and are ready for the next timber sale.

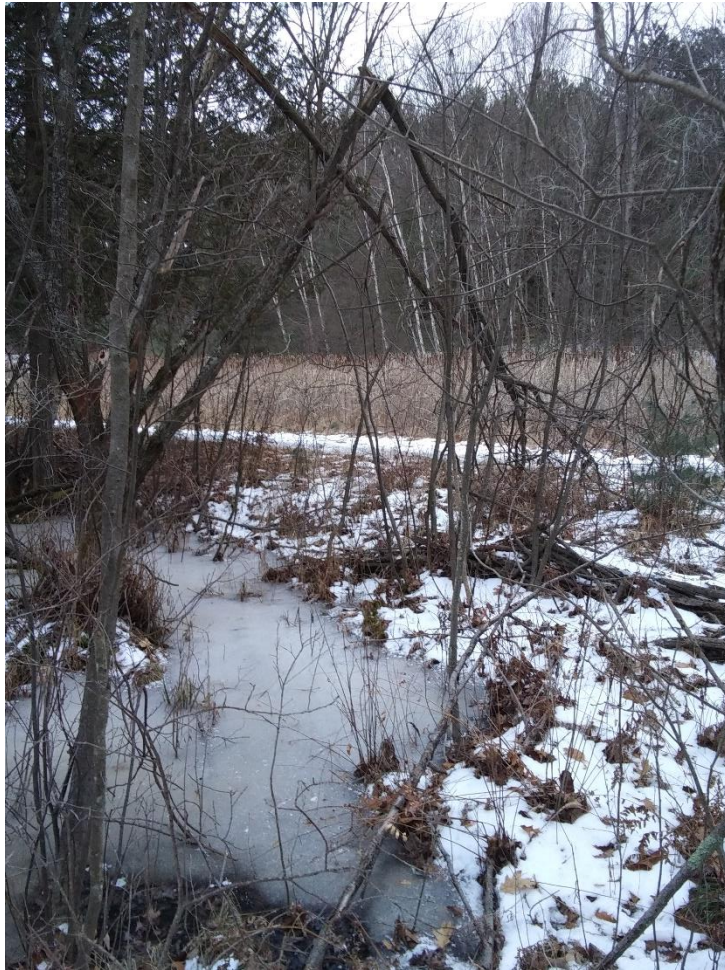
**Special Sites.** The Michigan Office of the Archaeologist for the State of Michigan reports that no special and historic sites are known on the property ([www.Michigan.gov/Archaeology](http://www.Michigan.gov/Archaeology)). Special sites also include unique natural communities, but there are no unique natural communities on this property ([mnfi.anr.msu.edu/communities](http://mnfi.anr.msu.edu/communities)).

**Threatened and Endangered Species.** The Michigan Natural Features Inventory (MNFI) reports that no threatened or endangered species are currently known to be on the property. For more information, see [mnfi.anr.msu.edu](http://mnfi.anr.msu.edu). Landowners are required to protect the habitat and not harm legally designated threatened or endangered.

**Water & Wetlands.** As mentioned, the Farwell Area Schools property contains important wetland resources that have legal protections and recommended best management practices, which are outlined in Michigan Department of Environmental Quality's (MDEQ's) voluntary Best Management Practices (BMPs) manual, *Sustainable Soil and Water Quality Practices on Forest Land* (2018). Most importantly:

Per Part 303, Wetlands Protection, of the NREPA, specified silvicultural and timber harvesting activities are exempt from obtaining a wetlands permit. Construction or maintenance of forest roads, or temporary roads for moving forestry equipment, is exempt, providing the roads are constructed and maintained in a manner to assure that any adverse effect on the wetland will be otherwise minimized. However, grading in wetlands associated with a forestry operation requires a permit because it involves dredging and filling. It should also be noted that a permit is required for tree clearing, if the purpose of the activity is to subject the land to a use to which it was not previously subject (e.g., preparation for development). In summary, typical forestry operations in wetlands including standard cultivation activities and even plantations are exempt, but the exemption does not permit land alterations to convert wetlands.

WATER/WETLAND RESOURCES – (Images taken December 2018)	
	Emergent wetland (Clarabella)



Mixed wetland  
near pipeline  
easement  
(Washington)

**Wildlife.** The forester observed evidence of deer as well as deer scat, tracks and browse on tree seedlings. Evidence was observed of other observed species included squirrels, rabbits, raccoons and songbirds, but wildlife activity was low due to the performance of data collection in December & January.

To promote habitat values, beneficial forest structure should be maintained. The following trees should be strategically retained (Wisconsin DNR, 2012):

- Large trees of a diversity of species for nesting and seed production
- Mast-producing trees, e.g. oaks, black cherry, American beech, for food sources
- Den/cavity trees for shelter
- Snags (dead trees) for food, shelter and habitat

**Wood & Fiber Production.** Significant timber value has been realized from the three parcels owned by Farwell Area Schools, and significant future value remains. The primary forest cover is primarily red pine - and secondarily white pine - plantation trees that were planted in the 1920s onwards. These trees continue to mature, and their most significant value lies ahead and can be realized from the remaining future potential harvests. An additional

minor amount of timber potential exists outside of these plantation trees in the hardwood stands.

Records are available for the two previous timber harvest as follows:

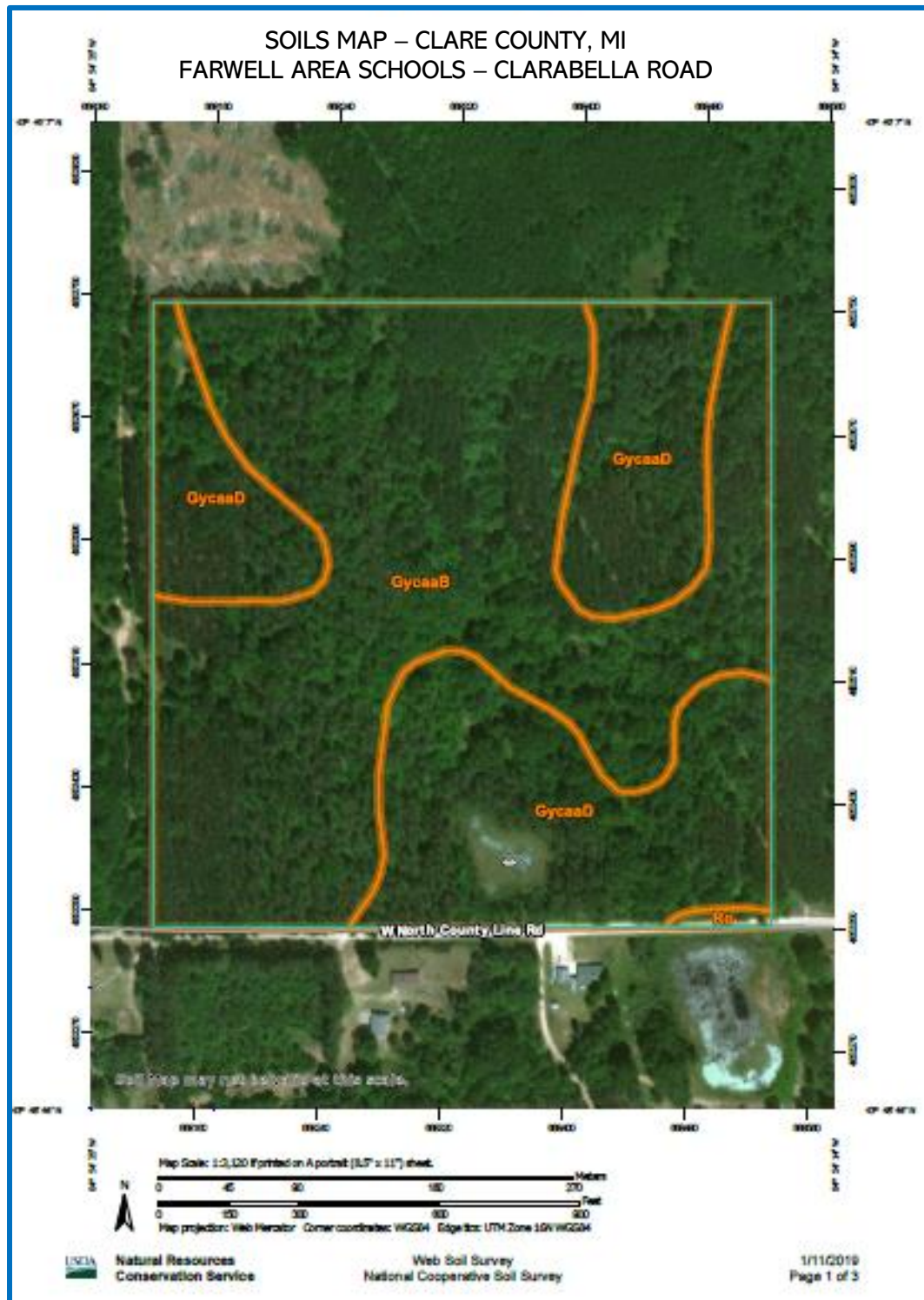
<b>DATE OF HARVEST</b>	<b>LOCATION OF HARVEST</b>	<b>INCOME REALIZED</b>	<b>BUYER</b>
Early 2000 or mid-2001	1. Clarabella Road 2. School Forest Park	\$15,793	Cherry Creek Post Company
2010	1. Clarabella Road 2. Washington Road 3. School Forest Park	\$11,630	Pine Tech

Absent any unforeseen issues such as a large storm or disease outbreak, harvests can be realized every 7-12 years for at least the next 40 years over most of the pine plantation area, and similar returns can be expected.

As these stands reach the end of their rotation, or life cycle, the smaller trees in the understory will replace the current plantation trees. This will be a more diverse, uneven aged forest that will have greater wildlife values.

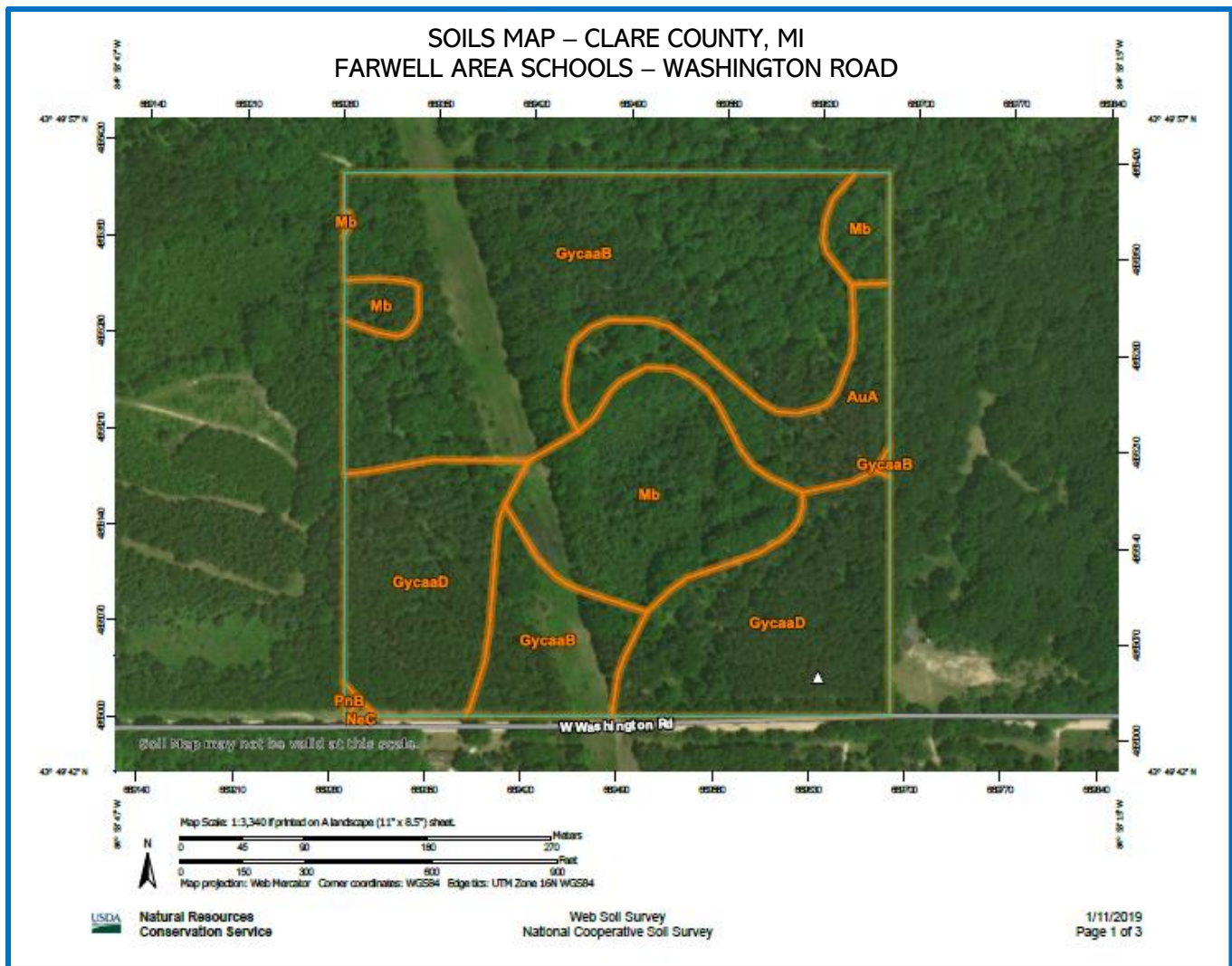
Soils maps

**FIGURE 4: Soils map for Clarabella Road Parcel (property boundary is approximate)**



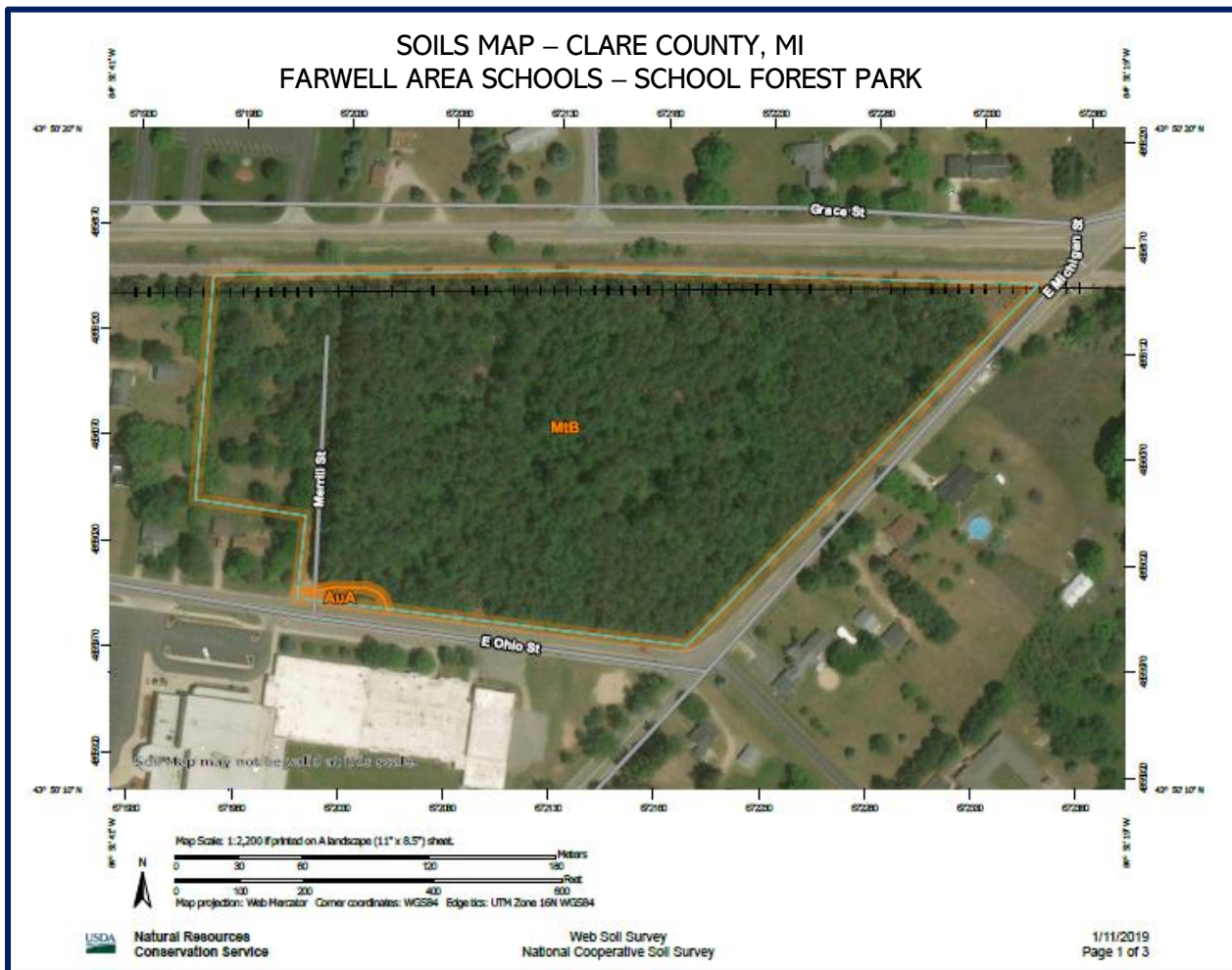
Data source: Natural Resources Conservation Service  
Soil Survey Geographic Database (NRCS, 2014)

**FIGURE 5: Soils map for Washington Road Parcel (property boundary is approximate)**



Data source: Natural Resources Conservation Service  
Soil Survey Geographic Database (NRCS, 2014)

**FIGURE 6: Soils map for School Forest Park Parcel (property boundary is approximate)**

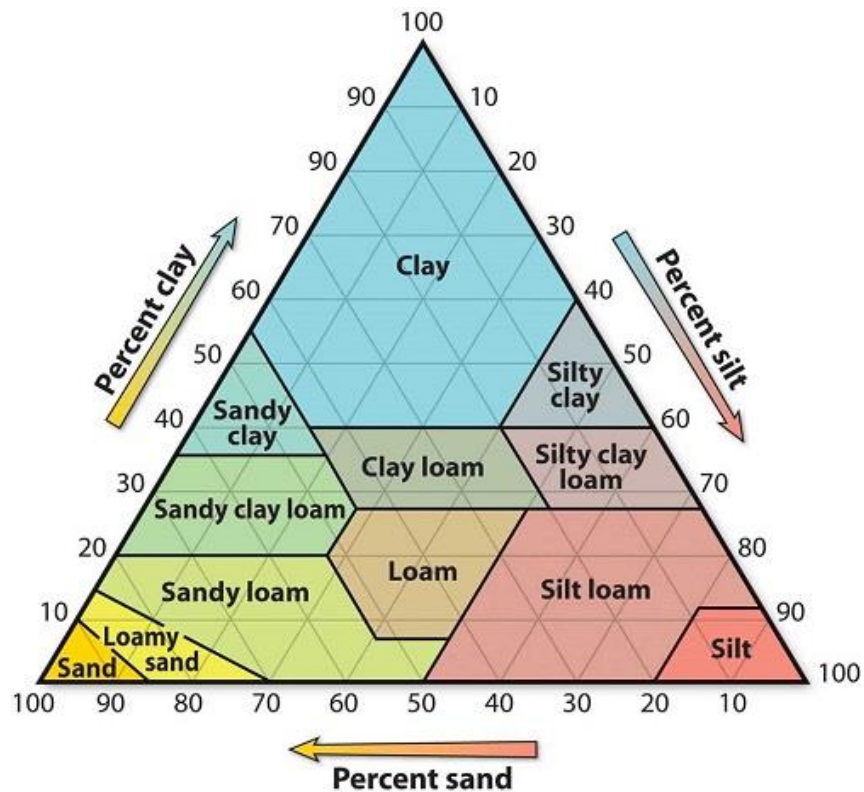


Data source: Natural Resources Conservation Service  
Soil Survey Geographic Database (NRCS, 2014)

## Soil Series Descriptions

**About forest soils.** Knowledge of soil types is important for determining the vegetation, water availability to vegetation, economic productivity, susceptibility to erosion, and suitability for heavy equipment used in timber harvests.

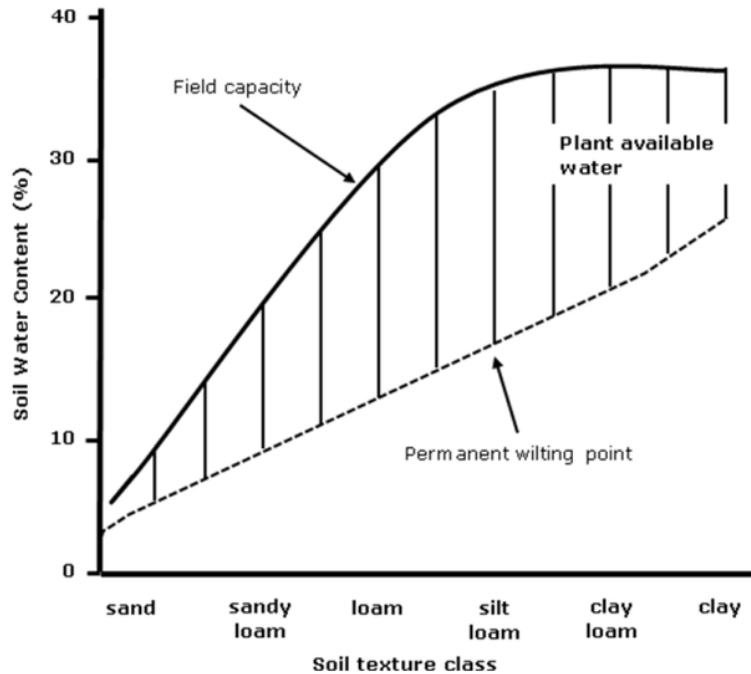
While soil science is a complex subject, in the context of an FSP, we are concerned foremost a soil's ability to hold water that is available for use by plants, which is determined by the texture of the soil. Soil texture is based on the proportion of sand, silt, and clay found in that soil. The identification of sand, silt, and clay are made based on size, with sand measuring 0.02 – 2.00 mm in diameter, silt 0.002 - 0.02 mm in diameter and clay < 0.002 mm in diameter. The USDA/NRCS Soil Texture Triangle below illustrates the names associated with the various compositions of sand, silt and clay.



Soil texture is critical for soil water availability because it controls both how well a soil can hold water and how well water is absorbed into the soil. Soils with different textures have very different water holding capacities as shown in the figure below.

(Continued on following page.)





Source: Nature Education

For trees to absorb water from a soil, it must be held in a form in which that trees can access it. Sand, which is relatively coarse with limited micropores, which results in relatively poor capacity for holding water. Clay, on the other hand, is composed of many very fine pores. Although clay can hold the most water of all soil textures, the very fine micropores hold water so tightly that plants have difficulty extracting it in large quantities. The point at which water is held microscopically with too much energy for a plant to utilize is called the “wilting coefficient,” and in general, water in such a state is not available for most plants to extract. Thus, loams and silt loams are the most productive soil textures because they hold large quantities of water that is available for plants to use.

Different tree and plant species possess different capacities to deal with low soil-water or oxygen availability.

On sites with low water availability, certain tree species are more tolerant than others and thrive better. These include most pine species, bigtooth aspen, black cherry and most oaks.

On sites that are wet, water logged or poorly drained, the limiting factors can be lack of water drainage and insufficient access to oxygen. Species that are tolerant of low oxygen availability include hemlock, spruces, northern white cedar, tamarack, red maple, American elm, yellow birch and American beech.

**Soils on property.** Most soils on the Farwell Area Schools property have a relatively high sand content, i.e. **loamy sands** (Montcalm @ School Forest Park, AuGres @ Washington)

and **sands** (Graycalm @ Clarabella & Washington). The remaining soils are poorly drained muck soils found in wetlands, mainly Markey Muck @ Washington.

Loamy sands are well- to somewhat well-drained with moderate to high water availability and are somewhat susceptible to drought and erosion. Regeneration is typically natural in most areas and tree planting is typically not needed.

Sands, meanwhile, are somewhat to very excessively well drained with low water availability, high susceptibility to drought and high potential for erosion (e.g. trails, post-harvest). Tree planting may be needed to assist natural regeneration and control erosion, in which case, a higher density should be planted due to high seedling mortality.

Mucks have severe limitations for rutting and damage from harvesting equipment and generally will not be involved in harvest operations.

The sands and loamy sands that are well drained (Graycalm & Montcalm) are ideal sites for red pine and white pine plantations, which cover the majority of the three properties. Less well drained soils, like AuGres loamy sand, are less suited to red pine due to their high water table and poor drainage. However, in the AuGres soil type one will find towering white pines because it can do well in these settings.

In areas where the plantations are not dominant on the landscape, one will find that these same sandy and sandy loam soils also support a wide range of other tree species, e.g. red and white oak, black cherry, white birch, red maple and aspen (bigtooth and quaking).

The forestry concept called “site index” is utilized to compare soil quality for tree growth, and the number indicates the expected height in feet of a particular tree species at age 50. These values for timber species in the Farwell Area Schools forest are medium and typical for these types of soils and range from 61 for sugar maple (low compared to mesic soils and here sugar maple is a good statewide indicator species though few are on the property), 63-66 for northern red oak and 45-70 for the aspens. These are medium values.

Additional details about soils are elaborated in Table 1 below.

Finally, all management activities on the property should take precautions to protect the soil from rutting or erosion. Voluntary Best Management Practices (BMPs) to protect soil and water quality on each soil type are summarized in the table below and described in greater depth in the publication *Sustainable Soil and Water Quality Practices on Forest Land*, which can be downloaded from ([www.Michigan.gov/PrivateForestLand](http://www.Michigan.gov/PrivateForestLand)).

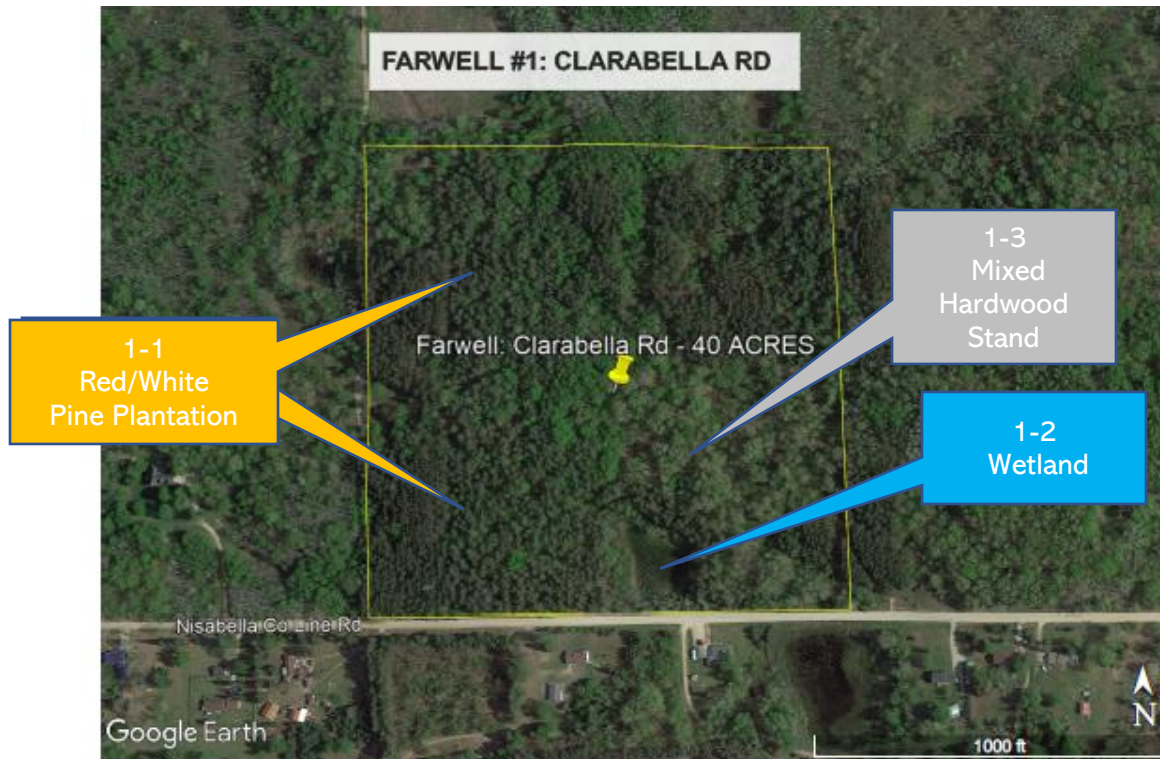
**Table 1: Forest Soil Types**

The following soil information is adapted from the soil maps and the publication USDA Soil Survey of Clare County, Michigan (1978).

Symbol	Soil name	% of area (estimate)	Percent slope	Drainage	Common native species with (site index)	Forest mgmt issues
AuA	AuGres loamy sand	Washington 9%	0-2%	Somewhat poorly drained	Quaking aspen (60), bigtooth aspen (60), balsam fir (53), paper birch (55), sugar maple (53), red maple (56), eastern hemlock, white pine (53)	Moderately suited for equipment, roads, landings (wetness/drainage)
GycaAB	Graycalm sand	Clarabella 59% Washington 45%	0-6%	Somewhat excessively drained	Bigtooth aspen (70), jack pine (54), northern red oak (63), quaking aspen (64), red pine (60)	Moderately suited for equipment, roads, landings (sandiness, slope in some areas)
GycaAD	Graycalm sand	Clarabella 10% Washington 28%	6-18%			
Mlb	Markey muck	Washington 18%	0%	Very poorly drained	Balsam fir (52), northern white cedar (41), tamarack, white spruce	Poorly suited for equipment, roads, landings (wetness/drainage)
MtB	Montcalm loamy sand	School Forest 100%	0-6%	Well to moderately well drained	Sugar maple (61), quaking aspen, northern red oak (66), white pine, red pine, red maple, balsam fir, bigtooth aspen, yellow birch, paper birch.	Well suited for equipment, roads, landings
Ro	Roscommon mucky loamy sand (wetland)	Clarabella < 1%	0%	Very poorly drained	Quaking aspen (45), black spruce (44), northern white cedar, jack pine (42), silver maple, red maple, yellow birch, balsam fir, eastern hemlock	Poorly suited for equipment, roads, landings (wetness/drainage)

## Clarabella Road Property – Resource Detail

**FIGURE 7: Clarabella Road Parcel - 40 Acres**



STAND TABLE - CLARABELLA ROAD PARCEL – 40 ACRES			
STAND #	STAND NAME	DNR IFMAP Classifications	APPROXIMATE AREA (ACRES)
1-1	<b>Red Pine Plantation Stand:</b> a well-stocked pole- to timber-sized stand of planted red pine	R42110-6	25 acres
1-2	<b>Non-forested Wetland:</b>	N6230	1 acre
1-3	<b>Mixed Harwood Stand:</b> non-plantation mixed hardwood stand (variable)	UM4119-8	14 acres

**GENERAL IMAGES - CLARABELLA ROAD (Images taken in January 2019)**



Red pine plantation trees



Hardwood trees in area outside of pine plantation

**Clarabella Stand 1-1 - Red Pine Plantation Stand**

<b>Name:</b>	<b>Red Pine Plantation Stand:</b> a well-stocked pole- to timber-sized stand of planted red	<b>DNR IFMAP</b>	R42110-6
<b>Land area:</b>	25 acres	<b>Current size:</b>	Poletimber average 10" dbh, (some timber > 11" dbh)
<b>Basal area:</b>	160 ft <sup>2</sup> /acre	<b>Stocking level:</b>	Well-stocked
<b>Soil types:</b>	Sand	<b>Site index:</b>	Medium to High
<b>Next recommended treatment:</b>	Thinning in near future		

**Cover type:** Clarabella Stand One is a successful planted plantation of almost exclusively red pine, covering nearly the complete western half and the northeastern quarter of the parcel. Plantations around Farwell began in the 1920s and 1930s by J. L. Littlefield, the

Civilian Conservation Corps and others and are around the same age or 10-20 years younger as compared with the Farwell Area Schools' plantations. Historically these efforts were performed to restore abandoned agricultural land and intensively harvested forestland (Dickmann, 2004).

This type of plantation grows well on the sandy Graycalm soil found uniformly on this parcel. The red pine trees have a high-quality form with minimal branching and significant timber value. Red pine is a perennially useful and valuable timber species in Northern Michigan.

Successful previous management via timber harvests have helped to maintain the health and quality of this stand. Previous harvests removed not only trees with timber value but also the lower-quality ones, e.g. with poor form, disease or overtopped. This management prevented the problems that arise when plantation trees are overcrowded, diseases, pests and increased wildfire risk.

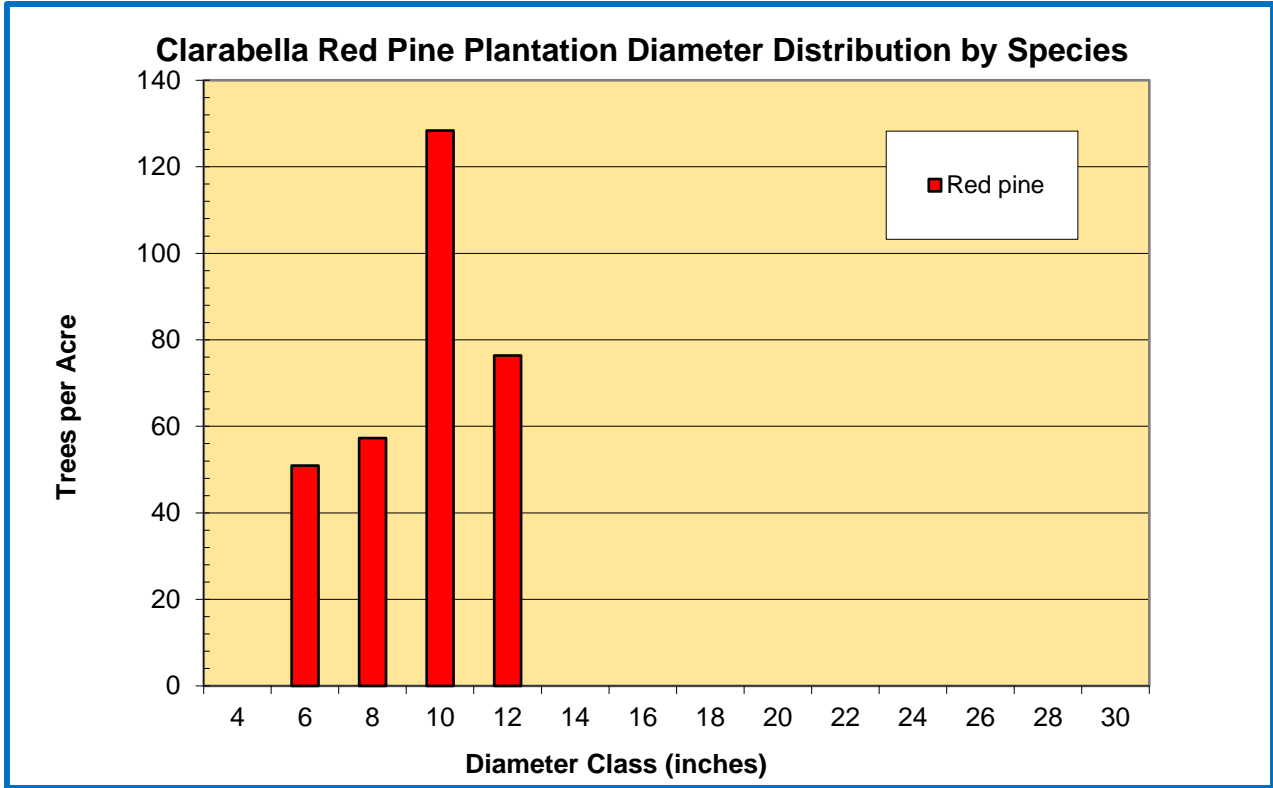
**Species composition.** Clarabella Stand 1-1 is the predominant forest cover type on the Clarabella Road property, covering around 25 acres. Most areas of this stand are dominated by poletimber size red pine trees in the upper canopy; only a few other species are scattered in the overstory, e.g. black cherry and red oak.

Meanwhile, interesting developments are happening down below on the forest floor. There is a range of density of ground-level vegetation with some areas are nearly devoid of vegetation and are a literal carpet of fallen pine needles and other areas containing high density and diversity of tree and plant species.

The most common saplings and poletimber trees in the lower canopy are red oak and black cherry. There are also seedlings of red oak, white oak, northern pin oak, red maple, American beech, balsam fir and witch hazel – but few red pines. Despite abundant red pine cones, few red pine trees are found on the forest floor because this species doesn't thrive in the shade of the forest floor and typically requires fire to become established unless human intervention (e.g. planting) is involved.

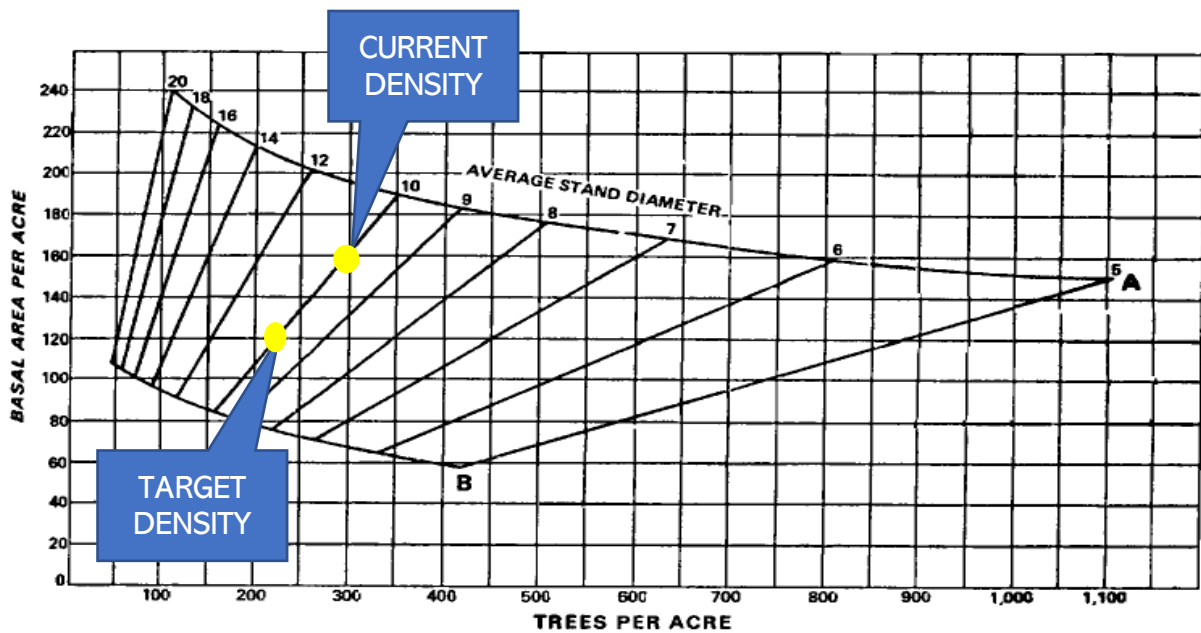
These small- to mid-size trees are the next generation of this forest. Common plants include bracken fern and clubmoss.

The species and size distributions in Stand 1-1 are as follows:



**Stand density.** This stand is around 160 ft<sup>2</sup>/acre of basal area. This is a high density that indicates a need for thinning. The stocking chart below indicates current and desired stand density.

**FIGURE 8: Stocking chart showing current and desired stand density for Stand 1-1**



Source: Benzie, 1977

**Soil types.** These are well-drained, medium fertility sandy soils to which red pine is well adapted.

**Wood & fiber production.** The red pine contains a significant quantity of high-quality trees that have excellent timber potential due to the conducive growing conditions of this site for this species. The red pines are dominant in the upper canopy where they enjoy unfettered access to light.

In the near future this stand can be harvested – a so-called free thinning in forestry - according to the target density mentioned above, i.e. harvesting around  $\frac{1}{4}$  of the trees and reducing basal area from the current 160 ft<sup>2</sup> to 120 ft<sup>2</sup>. This level of harvest will ensure integrity of the remaining trees that will not be at high risk of windthrow or becoming floppy from wet heavy snow or ice. This thinning will realize near-term timber income and promote future income potential via the removal of low-vigor and low-value trees and enhancing access to resources (growing space, light, etc.) for the remaining trees.

Thereafter, future thinnings around 25% every 8-12 years should be performed to maintain stand health and vigor and continue to realize sustainable profit from timber sales.

**Forest health issues.** No significant issues affecting forest health were encountered in this stand.

Nevertheless, at the time of each harvest, the Forester should monitor for forest health issues that are common to red pine plantations. The most significant of these is hetreobasidion root disease, which is caused by the fungus *Heterobasidion irregulare*, and is considered one of the most destructive diseases of conifers in the northern parts of the world (Wisconsin DNR, 2019).

**Threatened & Endangered Species.** None according to the Michigan Natural Features Inventory.

**Wildlife.** As stated on the signs in the forest, Farwell Area Schools maintains these properties as wildlife sanctuaries. Unfortunately, the monoculture found in pine plantations is ecologically less rich and diverse in numerous ways compared to native forest communities. Compared to natural forests, plantations provide fewer of the habitat requirements for wildlife, namely cover, food, space and water.

Allowing the pine plantations to develop into natural forest types that are more common for this area will significantly improve wildlife habitat values.

Still, wildlife benefits can be enhanced by utilizing timber harvest events to maintain habitat structure that will enhance wildlife habitat and ecological diversity, e.g. retaining some large, vigorous pine trees, snags, cavity trees and coarse woody debris (Wisconsin DNR, 2012).





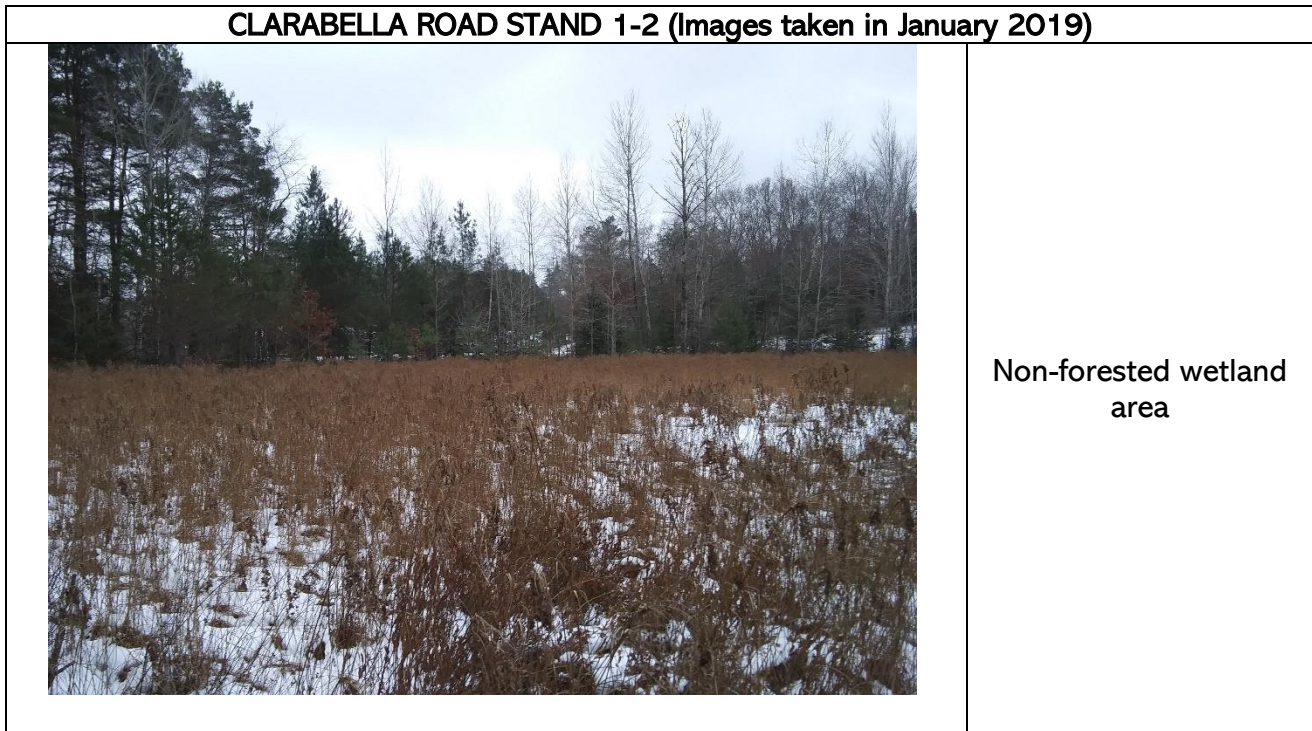
Despite the habitat-related deficiencies, Clarabella Stand 1-1 is a small part of a larger landscape. This stand is complemented by the adjacent non-plantation stands on the property. Not to mention the property to the immediate north is managed by the DNR, much of which was harvested in the past few years and is managed strategically for wildlife benefits. Therefore, wildlife benefits across the landscape are strong due to the mosaic of forest types and ages that exists.

Although numerous tracks and scat piles were encountered during the forester's field work at this property, including deer, rabbits and other small mammals, these were seen almost exclusively in the hardwood stand (1-3).

**Desired Future Conditions.** What happens when all of the red pine trees are eventually harvested? Thinnings have been and will be performed will cause a gradual reduction in red pine trees in upper tree canopy. As a result, ever more sunlight will reach the forest floor, stimulating the growth of the vegetation in the lower canopy and on the forest floor. Today's seedling and saplings down below – mostly mixed hardwoods but few red pines - are tomorrow's residents of the upper canopy.

Eventually an **uneven-aged** forest – one with a range of ages from natural regeneration that are not being planted concurrently – will replace the current even-aged plantation that was planted. The future situation is predicted to be similar to the nearby oak-dominated mixed hardwood stand. This stand will continue to produce timber but will simply be managed and harvested in a manner appropriate to this forest cover type. It will also be richer wildlife habitat, as outlined above.

Clarabella Stand 1-2 – Non-forested Wetland



<b>Name:</b>	Nonforested wetland: mixed emergent wetland		<b>DNR IFMAP</b>	M6230
<b>Land area:</b>	1 acre		<b>Current size:</b>	n/a
<b>Basal area:</b>	n/a		<b>Stocking level:</b>	n/a
<b>Soil types:</b>	Mucky, loamy sand		<b>Site index:</b>	n/a
<b>Next recommended treatment:</b>	No action, maintain in current state.			

**Species composition.** Because there is no timber value in these wetland areas, no inventory was performed. This wetland areas feature emergent wetland vegetation, e.g. cattails.

**Stand density.** Basal area is not relevant in this management unit due to nonexistent timber values and access issues.

**Soil types.** These are poorly drained wet soils, e.g. mucky, loamy sands.

**Wood & fiber production.** It is recommended that this area remain protected areas and maintained for wildlife values.

During timber harvests, the best management practices should be implemented as outlined above in “Resources Common to the Entire Property” and in the MDEQ best

practices manual for forestry to reduce erosion and not change the character of wetlands as outlined in statutory protections.

A buffer of at least 100 feet of forest cover should be left along the edge of the wetland in which no forest roads, trails or other harvest-related clearings should be located. However, selective harvesting of trees is permitted in this buffer area (Michigan Department of Environmental Quality, 2018).


**Forest health issues.** No notable problems issues were found.

**Threatened & Endangered Species.** None.

**Wildlife.** Freshwater marshes are some of the most productive ecosystems on earth. These aquatic habitats are an integral part of the diversity of habitats across the landscape. They are critical habitat - breeding, nesting, and feeding grounds - for waterfowl and other birds and are home to other unique animal and plant species.

**Desired Future Conditions.** Maintain current integrity of wetland area, as well as the 100-foot minimum buffer area along the wetland edge.

#### Clarabella Stand 1-3 – Mixed Hardwood Stand

CLARABELLA ROAD STAND 1-3 (Images taken in January 2019)	
	Sample 1 of mixed hardwood stand, aspen dominant



Sample 2 of mixed hardwood stand, oak dominant



Sample 3 large white oak tree with high wildlife value but marginal timber value

<b>Name:</b>	<b>Mixed Harwood Stand:</b> non-plantation mixed hardwood stand (variable)	<b>DNR IFMAP</b>	UM4119-8
<b>Land area:</b>	14 acres	<b>Current size:</b>	Poletimber average 10" dbh
<b>Basal area:</b>	80 ft <sup>2</sup> /acre	<b>Stocking level:</b>	Moderately well-stocked

<b>Soil types:</b>	Sand		<b>Site index:</b>	Medium
<b>Next recommended treatment:</b>	Thinning concurrent with harvest of plantation trees to improve stand quality			

**Cover type:** Clarabella Stand 1-3 is labeled here with a general name “Mixed Hardwood Stand” as a ‘catch all’ for the areas found outside of the Stand 1-1 red pine plantation areas. This mixed-hardwood stand features some variability, which in most areas is dominated by oaks and red maple and a complement of other mostly hardwood trees but also has areas with high concentrations of aspen. This stand also covers areas of transition between the Stand 1-1 red pine plantation (with fewer red pines) and non-red pine forest covers.

The general forest type is described more formally as a “Northern Dry-Mesic Oak Forest”, a common forest cover in Northern Michigan on acidic, moderately fertile, well-drained sands and loamy sands (Dickmann, 2004).

If the red pine plantation trees found in Stand 1-1 had not been planted, the entire forest would likely resemble Stand 1-3.

**Species composition.** The most common species mix in Clarabella Stand 1-3 is mostly poletimber size but some sawtimber size red oak, white oak, northern pin oak complemented by mid-canopy poletimber red maple trees and seedlings of oaks, red maple and American beech. The most common herbaceous species are club moss and bracken fern. In general, these areas contain a more diverse mix of tree and herbaceous species than the pine plantation areas.

Occasional large oak trees with large, low branches are present, which provide excellent habitat and food values for wildlife but possess marginal timber value.

A smaller area features mostly poletimber but some sawtimber big tooth and quaking aspen with similar components in the mid-canopy and on the forest floor.

A graph of diameter distributions is not included due to the variability of tree species and sizes in this stand.

**Stand density.** This stand is around 80 ft<sup>2</sup>/acre of basal area. This is a low density that indicates additional growth is needed to realize maximum timber potential.

**Soil types.** These are well-drained, medium fertility sandy soils to which various oak species, red maple and aspen are well adapted.

**Wood & fiber production.** Concurrent with the next harvest of Stand 1-3, Red Pine Plantation, the Mixed Hardwood Stand 1-3 can be thinned with the strategy of timber stand improvement. In this strategy, less-desirable trees are selected for harvest, including low-vigor, low-quality, and injured or unhealthy trees. This removal promotes the growth of

more desirable trees, or so-called “crop trees” within or below the upper canopy that will be relatively well formed, vigorous, and healthy and can provide premium timber income over the long term.

During timber harvests, trees that present a potential hazard to visitors can be removed or modified to reduce said risk.

“Group harvest” of oaks – opening small patches of canopy rather than selecting individual trees – will promote regeneration of oaks (which need larger areas of open canopy to do so) and promote growth on the forest floor, which will benefit wildlife, too.

**Forest health issues.** No significant issues affecting forest health were encountered in this stand.

Nevertheless, at the time of each harvest, the Forester should monitor for forest health issues that are common to stands with numerous oaks. The most significant of these is oak wilt, which is elaborated in the section “Resources Common to the Entire Property”. If oak wilt is found, it can be addressed to preserve the value of the oak timber found on the property.

In addition, the Forester did encounter several instances of human impacts that present concerns, including dumping of trash and hunting gear.



**Threatened & Endangered Species.** None according to the Michigan Natural Features Inventory.

**Wildlife.**

**WILDLIFE: CLARABELLA ROAD STAND 1-3 (Images taken in December 2018)**



Wildlife tracks  
observed at  
Clarabella  
Stand 1-3





An abundance of tracks – from small mammals and deer – were observed in Stand 1-3. This stand has a variety of ages of trees as well as more shrubs, plants and fallen trees in the understory, all of which supply the food sources and cover needed by wildlife. The most evidence of wildlife was encountered at transition area along the northern boundary of the property, which is shared with the DNR. On the DNR side, a timber harvest was recently performed, which is encouraging new growth and, therefore, excellent new habitat due to new food sources and cover.

Complementary to the strategy mentioned previously for promoting wildlife benefits, it should be noted that this stand features large, spreading ‘champion’ trees that should be retained for their wildlife values, seed production and aesthetic value. These include the mature red and white oaks in open areas that produce extensive acorns and the mature white pines.

**Desired Future Conditions.** Clarabella Stand 1-3 can continue to provide excellent recreational and wildlife habitat values while providing a steady supply of timber, mostly oak and other hardwoods, but also aspen. This stand comprises an important component in the goal of creating a more diverse mosaic of tree species and age classes across the landscape.

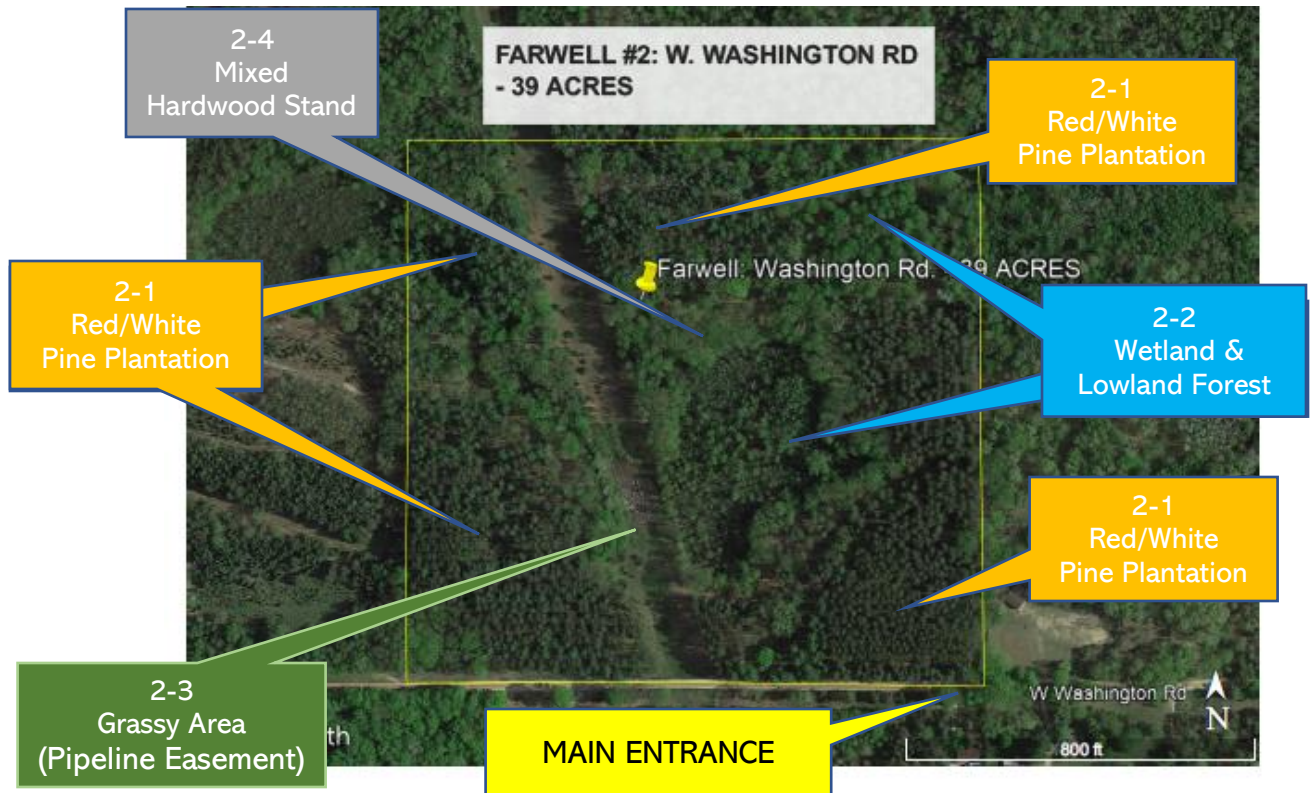
The group harvests of oaks mentioned above will assist in the development of this mosaic.

A “Community Cleanup Day” would also be useful for cleaning up the trash and debris found in this stand.



## Washington Road Property – Resource Detail

**FIGURE 9: Washington Road Parcel - 39 Acres**



STAND TABLE - WASHINGTON ROAD PARCEL – 39 ACRES			
STAND #	STAND NAME	DNR IFMAP Classifications	APPROXIMATE AREA (ACRES)
2-1	<b>Red &amp; White Pine Plantation Stand:</b> a well-stocked pole- to timber-sized stand of planted red and white pine	R42110-9	27 acres
2-2	<b>Wetland Areas:</b> emergent wetland, shrub & lowland mixed hardwood-conifer forest wetlands	N6230, N6229, LM6119-8	6 acres
2-3	<b>Mixed Hardwood-Conifer Stand:</b> non-plantation stand (variable)	UM4119-8	3 acres
2-4	<b>Grassy Area:</b> non-forested grassy area, pipeline easement	G310-0	3 acres

GENERAL IMAGES - WASHINGTON ROAD (Images taken in January 2019)



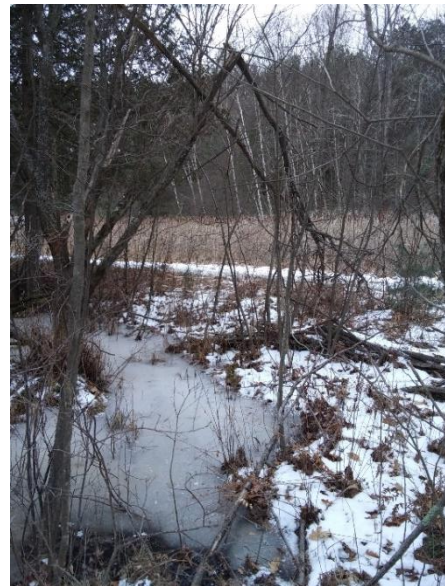
Red pine plantation trees



White pine plantation tree



Gas pipeline easement area



Wetland area adjacent to pipeline easement

	
<p>Walking trail</p>	<p>Evidence of previous timber harvest</p>

Washington Stand 2-1 - Red & White Pine Plantation Stand

<b>Name:</b>	<b>Red &amp; White Pine Plantation Stand:</b> a well-stocked pole-to timber-sized stand of planted red	<b>DNR IFMAP</b>	R42110-6
<b>Land area:</b>	27 acres	<b>Current size:</b>	Sawtimber average 13" dbh
<b>Basal area:</b>	150 ft <sup>2</sup> /acre	<b>Stocking level:</b>	Well-stocked
<b>Soil types:</b>	Sand, loamy sand	<b>Site index:</b>	Medium to High
<b>Next recommended treatment:</b>	Thinning in near future		

**Cover type.** Washington Stand 2-1 is similar to Clarabella Stand 1-1, i.e. a successful planted plantation of predominantly red pine, only with larger trees. In addition, Washington features a larger white-pine component. Most areas are red pine monoculture; a few areas are either white pine monoculture or a red pine-white pine mixture. Washington 2-1 trees are also somewhat larger than the Clarabella Stand 1-1.

This type of plantation grows well on the Graycalm sand and AuGres loamy sand found on this parcel. The red pine trees have a high-quality form with minimal branching and

significant timber value. Red pine is a perennially useful and valuable timber species in Northern Michigan. The white pine trees are also in excellent condition, but this species tends to retain lower branches and presents lower timber values in the marketplace.

Because this stand Washington 2-1 has received the same timber management as Clarabella Stand 1-1, it is in a similarly healthy condition, with minimal wildfire risk, timber potential, etc.

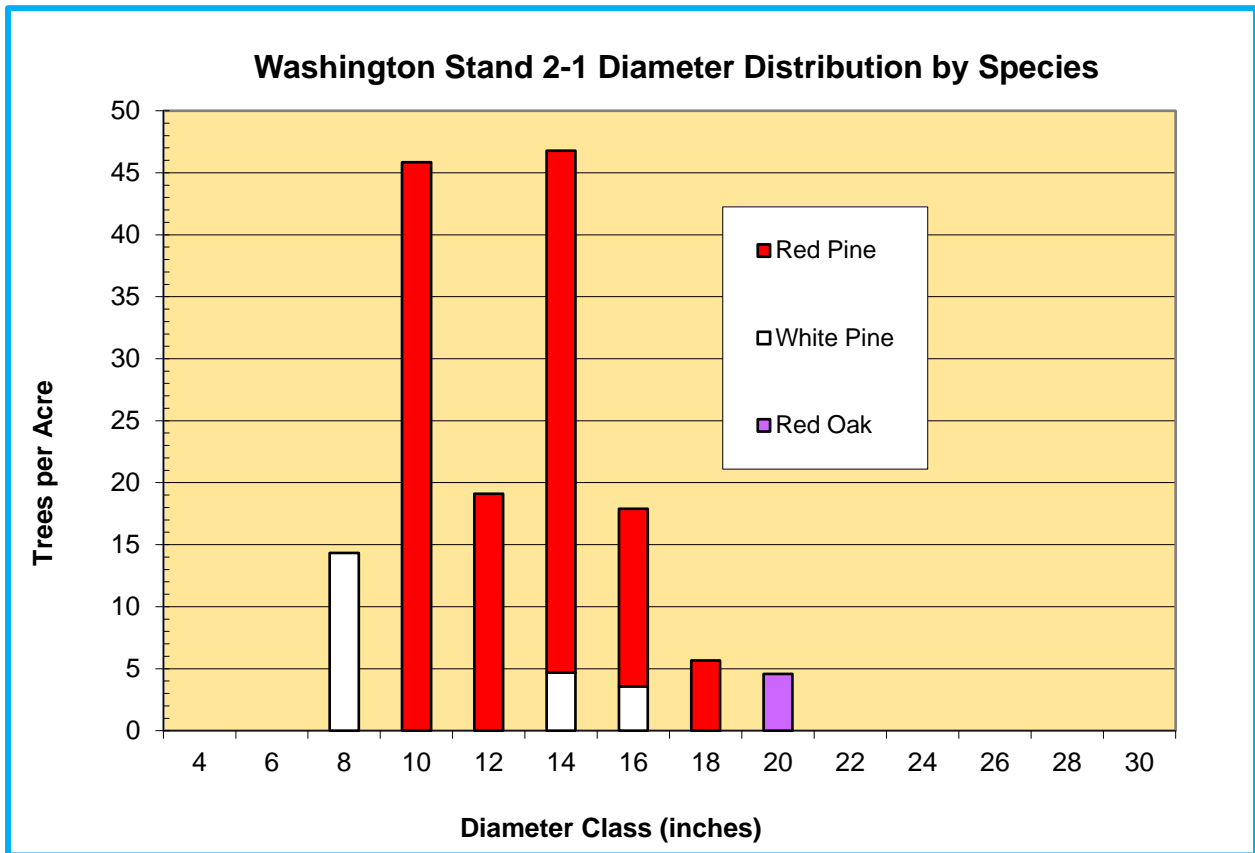
**Species composition.** Washington Stand 2-1 is the predominant forest cover type on the Washington Road property, covering around 27 acres. Most areas of this stand are dominated in most areas by sawtimber size red pine trees in the upper canopy and by sawtimber size white pine in some areas. Only a few other species are scattered in the overstory, e.g. red oak, northern pin oak, white spruce, black cherry, red maple and American beech.

Meanwhile, there is a dynamic story to tell about the mid canopy and forest floor. There is a range of density of ground-level vegetation with some areas are nearly devoid of vegetation and are a literal carpet of fallen pine needles and other areas containing high density and diversity of tree and plant species. The SW sector of the property features a unique situation in which white pine seedlings are so dense that it is difficult to walk through.

The most common saplings and poletimber trees – the next generations of trees - in the lower canopy are red oak, northern pin oak, American beech, white spruce and black cherry. There are also seedlings of red oak, white oak, red maple, white pine, American beech, balsam fir and witch hazel – but few red pines. Despite abundant red pine cones, few red pine trees are found on the forest floor because this species doesn't thrive in the shade of the forest floor and typically requires fire to become established unless human intervention (e.g. planting) is involved.

These small- to mid-size trees are the next generation of this forest. Common plants include bracken fern and clubmoss.

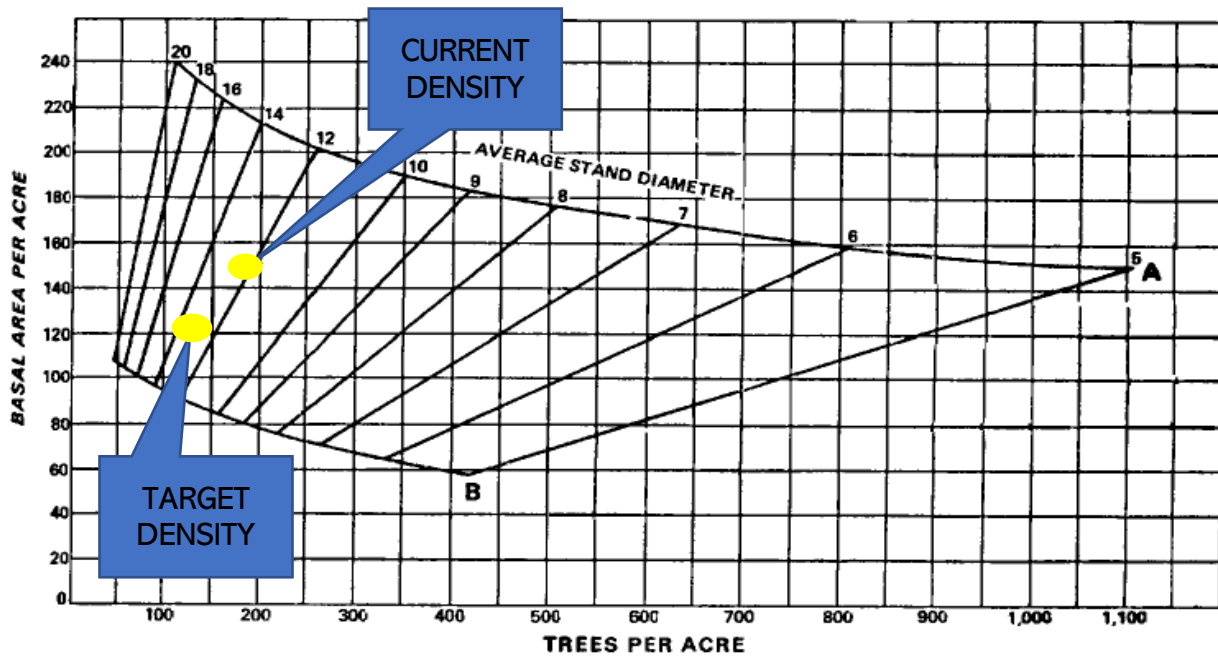
The species and size distributions in Stand 2-1 are as follows:



Only the small NW section of Washington Stand 2-1, which is almost solely sawtimber size white pine, differs from the above. This “white pine microstand” has an average dbh of around 16”.

**Stand density.** This stand is around 150 ft<sup>2</sup>/acre of basal area. This is a high density that indicates a need for thinning. The stocking chart below indicates current and desired stand density.

**FIGURE 10: Stocking chart showing current and desired stand density for Stand 2-1**



Source: Benzie, 1977

**Soil types.** These are well-drained, medium fertility sandy soils to which red pine is well adapted.

**Wood & fiber production.** The red pine contains a significant quantity of high-quality trees that have excellent timber potential due to the conducive growing conditions of this site for this species. The red pines are dominant in the upper canopy where they enjoy unfettered access to light.

In the near future this stand can be harvested – a so-called free thinning in forestry - according to the target density mentioned above, i.e. harvesting around ¼ of the trees and reducing basal area from the current 150 ft<sup>2</sup> to 120 ft<sup>2</sup>. This level of harvest will ensure integrity of the remaining trees that will not be at high risk of windthrow or becoming floppy from wet heavy snow or ice. This thinning will realize near-term timber income and promote future income potential via the removal of low-vigor and low-value trees and enhancing access to resources (growing space, light, etc.) for the remaining trees.

Thereafter, future thinnings around 25% every 8-12 years should be performed to maintain stand health and vigor and continue to realize sustainable profit from timber sales.

**Forest health issues.** No major issues affecting forest health were encountered in this stand. As with Clarabella Stand 1-1, this stand should be monitored for forest health issues that are common to red AND white pine plantations, e.g. heterobasidion root disease.

**Threatened & Endangered Species.** None according to the Michigan Natural Features Inventory.

**Wildlife.** As a predominantly plantation stand, wildlife conditions in Washington Stand 2-1 are similar to those found in Clarabella Stand 1-1. Gradually, wildlife habitat will improve as the mature red pine trees are harvested.

In addition, Washington Stand 2-1 has two interesting nearby elements, i.e. the abundant water resources in the nearby wetland areas and the pipeline easement. Both of these elements increase wildlife habitat values across the entire parcel by offering wildlife additional resources (water and cover types), that combine to create a rich mosaic of structural landscape elements benefiting deer, small mammals and bird species. Diverse habitat types attract birds with diverse habitat requirements.


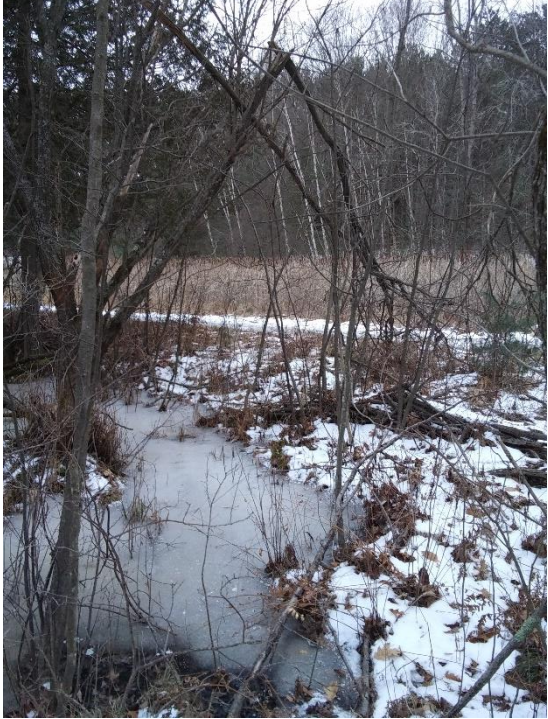
Selected white pines should be maintained because they are especially beneficial for raptor. These trees grow tall and form an upper “supercanopy” for nesting and hunting.

A harvest strategy focusing on wildlife benefits should be the same as Clarabella Stand 1-1.

Deer were encountered by the Forester during field work.

**Desired Future Conditions.** As with the other pine plantation, this stand should be allowed to develop into a rich, diverse forest cover, consisting of the seedlings and saplings below the upper canopy, that is appropriate to the local conditions.

Washington Stand 2-2 –Wetland Areas

WETLAND AREAS - WASHINGTON ROAD STAND 2-2 (Images taken in January 2019)	
	
Lowland forest	Lowland forest (foreground) and emergent cattail wetland (rear)

<b>Name:</b>	<b>Wetland Areas:</b> emergent wetland, lowland shrub & lowland mixed hardwood-conifer forest	<b>DNR IFMAP</b>	N6230, N6229, LM6119-8
<b>Land area:</b>	6 acres	<b>Current size:</b>	n/a
<b>Basal area:</b>	n/a	<b>Stocking level:</b>	n/a
<b>Soil types:</b>	Mucks	<b>Site index:</b>	n/a
<b>Next recommended treatment:</b>	No action, maintain in current state.		

**Cover type.** The wetland classification on the Washington Road parcel includes three types: emergent wetland, lowland shrub & lowland forest

The emergent wetland and lowland shrub areas are generally in the central regions straddling the gas pipeline.



This lowland forest – found primarily in the NE corner of the parcel - is classified as a Northern Hardwood-Conifer Swamp (Dickmann, 2004). This stand contains a great deal of variability and diversity of both topography and tree species. Topography is typified by mounds, where the trees are, and depressions, where the water is.

**Species composition.** The lowland forest consists primarily of sawtimber and poletimber size red maple, white pine, spruce, balsam fir, white birch, swamp white oak, hemlock and aspen.

**Stand density.** Basal area is not relevant in this management unit due to marginal timber values and access issues.

**Soil types.** These are poorly drained wet soils, e.g. mucks.

**Wood & fiber production.** It is recommended that this area remain protected areas and maintained for wildlife values.

During timber harvests, the best management practices should be implemented as outlined above in “Resources Common to the Entire Property” and in the MDEQ best practices manual for forestry to reduce erosion and not change the character of wetlands as outlined in statutory protections.

A buffer of at least 100 feet of forest cover should be left along the edge of the wetland in which no forest roads, trails or other harvest-related clearings should be located. However, selective harvesting of trees is permitted in this buffer area (Michigan Department of Environmental Quality, 2018).



**Forest health issues.** If any black ash is present, a very typical lowland forest tree, it is probable that all mature trees have been extirpated by the emerald ash borer pest. No other notable problems issues were found.

**Threatened & Endangered Species.** None.

**Wildlife.** Wetlands are some of the most productive ecosystems on earth. These aquatic habitats are an integral part of the diversity of habitats across the landscape. They are critical habitat - breeding, nesting, and feeding grounds - for waterfowl and other birds and are home to other unique animal and plant species.

**Desired Future Conditions.** Maintain current integrity of wetland area, as well as the 100-foot minimum buffer area along the wetland edge.

Washington Stand 2-3 – Mixed Hardwood-Conifer Stand

WASHINGTON ROAD STAND 2--3 (Images taken in January 2019)	
	
Typical scene in Stand 2-3	Walking trail in Stand 2-3

<b>Name:</b>	<b>Mixed Harwood Stand:</b> non-plantation mixed hardwood stand (variable)	<b>DNR IFMAP</b>	UM4119-8
<b>Land area:</b>	3 acres	<b>Current size:</b>	Poletimber average 10" dbh
<b>Basal area:</b>	60-90 ft <sup>2</sup> /acre	<b>Stocking level:</b>	Moderately well-stocked
<b>Soil types:</b>	Muck to sand transition area	<b>Site index:</b>	Medium
<b>Next recommended treatment:</b>	Thinning concurrent with harvest of plantation trees to improve stand quality		

**Cover type:** Washington Stand 2-3 is labeled here with a general name “Mixed Hardwood-Conifer Stand” as a ‘catch all’ for the areas found outside of the Stand 2-1 red & white

pine plantation areas. This stand consists of the buffer area around the main central wetland as well as and dispersed patches of mixed-species forest and transition zones between stands.

The general forest type is described more formally as a “Northern Dry-Mesic Oak Forest”, a common forest cover in Northern Michigan on acidic, moderately fertile, well-drained sands and loamy sands (Dickmann, 2004).

More areas would resemble this stand if it had not been planted as a pine plantation.

**Species composition.** This mixed-hardwood-conifer stand features some variability, but in most areas is dominated by red oak, northern pin oak, white pine and hemlock with a complement of other species such as red maple, white spruce and aspen.

The most common herbaceous species are club moss and bracken fern. In general, these areas contain a more diverse mix of tree and herbaceous species than the pine plantation areas.

A graph of diameter distributions is not included due to the variability of tree species and small area of this stand.

**Stand density.** This stand is too variable for a definitive stand density value but probably ranges from 60-90 ft<sup>2</sup> per acre, meaning it is moderately stocked.

**Soil types.** This stand is generally in the muck-to-sand (and lowland to upland) transition zone near the wetland, which helps to explain the species variability.

**Wood & fiber production.** Because Washington Stand 2-3 is generally close to the wetland, it should be treated as a buffer and only selectively harvested. Nevertheless, one should follow a strategy of timber stand improvement, i.e. less-desirable trees are selected for harvest, including low-vigor, low-quality, and injured or unhealthy trees. This removal promotes the growth of more desirable trees, or so-called “crop trees” within or below the upper canopy that will be relatively well formed, vigorous, and healthy and can provide premium timber income over the long term. Snags, downed trees and tree tops leftover from timber harvests are especially beneficial in this area both for erosion control and for wildlife as cover, as this is the transition zone between the upland forest and water source.

During timber harvests, trees that present a potential hazard to visitors can be removed or modified to reduce said risk. This is especially pertinent since an attractive walking trail runs through this stand.

**Forest health issues.** No significant issues affecting forest health were encountered in this stand.

Nevertheless, at the time of each harvest, the Forester should monitor for forest health issues that are common to stands with numerous oaks. The most significant of these is oak wilt, which is elaborated in the section “Resources Common to the Entire Property”. If oak

wilt is found, it can be addressed to preserve the value of the oak timber found on the property.

**Threatened & Endangered Species.** None according to the Michigan Natural Features Inventory.

**Wildlife.** As mentioned, this area is the transition zone between the upland forest and water source, making it an important area for wildlife habitat.

**Desired Future Conditions.** Washington Stand 2-3 can continue to provide excellent recreational and wildlife habitat values while providing an incidental supply of timber, mostly oak. Timber harvests can be utilized to improve wildlife benefits, i.e. adding new structure to benefit wildlife. This stand comprises an important component in the goal of creating a more diverse mosaic of tree species and age classes across the landscape.

#### Washington Stand 2-4 – Grassy Area

**Cover type.** The 3-acre pipeline easement must be maintained as non-forest cover to facilitate its maintenance. The central area features emergent cattail wetland, which is bisected by the service road.

**Recreation.** This area is useful for recreation because visitors can use the service road as a trail, allowing them to observe and gain access to the forested areas on both sides.

**Wildlife.** This easement is useful for wildlife by adding a cover type to the landscape for species requiring grassy conditions.

School Forest Park – Resource Detail

FIGURE 11: “School Forest Park” adjacent to Farwell Area Schools Complex - 12 acres



**GENERAL - SCHOOL FOREST PARK STAND 3-1 (Images taken in December 2019)**



Walking trail in Stand 3-1



High-quality red and white pine trees in Stand 3-1



White pine plantation trees in Stand 3-1



Jack pine in Stand 3-1

School Forest Park Stand 3-1 - Red & White Pine Plantation Stand

<b>Name:</b>	<b>Red &amp; White Pine Plantation Stand:</b> a well-stocked pole-to timber-sized stand of planted red and white pine	<b>DNR IFMAP</b>	R42110-6
<b>Land area:</b>	12 acres	<b>Current size:</b>	Sawtimber average 13" dbh
<b>Basal area:</b>	150 ft <sup>2</sup> /acre	<b>Stocking level:</b>	Well-stocked
<b>Soil types:</b>	Loamy sand	<b>Site index:</b>	Medium to High
<b>Next recommended treatment:</b>	Thinning in near future		

**History.** The J.L. Littlefield biography includes the following passage about reforestation that was performed beginning in 1929:

*The entire school and some members of the Women's Club turned out and helped to plant 17,000 pine and Norway spruce seedlings. On account of a very dry season, many of the plants did not survive, so the area with the Norway spruce is considerably curtailed. But in 7-10 years from the time of planting, we expect there will be a nice lot of Christmas trees to sell.*

**Cover type.** School Forest Park Stand 3-1 is most similar to Washington Stand 3-1, i.e. a successful planted plantation of predominantly red pine, with a significant white-pine component. The white pines were planted first, as indicated above, and red pine later.

This type of plantation grows well on the Montcalm loamy sand found on this parcel. The red pine trees have a high-quality form with minimal branching and significant timber value. Red pine is a perennially useful and valuable timber species in Northern Michigan. The white pine trees are also in excellent condition, but this species tends to retain lower branches and presents lower timber values in the marketplace.

This stand is in healthy condition, with minimal wildfire risk and significant timber potential.

**Species composition.** Red and white pine plantation trees are the predominant forest cover on the School Forest Park property, covering around 12 acres. On the western edge of the property, there is a small stand of mixed conifers that also has several jack pine trees.

Incidental species of other trees are scattered in the overstory, e.g. red oak and aspen.

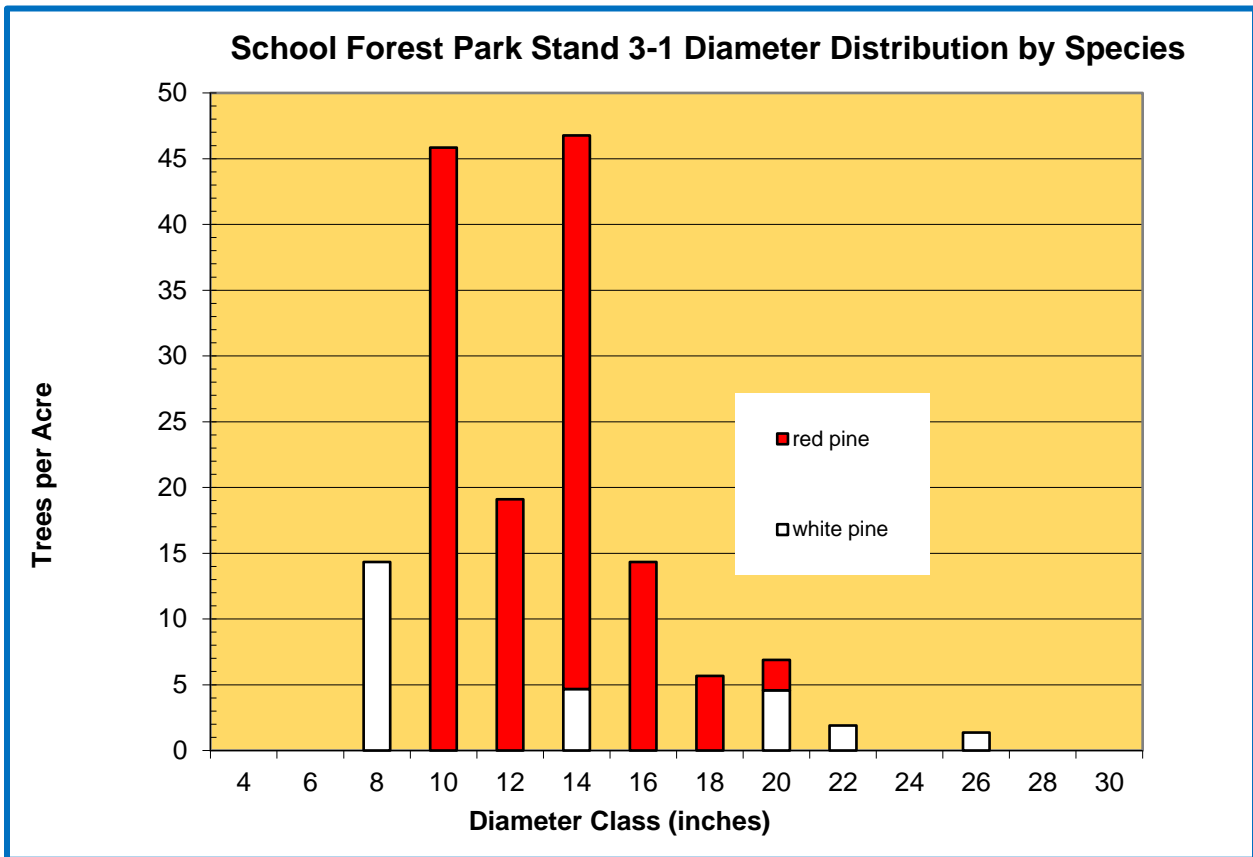
Meanwhile, in the mid canopy and forest floor, there is a range of density of ground-level vegetation with some areas are nearly devoid of vegetation and are a literal carpet of

fallen pine needles and other areas containing high density and diversity of tree and plant species.

The most common saplings and poletimber trees – the next generations of trees - in the lower canopy are red oak, white pine and black cherry. There are also seedlings of white oak, white pine and American beech – but few red pines. Despite abundant red pine cones, few red pine trees are found on the forest floor because this species doesn't thrive in the shade of the forest floor and typically requires fire to become established unless human intervention (e.g. planting) is involved.

These small- to mid-size trees are the next generation of this forest. Common plants include bracken fern.

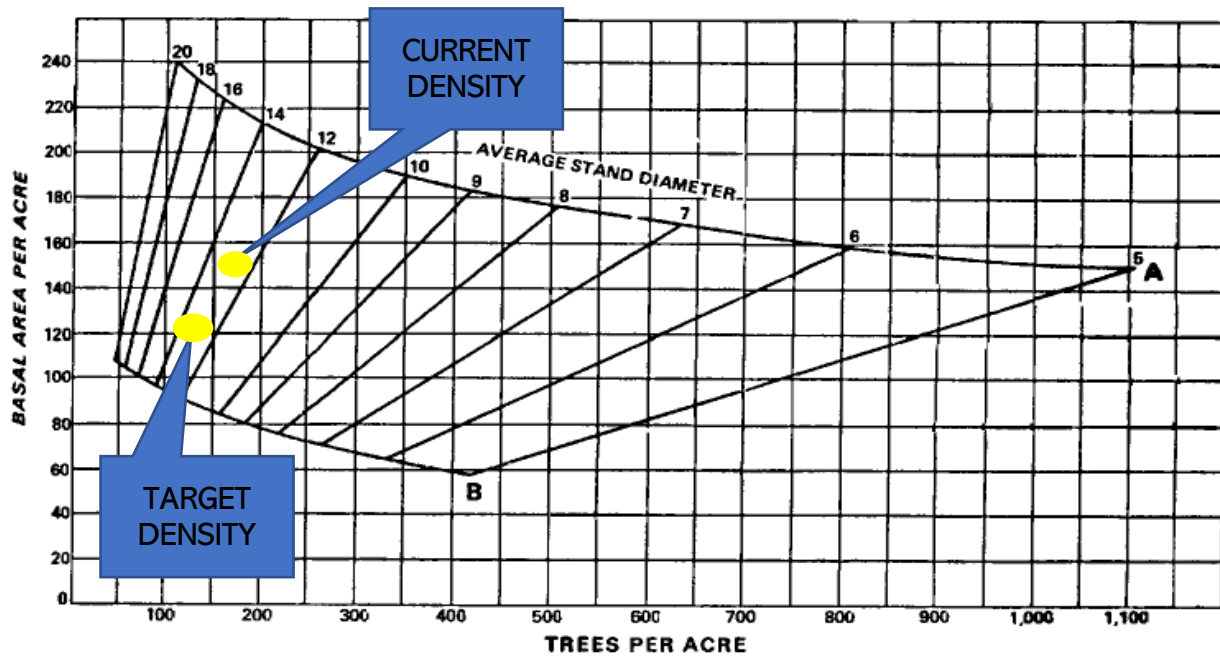
The species and size distributions in Stand 3-1 are as follows:



**Stand density.** This stand is around 150 ft<sup>2</sup>/acre of basal area. This is a high density that indicates a need for thinning. The stocking chart below indicates current and desired stand density.



**FIGURE 12: Stocking chart showing current and desired stand density for Stand 3-1**



Source: Benzie, 1977

**Soil types.** These are well-drained, medium fertility sandy loam soils to which red pine and white pine are well adapted.

**Wood & fiber production.** The red pine contains a significant quantity of high-quality trees that have excellent timber potential due to the conducive growing conditions of this site for this species.

The white pine is of more varied quality, and in some areas, crowding is occurring. This area is in more immediate need of thinning to reduce this crowding.

In the near future this stand can be harvested – a so-called free thinning in forestry - according to the target density mentioned above, i.e. harvesting around  $\frac{1}{4}$  of the trees and reducing basal area from the current 150 ft<sup>2</sup> to 120 ft<sup>2</sup>. This level of harvest will ensure integrity of the remaining trees that will not be at high risk of windthrow or becoming floppy from wet heavy snow or ice. This thinning will realize near-term timber income and promote future income potential via the removal of low-vigor and low-value trees and enhancing access to resources (growing space, light, etc.) for the remaining trees.

Thereafter, future thinnings around 25% every 8-12 years should be performed to maintain stand health and vigor and continue to realize sustainable profit from timber sales.

Timber harvests are excellent times to remove or prune trees that create safety hazards for visitors.

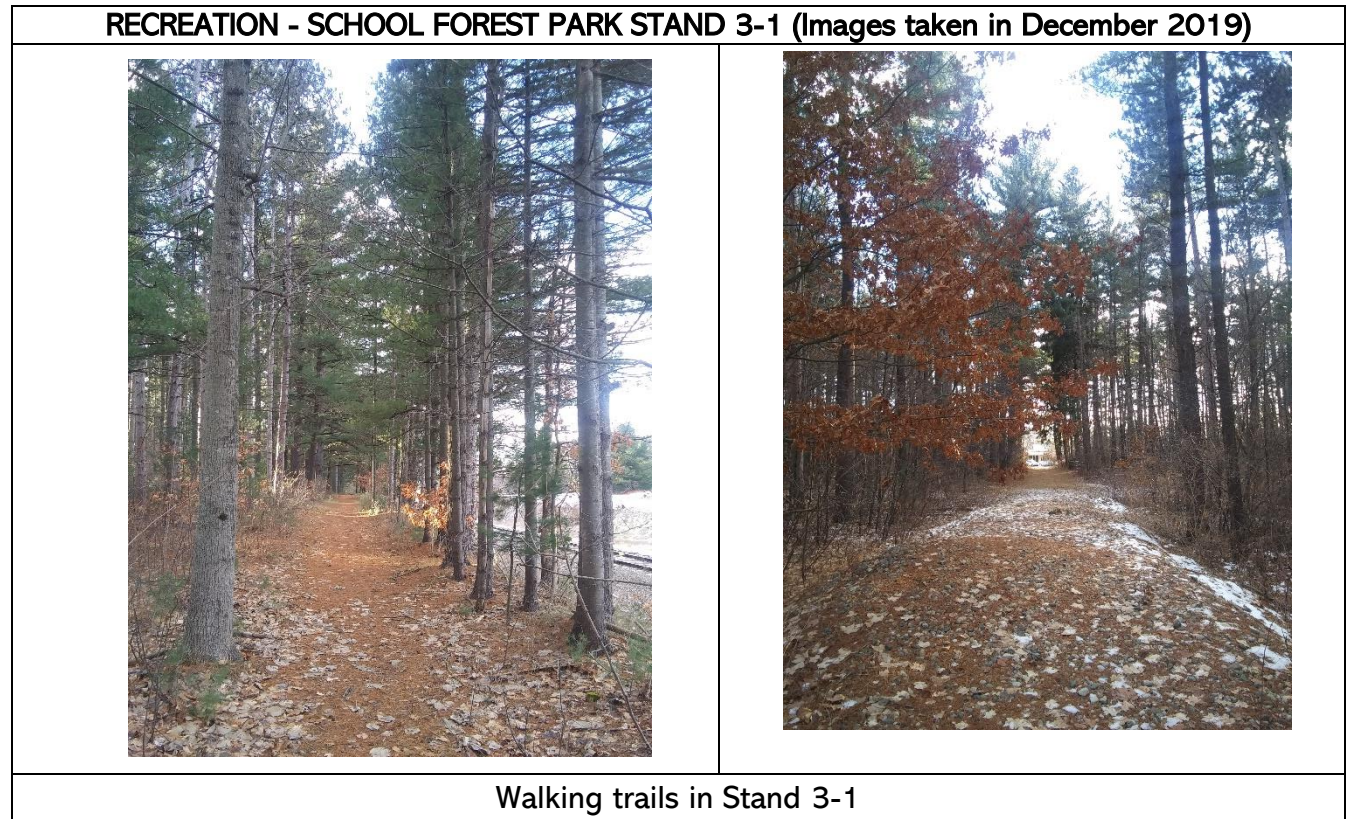
**Forest health issues.** No major issues affecting forest health were encountered in this stand, which should be monitored for forest health issues that are common to red and white pine plantations, e.g. hetreobasidion root disease.

**Threatened & Endangered Species.** None according to the Michigan Natural Features Inventory.

**Wildlife.** Being an urban forest, this stand is most useful as a bird sanctuary. A timber harvest will promote new growth on the forest floor, which will offer more habitat niches for different bird species, some of which seek mature, closed-canopy forests and others that seek ground cover, shrubs, etc.

Birdwatching and collecting data on bird species and pollinators would be an excellent uses of this forest.

**Recreation.**



School Forest Park has an excellent network of walking trails that traverse the property. The Farwell Cross Country Team was observed utilizing these trails during data collection. These same trails can facilitate timber harvest operations.

An annual safety audit should be performed at all sites, but especially this site due to its proximity to the school and wide public use. Hazardous trees can be pruned or removed at the time of harvest but this also should be performed at least annually by an arborist.

**Desired Future Conditions.** As with the other pine plantations, this stand should be allowed to develop into a rich, diverse forest cover, consisting of the seedlings and saplings below the upper canopy, that is appropriate to the local conditions.

It can also serve as an excellent urban bird sanctuary and forest learning laboratory with easy access from the schools across the street.

## *Recommendations*

Forest management activities are meant to accomplish the landowner's goals for the property, enabling desired future conditions and maintaining healthy conditions across the landscape.

### General Activities for the Entire Property

#### **Activity G-1: Join the American Tree Farm System and the Michigan Forest Association.**

Joining of the American Tree Farm System (ATFS - [www.TreeFarmSystem.org](http://www.TreeFarmSystem.org)) is part of this project. ATFS is a 'stamp of approval' that the Farwell Area Schools forest is sustainably managed. This Forest Stewardship Plan is a requirement of and complies with the ATFS 2015-2020 Standards of Sustainability, so joining the program at no cost is guaranteed.

An additional benefit of ATFS is that harvested timber is certified under the Sustainable Forestry Initiative (SFI), a nationwide and internationally recognized forest certification program. SFI-certified timber may fetch a higher price or be in higher demand than non-certified timber. This certification documents the public goods that "Tree Farmers" provide to society, including wood, water, recreation and wildlife. Free inspections are provided by a certified Tree Farm Inspector, and there is no additional cost after developing this Forest Stewardship Plan. Finally, ATFS offers a range of outreach materials

This plan also includes membership in the Michigan Forest Association (MFA), an organization of private forest owners in Michigan and the DNR will cover the first year's dues of \$40 ([www.MichiganForests.org](http://www.MichiganForests.org)). MFA provides landowners with useful information on forest management – such as magazines and newsletters - and opportunities for networking with other active and involved forest landowners, such as conferences, workshops and field days.

**Activity G-2: Establish Forest Oversight Committee.** A forest oversight committee is ideal for overseeing the management and utilization of Farwell Area Schools' unique forest resources. Ideally the committee will include administrators, teachers, support staff, students and the general public. This committee will submit proposals to the superintendent and school board regarding management of the forests, such as policies, timber sales, budget, etc. An added benefit of the committee is a 'push' to better utilize these currently underutilized resources.

**Activity G-3: Review and renew forest policies and budget, perform liability and safety review.** The Forest Oversight Committee should quickly review and revise policies such as public access, permitted activities, signage, liability coverage in insurance policy, activity schedule and other administrative requirements to manage the forests effectively. It should also establish a budget and hire an arborist to review and remove any safety hazards in the forests. This should be an ongoing process.

**Activity G-4: Establish forest education committee.** This committee, comprised of teachers and administrators of all levels, will be responsible for coordinating curriculum and activities in the forests.

**Activity G-5: Develop curriculum and activities related to forests.** Potential areas to explore include:

- Resources found in the [Michigan School Forest Guide](#) (MDNR, 2019)
- [Project Learning Tree](#) (Project Learning Tree, 2019)
- Natural science: learning about ecology, local tree and plant species, etc.
- Mathematics: collecting and analyzing data from the forest, economics
- Literacy: writing about trees and forests
- Social studies: the social & economic importance of forests for Farwell & the State of Michigan
- History: studying the history of J.L. Littlefield, donor of the School Forest Park, whose papers are available at the University of Michigan Bentley Historical Library.
- Citizen science: participating in initiatives to monitor plant and trees species through data collection
- Careers related to forestry, forest economics and wood products

In addition, the Forester is available to adapt the process of developing this management plan into hands-on, practical learning activities in science, math, social studies, literacy, citizen science and career exploration

**Activity G-6: Perform annual assessment of forest health and public safety issues.** Hire arborist to review and remove any safety hazards in the forests.

In non-harvest years, have forester perform monitoring review (between May-October) to look for new forest health threats and address them in concert with Forest Oversight Committee. The Natural Resources Conservation Service (NRCS) offers financial support to address forest health issues.

Integrated Pest Management (IPM) practices should be implemented to protect soil and water resources. IPM requires the correct identification of a pest, setting an economic or action threshold, and then implementing the most effective and appropriate method to control the pest. IPM actions may include cultural, mechanical, biological, and chemical controls. Chemical pesticides are a useful tool but should not be the first or only choice for controlling a pest. For example, the most effective way to prevent oak wilt involves the practice of not wounding oaks between April 15 and July 15. Once oak wilt is established,

the primary practice is mechanical control to cut oak roots in an effort to prevent the spread of the fungus through root grafts.

## Harvest-related Activities

Within the 20-year scope of this plan (2019-2039), the following timber harvests and improvement measures are recommended.

**H-1: Intermediate thinning of all parcels & concurrent trail improvement at Washington Road forest (2020-2022).** All three properties are ready for a thinning since the last thinning was performed around 2010. A similar harvest income can be expected.

Superintendent Scoville expressed interest in improving the trail system for a cross country ski race. This would be ideal for the Washington Road forest due to the existence of an excellent trail system and the clearing in the easement. In addition, the old railroad grade is distinguishable and could be cleared for an additional trail segment. The creation of new trails can be part of the timber harvest contract and operation.

Strategic considerations related to timber and wildlife considerations for each stand are elaborated in the Resource Detail section for each stand.

**H-2: Intermediate thinning at all three parcels (2031-2033).** All three properties are ready for a thinning around 2031-2033 and every 8-12 years thereafter.

## Timber Harvest Planning

It should be noted that sustainable timber production is very compatible with many other forest management goals, and it is possible to conduct a conservative timber harvest every ten to fifteen years while maintaining important priorities such as forest health, recreation, aesthetics, wildlife habitat and recreation. Income from timber harvests can help to finance other management activities, pay for taxes and provide income family needs, as well.

**Timber Harvest Objectives.** The main objective for any timber sale is to improve the state of the forest, always keeping in mind the values of the landowner and the characteristics of the forest. A timber sale should improve the species composition and growing conditions of remaining trees for future timber sales. A timber sale is also useful for dealing with diseased or at-risk trees and dealing with trees in or near decline stage. A forester's primary concern is keeping strong genetic diversity in the forest, e.g. to provide healthy seed crops, not stripping it of its best trees. A timber sale can be used to improve wildlife habitat, develop trails for recreation, improve forest health and regenerate new trees of varying age classes. Finally, a timber sale should also seek to optimize (but not necessarily maximize in the short term) the profits for the landowner in keeping with the above objectives.

**Timber Harvest Method.** The harvest method depends on the species. While sugar maple dominated stands call for selective harvests, one should harvest larger areas via "group

selection” or “shelterwood” to promote oak regeneration. Aspen regeneration calls for a clearcut regime.

**Timber Sale Process.** Farwell Area Schools can hire a consulting forester to assist with a timber sale or they can manage your own sale. Either way, there are five basic steps in a timber sale. The timber sale process can take six to eighteen months, so start planning at least a year before the desired time.

Step One. A forest inventory measures the attributes of the forest to determine how to proceed with the sale. This Forest Stewardship Plan does not include this inventory.

Step Two. The inventory is used to decide what trees to sell and what trees to keep. Determine the trees to sell, paint those trees at stump and breast height, measure volume, and estimate market value. Based on a licensed boundary survey, identify the property corners and property lines so that all trees that are included in the sale are within the property boundary.

Step Three. Farwell Area Schools or their forester should advertise the timber sale. The true market value of the trees marked for sale is determined by getting multiple bids. The prospectus should be sent to several reputable timber buyers to invite them to inspect the trees marked for harvest and bid on the sale.

Step Four. The fourth step is to negotiate a timber sale contract between the landowner and the timber buyer. Select the best buyer based on price and other factors (reputation, timing, equipment, references, etc.). Negotiate a comprehensive contract, collect a performance bond, verify insurance, and collect full payment prior to harvest (for a lump sum stumpage sale). A ‘scale’ sale is when the landowner is paid after harvested trees are taken to the mill and weighed. While a lump sum is more secure, and the latter has the potential to be more profitable, though more risk is involved.

Step Five. Supervise the harvest to ensure the contract is followed. Determine the location of skid trails and log landing for harvest equipment (place them where you would like to improve recreational trails for later use). Visit the site during timber harvest to verify performance. Also visit the site after the harvest to determine the refund of the performance bond.

**Timber Sale Timing.** Ideally mark the trees for sale several months in advance. The harvest should be conducted in a season when the soil is frozen or dry. A fall or winter harvest will reduce the exposure of wounded trees to insects or disease (oak wilt). Avoid a spring harvest to minimize rutting which damages both the soil and the roots of the residual trees.

**Forest Certification.** If Farwell Area Schools intends to join the American Tree Farm System, they should keep in mind the applicable Standards of Sustainability for certified properties. The standards most applicable to timber harvest are as follows:

Standard Three - Reforestation and Afforestation: Reforestation or afforestation shall be achieved by a suitable process that ensures adequate stocking levels. Except where oak regeneration is desired, natural seeding from the existing seed bank and residual trees in the stand should produce adequate regeneration. Planting seedlings to regenerate this stand is not likely to be biologically necessary or economical.

Standard Four - Air, Water, and Soil Protection: Forest management practices maintain or enhance the environment and ecosystems, including air, water, soil and site quality. To comply with this standard, logging operations should be conducted when the soil is either dry or frozen. Harvest operations should be suspended if soils are too wet and susceptible to damage. All applicable Best Management Practices should be followed (“Sustainable Soil and Water Quality Practices on Forest Land” at [www.Michigan.gov/PrivateForestLand](http://www.Michigan.gov/PrivateForestLand)).

Standard Six - Forest Aesthetics: Forest management activities recognize the value of forest aesthetics. A single tree or group selection harvest in this stand will have minimal impacts on aesthetics. Conducting the sale in the right season and harvesting a conservative number of trees (four to eight trees per acre) will maintain good aesthetics.

Standard Eight - Forest Product Harvests: Forest product harvests and other management activities are conducted in accordance with the landowner’s objectives and consider other forest values. This standard requires using qualified natural resource professionals, a contract, and complying with this plan when conducting a timber harvest.

## Summary Table

The recommended activities are summarized below in Table 1. The timing of timber sales should be based primarily upon biological considerations like stand age, density, and forest health issues, but timing can be modified by several years according to other factors including landowner preferences, timber prices, income needs, tax payments, etc.

## Summary of Recommended Management Activities, 2019-2038

Activity	Extent	Activity Description	Dates	
			Planned	Complete
G-1	all properties	Join American Tree Farm System & Michigan Forest Association	January 2019	In process
G-2	all properties	Establish Forest Oversight Committee	2019	
G-3	all properties	Forest Oversight Committee reviews and renews forest policies & budget, performs liability and safety review	2019	
G-4	all properties	Establish forest education committee	2019	
G-5	all properties	Develop curriculum and activities related to forests	2019 and ongoing	
G-6	whole property	Perform annual assessment of forest health and public safety issues	Annually	
G-7	all properties	Perform annual safety improvements with arborist and forest health improvements with forester (if needed)	Annually	
<b>HARVEST ACTIVITIES</b>				
H-1	all properties	INTERMEDIATE THINNING & Concurrent trail improvement at Washington Road	2020-2022	
H-2	all properties	INTERMEDIATE THINNING	2031-2033	
H-3	all properties	INTERMEDIATE THINNING	Every 8-12 years thereafter	



## *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 least annually to inspect the forest for changes and to evaluate the success of earlier management activities. Monitoring for forest health issues should occur more frequently, at least two or three times a year to look for signs and symptoms of insects or disease during different seasons. All Forest Stewardship Plans should also be adaptable and flexible enough to accommodate changes in landowner goals or forest resources over the twenty- year planning period. 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.

## Appendix – General Forestry Information and Related Programs

### Scientific Names for Tree Species

Here are the scientific and common names of the common trees found on the properties. This list is extensive but not all-inclusive.

DECIDUOUS TREES	
COMMON NAME	SCIENTIFIC NAME
northern red oak	<i>Quercus rubra</i>
northern pin oak (this species differs from the pin oak found in Southern Michigan, <i>Quercus palustris</i> )	<i>Quercus ellipsoidalis</i>
white oak	<i>Quercus alba</i>
American beech	<i>Fagus grandifolia</i>
red maple	<i>Acer rubrum</i>
white ash	<i>Fraxinus americana</i>
largetooth aspen	<i>Populus grandidentata</i>
quaking aspen	<i>Populus tremuloides</i>
black cherry	<i>Prunus serotina</i>
white birch	<i>Betula papyifera</i>
CONIFEROUS/EVERGREEN TREES	
red pine	<i>Pinus resinosa</i>
white pine	<i>Pinus strobus</i>
white cedar	<i>Thuja occidentalis</i>
balsam fir	<i>Abies balsamifera</i>
hemlock	<i>Tsuga canadensis</i>
jack pine	<i>Pinus banksiana</i>
white spruce	<i>Picea glauca</i>

### 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 – A log 8-feet in length

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.

## 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 "Sustainable Soil and Water Quality Practices on Forest Land" and the document is online at [www.Michigan.gov/PrivateForestLand](http://www.Michigan.gov/PrivateForestLand). 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 BMPs.

## Forest Health Information

Emerald Ash Borer. The emerald ash borer (EAB) is an exotic invasive beetle from Asia that infests both healthy and dying ash trees, ultimately killing them. North American ash trees (*Fraxinus* spp.) have no immunity to the pest. In the unlikely event that any living ash trees are found, those that are  $\geq 16$ " DBH should be included in the next timber sale. One positive observation of the EAB is that it only damages the exterior portion of the tree, which enables the wood to be utilized for timber. Smaller diameter ash trees can be harvested for firewood, milled for mulch, etc. This entire Lower Peninsula is within the Level One Quarantine Area, meaning that logs or firewood cannot legally leave the quarantined area. One management alternative is to leave trees standing to provide valuable tall snags for wildlife (nesting sites for birds, sheltered cavities for mammals and structure for a plethora of other organisms), although ash crowns quickly become brittle and fall apart, creating a safety hazard. See [www.EmeraldAshBorer.info](http://www.EmeraldAshBorer.info) and *My Ash Tree is Dead...Now What do I do?* (Michigan State University Extension, 2007) for more information about EAB.

Beech Bark Disease. Beech bark disease (BBD) is initiated by a scale insect that attaches to the tree, pierces the beech tree's thin bark and feeds on its sap. The tiny scale (~1 mm) secretes a white, wooly, waxy covering that makes the trunk appear like it is covered with a white powder. The feeding damage from the insect allows a fungus to infect the tree, which inhibits the flow of sap which causes a general decline in tree health and eventually kills the tree. Controlling the natural spread of BBD is not feasible because both the scale and fungus are transported by the wind. Since the scale appears to not yet be present, a reduction in the amount of beech should be a part of the harvest plan. If beech scale is already present, harvest the infected trees. Infested firewood should not be transported, as this will spread the scale and fungus that causes beech bark disease. For more information, visit the aforementioned DNR, MDARD or MSU Extension resources, all of which contain excellent information about BBD.

Oak Wilt. Oak wilt is caused by a fungus that is transported by sap-feeding nititolid beetles and root grafts. The fungus enters the tree through a wound and proceeds to block the water-transporting xylem cells, effectively hindering a tree from transporting water. Signs of oak wilt include leaf browning and wilting beginning at the leaf margin and sudden leaf drops during summer. An oak tree can die as rapidly as within 6 weeks of infection, and 90% of mortality is caused by root grafts between trees, with an uninfected tree pulling the fungus from a neighboring tree. Red oak is the most susceptible species, followed by bur and white oaks. Preventing oak wilt is much easier than treating it after infection. The best way to prevent oak wilt is to not harvest, wound or prune any oak trees between April 15 and July 15 when the trees are actively growing and the beetles are also active. Transporting firewood can spread oak wilt. Firewood that is infected can be dried via tarping to rid it of the fungus. Timber sales should be conducted in the fall or winter. For more information, visit the aforementioned DNR, MDARD or MSU Extension resources, all of which contain excellent information about oak wilt.

### Forest Health Resources

The DNR publishes the annual *Forest Health Highlights* publication 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.

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 - [fhm.fs.fed.us](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)

Forests for Fish initiative - [www.forestsforfish.org](http://www.forestsforfish.org)

Michigan United Conservation Clubs - [mucc.org](http://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 – [vt.audubon.org/foresters-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)

## Timber Tax

Profits from timber sales are taxed as capital gains, rather than ordinary income, if you own the timber for more than twelve months. Expenses, including the cost of a management plan or a consulting forester's fees for a timber sale, can be deducted from profits. Natural Capital Forestry collaborates with Michigan's most experienced timber tax experts and can provide guidance on taxation issues. In addition, there are many great 'do-it-yourself' resources available on [www.TimberTax.org](http://www.TimberTax.org), including the most recent edition of the annual publication *Tax Tips for Forest Landowners*.

## American Tree Farm System

The Forester recommends that you maintain membership in the American Tree Farm System to certify your exemplary and sustainable forest management. This Forest Stewardship Plan complies with the Farm System's eight Standards of Sustainability listed below. See [www.TreeFarmSystem.org](http://www.TreeFarmSystem.org) for information about the Tree Farm program, forest certification, and the full Standards of Sustainability.

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.

## Qualified Forest Program

The Qualified Forest Program (Public Acts 42 and 45 of 2013, as amended) exempts forest owners from paying local millage taxes up to 18 mills in each tax jurisdiction (township). Landowners must have between 20 and 640 acres, a forest management plan, and agree to comply with their forest management plan. Landowners must report harvests to the Michigan Department of Agriculture and Rural Development after they occur. A Forest Stewardship Plan is accepted by the Qualified Forest program. See <http://www.Michigan.gov/QFP> for information and enrollment forms. The application deadline is October 1 for tax benefits in the following year.

## Commercial Forest Program

The Commercial Forest Program offers a specific property tax of \$1.25 per acre (Parts 511 & 512 of Public Act 451, 1994, as amended). Landowners must have at least 40 acres of forest, a forest management plan, conduct commercial harvests as prescribed in the plan, and allow public foot access for hunting and fishing. Landowners must notify the DNR before they harvest forest products. A Forest Stewardship Plan is accepted by the Commercial Forest program. For more information and enrollment forms, see [www.Michigan.gov/CommercialForest](http://www.Michigan.gov/CommercialForest). The application deadline in April 1 for tax benefits in the following year.

## Financial Assistance Programs

The Natural Resources Conservation Service (NRCS) administers several programs such as the Environmental Quality Incentives Program (EQIP) or Conservation Stewardship Program (CSP) that may provide financial assistance to forest owners to implement conservation practices” to address so-called resource concerns” on their land. Landowners must have an approved forest management plan prior to enrolling. Forest Stewardship Plans are accepted by the NRCS when applying for EQIP funding, although they do not require the same level of detail as NRCS conservation activity plans. Work with your NRCS District Conservationist and forester to fill out supplemental “Job Sheets.” See [www.mi.nrcs.usda.gov/technical/forestry.html](http://www.mi.nrcs.usda.gov/technical/forestry.html) for info.

Some of the recommended activities in this plan have potential for financial assistance. NRCS forestry conservation practices include forest trails and landings, stream crossings, riparian forest buffers, stream habitat improvement, forest stand improvement, tree and shrub establishment, brush management, early succession habitat, wetland wildlife habitat, and upland wildlife habitat. NRCS conservation practices address resource concerns, i.e. environmental problems, like soil erosion, soil quality, water quality degradation, plant productivity, habitat fragmentation, invasive plants, forest health, etc. Contact your local NRCS Service Center to apply for financial assistance ([www.nrcs.usda.gov/wps/portal/nrcs/main/mi/contact/local](http://www.nrcs.usda.gov/wps/portal/nrcs/main/mi/contact/local)).

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*Notes, Records, Updates or Modifications*