

# Forest Stewardship Plan



Prepared for Joe and Jane Landowner

Example Plan Prepared by Mike Smalligan  
DNR Forest Stewardship Coordinator

Plan Duration: 2014 to 2034  
[Updated October 2016]



The Forest Stewardship Program is funded by the United States Forest Service and administered by the Michigan Department of Natural Resources.

This plan also meets the requirements of the American Tree Farm System.

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

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

Landowner Contact Information		Plan Writer Contact Information		
Name: Joe and Jane Landowner		Name: Mike Smalligan		
Address: 1234 Main Street, Anywhere MI 49337		Address: 525 West Allegan Street, Lansing MI 48933		
Phone: 123-456-7890		Phone: 517-284-5884		
Email: <a href="mailto:joeandjane@gmail.com">joeandjane@gmail.com</a>		Email: <a href="mailto:smalliganm@michigan.gov">smalliganm@michigan.gov</a>		
Property Information				
Total Acres: 63	Forested Acres: 63	Acres in Plan: 63	Tax ID:	
Town:	Range:	Section:	Township:	County:
Property Legal Description (Quarter-Quarter Section, Quarter Section, Section, Town, Range, Township, County):				
How to Find Property from Nearest Town:				
Participation in Related Forestry Programs				
<input type="checkbox"/> I intend to enroll this parcel in the Qualified Forest Program (QF).		<a href="http://www.Michigan.gov/QFP">www.Michigan.gov/QFP</a>		
<input type="checkbox"/> I intend to enroll this parcel in the Commercial Forest Program (CF).		<a href="http://www.Michigan.gov/CommercialForest">www.Michigan.gov/CommercialForest</a>		
<input checked="" type="checkbox"/> I intend to enroll this parcel in the American Tree Farm System.		<a href="http://www.TreeFarmSystem.org">www.TreeFarmSystem.org</a>		
<input checked="" type="checkbox"/> I intend to apply to the NRCS for financial assistance.		<a href="http://www.nrcs.usda.gov">www.nrcs.usda.gov</a>		
Michigan's Stewardship Ethic				
Stewardship is an ethic recognizing that the land and its natural inhabitants have an inherent worth. We acknowledge that we have a responsibility to consider the current and far distant future value of the land as we manage, protect, and enjoy the forest. Stewardship guides us to conduct our activities to the utmost of our abilities and to insure the future health, productivity, diversity, and well-being of the land, its natural communities and native species. Stewardship today provides opportunities to future generations to use and enjoy the land and its resources.				
Signatures of Approval from Landowner, Plan Writer, and DNR Service Forester				
This plan describes my goals and objectives for my forest. Participation in the Forest Stewardship Program is voluntary and only indicates my intent to practice sustainable forest management. I understand that enrolling forest land into separate property tax programs like the Commercial Forest program or the Qualified Forest program requires my compliance with an approved forest management plan in exchange for the reduction in property taxes.				
Landowner:		Date:		
Plan Writer:		Date:		
DNR Service Forester:		Date:		
After review and signed approval by the Landowner, the Plan Writer submits the entire Plan to the nearest DNR Service Forester for their review. <b>Electronic submission of the Plan is encouraged by emailing a Word document or pdf file to the Service Forester.</b> The DNR Service Forester will return a hard copy or pdf of the signature page and plan to the Plan Writer after approval.				

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# Introduction

## *Forest Stewardship Program*

The purpose of the Forest Stewardship Program is to help forest landowners manage, protect, and enjoy their land. The 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 [www.Michigan.gov/ForestStewardship](http://www.Michigan.gov/ForestStewardship) for more information. Since 1990, more than 5,700 landowners from every county in Michigan have developed a Forest Stewardship Plan to help them manage, protect, and *enjoy* their own forest.

## *Landowner's Goals*

Joe and Jane Landowner have a variety of goals for their property that reflect their personal preferences, the attributes of their forest, and their desired future conditions for their land. Their primary goal is to sustainably manage their forest so they can pass it on to their children in 15 to 20 years as a healthy and productive forest. They have already placed their forest into a trust to plan for their forest succession to pass their land on to their heirs (see [www.TiesToTheLand.org](http://www.TiesToTheLand.org) for more information on succession planning). When discussing their values and intentions with their forester, Joe and Jane Landowner identified the following goals:

1. Maintain high quality aesthetics because the forest is visible to a public lake.
2. Provide recreational opportunities for walking trails, bird watching, and deer hunting.
3. Enroll in a property tax program to keep costs of ownership affordable.
4. Protect water quality of the creek and lake and improve the fish habitat in the creek.
5. Address forest health issues, especially Emerald Ash Borer and Beech Bark Disease.
6. Sustainable production of timber for occasional income from moderate harvests.

## *General Property Description*

The Landowners have owned this 63 acre forest for almost 50 years. It is a beautiful forest along a lake with a stream running through the forest. The forest has great aesthetics, recreational value, and timber resources. The Landowners do not live on the property year-round but spend most of their summer at a cottage on the south side of the forest. There are some forest health issues with Emerald Ash Borer already present and the potential for Beech Bark Disease. A small Scotch pine plantation (now considered invasive) is over-mature and already declining.

Throughout this plan I have divided the forest into three separate management units or “stands.” A stand is a forestry term for an area of land containing a similar cohort of trees according to species, age class, site conditions, or management practices. See Ownership Map on page 6.

**Stand One** is a 30 acre northern hardwoods forest dominated by beech, red oak, and white oak. It is an outstanding example of northern hardwoods with very large diameter and tall trees. It also has an unusual number of large white pine interspersed throughout the stand that are remnants from the old white pine logging era in the late 1800's.

**Stand Two** is a 28 acre lowland hardwoods forest with a creek running through the center of the stand that empties into the lake to the east. The stand also has about 1,500 feet of frontage along the lake so soil and water quality issues are very important for Stand Two. Red maple and ash dominate the stand, but the Emerald Ash Borer is starting to cause lots of ash mortality.

**Stand Three** is a 5 acre Scotch pine plantation in the southwest corner of the property on some sandy soils. It is about 50 years old and has never been thinned. The pines are in poor condition, but a nice understory of red maple and black cherry saplings are starting to replace the pines.

### *Planning Process*

Joe Landowner contacted Mr. Plan Writer in August of 2014 when interviewing several foresters about developing a forest management plan. They discussed several programs available for Michigan forest landowners including the Forest Stewardship Program, Environmental Quality Incentives Program, Commercial Forestry Program, Qualified Forestry Program, and the American Tree Farm System. Joe Landowner is interested in doing some commercial timber harvests to manage his forest for multiple objectives so he would be eligible for any of these programs (only the tax programs require harvesting according to the landowner's management plan). Joe Landowner liked Mr. Plan Writer's forest management philosophy and agreed to hire him to develop a Forest Stewardship Plan. They scheduled a time the following week to meet on the property to discuss Joe and Jane Landowner's goals and to do an assessment of the forest. They met on August 11 for a site visit to inspect the general condition of the forest and to discuss goals and possible management choices. Mr. Plan Writer collected some basic data while walking through the forest with Joe and Jane Landowner and then returned to his office to write the plan. The Forest Stewardship Plan was sent to Joe and Jane Landowner for their review a few weeks later. After their approval, the plan was sent to the DNR for their review and approval by the end of August.

### *Stand Assessment Method*

The Plan Writer collected basic stand assessment data by visual survey while walking through the forest with the Landowners on August 11. He had done some research about the property prior to the site visit to determine the potential boundaries of the forest cover types and soil types on the property. One of the actions on the site visit was to confirm the boundaries of the three stands according to their forest type. A few "point samples" were taken in each stand to get a rough idea of the forest density and the primary tree species occurring in that stand. Saplings and shrubs in the understory, wildlife habitat, and forest health issues were also noted throughout each stand. This was not a formal inventory of the forest as this more expensive data collection and analysis can wait until preparing for a timber sale or other more intensive activity.

### *Assessment for the Natural Resources Conservation Service*

"Resource concerns" present or possible on this property include water quality degradation, soil erosion, plant health, plant productivity, degraded fish habitat, degraded wildlife habitat, and invasive plants. Potential "conservation practices" for this property include stream crossings, stream habitat improvement, forest trails and landings, riparian forest buffers, forest stand improvement, tree establishment, brush management, and tree site preparation.

## Ownership Map

Figure 1. Map of the Landowner property showing forest types and water resources.



(Image Source: USDA Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov/>)

Geographic Location: Parcel is in the NE  $\frac{1}{4}$  of Sec 2, T\_N, R\_W, \_\_\_ Township, \_\_\_ County.

## Resource Descriptions

### *Resources Common to the Entire Property*

The following natural resource elements are applicable to the entire property. Additional resources will be described in more detail for each stand.

**Threatened and Endangered Species.** The Michigan Natural Features Inventory (MNFI) reports that the Lake herring or Cisco (*Coregonus artedii*) is a Threatened species (legally protected) that may be present in the adjoining lake, although it was last observed in 1984. Eutrophication of a lake (excess nutrients leading to algae blooms and decreased oxygen) is the biggest threat, and typical forest management activities should not have any impact if the fish is still present in the lake. 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 species.

**Special Sites.** There are no known special sites on the property. The State Historic Preservation Office database does not show the presence of any historical sites in this section of the Township ([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)).

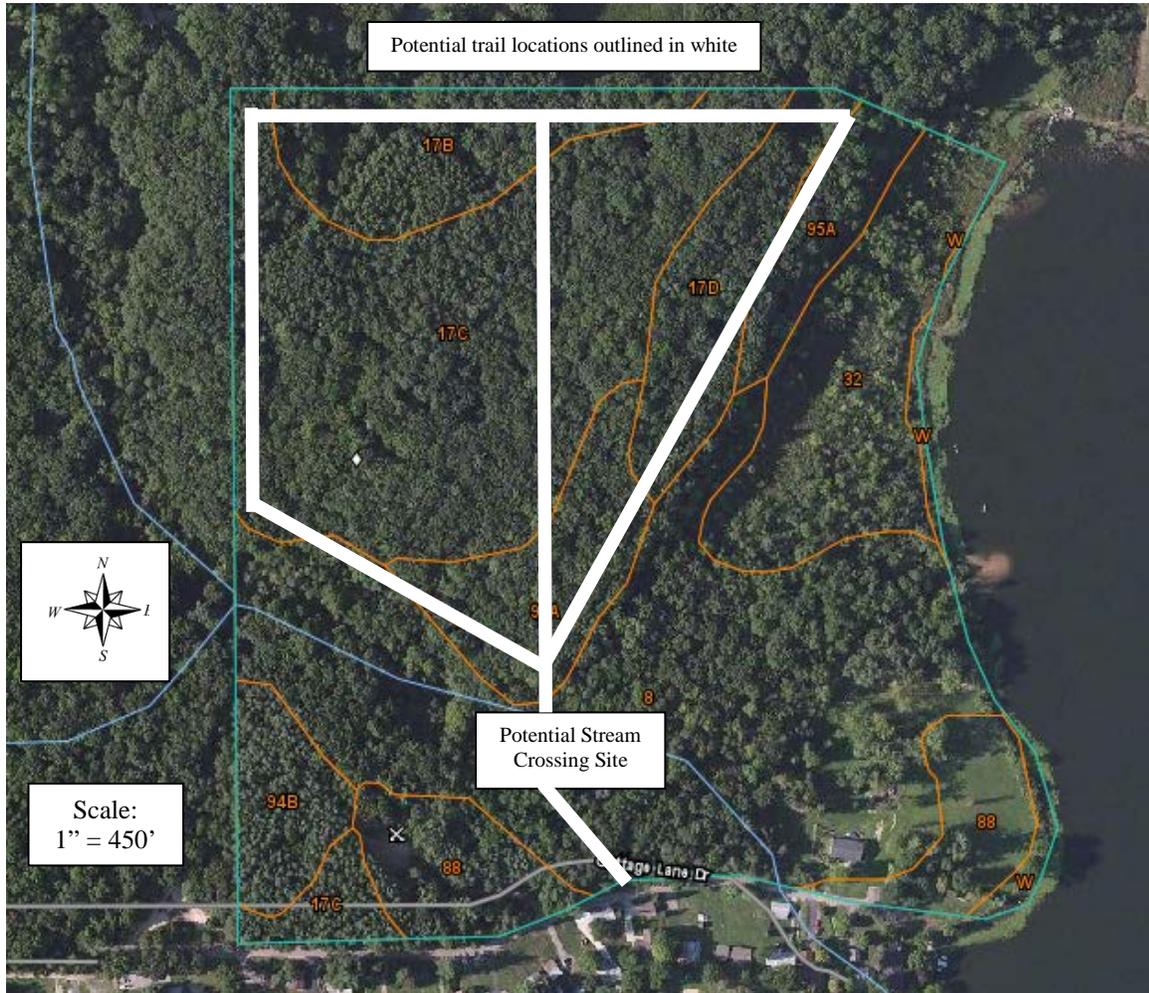
**Fire.** Prescribed fire is a management tool used to reduce hazardous fuels or unwanted understory plants. Prescribed fire should only be conducted by highly trained and properly insured professionals. All prescribed fires require a Burn Permit available from the DNR at [www.Michigan.gov/BurnPermit](http://www.Michigan.gov/BurnPermit). Prescribed fire is not likely to be a suitable tool for Stands One or Two in the Landowner forest. More information about prescribed fire is available on the Michigan Prescribed Fire Council website at [FireCouncil.org](http://FireCouncil.org). Wildlife is not a significant risk in this County or for the hardwood forest types on the property. However, more information about minimizing the risk of wildfire in Michigan can be found at [firewise.msu.edu](http://firewise.msu.edu).

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

**Forests of Recognized Importance.** This property is not located within a "Forest of Recognized Importance" (FORI), which in Michigan are forests along the Great Lakes coastline, forests along Natural or Wild and Scenic Rivers, rare forest types (old growth), or forests that provide important wildlife habitat (>500 contiguous acres in the southern Lower Peninsula, or required habitat for threatened or endangered species statewide). Landowners within a FORI should manage their forest to protect the ecological integrity of that larger important ecosystem.

## Soils Map

Figure 2. Soil map and potential locations for new forest trails and stream crossing.



(Image Source: USDA Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov/>)

### Legend for the Landowner Forest Soil Types

Symbol	Soil Name	Percent Slope	Acres	Percent
8	Cohoctah fine sandy loam		19.8	31.2%
17B	Spinks-Metea-Coloma complex	1 to 6	4.1	6.5%
17C	Spinks-Metea-Coloma complex	6 to 12	17.1	26.9%
17D	Spinks-Metea complex	12 to 25	3.5	5.4%
32	Carlisle muck		6.2	9.7%
88	Ceresco fine sandy loam		4.6	7.2%
94B	Brems sand	0 to 4	2.0	3.2%
95A	Abscota loamy sand	0 to 3	5.6	8.8%
W	Water		0.7	1.1%
Totals for Area of Interest			63.6	100.0%

## Soil Series Descriptions

The various soil types on the property determine the vegetation, economic productivity, potential for wind throw, susceptibility to erosion, and suitability for heavy equipment for active forest management. All management activities should take caution to protect the soil from rutting or erosion into the creek or nearby lake. Utilize Best Management Practices described in the “Sustainable Soil and Water Quality Practices on Forest Land” to protect soil and water quality ([www.Michigan.gov/PrivateForestLand](http://www.Michigan.gov/PrivateForestLand)). The following soil information is adapted from the soil maps and reports on the USDA Web Soil Survey at <http://websoilsurvey.sc.egov.usda.gov>.

**Cohoctah.** The Cohoctah series consists of very deep, poorly drained or very poorly drained soils formed in loamy alluvial deposits on flood plains. Slope ranges from 0 to 2 percent. Native vegetation is red maple, white ash, swamp white oak, American elm, alder, and quaking aspen. The site index for red maple is 56 and the expected annual growth rate is 29 ft<sup>3</sup>/acre. [Site index is the expected height at age 50 and is used to compare the quality of soil for growing trees.] Cohoctah soils are poorly suited for harvesting equipment because of low strength and wetness.

**Spinks.** The Spinks series consists of very deep, well drained soils formed in sandy eolian or outwash material. They are on dunes, moraines, till plains, outwash plains, beach ridges, and lake plains. Slope ranges from 0 to 70 percent. Native vegetation is hardwoods, dominantly of oak and hickory. The site index for red oak is 65 and the expected annual growth rate is 57 ft<sup>3</sup>/acre. Spinks soils are well suited for harvesting equipment.

**Carlisle.** The Carlisle series consists of very deep, very poorly drained soils formed in woody and herbaceous organic materials in depressions within lake plains, outwash plains, ground moraines, flood plains and moraines. Slope ranges from 0 to 2 percent. Major tree species include American elm, white ash, red maple, willow, tamarack, quaking aspen, and alder. The site index for red maple is 56 and the expected annual growth rate is 29 ft<sup>3</sup>/acre. Carlisle soils are poorly suited for harvesting equipment because of low strength and wetness.

**Ceresco.** The Ceresco series consists of very deep, somewhat poorly drained soils that formed in loamy alluvium on flood plains in river valleys. Slope ranges from 0 to 3 percent. A large amount is in woods consisting of elm, ash, and cottonwood. The site index for red oak is 66 and the expected annual growth rate is 57 ft<sup>3</sup>/acre. Ceresco soils are moderately suited for harvesting equipment because of wetness and flooding.

**Brems.** The Brems series consists of very deep, moderately well drained soils formed in acid sandy outwash on outwash plains and moraines. Slope ranges from 0 to 8 percent. Native vegetation is deciduous forest. The site index for pin oak is 59 and the expected annual growth rate is 43 ft<sup>3</sup>/acre. Brems soils are moderately suited for large equipment for being too sandy.

**Abscota.** The Abscota series consists of very deep, moderately well drained soils that formed in sandy alluvium on flood plains. Slopes range from 0 to 6 percent. Native vegetation is American elm, red maple, black ash, and sycamore. The site index for red maple is 56 and the expected annual growth rate is 29 ft<sup>3</sup>/acre. Abscota soils are moderately suited for harvesting equipment for wetness and flooding.

## *Stand One*

**Narrative Description.** Stand One is a 30 acre, uneven-aged, northern hardwoods forest dominated by beech, red oak and white oak. The stand has not been harvested for more than 50 years, and it is an outstanding example of northern hardwoods with very large diameter and tall trees. It also has an unusual number of large white pine interspersed throughout the stand that are remnants from the old white pine logging era in the late 1800's. Stand One has very good aesthetics for a mature hardwoods forest. The forest is on a bluff above a public lake so management activities will be highly visible.

**Forest Health.** I did not observe any forest health issues (insects, disease, invasive plants) in Stand One. However, the abundance of beech is a potential concern when beech bark disease arrives in this county in a few years (it is not present yet).

**Invasive Species.** No invasive plants, animals or diseases were observed in Stand One.

**Soil.** The primary soil type for Stand One is the Spinks-Metea-Coloma complex. These soil types are well drained and have very good site quality for high value trees. The site index for red oak is 66 on Spinks soil types. [Note: site index is the expected height at age 50 for a species on a given soil type. It is used to compare site quality between different soil types.] The well-drained soils in Stand One should be protected from any heavy equipment by conducting any management activity when soils are frozen (Dec-Feb) or dry (late summer-fall).

**Water.** Stand One does not have any surface water, but is near a creek and lake.

**Wetlands.** Stand One has well-drained soils and does not contain any wetlands.

**Wood and Fiber Production.** Stand One has at least 13 tree species and the dominant species in the stand are beech, white oak and red oak. Secondary species include white pine, red maple, sugar maple, big tooth aspen, black oak, black cherry, ash, bitternut hickory, musclewood, and paper birch. This is a good species diversity for a northern hardwoods forest type. The basal area is dominated by beech and several oak species including red oak, white oak, and black oak. Stand One is an uneven-aged stand with many age classes. Stand One is a sawtimber size stand with most of the trees  $\geq 10$ " in diameter. Merchantable sawtimber is usually 16" to 24" DBH. Stand One has exceptional stand quality and is developing "old growth" characteristics because it has not been harvested for more than 50 years. A forest cover type abbreviation for this stand is "MbO9" where "Mb" is beech, "O" is mixed oak, and "9" represents a saw log size stand with a basal area of  $> 70 \text{ ft}^2$  per acre

Density – The basal area for Stand One is  $145 \text{ ft}^2/\text{acre}$ . This is a very high basal area for this forest type as many mature northern hardwoods forests in southern Michigan have a basal area between 90 and  $120 \text{ ft}^2/\text{acre}$ . [Note: The *basal area of a tree* is the cross sectional area of the trunk at 4.5 feet. The *basal area of a stand* is the sum of each individual tree's basal area.]

Volume – The merchantable volume for Stand One is almost 15,000 board feet per acre using the Doyle log rule. This is a very high volume for this type of forest. Typical mature, hardwoods forests in southern Michigan may range from 5,000 to 10,000 board feet per acre.

**Recreation.** Stand One is frequently used by the Landowners and their friends for walking, skiing, trail riding, bird watching, and deer hunting. There are no roads for vehicle traffic in Stand One but there is a network of foot paths used by the Landowners and their neighbors.

**Desired Species.** The landowners use the property for deer hunting and wildlife viewing. Stand One has excellent wildlife habitat. Stand One has thick cover and water nearby for wildlife. Deer trails were observed throughout Stand One and I saw a bald eagle fly over while conducting the inventory. The creek does not support many game fish, but the lake on the east side of the stand is heavily used for fishing by people living on the lake.

### *Stand Two*

**Narrative Description.** Stand Two is a 28 acre lowland hardwoods stand with a creek running 1,275' through the center of the stand that empties into the lake just south of the stand. The forest is dominated by white ash and red maple. The stand has more than 1,500 feet of frontage along the lake and most of the soil in the stand is very poorly drained. Stand Two has average aesthetics for a lowland hardwoods forest. The forest is visible from the lake and a private road.

**Forest Health.** Emerald Ash Borer is the primary insect problem in the stand infecting most or all of the ash trees. Ash trees are about a third of the stand basal area so EAB will dramatically impact the stand. Secondary forest health issues include Dutch Elm Disease but elm is a minor component of the stand.

**Invasive Species.** I did not observe any noxious or invasive plant species in Stand Two. EAB is an invasive insect that is native to China and was found in Detroit in 2002.

**Soil.** The primary soil types for Stand Two are Cohoctah fine sandy loam (very poorly drained) and Carlisle muck (very poorly drained). Stand Two has average site quality because of the very poorly drained soils. The site index for red maple is 56 on the poorly drained Cohoctah soils. The poorly-drained soils in Stand One must be protected from any heavy equipment by conducting any management activity when soils are frozen or dry.

**Water.** Stand Two has abundant surface water resources with both a creek running through the stand and significant lake frontage.

**Wetlands.** The DEQ Wetlands Map Viewer at [www.mcgi.state.mi.us/wetlands](http://www.mcgi.state.mi.us/wetlands) indicates that all of Stand Two is a wetland according to state and federal definitions. A permit is not required for typical forest management activities in a wetland, but a permit is required for filling, dredging, draining, or development. A DEQ permit (usually \$50 or \$100) is also required for a stream crossing (culvert or bridge). See [www.Michigan.gov/DEQWetlands](http://www.Michigan.gov/DEQWetlands) for more information about wetlands. Any management activity in Stand Two should follow the "Sustainable Soil and Water Quality Practices on Forest Land" ([www.Michigan.gov/PrivateForestLand](http://www.Michigan.gov/PrivateForestLand)).

**Wood and Fiber Production.** Stand Two has at least 15 tree species and the dominant species are white ash, red maple and big tooth aspen. Secondary species include musclewood, elm, black cherry, basswood, bitternut hickory, paper birch, hawthorn, willow, cottonwood, and beech. Stand Two is a sawtimber size stand with most of the basal area in trees  $\geq 10$ " DBH. Stand Two has average stand quality and is an uneven-aged forest with many age classes. A forest cover abbreviation for this stand is "E9" where the "E" is lowlands and "9" is a sawtimber

stand with a basal area  $>70 \text{ ft}^2/\text{acre}$ . The basal area in Stand Two is  $105 \text{ ft}^2/\text{acre}$  which is a good basal area for a lowland hardwoods stand. The merchantable volume of Stand Two is about 5,000 board feet per acre using the Doyle log rule. This is a below average volume for a mature lowland hardwoods stand. Most of the merchantable trees are white ash and red maple.

**Recreation.** Stand Two is also used by the Landowners and their neighbors for recreation, primarily walking trails along the creek. There is a forest trail for vehicle traffic in Stand Two.

**Desired Species.** Stand Two has excellent wildlife habitat with thick cover and water nearby for wildlife. Deer trails were observed throughout Stand Two. The stand is also adjoining a lake that is used for fishing. The landowners would like to improve the fish habitat in the creek.

### *Stand Three*

**Narrative Description.** Stand Three is a 5 acre Scotch pine plantation. It is about 50 years old and has never been thinned. The pines are starting to decline and blow over but there is already some advanced regeneration of red maple and black cherry in the understory. Stand Three has poor aesthetics as the pine plantation is overgrown and the trees are starting to fall over. The stand is visible from a private road.

**Forest Health.** I did not observe any insect or disease problems in Stand Three, apart from some minor canker disease on the black cherry.

**Invasive Species.** Scotch pine is now considered to be invasive ([www.Michigan.gov/Invasives](http://www.Michigan.gov/Invasives))

**Soil.** The primary soils in Stand Three are Brems sands and Abscota loamy sand. Both soils are moderately well drained, sandy soils. Stand Three has average site quality because of the sandy soils. The site index for pin oak is 59 on Brems soils.

**Water.** There are no surface water resources in Stand Three.

**Wetlands.** There are no wetlands in Stand Three because the soils are sandy and well drained.

**Wood and Fiber Production.** Stand Three has low diversity with just three tree species present – Scotch pine, red maple and black cherry. More than 75% of the stand is Scotch pine. Stand Three has average stand quality for a pine plantation and Scotch pine has very poor market value. The basal area of Stand Three is around  $180 \text{ ft}^2/\text{acre}$  and this is a high basal area for a Scotch pine plantation. The volume of timber in Stand Three is almost 11,000 board feet per acre using the Doyle log rule and this is a good volume of board feet per acre for a Scotch pine plantation of this age. However, the low quality Scotch pine is more likely to produce low value biomass (pellets, chips) or pulp rather than higher value products like sawtimber (boards) or utility poles (usually red pine). Most of the Scotch pine are about 12” in diameter. A forest cover abbreviation for this stand is “I9” where the “I” is for exotic species and “9” is sawtimber.

**Recreation.** Stand Three is not used for recreation because the pines and the hardwoods in the understory are too thick for easy walking. There are not any roads or trails in Stand Three.

**Desired Species.** Stand Three has excellent wildlife habitat with very thick cover and water available nearby. Deer trails were observed throughout Stand Three.

## Recommendations

### *Desired Future Conditions*

Forestry management activities are meant to accomplish the landowner's goals for that particular stand and to bring about desired future conditions for the forest. The goals for the entire property include recreation, maintaining aesthetics, conducting sustainable timber harvests, maintaining excellent wildlife habitat, and protecting soil and water quality.

**Stand One** is a 30 acre northern hardwoods forest with great aesthetics and biodiversity for recreation. It also has high quality timber with very good economic value. This stand can support timber harvests every ten to fifteen years without compromising the aesthetic and recreational value of the forest. I suggest managing this stand for sustainable timber production that is compatible with the maintaining biodiversity, recreation, and aesthetics. The desired future condition is the continuation of a mature and healthy northern hardwoods forest.

**Stand Two** is a 28 acre lowland hardwoods forest with good biodiversity but poor timber quality due to forest health issues and poorly drained soils. It is very important for water quality and fish habitat with a creek and 1,500' of lake frontage. Stand Two should be managed to minimize the forest health impacts and maximize soil and water protection. The desired future condition is the continuation of a lowlands hardwoods forest that protects soil and water resources.

**Stand Three** is a 5 acre Scotch pine plantation. The trees are mature and starting to decline so the current stand should be harvested and replaced with more desirable trees. Unfortunately the market for Scotch pine is very limited so removing these trees may be a cost rather than income. The desired future condition is a replacement of Scotch pine with a native hardwoods forest.

### *General Activities for the Entire Property*

**Activity 0-1: Join the American Tree Farm System and Michigan Forest Association.** You should consider joining the American Tree Farm System ([www.TreeFarmSystem.org](http://www.TreeFarmSystem.org)) to certify that your forest is sustainably managed. Certification documents the public goods that "Tree Farmers" provide to society including wood, water, recreation and wildlife. Certified forests are assessed by a third party to show society that both the American Tree Farm System and forest landowners are complying with their "Standards of Sustainability." The minimum requirements to join Tree Farm are ten acres of forest, a current forest management plan, compliance with the "Standards of Sustainability" (listed in the Appendix), and a free inspection by a Tree Farm Inspector. There is no additional cost for you after developing this Forest Stewardship Plan.

You may also want to consider joining other forest landowner groups. According to USFS research, only 4% of family forest owners have a written forest management plan (Butler, 2008). Your investment in this management plan puts you into an elite group of forest owners! The Michigan Forest Association (MFA) is an organization of private forest owners in Michigan and only costs around \$40 in annual dues ([www.MichiganForests.org](http://www.MichiganForests.org)). MFA provides useful forest management information (magazines, newsletters, emails) and opportunities for networking with other active and involved forest landowners (annual conferences, workshops, field days).

**Activity 0-2: Monitor Forest Health Annually.** Forest health is an issue of moderate concern with Emerald Ash Borer already present in Stand Two and a high potential for Beech Bark Disease in Stand One. I recommend monitoring the forest regularly (each year and during different seasons) for changes that may indicate additional insect or disease problems. The “Forest Health Highlights” publication about forest insects and diseases is a great resource that is updated annually and available at [www.Michigan.gov/ForestHealth](http://www.Michigan.gov/ForestHealth). MDARD has information on regulated forest pests and quarantines at [www.Michigan.gov/ExoticPests](http://www.Michigan.gov/ExoticPests).

There are several new insects and diseases that are not yet present or well established in Michigan but are in nearby states (Asian longhorn beetle, Thousand cankers on walnut, Hemlock Woolly Adelgid, etc.). Report any unusual problems to the DNR or MDARD. Contact Roger Mech, the DNR Forest Health Specialist, at [MechR@michigan.gov](mailto:MechR@michigan.gov), or 517-243-0300.

Integrated Pest Management (IPM) should be practiced to protect soil and water. IPM requires correctly identifying pests, setting an economic or action threshold, and then implementing the best 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 to control pests. For example, oak wilt is prevented by the cultural practice of not wounding oaks between April 15 and July 15. After oak wilt is established, the primary action is a mechanical control to cut oak roots to prevent the spread of the fungus through root grafts.

Emerald Ash Borer. The Emerald Ash Borer (EAB) is an exotic invasive pest that is attracted to both healthy and dying ash trees. All living ash trees  $\geq 16$ ” DBH should be included in the next timber sale. Harvest smaller diameter ash trees for firewood. This County is within the Level One Quarantine Area so logs or firewood cannot legally leave the Lower Peninsula. Girdled trees could be left standing to provide tall snags for wildlife, but ash crowns quickly become brittle and fall apart. See [www.EmeraldAshBorer.info](http://www.EmeraldAshBorer.info) for more information about EAB.

Beech Bark Disease. Beech bark disease (BBD) is initiated by a scale insect that attaches to the tree and feeds on its sap. The tiny scale (~1 mm) secretes a white, wooly, waxy covering and the trunks look like they are covered in white powder. The scale feeding damage allows a fungus to invade 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 moved by the wind. If the scale is not in your forest, consider reducing the amount of beech in your forest so that beech is <20% of the stand basal area. If beech scale is already present, harvest the infected trees. Do not move infested firewood as this will spread the scale and fungus that causes beech bark disease. See <http://na.fs.fed.us/fhp/bbd>.

Oak Wilt. Oak wilt is caused by a fungus that is transported by beetles and root grafts. Red oak is more susceptible to oak wilt than white oak. It is easier to prevent oak wilt than to treat 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. Timber sales should be conducted in the fall or winter. See <http://na.fs.fed.us/fhp/ow>.

**Activity 0-3: Enroll in Property Tax Program.** The State of Michigan offers two programs to lower your property taxes on forest land, and both of these programs require a written forest management plan prior to enrolling in the program. The Landowner forest meets the biological requirements of both programs so you should choose which program best fits your financial

situation and personal goals for your forest. The Commercial Forest program does not allow buildings so a new tax ID will need to be created to separate the pole barn and a few acres from the commercial forest land.

The Qualified Forest (QF) program reduces property taxes by up to 18 mills for landowners with parcels between 20 and 640 acres who comply with their forest management plan to optimize their forest resources. Landowners do not have to allow the public on their land to hunt or fish, so this program is more attractive to family forest owners who own land for their own recreation. There is a \$50 application fee and an annual fee equivalent to 2 mills to help fund the operation of the program. Landowners must also report timber harvests or other forest practices in the year they occur. See [www.Michigan.gov/QFP](http://www.Michigan.gov/QFP) for information and program enrollment forms.

The Commercial Forest (CF) program provides a specific property tax of \$1.25 per acre for landowners that have at least 40 acres of forest and are engaged in sustainable timber production in support of the state's forest products industry. Participating landowners must make their land open to the public for foot access for hunting and fishing, so this program is usually more attractive to corporate forest owners who own large forests in the Upper Peninsula. The application fee is \$1 per acre with a minimum fee of \$200 and a maximum fee of \$1,000. See [www.Michigan.gov/CommercialForest](http://www.Michigan.gov/CommercialForest) for more information and the application forms.

The recommendations in a Forest Stewardship Plan are voluntary unless the property is enrolled in the Commercial Forest Program or the Qualified Forest Program, especially those related to commercial timber harvests. *Landowner Statement of Compliance: "I hereby acknowledge that I have reviewed this forest management plan and understand my responsibilities regarding conducting management practices and harvests as called for in the plan."*

### *Stand One Activities*

**Activity 1-1: Construct Forest Trails.** One of the limitations to management and recreation in Stand One is the lack of established trails for motor vehicle to all parts of the stand. Although loggers will be able to develop skid trails throughout the forest for their equipment when conducting a timber sale, it may be beneficial to develop a trail system prior to conducting the next timber sale to direct logging traffic where you want it. This activity could be a great effort or expense, but there are options available for reducing your expenses. The Natural Resource Conservation Service (NRCS) offers financial assistance through the Environmental Quality Incentives Program (EQIP). The NRCS "conservation practice" code for Forest Trails and Landings is #655 and the following are their specifications for forest trails.

Site Map – Figure 2 shows the potential location of forest trails for vehicle traffic. The primary objective is to access all corners of the stand and across the creeks in Stand Two.

Timing – If you apply for competitive NRCS funding in the fall of 2014, you may have a contract awarded in the spring of 2015. You should wait to begin construction of the trails until the fall of 2015 to avoid wounding oaks during "oak wilt season" from April 15 to July 15. NRCS contracts usually have a three year window for completion.

Detailed Design Information – The property corners are surveyed and the boundary lines are apparent. The soils throughout Stand One are well drained and suitable for trails and heavy

equipment. The primary concern will be minimizing any erosion as the trails cross steep slopes and the creek. The trails should follow the contours as much as possible to reduce the potential for erosion. The trail surface should be slightly crowned to encourage drainage.

Length, Width and Slope of Trails – Moderate the slope of the trails and follow contours across steep hillsides. The trail must accommodate larger vehicles like a truck or logging skidder so it should be twelve to fourteen feet wide. The total length of trail is around 3,500 feet.

Location of Buffer Zones for Streams – Trails should be kept 100 feet from rivers or lakes for a riparian buffer zone when possible. However, the trail will need to cross the creeks so consult the Stream Crossing recommendations in the next activity.

Location of Structural Erosion Control – The steep slopes offer potential for erosion into the creek or lake so water bars to reduce water flow down the trail into the creek may be needed. It is also necessary to follow the contour when possible and other surface erosion measures may be required. All forest trails and log landings must comply with Best Management Practices in the “Sustainable Soil and Water Quality Practices on Forest Land.”

Specifications for Timing of Operating – Fall or winter is the preferred time to construct trails. Avoid constructing trails in the spring (wet soils) and the summer (prevent oak wilt).

Location of Seeding Sites – Trails and log landings should be seeded with vegetative cover to help stabilize soil and prevent erosion. Since this is primarily a hunting and recreation property, select seed mixes that are commonly used for food plots for deer and other desirable wildlife.

Seeding Species, Rates and Planting Information – Use native and non-invasive species for re-vegetating trails and landings. Select species that tolerate shade. Potential species for vegetative cover for erosion control and utility as a food plot include annual rye, Alsike clover, brassicas, and turnips. Follow rates and planting recommendations on the seed packaging.

Operation and Maintenance – Conduct regular inspections of the trails in every season. Note especially the condition of steep slopes or stream crossings after heavy rain or spring thaw.

**Activity 1-2: Commercial Timber Harvest.** Stand One is a very high quality forest from an economic and timber perspective because of the abundance of high quality trees in commercially desirable tree species like red oak, white oak, sugar maple, and beech. Sustainable timber production is compatible with many other forest management goals. It is possible to conduct a conservative timber harvest every ten to fifteen years while keeping aesthetics, biodiversity, wildlife habitat and recreation as equal priorities. I recommend a timber harvest between 2016-2018 to manage Stand One for long term productivity and health.

Timber Harvest Objectives. The primary objective for any timber sale is to *improve the forest*, as defined according to the values of the landowner and the attributes of the forest. A timber sale should improve the species composition and growing conditions of remaining trees for future timber sales. A forester’s primary concern is *keeping quality trees* in your forest, instead of selling most of your quality trees (a very poor practice called “high-grading”). A timber sale can be used to improve wildlife habitat, develop trails for recreation, improve forest health and regenerate new trees. Finally, a timber sale should also seek to *optimize* (but not necessarily maximize) the profits for the landowner in keeping with the above objectives.

Timber Harvest Method. Foresters use “even age” and “uneven aged” methods to harvest trees. Even aged methods create a new cohort of trees with a similar age throughout the entire stand. “Shelterwood” or “clearcut” favors the regeneration of shade intolerant species like aspen, oak or black walnut. Uneven aged methods preserve variation in age classes in the stand. “Single tree selection” or “group selection” favor the regeneration of shade tolerant species like sugar maple and beech. Use uneven aged methods in Stand One to maintain diverse age classes and species.

Timber Sale Process. You can hire a consulting forester to assist you with a timber sale or you 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 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, but the visual stand assessment determined that Stand One is ready for harvest anytime in the next few years.

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 your property boundary.

Step Three. You or your forester should advertise your timber sale. The true market value of the trees marked for sale is determined by getting multiple bids. Send the prospectus 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).

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. Stand One has a high basal area so plan for a timber harvest in the winter of 2016. Mark the trees for sale in the summer of 2015. 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 (bark beetles) or disease (oak wilt). Avoid a spring harvest to minimize rutting which damages both the soil and the roots of the residual trees. Harvest most of the mature beech trees before beech bark disease arrives in this county. Selection harvests are often done on a ten to fifteen year interval. Stand One may be ready for another harvest around 2030.

Forest Certification. There are several applicable “Standards of Sustainability” for properties certified by the American Tree Farm System. See Appendix for more info about Tree Farm.

Standard Three - Reforestation and Afforestation. Natural seeding from the residual trees in the stand should produce adequate regeneration. Planting seedlings to regenerate this stand is not likely to be biologically necessary, economical, or even successful with the high deer population.

Standard Four - Air, Water, and Soil Protection. 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. Follow all applicable Best Management Practices (“Sustainable Soil and Water Quality Practices on Forest Land” at [www.Michigan.gov/PrivateForestLand](http://www.Michigan.gov/PrivateForestLand)).

Standard Six - 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. This standard requires using qualified natural resource professionals, a contract, and complying with this plan when conducting a timber harvest.

### *Stand Two Activities*

**Activity 2-1: Stream Crossing.** Stand Two has a large creek (20’ wide at bank full) that is a barrier to access most of the property for recreation (foot or ATV) or forest management (skidders, trucks, harvesters). The entire property would greatly benefit from installing a new stream crossing that will allow commercial traffic prior to a commercial timber harvest in 2016. The NRCS provides cost share funding through EQIP practice #578. The following recommendations should be expanded based on the “Sustainable Soil and Water Quality Practices on Forest Land” and in consultation with NRCS staff, DEQ staff, and local contractors.

Purpose: To provide access to recreation and forest management activities, to prevent the erosion of sediment into the creek and nearby lake, and to allow for unobstructed fish passage upstream.

Regulations: Contact the local DEQ office ([www.Michigan.gov/DEQ](http://www.Michigan.gov/DEQ)) to obtain the required permit for the stream crossing. Stream crossing permits usually cost \$50 or \$100 depending upon the size of the drainage and the type of crossing.

Locations: See Figure 2 for a potential location for the stream crossing. The final location should take into account the stability of the streambed and the slope of the trail to the stream. Avoid placing a crossing near a tributary entering the main stream or near a bend in the stream.

Approach: The side slopes approaching the crossing should be graded to minimize their slope approaching the crossing. The approaches should also be planted with perennial vegetation to prevent erosion of sediment into the stream.

Bridge Design: The bridge should be installed perpendicular to the direction of the stream. The bridge must be at least 16 feet wide and long enough to span the “bank full width” of the stream. The bridge must support the weight of large harvesters and loaded log skidders or forwarders.

Best Management Practices: Consult the “Sustainable Soil and Water Quality Practices on Forest Land” published by the DNR and DEQ for additional guidance on stream crossings. Take precautions to minimize any sediment deposits into the stream when installing the footings.

Operation and Maintenance: The integrity of the bridge should be checked annually. Monitor for structural damage or changes in the streambed that may affect the utility of the crossing.

**Activity 2-2: Commercial Timber Harvest.** Stand Two is a lowlands hardwoods forest with average timber quality, average basal area of 105 ft<sup>2</sup>/acre, and major forest health concerns with Emerald Ash Borer (EAB) already present and killing trees. Stand Two should be harvested when a timber sale is conducted in Stand One (2016-2018). The stand can be improved by reducing ash and mature maples to allow for regeneration. The stand is on wet soils with a creek and lake frontage so follow Best Management Practices to protect soil and water quality. Maintain a Riparian Management Zone (RMZ) of 100 feet on either side of the creek and along the lake. Trees may be harvested within the RMZ, but leave enough trees to shade the creek and avoid cutting trees right along the bank. Keep soil disturbance to a minimum and avoid building roads in the RMZ when possible. The harvest should be conducted when soils are dry or frozen. It will be necessary to install a stream crossing to allow for large harvesting equipment to cross the creek. This requires a DEQ permit (\$50 or \$100), and NRCS may have funding for a stream crossing (Code #578). Aesthetics along the lake may be impacted so harvest the ash and mature red maple and leave most other species. Natural regeneration should be successful, but it may be wise to limit the reproduction of ash as the future impacts of EAB are not known.

**Activity 2-3: Forest Stand Improvement.** A timber harvest in Stand Two will not adequately deal with EAB in the small diameter ash trees. Because timber sales only occur every ten to fifteen years for most hardwoods forests, it would be good to do some forest stand improvement (FSI) activities between timber sales (2018+). The primary forest stand improvement activity for Stand Two is to address forest health by removing ash trees too small to sell for timber (<15" DBH). Secondary objectives include improving aesthetics, protecting soil and water quality and managing for wildlife habitat. This activity is likely to be a cost rather than an expense, but forest stand improvement activities are eligible for funding from the NRCS (Code #666).

Small ash trees have low timber value but excellent firewood value so forest stand improvement activities should focus on salvaging small ash for local firewood use. If this produces more firewood than you can use personally, it may be possible to sell it to nearby campgrounds or other people who burn wood for heat. Most of Michigan is under a state and federal quarantine to slow the spread of the EAB (see [www.EmeraldAshBorer.info](http://www.EmeraldAshBorer.info)), but seasoned or kiln dried ash firewood can be moved within the quarantined areas. For local firewood, see [www.FirewoodScout.org](http://www.FirewoodScout.org). Forest Stand Improvement activities should also follow Best Management Practices near the creek and lake to protect soil and water quality.

**Activity 2-4: Riparian Forest Buffer.** A riparian forest buffer is a strip of forest along a creek or lake that is managed intentionally to protect water quality and provide wildlife habitat. These riparian forest buffers are sometimes newly planted forests along streams in agricultural land (an agroforestry practice), but they can also be located in existing forests. Because Stand 2 is losing so many of its native ash and elm trees to Emerald Ash Borer and Dutch Elm Disease, it will be helpful to do some active management to protect the ecological functions of this riparian forest. The NRCS conservation practice code is #391 and the following are specifications to be followed when using EQIP funds for a riparian forest buffer.

**Purpose of Treatment:** The purpose of the riparian forest buffer in Stand Two is to provide high quality habitat for the fish and animals that depend upon an aquatic or riparian environment. This riparian habitat includes trees that shade the stream to maintain proper water temperatures for fish habitat and trees, both live and dead, that offer habitat for birds and other animals.

Width and length of the RFB: Stand 2 has zero to 10% slopes, so the width of the buffer is 200' or 100' on either side of the creek. The length of the buffer is 1,275 feet so the area is 5.9 acres.

Map of Treatment: See Figure 2 for the location of the creek running east-west. The riparian forest buffer is 100' on either side of the creek.

Species to be Planted: Tree and shrubs species to be planted should be suited for poorly drained soils, moderate shade, and have minimal forest health pressures. These species include silver maple, red maple, basswood, cottonwood, willow and red osier dogwood.

Number of Plants Required: A double row of shrubs at 2'x2' spacing on both sides of the creek would be 2,550 shrubs. Planting 109 trees per acre would be 637 trees for the 5.9 acres.

Plant Spacing: Plant a double row of shrubs along the banks of the creek at a high density of 2' x 2' to reduce sediment flow into the stream. Trees can be planted throughout the entire 200' width of the riparian buffer at a lower density of 20'x20' because Stand 2 still has many trees.

Site Preparation and Planting Techniques: Stand 2 had minimal herbaceous cover so it does not require mechanical or chemical site preparation to control competing vegetation. Stand 2 is not suitable for mechanized planting so the seedlings must be hand planted.

Timing of Planting and Other Activities: Bare root seedlings should be planted in the spring in April or May. Containerized seedlings can be planted throughout the growing season, but usually in coordination with adequate rainfall in the spring or fall. Harvesting timber is allowed in a riparian forest buffer, but any timber harvest should retain at least 60 ft<sup>2</sup> of basal area and be very careful to follow Best Management Practices to protect soil and water quality. Harvesting trees on the bank should be minimized unless designed to provide desired fish habitat.



### ***Michigan's Forests Provide Abundant Clean Water and Quality Fish Habitat***

**Activity 2-5: Stream Habitat Improvement.** The stream in Stand 2 does not have adequate large wood in the water to provide suitable fish habitat, and the banks do not have adequate vegetation to minimize erosion of sediment into the stream. The NRCS conservation practice code is #395 and the following are specifications when applying to EQIP for financial assistance. Placing wood structures into the stream for fish habitat requires a permit from the DEQ, and also the DNR Fisheries Division if it is a designated Natural River, so obtain permits early in the planning stages for this conservation practice.

**Purpose of the Treatment:** The purpose of the conservation practice is to improve the fish habitat of the stream by enhancing the wood in the water and stabilizing the stream channel. Placing wood into streams can provide overhead cover for fish, scour deeper holes, direct flow away from an eroding bank, and also slow water velocity to reduce erosion. The design of the installation will match the stream characteristics and landowner objectives. Obtain site specific guidance from a DNR Fisheries Division biologist ([www.Michigan.gov/Fishing](http://www.Michigan.gov/Fishing)) or a Trout Unlimited ([www.MichiganTU.org](http://www.MichiganTU.org)) fisheries biologist to plan the location and design of the woody structures to be placed in the stream.

**Site Description:** The creek runs 1,275' through Stand 2. The bank full width is 20' and the stream bank is 6' tall in most places. Several bends are eroding and releasing sediment with heavy rainfall events.

**Dates and Sequence.** In-stream construction of placing large wood into the stream can be done throughout the year, except during specific seasonal restrictions to protect spawning fish as determined by the local DNR Fisheries biologist.

**Vegetation Planting Plan.** Planting vegetation on top of the banks to provide shade is covered by the Riparian Forest Buffer in Activity 2-4. Willow, elm and red osier dogwood may be planted in the slope of the stream bank at eroding corners. Plant at 1'x1' spacing in the spring after high water from snowmelt has receded. Tree tubes or stakes may be necessary to protect from herbivores or high water. Herbaceous vegetation like grasses is also suitable for erosion control.

**Maintenance Requirements.** Check the woody structures in the stream channel each spring and after heavy rainfall events. Additional staking or chaining may be needed to keep them in place. Vegetation planted on the side of the stream bank may need to be supplemented each spring.

**Site Protection and Preparation.** Follow Best Management Practices when using any heavy equipment to install the large woody structures. Follow guidance from Trout Unlimited or a DNR Fisheries biologist to prepare the site for tree planting and the placement of wood structures in the stream channel.

**Map.** See location of creek on Figure 2.

### *Stand Three Activities*

**Activity 3-1: Commercial Biomass Harvest.** Stand Three is a 5 acre Scotch pine plantation that is 50 years old and rapidly declining. Scotch pine, now considered to be an invasive plant, has very little market value so there are no economic or ecological reasons to try to improve the pines. I recommend a regeneration harvest (clearcut) to remove all Scotch pines and start a new stand of hardwoods. This county does not have a significant market for conifers, and 5 acres is a small stand even if there were good markets nearby for pine. Therefore, I recommend converting this pine stand back to a hardwoods stand. The clearcut can occur anytime in the next few years, but sooner would be better (2016-2018), especially if it can be included in the timber sale in Stand One and Two. The seasonal timing of this harvest is more flexible with sandy soils supporting equipment most months of the year and no forest health restrictions either.

It may be possible to sell the Scotch pine for biomass (pellets or chips) or other local niche markets (some Amish mills buy Scotch pine). However, removing the Scotch pine may be an expense rather than income. This harvest could qualify for NRCS funding through a forest stand improvement (Code #666) to address plant productivity concerns since Scotch pine is considered to be an invasive plant. Best Management Practices certainly apply to harvests on sandy soils, but it is easier to protect well drained sandy soils. Aesthetics will be a concern since this small clearcut will be visible along the road so I recommend discussing the harvest with neighbors before cutting the pines to explain your objectives. Pine plantations are often re-planted with other pine seedlings, but this plantation should be converted to a natural hardwoods stand. There is advanced natural regeneration of black cherry and red maple so these and other hardwoods should successfully colonize the site (aspen and oak are also nearby in Stand Two). Wait three to five years to see if the hardwoods are successful in natural establishment on the site.

**Activity 3-2: Plant Trees and Shrubs.** If natural regeneration of hardwoods is not successful in Stand Three within five years after the pines have been removed, it may be necessary to plant seedlings (2020-2022). Planting hardwoods may not be an economical land investment due to the high initial costs and long rotation length (80 years or more). Most forestry plantations are conifers like red pine that have a shorter rotation length and good economic returns if located near well-developed markets. However, you can certainly try planting some high value (economic and wildlife habitat) hardwood species like red oak, white oak, red maple, sugar maple, and black cherry if natural regeneration is not adequate in Stand Three. You could plant about 680 trees per acre or at 8' x8' spacing in the spring.

The site will require preparation to remove competing weeds and ongoing weed control for a few years after planting. The young seedlings will require fencing or tree tubes to prevent deer or rodent damage. If you are buying a large quantity of tree seedlings, purchase them directly at wholesale prices from a commercial seedling nursery. The DNR maintains a list of about 25 commercial nurseries around the state that produce tree seedlings for forestry planting available at [www.Michigan.gov/PrivateForestLand](http://www.Michigan.gov/PrivateForestLand). You could also plant some shrubs like grey dogwood, hazelnut, serviceberry, sumac, crabapple, hawthorn, ninebark, and wild plum for wildlife habitat. Local Conservation District tree sales might be a good source for these wildlife and conservation trees and shrubs. The NRCS may provide funding for Tree and Shrub Establishment (#612) and Tree and Shrub Site Preparation (#490) if you are planting several thousand seedlings.

### *Summary Table*

The previous recommended activities are summarized in Table 1. This table includes space for you to make notes about your management decisions over the next twenty years. See descriptions above for the proper season to conduct management activities. 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 economics (timber prices, income needs, taxes) or landowner preferences. Please note that enrolling in the Commercial Forest or Qualified Forest property tax programs will require compliance with the recommendations in this Forest Stewardship Plan. This plan may be amended to reflect changes in market conditions or landowner goals. Notify the administrators of the property tax program if you modify this plan and the timing of management activities.

Table 1. Summary of Recommended Management Activities for the Next Twenty Years.

Stand	#	Extent	Activity Description	Dates		NRCS	Cost / Profit
				Planned	Complete		
All	0-1	63 ac	Join Tree Farm & MFA	2014			
All	0-2	63 ac	Monitor Forest Health	annual			
All	0-3	63 ac	Enroll in QF or CF Property Tax Reduction Program	2014			
One	1-1	3,000'	Construct Forest Trails	2015		EQIP #655	
One	1-2	30 ac	Commercial Timber Harvest	2016, 2030			
Two	2-1	30'	Install Stream Crossing	2015		EQIP #578	
Two	2-2	28 ac	Commercial Timber Harvest	2016, 2030			
Two	2-3	28 ac	Forest Stand Improvement	2018-20		EQIP #666	
Two	2-4	5.9 ac	Riparian Forest Buffer	2020		EQIP #391	
Two	2-5	1,275'	Stream Habitat Improvement	2020		EQIP #395	
Three	3-1	5 ac	Commercial Biomass Harvest	2016		EQIP #666	
Three	3-2	5 ac	Plant Trees and Shrubs	2020-22		EQIP #612	

## 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 ten to twenty year planning period. Forest management plans for the Commercial Forest Program (up to 20 years long) must allow for record keeping of silvicultural practices and amendments due to unexpected events or natural disasters. Please use the table at the end of this plan to record notes and make modifications to this plan as needed. Forest management plans for the American Tree Farm System do not have an expiration date, but must be kept current to reflect the conditions of the forest and the goals of the landowner. The Michigan Tree Farm Committee provides a short Addendum that helps landowners keep their plan current with the Standards of Sustainability that are updated every five years.

## Appendix – General Forestry Information and Related Programs

### *Glossary of Common Forestry Terms*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Site Index** - measure of quality of a site based on the height of a dominant 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 best management practices.

## *Forest Health*

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

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

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

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

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

## *Wildlife Habitat*

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

DNR Wildlife Division – [www.Michigan.gov/Wildlife](http://www.Michigan.gov/Wildlife)

Michigan United Conservation Clubs - <https://mucc.org>

Quality Deer Management Association – [www.qdma.com](http://www.qdma.com)

Audubon Society - [www.MichiganAudubon.org](http://www.MichiganAudubon.org)

Foresters for the Birds – <http://vt.audubon.org/foresters-birds>

Ruffed Grouse Society - [www.RuffedGrouseSociety.org](http://www.RuffedGrouseSociety.org)

National Wild Turkey Federation - [www.nwtf.org](http://www.nwtf.org)

Michigan Trout Unlimited – [www.MichiganTU.org](http://www.MichiganTU.org)

US Fish and Wildlife Service - [www.fws.gov/partners](http://www.fws.gov/partners)

## *Forest Economics*

**Capital Gains Tax Information.** 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. There are many great tax related resources available on [www.TimberTax.org](http://www.TimberTax.org), including the most recent edition of the annual "Tax Tips for Forest Landowners."

### *American Tree Farm System*

I recommend that you join the American Tree Farm System to certify your exemplary and sustainable forest management. A free inspection from one of the 145 Tree Farm Inspecting Foresters is required to enroll. 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 [www.Michigan.gov/QFP](http://www.Michigan.gov/QFP) for information and enrollment forms. The application deadline is September 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.

