NRCS FOREST MANAGEMENT PLAN

Landowner:

Warren Suchovsky
N 9677 County Road 577
Stephenson, Michigan 49887
(906) 753-6666

Legal Description:

T. 35 N. – R. 27 W. - Portions of Section 6
T. 35 N. – R. 28 W. - Portions of Sections 1 & 11
T. 36 N. – R. 27 W. - Portions of Section 31
T. 36 N. – R. 28 W. - Portions of Section 26
Menominee County, Michigan
848 Acres

Prepared By:

Rexx A. Janowiak, ACF

Signature of Plan Writer:

Green Timber
Consulting Foresters, Inc.

Green Timber Consulting Foresters, Inc.
11521 DesRochers Road
Pelkie, Michigan 49958
(906) 353-8584 or (906) 281-6458
rexx@greentimberforestry.com
www.greentimberforestry.com
September 30th, 2014

Landowner Approval Signature: **Date:**

NRCS Approval Signature: **Date:**

NRCS Approval (Print): **Date:**

TABLE OF CONTENTS

SECTION I- MAPS AND INTRODUCTION

INTRODUCTION

This forest management plan has been prepared for the landowner, Warren Suchovsky, in order to describe the current conditions of the forest and related natural resources on his property and to prescribe management activities for the 20 years following the date of completion of the plan. When this plan has expired, the property should again be visited by a forester in order to assess the conditions of the forest and to make recommendations for future management. At that time, this forest management plan should also undergo an update or complete revision; this decision should be made by the landowner with the advice of the forester. This plan will describe:

- Landowner goals and objectives.
- All conditions and components of the land.
- Recommended management options to fit the landowner's goals while properly managing the land.

This plan will also make reference to specific Natural Resource Conservation Service (NRCS) Conservation Practices and Practice Codes. If the landowners choose to implement any of these practices, they may be eligible for some cost sharing funds through the NRCS to offset their out-of-pocket cost. More information about cost sharing is available from the NRCS office in Stephenson, Michigan at (906) 753-6921.

Vocabulary that is commonly used in forest management plans, but may be unfamiliar to the landowner is defined in the Glossary in Section IV.

LANDOWNER OBJECTIVES

The landowner lives on this property and utilizes it very extensively. The landowner's main objective for the property is to manage it sustainably through proper forestry and farming practices to promote overall health and productivity. The landowner and his son own and operate a commercial logging company and therefore they have the capacity to implement many forest management techniques on their own. The luxury of owning their own logging equipment will allow them to explore management strategies that may not be available to other landowners. The landowner is particularly concerned with the affects of climate change on the health and productivity of the forest and would like to implement management techniques that could help counteract the future impacts of climate change. The landowner would like to implement forest management that leaves the forest in better condition than it is today while still capturing the financial value of those trees that should be harvested for the benefit of the forest. In addition the landowner would also like to promote or maintain wildlife habitat for a variety of wildlife species except for white tailed deer which currently are over populated in the location of the property.
`

In many situations, management options can be designed to achieve multiple long-term goals while enhancing the current benefits the landowners obtain from the property. Conducting proper forest management now will also help to ensure that the future owners of the land will be able to benefit from the forest. This principle, known as sustainable forest management, considers current conditions of the forest and applies scientific principles of forestry to ensure

that the forest is able to provide "the greatest good for the greatest number for the longest time," as stated by Gifford Pinchot, one of the founders of modern American forestry.

Management actions conducted on one parcel of land often affect the ecosystems of adjacent parcels. Likewise, the ecosystems found in a particular area can influence the outcomes of forest management. It is important for land management options to consider the types of ecosystems present on this property and on adjacent properties. Natural occurrences such as windstorms, soil types and topography **do not occur with respect to property lines**. Forest management that mimics natural disturbances and considers the range of factors that impact tree growth is a key component of broad-scale "landscape management." It is difficult to coordinate landscape management activities across a number of small parcels of land under different ownerships. Conducting sustainable forest management that considers the influence of ecosystems and mimics natural disturbances is one step towards landscape management. The recommendations made in this management plan have been developed to ensure sustainable forest use.

SECTION II- THE LANDOWNERS AND THE LAND

GENERAL PROPERTY DESCRIPTION

Location

This property is located in Lake Township, within Menominee County, Michigan, just a few miles west of the community of Daggett. The access route to the property is depicted on the Locator Map included in Section I of this management plan. County Roads 577 and 358, along with Olsen Road, provide excellent access to most of the property. During the property inspection very little effort was made to identify property corners and boundaries. Therefore very little of this evidence was observed. However, given the frequency of past management it is safe to assume that the majority of the property boundaries and corners are in place. The existing evidence will be considered in the development of future harvest boundaries however, **it should not be viewed as indicative of the precise corner or property line locations**; rather it was likely placed by a forester to indicate an approximate corner point or property line. Only a registered professional surveyor may set **legal** property corners and boundaries. Topographic maps and/or aerial photos would be very helpful when navigating through this property. The legal description of the property is:

T. 35 N. – R. 27 W. Portion of Section 6
T. 35 N. – R. 28 W. Portion of Sections 1 & 11
T. 36 N. – R. 27 W. Portion of Section 31
T. 36 N. – R. 28 W. Portion of Section 36
Menominee County, Michigan

Brief Description

This property is located within a part of Menominee County and is comprised of a mixture of forest and farmland. The forest types found on the property can be broken into four general categories; aspen, northern hardwoods, upland pine and lowland conifer. The terrain across the property is relatively flat with just a few small rolling hills. A significant portion of the property is made up of a mixture of lowland conifers, bogs and swamps however only one natural surface water feature exists. The surface water feature found on this property consists of a small creek.

The landowner has a home located in the central portion of the property. Surrounding the home are barns, various outbuildings and a maintained lawn. The area around the home site also serves as the main headquarters for the farming activities.

LAND HISTORY/ PAST LAND USE

Humans have utilized this land and its resources for many years. The forests of Upper Michigan were logged in three phases during the late 19th and early 20th centuries. The first phase consisted of a focused effort to only harvest the highly sought after white pines because lumber from these trees was in high demand at the time. When the seemingly endless supply of pines dwindled, many people left Upper Michigan for the western and southern forests. Those who stayed found opportunities in the hemlock and hardwood forests that remained, transitioning to production of hardwood lumber, railroad ties, mine timbers, charcoal for the manufacturing of iron, and chemical wood for industrial processes. This second phase of logging was the most influential on this property and the surrounding area. These uses created markets for species that were once considered useless, in addition to utilizing a higher percentage of the volume in each tree when compared with the past pine logging.

In many parts of the Upper Peninsula wildfires broke out, burning the large amounts of slash and debris that remained following the first two phases of logging. As the fires subsided, the forests began to naturally regenerate with a diverse and vigorously growing mixture of tree species. The tree species composition and quality of the forests that regenerated were largely determined by the available seed source and soil conditions. Aspen was one of the most common species in this regenerating forest and once again, markets and utilization adapted to the change in forest composition, leading to today's highly mechanized pulp and paper industry, new products like fiberboard, and the advent of selective cutting.

Figure 1: Charred stump indicative of past forest fires.

More recently this property has been used for various farming and forestry purposes. The more recent forestry and farming practices that have taken place have had an impact on the current conditions of the property. Forestry and farming practices such as selective cutting, clearcutting and crop rotation have had a positive impact on the productivity of the property. Other practices that have occurred, such as over grazing, have limited the productivity of the property in small localized areas.

CURRENT LAND USE

The landowner currently utilizes this property to facilitate a diverse array of activities. The primary use of the land is sustainable forestry and farming. The landowner is very active when it comes to managing the property. Being highly involved in both farming and logging has provided the landowner with the capability to efficiently carry out these activities. The landowner has used the property to produce income through the implementation of timber sales and farming practices and would like to continue to manage the property in a sustainable fashion to provide future economic opportunities. In addition the property is used for recreational purposes such as hunting. The landowner has given permission to others to hunt the property primarily for white tailed deer to attempt to keep the localized deer population in check. Beyond these activities the landowner also uses the property to collect firewood.

CURRENT LAND CONDITIONS

Water/Wetlands

Given the size of this property and the fact that much of the ground is found in low lying areas one could assume that there would be a number of water and wetland features. However, during the field inspection only one natural surface water feature was noted. This surface water feature consists of Harding Creek, a small creek located in the southeast portion of the property found in Section 6. Harding Creek originates just north of County Road 358 and flows slowly to the south from the property before joining with Phillips Creek and eventually emptying into the Menominee River. Within the Suchovsky property, Harding Creek is a small stream averaging roughly four to six feet in width. It has a relatively slow flow with a black mucky bottom. The landowner indicated that there is typically water flowing through this portion of the creek all year however during very dry summers it nearly dries up.

A second water feature found on the property consists of a small manmade wildlife scrape located in the central part of the ownership. This shallow scrape was developed as part of a wetland mitigation project between the Menominee County Road Commission and the Department of Environmental Quality. The landowner encouraged the development of this wetland scrape within his property to increase diversity and improve wildlife habitat. This manmade scrape typically holds water during the wet conditions of the spring and fall however it commonly dries up during the summer months.

It is important that any timber harvesting or other equipment operation on this property considers the potential impacts it may have on the quality of water flowing across the soil surface or into ground water reserves. Once contaminants such as soil particles, chemicals, fuel or lubricant enter water, they can be very difficult to remove. Soil eventually settles out of the water however it can then alter the bed of the lake or river in which it settles, thereby degrading habitat for aquatic insects and fish in larger streams. Manmade contaminants, especially pesticides, fuels and lubricants can have a more drastic impact, especially in larger quantities. These materials also do not settle out of the water. For these reasons it is important that loggers are instructed to use care when fueling, lubricating or conducting any other maintenance on their

machines. Furthermore it is important to consider surface water flow when installing skid trails, especially if any management occurs during the summer months.

Management activities that are implemented on this ownership should adhere to the guidelines found in the "Sustainable Soil and Water Quality Practices on Forest Land" manual, also known as Michigan's "Best Management Practices." This manual can be found on the Michigan DNR website at www.mi.gov/dnr. At the DNR home page, click on the "Forest, Land and Water" tab and then on "Land Management." In the drop-down list under "Land Management", click on "Soil & Water Quality Manual (BMP)."

Wildlife

Wildlife is very important to the landowner, especially non-game species such as songbirds. It is important that management on the property benefit wildlife and that habitat be maintained or improved whenever possible and practical. However, the landowner is also aware of the negative impact wildlife can have on a forest especially when the population of a certain species exceeds the traditional carrying capacity of the land. The wildlife species that is negatively impacting this property most dramatically is the white tailed deer. High deer populations have resulted in extensive deer browse which is having a dramatic negative impact on the natural regeneration of the forest. It is because of the deer browse issue that the landowner would like to avoid creating new habitat for deer where possible or practical. More detail pertaining to deer and their impacts on a forest can be found in the Forest Health section of this management plan.

Figure 2: Large cull sugar maple with a cavity that was likely created by woodpeckers.

There are a few passive things that can be done to benefit wildlife. The first is ensuring that some large dead or hollow trees are retained on the property following a timber harvest. Retaining large cull trees, which are live trees with little to no economic value, as well as standing dead "snags" in a forest provides quality habitat for many species of wildlife. These "wildlife trees," or "den trees," like the one pictured above, are low in timber value but they still provide a range of benefits to wildlife. Raptors use these trees as nesting locations, or to perch in and hunt from. Animals such as porcupines, bats, and owls use cavities in these trees as dens. Insect larvae feed on decaying wood and many are eaten by woodpeckers. Those insects that reach maturity are a source of food for songbirds, bats, reptiles and amphibians. Once the trees die and fall over, other animals use the down logs, known as coarse woody debris, for various purposes. Raccoons, foxes and numerous small mammals use down logs as dens. Grouse may use the logs as drumming logs during their mating season. Coarse woody debris retains moisture and provides a crucial refuge for salamanders and other amphibians during hot summer days.

When coarse woody debris has decayed to a point where it is no longer usable by most wildlife, it becomes a part of the soil. Snags and coarse woody debris can also harbor disease and insects that may grow to a large enough population to detrimentally affect the live trees on the property, however during the field inspection, no serious concerns were noted. Proper forest management must consider the balance of providing enough snags and coarse woody debris to retain the value of the property for wildlife without posing a threat to the health of the forest. The wildlife trees retained on the property should be carefully selected to ensure that they are not harboring any serious diseases or pests that may negatively impact the overall health of the forest. Generally speaking, larger wildlife trees are more beneficial because they take longer to decay and have the capacity to support larger wildlife.

Fields and other openings in the forest create edge habitat. Edge habitat occurs at the transition between two distinctly different cover types, most often the transition between forests and clearings. In addition to the herbaceous plants that provide a source of forage for many species, the trees growing along the edge of the forest form very dense crowns that extend low on the tree trunk. These dense, extensive crowns provide extra nesting habitat and produce high quantities of seed. Birds of prey, including bald eagles and hawks also take advantage of these open areas for the easy hunting these areas provide. The areas of this property where the farm fields meet the forest are examples of excellent edge habitat.

The following list provides a sampling of some of the wildlife that may be observed on and near the property.

The various forest types are used by migrating and non-migrating birds such as:

Black-capped Chickadee	Kingfishers	Warblers
Blue Jay	Nuthatches	Wild Turkeys
Flickers	Ruffed Grouse	Woodcock
Finches	Sparrows	Woodpeckers
Grosbeaks	Thrushes	Wrens

The northern white cedar, mature pine and mature hardwoods found on the property and in the area offer ideal perching, hunting and nesting opportunities for owls and other raptors such as:

Bald Eagle	Great Horned Owl	Red-Tailed Hawk
Barred Owl	Northern Goshawk	Rough-Legged Hawk
Broad-Winged Hawk	Red Shouldered Hawk	Saw-Whet Owl

The lowlands and stream found on the property offer good habitat for wildlife species that require large amounts of lowland brush and water to survive. Some of the animals that may be found in these areas of the property are:

Beaver	Frogs	Otter
Bitterns	Herons	Turtles
Fish	Muskrat	Various Waterfowl

There are many terrestrial animals that exist on the property. The vegetation provides a variety of food sources and rotten, hollow trees offer den opportunities. Some examples of the animals that benefit from the habitat of this property and the surrounding area are:

Black Bear	Mink	Salamander
Bobcat	Pine Marten	Snakes
Chipmunks	Porcupine	Toads
Coyote	Rabbit	Weasel
Fisher	Raccoon	White-tailed Deer
Fox	Red Squirrel	Wolf

Forest Health

Forest health is a broad term and may have different meanings to individual landowners as well as forest managers. In this section, specific information is given about threats to forest health and the resilience of the forests growing on this property. Special emphasis is given to pest problems in the form of both native and non-native insects and diseases (fungi, etc.) that are most relevant to this property and location.

The forests on this property are generally quite healthy, but there are some forest health concerns that must be addressed to assure a healthy future forest. Major forest health concerns that are currently impacting the forest on this property include **climate change**, **Pennsylvania sedge, eastern larch beetle** and **deer browse**. Other forest health issues of moderate concern that are impacting the forest included **white pine blister rust**, **white pine weevil**, **reed canary grass**, and **spruce budworm**. Forest health issues that have not been observed on the property but could have a future impact include **annosum root rot** and the **emerald ash borer**. All of these forest health issues will be discussed in further detail in this section of the management plan except for the impacts of climate change which will described in further detail in its own unique section of the plan.

Pennsylvania sedge is a native plant that typically grows in small dense tufts on the forest floor. Recently the presence of this sedge on high quality northern hardwood sites has drastically increased. This increase could be caused by a number of factors including intense forest harvests, deer browse, or earthworms altering soil conditions. The increased presence of Pennsylvania sedge is having a negative impact on the successful natural regeneration of northern hardwood forests. The dense mat that this sedge produces inhibits the successful establishment of seedlings and in some cases can kill young established tree regeneration as the sedge competes with the seedlings for water and nutrients. On this property Pennsylvania sedge is having a dramatic impact on the northern hardwood forests found in Section 6. Little research has been done regarding the control of Pennsylvania sedge however at this point it seems like herbicides such as Oust may be the best means of control. Other control methods include scarification and prescribed fire however both of these methods have very little impact on the abundance of the sedge.

Deer browse is another issue having a great impact on the success of natural regeneration in the northern hardwood forests found on this property. Deer populations on and around this property

are very high due to the good winter cover provided by the dense cedar swamps and the large amount of available food resulting from agricultural practices. During the winter, when the snow covers most agricultural sources of food, deer browse on the buds of many regenerating tree species including sugar maple, red maple, red oak, aspen, cedar, white pine, red pine and others. Usually one or two consecutive years of browse is not enough to kill a seedling however beyond that chances for seedling survival are greatly reduced. Heavy deer browse coupled with the presence of Pennsylvania sedge is resulting in very poor regeneration in the northern hardwood forest. Trees that are regenerating in the northern hardwood forests include less desirable species such as ironwood, beech, ash, leatherwood, and balsam fir. Due to the extremely high deer populations, hunting has not had a significant impact on reducing the deer herd enough to encourage successful regeneration.
The best means of discouraging deer herbivory is to establish a physical deterrent such as a fence. While establishing a large scale fence is an effective means of excluding deer from an area it is very costly and requires a lot of maintenance and therefore is not very practical. The future management in the northern hardwood forest type will likely require some form of artificial regeneration in which the planted seedlings are protected from browse by tree shelters or bud caps.

Another forest insect that has impacted this ownership is the **eastern larch beetle**. The eastern larch beetle is a native insect that occurs throughout the range of tamarack extending through much of Canada and the northeastern United States. The primary hosts for the eastern larch beetle include tamarack and other exotic larch species planted in the U.S. including Japanese and European larch. On this property there is a plantation of hybrid larch which is a cross between Japanese and European larch. It is possible that the hybrid larch planted on this ownership is susceptible to infestations of the eastern larch beetle. In fact, the landowner has observed some mortality within the larch plantation that is believed to have been caused by the eastern larch beetle. New host trees are infected by the adult beetle in the spring of the year. Once a host tree is selected the female attracts and selects a mate. The pair then constructs a vertical egg gallery in the phloem of the tree. The female will then lay up to 50 eggs per gallery. Trees typically show signs of infestation by the yellowing of the crown from the bottom up, starting in late July or early August. Sometimes this yellowing of the crown coincides with the normal fall color change and therefore can go undetected until the following spring when the tree fails to leaf out. Eastern larch beetles breed in storm damaged trees or those damaged by logging, and in slash piles consisting of large diameter wood. Therefore to reduce breeding sites, logging should be conducted in a manner in which damage to residual trees is minimized and all wood four inches in diameter and greater is merchandised and hauled from the site. Sufficient research on sivicultural practices to discourage eastern larch beetle outbreaks has not occurred and therefore the impacts of sivicultural practices are unknown at this time. More information on the eastern larch beetle can be found in the Appendix of this management plan.

One forest health issue having a moderate impact on the forest found on this property is **white pine blister rust**. White pine blister rust is non-native fungus that was introduced to the United States around 1900. Since then it has spread throughout the entire range of white pine. White pine blister rust is most prevalent in the northern latitudes where cool, damp conditions are common from August through September. Pruning can be an effective means of control in areas with a moderate infestation of white pine blister rust. It is recommended that all infected limbs

within roughly ten feet of the ground be pruned flush with the trunk of the tree. Additionally, limbs above ten feet from the ground that have an infection site within four to eighteen inches from the stem should also be pruned if accessible. Pruning infected limbs not only removes the infection site from the tree but it also opens the lower portions of the stand to air movement which can combat the cool, damp conditions that the blister rust fungus thrive in. For more information on white pine blister rust see the publication "How to Identify White Pine Blister Rust and Remove Cankers" found in the Appendix of this management plan.

The **white pine weevil** is a native insect found throughout the range of eastern white pine. The most common host trees for the white pine weevil include white pine, jack pine, and Norway spruce. The white pine weevil feeds on the leaders of host trees in both its larvae and adult stage. However, it is the larvae that have the greatest impact on the leader as the burrow downward feeding on the inner bark and cambium layer. Infected trees are not often killed by a white pine weevil infestation. However, growth rates and timber quality are drastically reduced by the death of the leader leading to crooks in the boles of infected trees. White pine weevils prefer open grown trees with full sunlit leaders. Therefore, growing white pine under partial shade can reduce the impacts of the white pine weevil. It is recommended that if possible, white pine should be grown under roughly 40 to 50 percent canopy cover to reduce the impacts of the weevil. Another sivicultural practice to lessen the impacts of the white pine weevil is to maintain high densities of young white pine. A minimum of 800 trees per acre will force rapid upward growth of white pine which reduces the diameter of the terminal leader making it less desirable for the white pine weevil. Furthermore, the fast upward growth caused by maintaining high stockings can help to straighten the laterals of affected trees. Growing young white pine at high densities also causes the mortality of lower branches thus creating airflow that helps to control the spread of white pine blister rust. More information on the white pine weevil can be found in the Appendix of this management plan.

Reed canary grass is a non-native invasive plant species that can have a drastic impact on the natural plant community. On this property it was noted in a small area in the northeast corner of the Section 11 ownership. Reed canary grass is typically found on a variety of wetland types. It commonly occurs after some sort of disturbance especially if bare soil is exposed and full sunlight is available. Once established, reed canary grass spreads vigorously and displaces native vegetation. Controlling or eradicating reed canary grass can be very difficult due to its ability to grow and spread rapidly. Information on control methods in included in the "Reed Canary Grass Management Guide" found in the Appendix of this plan.

The **spruce budworm** is another insect impacting the health of the forests on this property. While the impacts observed on this property are not dramatic, they should be monitored over the next few years. The spruce budworm is a native species of moth. As the name of this insect implies, the spruce budworm impacts the buds of spruce trees. Specifically, the spruce budworm lays its eggs on spruce trees, as well as on balsam fir. When the eggs hatch, a small caterpillar feeds on the buds and young growth of the tree. This limits the ability of the tree to produce energy, as well as effectively killing off entire branches by destroying the buds which are the source of a tree's new growth. Spruce budworm cannot kill a tree overnight however a serious infestation of the insects can kill a tree within a few growing seasons. Chemical and bacterial agents are available to treat infestations of budworm however these are typically not cost

effective for small landowners or properties with only a few acres of spruce and fir. Another way to minimize the impact of spruce budworm is to maintain a forest at healthy stocking levels. Trees that are growing too densely together can be at a higher risk of damage because they are already under stress caused by the growing conditions; additionally, populations of the budworm increase much faster when they have a lot of food. Maintaining proper stocking levels will also help the trees to continue to grow vigorously so that they are more capable of fighting off infestations of budworm and other insects or diseases. More information on spruce budworm can be found in the Appendix of this plan.

One forest health issue of concern that is not currently occurring on this property is **annosum root rot.** Annosum root rot has been observed just across the state line in Marinette County, Wisconsin. Annosum root rot can affect many species of trees however it is most commonly found in red pine and white pine plantations. Annosum root rot is caused by a fungus that enters trees through freshly cut stumps. Once the fungus infects a stump it spreads from tree to tree through root grafts. Live trees that are infected through root grafts die, creating pockets of mortality centered around the initial infection site. Once annosum enters a stand it is very difficult to stop its spread therefore prevention is very important. The best way to prevent annosum from entering a stand is to treat the stumps of harvested trees with a fungicide within one day of the tree being cut. The use of a fungicide will prevent new infections, but will not stop the spread of annosum if the stump is already infected. Fungicides including Sporax and Cellu-Treat have been proven effective in preventing the spread of annosum. More information on annosum root rot can be found in the Appendix of this management plan.

Another forest health issue not currently observed on this property but likely to have future impacts is the **emerald ash borer (EAB)**. Most of the ash trees found on this property are displaying poor productivity due to the excessively wet soils they are growing on. Therefore, the presence of EAB will likely not have a dramatic impact on timber production however it will impact overall forest health. This insect is native to Southeast Asia and it is believed to have entered the U.S. through shipping materials. All species of ash trees[1] are susceptible to EAB, and once infected, they can be killed by EAB in a matter of a few years. Ash trees in Lower Michigan are being decimated by EAB; in the Upper Peninsula EAB has been documented, however its impacts are minimal thus far.

Menominee County is currently not part of the quarantine area for EAB. Adult EAB are virtually harmless to trees, however the juvenile stage of the insect (larvae) feed on the living tissues of the tree just under the bark; this cuts off movement of water, nutrients and energy throughout the tree. Over a period of just a few years, the presence of these larvae will cause enough damage to completely kill the tree. Ash trees are found throughout this ownership, however they are not a significant proportion of the overall stocking. If EAB impacts this property, the space occupied by the ash trees will likely be taken over by wetland tree species, however some of the wetter sites occupied by black ash may convert to tag alder. Some EAB researchers recommend that the prescription for stands with a significant portion of merchantable

[1] Species of mountain ash, including American mountain ash and European mountain ash are not impacted by EAB as they are not “true” ash species.

white ash should be to reduce the basal area of just white ash to not more than 10 square feet of basal area per acre.

Additional information on EAB, as well as up-to-date quarantine information, can be found at www.michigan.gov/eab. An EAB factsheet is also included in the Appendix of this plan. The most effective thing a landowner can do to help slow the spread of EAB, as well as other insects and diseases, is to avoid moving firewood long distances.

The landowners should continue to monitor the property for non-native invasive plants. If the plant cannot be identified, a forester or botanist should be contacted to identify the plant, determine if it is native or non-native and make recommendations for its removal, if necessary. There are a number of invasive species that have been identified in the Upper Peninsula and these species are often spread when their seeds become attached to a hiker's boots or clothing and then fall off in another location. It is therefore important that the landowners remain observant, especially if they do any recreating off the property. Invasive species can alter the ground flora composition and even interfere with the regeneration of desirable tree species if they are able to enter an area and spread unchecked.

Based on the geographic location of the property and the ecosystems present there is not a high risk of wildfire. Therefore, it is not necessary to conduct specific forest management aimed at reducing the risk of wildfire. However, precautions should be taken to minimize the risk of accidental fires during dry periods when leaf litter and other organic material are extremely dry. Things to consider include parking vehicles with hot exhaust systems on clear areas and not in tall dry grass, the operation of small engines, and location of outdoor fires. The Michigan DNR provides daily assessments of fire danger throughout snow-free periods of the year. Fire danger can be viewed online by visiting http://tinyurl.com/as6b36j and clicking on the link "Daily Fire Danger - Fire Danger Rating" near the top of the page.

Climate Change

The Earth's climate has changed over the past century, and these changes are expected to continue. The following section is a quick summary of observed and projected climate change and impacts to forests (Janowiak et al. 2014; more information at www.forestadaptation.org). Specifically in northern Wisconsin and western Upper Michigan, some of the changes that have already been observed include:

- Annual temperature has increased by 1.4 °F over the past century
- Winter temperatures have increased by more than 2 °F over the past century
- Annual precipitation has increased by more than 2 inches, particularly in the spring and fall.
- Heavy rainfall events (3+ inches) have become much more frequent
- Lake ice break-up, leaf-out, and bird migration dates are shifting earlier into the spring
- Falling killing frosts are occurring later.

Climate change is projected to continue, although there will always be uncertainty in long-term projections. The best available science supports the idea that temperatures will increase across all seasons in northern Wisconsin and western Upper Michigan over the next century. Projected

change is on the order of 2 to 9 °F by the end of the century, with winters likely to continue warming faster than other seasons. Precipitation is projected to increase up to 1 inch during winter and about 1 to 3 inches in spring by the year 2100. The greatest uncertainty exists for summer precipitation, with slight increases or large decreases possible. There may be greater moisture stress in summer and fall, because higher temperatures will lead to greater water loss from evaporation and transpiration.

Climate change will not affect all forest species, communities, and parts of the landscape in the same way. Additional stress will amplify some threats that forests already face, such as insect pests and diseases. Generally, boreal tree species are expected to decline and temperate or southern species are expected to be favored; see species tables found in the Appendix of this plan. Species and forest types that are more tolerant of disturbances may have less risk from climate change, and forests with greater diversity (species, genetic, and structural diversity) may also have less risk.
Confronting the challenge of climate change presents opportunities for forest managers and landowners to plan ahead, assess risk, and ensure that the benefits forests provide are sustained into the future. Landowners will naturally have unique goals for their woods, and different opportunities and constraints for how they might respond to climate change risk. These factors will help determine the most appropriate actions to prepare for climate change. Different adaptation actions can be used to resist change, boost resilience, or encourage change. Choosing a range of actions may be appropriate for many landowners, depending on their values and site-specific risks or opportunities. This plan made use of an "Adaptation Workbook" that has been produced to help forest managers and landowners incorporate climate change considerations into forest management (www.forestadaptation.org/far).

Included in the Appendix of this management plan are two lists detailing the climate change projections for individual tree species. Each list details a different climate change scenario, one with less change occurring, the other with greater climate change occurring. These lists were used to aid the development of the sivicultural prescriptions pertaining to the different forest types found on this ownership, which will be discussed in detail later in this plan.

Rare, Endangered and Threatened Species

During the property inspection, no threatened or endangered plant or animal species were noted. However one endangered species and two species of special concern have been observed during previous property inspections by the landowner and other researchers. The endangered species observed in the past is the Henslow's sparrow (*Ammodramus henslowii*). The Henslow's sparrow is a small grassland bird that can be found throughout the upper mid west and along the Atlantic coast. Traditionally this sparrow thrived in tall grass prairies, lowland prairies and marshes. This species has shown steep declines in population due primarily to changes in land use and new agricultural practices that have resulted in more row crops and less hay fields and pastures. Additionally, the encroachment of woody plants in old fallow farm fields deteriorates the quality of the habitat for the sparrow. Habitat for the Henslow's sparrow can be maintained through three practices; prescribed burning, mowing, and grazing. Implementing these practices helps to reduce or eliminate the encroachment of woody plants. However, some precautions must be taken before any of these practices are implemented. When conducting a prescribed

burn or mowing care should be taken to ensure that the nesting season for the sparrow has been completed. Typically, this sparrow concludes its nesting season in late August after raising two broods. If grazing is going to be used to discourage woody vegetation monitoring must occur to ensure an area is not over grazed resulting in a loose of adequate amounts of tall grassy vegetation. More information on the Henslow's sparrow can be found in the Appendix of this management plan.

A species of special concern that has been observed on the property is the northern goshawk (*Accipiter gentilis*). The goshawk prefers large tracts of forest with diverse vertical structure including an intermediate amount of canopy closure, small openings, and an open understory. Goshawks are commonly found in various forest types ranging from hardwoods to conifers as long as the suitable vertical structure is present. Goshawks lay their eggs in late March or April. The eggs hatch in May and the young fledge from mid-June to mid-July. Goshawks are very territorial around their nests. The primary threat to goshawk populations is degradation or loss of habitat. Management activities that maintain a moderate canopy closure, preserve large tracts of forest, and maintain large hardwood trees for nesting sites will help preserve suitable habitat for the goshawk. More information on the northern goshawk can be found in the Appendix of this management plan.

A search of the Michigan Natural Features Inventory (MNFI) indicates that the bald eagle, a species of special concern, may make use of this property. Additionally, the landowner has also observed this species on the property. The bald eagle (*Haliaeetus leucocephalus*) gained national attention as its populations reached very low levels in the second half of the 1900's. It was discovered that agricultural pesticides had entered the food chain and were causing eagle egg shells to become very brittle, leading to nesting failures. Degradation and loss of habitat further contributed to population declines. Restoring this national symbol became a major concern and changes in pesticide use along with management geared at increasing eagle populations have brought the bald eagle back from its lowest populations. The open fields and proximity of the property to open water may be suitable for eagles to hunt in. Bald eagles have been observed on this property, however no nests have been discovered. If a nest is found management should be altered to ensure that the tree which contains the nest remains intact. This generally requires maintaining a group of trees to prevent windthrow.

It is possible that other threatened or endangered species may use the property. If any such species are encountered on the property, it may be necessary to alter the management prescribed in this plan. The changes will depend on the type of species found, and the degree to which they make use of the property. More information about the MNFI is available online at www.http://mnfi.anr.msu.edu/

Soils

The word "soil" is defined as "the product of the *parent material*, influenced by *climate* and *biota*, in a *landform*, over *time*." Each of the five terms listed in italics exerts a specific influence over how a soil forms. These five factors interact in diverse ways resulting in the broad diversity of soils found across the planet, and even on one particular parcel of land. Each factor influencing soil formation is briefly described below.

Parent Material: Parent material is the source of the mineral components of soil. It is typically unweathered rock but can also be recently deposited beach sand, or rocks and gravel deposited by glaciers. Parent material provides the majority of the nutrients used by plants; it also plays a major role in the soil texture.

Climate: The climate relates to temperatures, rainfall, wind and other weather phenomena that work to erode the parent material and make it more usable for plant growth. Climate also impacts the types of plants and animals that use soil in an area, which directly impact soil formation.

Biota: Biota are the particular groups of plants and animals that occupy an area. Plants impact soil formation by using particular nutrients, and root growth causes fractures in rock to expand and eventually split. Animals can impact soil formation by mixing and aeration. Insects and earthworms often have a more significant impact on soil formation than larger wildlife like deer and moose.

Landform: Landform affects how soil accumulates and how parent material erodes. Little if any soil will form on steep rock outcrops, while a great deal of sediment and organic matter can gather in low-lying areas, forming soils that are often very high in nutrients, but which may also contain excess amounts of water.

Time: Time is crucial to the development of soils. The longer a soil is allowed to develop, the stronger the impacts of the other four factors can become. A soil that has existed for thousands or tens of thousands of years may have a finer texture and more nutrients available for plant growth than a soil that began to form a few hundred years ago.

Soil maps are labeled with **mapping unit symbols.** A mapping unit symbol is a number and letter combination that refers to a unique soil type, found across the landscape on a particular slope class. The number indicates a unique soil series, determined by factors such as texture, color, moisture and acidity. The letter in the mapping unit symbol corresponds to the slope of the soil. An area listed as "A" slope is generally flat or very gently sloping, while an area listed as "F" slope is extremely steep. The letters from B to E indicate intervals along the gradient from mostly flat to extremely steep. These areas are mapped separately and given unique mapping unit symbols to allow considerations to be made for the slopes. In forest management, the slope of a soil can impact the ability to safely conduct timber harvesting in an area, as well as increasing the potential for erosion following a timber harvest. Soil descriptions also provide information about drainage characteristics and available water capacity.

Drainage is a measure of how rapidly excess water moves through the soil and can range from excessively drained to very poorly drained. If a soil is poorly drained, excess water is retained for a longer period of time; this can result in stagnant conditions where oxygen, necessary for root growth, is limited. Available water capacity is essentially a measure of the water available for plant growth after all excess water has drained out following a precipitation event. It can be visualized by considering the soil as a sponge, which has become saturated in a bowl of water. When the sponge is removed from the bowl, excess water drains out. At a certain point, no more water drips out of the sponge, however it is still possible to extract water from the sponge by wringing it out. The water that can be wrung out of the sponge may be thought of as its available water capacity. Moderate available water capacity is usually tolerable for the growth of most upland trees and other forest plants except during times of extreme droughts. During droughts, trees and other plants are often unable to obtain adequate amounts of water for proper growth; it is during these times that they can be at an increased risk of attack by insects and diseases. Maintaining at least partial forest cover and preventing soil compaction can help to preserve a soil's ability to retain water, thereby protecting against unnecessary drought stresses. Keeping partial forest cover helps to keep the soil cooler, which limits evaporation; preventing compaction maintains the structure of the small spaces between soil particles, which are crucial in the retention of water. Available water capacity ranges from very low to very high; a soil with very low available water capacity can limit plant growth by causing moisture stress, making plants more susceptible to insect damage or disease.

Several of the mapping units identified on this property consist of more than one unique soil type; these areas are known as **complexes**. A soil complex consists of two or more distinctive soil types that are arranged across the landscape in a fashion that made it difficult to map them separately when the original soil surveys were conducted. When a soil complex is named, the first soil listed in the name is the most common and the second soil listed is the second most common. There are often other soils that are not identified in the name; these are listed in the soil description as "minor components." A minor component is any soil that makes up less than ten percent of the area of a mapping unit. The varying soil types that comprise a soil complex may have differing impacts on plant growth and forest management; where these differences exist they will be noted.

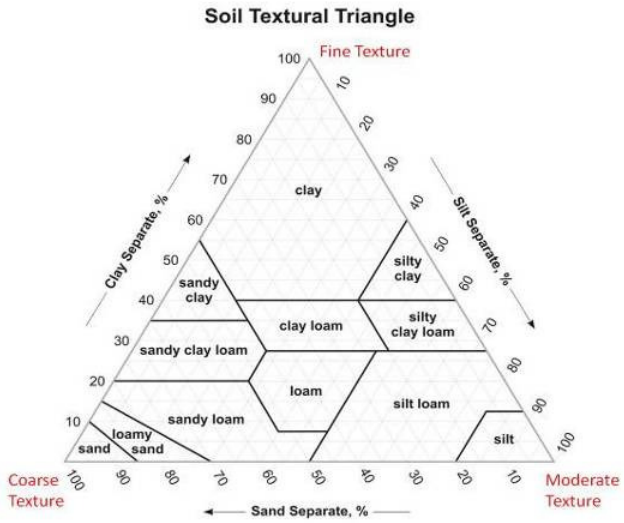

Figure 3: USDA Soil Textural Triangle.
Source: http://soils.usda.gov/education/ resources/lessons/texture/textural_tri_hi.jpg

Figure 3 shows the chart used to determine the specific texture of a soil, with modifiers such as "fine" reflecting the specific size of particles within the soil. The texture of a soil is one of its most important characteristics for a number of reasons.

Texture impacts how rapidly water moves downward through the soil, the amount of water held in the soil following precipitation and the length of time for which it is held there, the availability of nutrients and the stability of trees in high winds, as well as many other characteristics. The three primary soil textures are sand, silt and clay, with sand being the coarsest and clay being the finest. The size of soil particles impacts how closely together they occupy the space of the soil. Smaller soil particles are able to pack together more tightly. The tightly packed soil particles of a silt or clay give it a higher surface area per unit of mass than a comparable volume of sand. This extra surface area means that silt and clay are able to retain more water than sand. Nutrients needed for plant growth are dissolved in the water that occupies this space in the soil. On the other end of the spectrum, when a soil becomes packed too densely together, for instance after being compacted by improper logging operations, its ability to retain small pockets of oxygen in the pore spaces between soil particles is decreased. This limits root growth because roots require oxygen to conduct respiration. Sandy soils are less susceptible to compaction than clays or silts.

The soils we see today have formed over the span of approximately 10,000 years since the last glaciers retreated from what is now Upper Michigan. Following the retreat of the glaciers, upland areas consisted of little more than exposed bedrock, deposits of sand, rock and gravel, and scattered large boulders. Many low-lying areas consisted of small lakes and ponds. Over time this material has been weathered down both physically and chemically into varying soil types, and material has been eroded by wind and water to fill some low-lying areas. Other low-lying areas have undergone the process of wetland soil development.

According to Web Soil Survey, a service of the Natural Resource Conservation Service (NRCS) there are ten unique soil types found across this property. The soils found on this property are:

u	10B:	Onaway fine sandy loam, three to nine percent slopes
u	10D:	Onaway fine sandy loam, 12 to 35 percent slopes
u	12B:	Nadeau fine sandy loam, three to 12 percent slopes
l	14:	Minocqua-Tawas complex
l	16:	Ensley mucky silt loam
l	17:	Cathro-Ensley complex
l	18:	Lupton-Cathro association
u	20A:	Solona loam, zero to three percent slopes
u	30B:	Cunard-Onaway find sandy loams, zero to six percent slopes
u	52B:	Onaway-Nadeau fine sandy loams, three to 12 percent slopes

The distribution of these soil types can be seen on the Soils Map, which is included in Section I of this plan.

Of the soils listed above six are considered upland as indicated by the small “u” before the soil code and name. These upland soils consist primarily of loam and sandy loam particles making them very good for agriculture, timber growth, and logging. Of the upland soils present all are well drained with the exception of 20A. The well drained characteristic of these soils makes them very suitable to support the growth of a variety of different tree species. Areas of the upland soils where the soil nutrient levels are rich are supporting the growth of the high quality northern hardwoods found on the property. Areas with slightly less nutrient and water

availability typically support the growth of aspen and mixed pine. The well drained characteristic of these soils also make them very suitable for logging. Since they drain well water does saturate these soils for long periods of time following a precipitation event. Therefore, these soils are typically very stable during the summer months and thus able to support the use of heavy logging and farming equipment with only a minimal risk of rutting and compaction.

The remaining four soils found on this property are considered lowland soils as indicated by the small "l" before the soil code and name. These lowland soils are typically saturated with water throughout most of the year thus making them very susceptible to rutting and compaction. Therefore these lowland soils should only be operated on with heavy logging equipment during the winter when the ground is frozen and the risk of rutting and compaction is minimized. The wet lowland soils found on this property are not suited to any sort of agricultural use however they can be productive from a timber standpoint. These soils are typically supporting a mixture of cedar, balsam fir, black spruce tamarack, black ash, red maple and yellow birch. In some portions of the property these lowland soils are so saturated with water they are inhibiting root development and therefore tree growth. In these areas the trees present have a very stunted look and are displaying very poor growth rates.

Detailed technical information about each soil type on this property is included in the Appendix of this forest management plan. More information on the soil types found on this property may be obtained on the Natural Resources Conservation Service (NRCS) web site at: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx or by contacting the NRCS Stephenson, Michigan office at (906) 753-6921.

Trails / Roads

The majority of this property is readily accessible from County Road 577, County Road 358, and Olsen Road. From the three county roads mentioned above the landowner has developed a number of woods roads that provide access to the entire property. These woods roads typically dissect the upland areas and therefore are suitable for use throughout the entire year. Access to the lowland areas of the property is achieved through the use of the adjacent roads in the upland areas or by crossing adjacent farm fields. The toughest portion of this property to access is that area found in Section 11. No county roads border this parcel however the landowner does have legal access to this parcel by crossing his own ownership in Section 1 and a small portion of an adjacent ownership found in Section 2. Once across the adjacent ownership an old railroad right-of-way provides access to the entire parcel.

SECTION III- VEGETATION AND MANAGEMENT RECOMMENDATIONS

VEGETATION

Methods

During December of 2013 and March of 2014, a field inspection was conducted on this property. Prior to this visit, preliminary stand lines were delineated on an aerial photograph of the property. These lines were also loaded onto a field GPS receiver to allow the forester to navigate throughout the property and visit each stand. Within each stand, basic observations were made. These observations include:

- Tree Species Composition
- Tree Quality and Health
- Tree Size Class (Qualitative)
- Tree Stocking (Basal Area)
- Regeneration Stocking
- Logging History and Future Potential
- Ground Vegetation and Exotic Species
- Soil Conditions
- Wildlife and Endangered Species

In addition to making these observations, the forester verified the preliminary stand lines and corrected them where necessary. These stand lines are then used to determine stand acreage. Within each stand, a timber type and habitat type are identified. Timber types are determined by examining the tree species composition, size class and stocking density of the forest within each unique stand. Habitat types are determined by examining the soils, topography, tree species, and ground flora found within the stand. Knowledge of habitat types is useful to estimate tree productivity and determine potential equipment limitations of a forest stand. This information is then used to develop the management recommendations set forth later in this section.

For the purpose of categorizing different vegetation size classes in the stand descriptions below, trees are divided into overstory, understory and regeneration size classes. The overstory tree size class is any tree five inches or greater in diameter at breast height (DBH). DBH is measured at four and one-half feet up from the soil surface. The understory tree size class is any tree two to five inches in DBH. Additionally, the regeneration size class is any tree one inch tall up to two inches in DBH.

All of the individual forest stands found on this property can be seen on the Timber Type Map included in Section I. The management recommendations that correspond to these stands are discussed later in this section.

Habitat Types

The system of habitat typing has been developed as an aid to forest management decision making. It is based on the observation that forest plants, both trees and herbaceous vegetation, grow in relatively consistent associated groups. An understanding of these groups and how they progress over time is crucial to being able to conduct forest management that cooperates with natural processes. Doing so greatly increases the effectiveness of particular management strategies and minimizes the need for inputs such as site preparation and planting. Awareness of habitat types on a particular site also provides insights into the potential productivity of certain tree species and the likely outcomes of particular management strategies. Habitat types are named after three or four significant indicator plants, one or two of which are typically trees. The frequency of numerous other plants determines the actual habitat type. A brief description of the habitat types found on this property and the associated understory plants, are listed below:

***Acer saccharum – Tsuga canadensis / Maianthemum canadensis* – (Sugar Maple – Hemlock/Wild lily-of-the-valley) ATM:** The ATM habitat type is a widely distributed habitat type commonly found on moderately to well drained sandy loam soils. On this property this habitat type is found in the stands typed as northern hardwoods. This habitat type typically supports the growth of a variety of upland hardwood tree species, most prevalent being sugar maple and aspen. In stands with a relatively open canopy the shrub layer is commonly well developed, consisting of beaked hazelnut, alternate-leaved dogwood, American fly honeysuckle and bush honeysuckle. Common understory vegetation found on the ATM habitat type include the following:

Large-leaved aster	Wild Sarsaparilla	Wild Lily-of-the-Valley
Bracken Fern	Club Moss	Shield Fern
Lady Fern	Starflower	Yellow Beadlily

***Pinus strobus-Acer rubrum/Vaccinium angustifolium* [Wisconsin variant] – (White pine-Red maple/Blueberry) PArV[w]:** The PArv[w] habitat type is commonly found across the western Upper Peninsula. On this ownership the PArV[w] habitat type is associated with the stands dominated by aspen found in the southwest portion of the property. The PArV[w] habitat type is commonly found on excessively drained sandy and loamy sand soil types. The forests on this habitat type are commonly dominated by pine and aspen with red oak and red maple as common associates. Common ground flora species associated with this habitat type include the following:

Bracken Fern	Wintergreen	Wild Lily-of-the-Valley
Large-leaved Aster	Starflower	

***Pinus strobus-Acer tubrum/Vaccinium angustifolium* (White Pine-Red maple/Blueberry) ParV:** The PArV habitat type is very similar to the PArV[w] habitat type described above. The main difference is the PArV habiat type is slightly drier and has less available nutrients. Due to the drier, nutrient poor conditions this habitat type commonly supports the growth of pines and rarely stands of aspen. On this property the PArV habitat type is associated with the pine and larch dominated stands. Common shrubs found on this habitat type include blueberry, pine

seedlings, and balsam fir seedlings. Ground flora species commonly associated with this habitat type include the following:

Bracken Fern	Wintergreen	Wild Lily-of-the-Valley
Trailing Arbutus	Cow Wheat	Grass/Sedges

***Acer saccharum/Vaccinium angustifolium-Viburnum acerifolium* – (Sugar maple/Blueberry-Maple-leaved viburnum) AVVb:** On this property the AVVb habitat type is found supporting the growth of the forest stands dominated by balsam fir and white spruce. This habitat type is relatively dry with average nutrient availability. It is typically dominated by one of the following; red oak, red maple, white birch, or aspen. Balsam fir and white spruce are common associates. The shrub layer on this habitat type is typically well represented and comprised of beaked hazelnut and maple-leaved viburnum. The ground flora species most commonly associated with the AVVb habitat type include the following:

Bracken Fern	Large-leaved Aster	Wintergreen
Starflower	Wood anemone	Wild Sarsaparilla
Sessile-leaved Bellwort	Partridgeberry	Wild Lily-of-the-valley

***Thusga canadensis-Thuja Canadensis/Sphagnum* – (Helock-Cedar/Sphagnum) TTS:** The TTS habitat type is a lowland type that is commonly found on mucky soils with excessive soil moisture. This habitat type is marginally productive from a timber standpoint due to the high soil moisture and low available nutrients associated with it. On this property the TTS habitat type is associated with the lowland hardwood and cedar forest types. Common tree species associated with the TTS habitat type include hemlock, cedar, balsam fir, black spruce and tamarack. The ground flora of this habitat type is dominated by sphagnum moss which often times will create a dense mat. Common ground flora species associated with this habitat type include the following:

Sphagnum Moss	Goldthread	Bunchberry
Starflower	Sedges	Blueberry

***Picea mariana/Osmunda cinnamomea* - (Black Spruce/Cinnamon Fern) PO:** The PO habitat type is a lowland type that is considered poorly productive from a timber standpoint. This habitat type is found on excessively wet soils with poor nutrient availability. On this property the PO habitat type is associated with the swamp conifer stands. Tree species commonly found on the PO habitat type include black spruce, tamarack, cedar and white pine. The majority of the trees found on this habitat type display a stunted look due to the high soil moisture and low nutrient availability. Common ground flora species associated with the PO habitat type include the following:

Cinnamon Fern	Sphagnum Moss	Sedges
Starflower	Goldthread	Bunchberry

***Fraxinus nigra/Eupatorium perfoliatum* - (Black ash/Boneset) FE:** On this property the FE habitat type is associated with the small lowland hardwood stand located in the southwest portion of the property. The FE habitat type is commonly found on soils with impeded surface drainage. This habitat type is generally poor quality from a timber standpoint and overharvesting can result in areas converting from forest to tag alder. Common ground flora species associated with the FE habitat type include the following:

Mints	Tag Alder	Sedges
Dewberry	Shield Fern	Jewelweed

MANAGEMENT RECOMMENDATIONS

Proper land management must take many factors into account such as past land use, current land use, desired land use, conditions of the land and the potential of the land. Because nature does not consider property lines, land management must consider the landscape as a whole (landscape management). The options recommended in this plan consider the parcel of land being discussed and how it fits into the surrounding landscape. Management of this parcel is designed to benefit the land being managed, without negatively impacting the adjacent and surrounding natural ecosystems.

Recommended dates for forest management provided later in this plan are the dates in which we recommend initiating the implementation of the forest management practice prescribed by contacting your consulting forester. These dates are determined by considering the current conditions of the forest and its anticipated growth rates. However timber markets, weather conditions and many other factors may impact the date in which a timber harvest actually occurs. It is important to note that in many cases, the time frame from when a landowner contacts a consulting forester until the time when the first tree is cut is often one to two years due to the time it takes to schedule and implement the timber harvest layout, conduct any prescribed timber marking and sign a contract with a logger. Additionally, once a contract is signed with a logger it will take them time to mobilize their harvesting equipment and begin the cutting. In most situations, a time frame of approximately three years is considered acceptable for the implementation of any recommended practice.

Pre-Treatment Activity
Prior to the implementation of any treatment, the following details should be considered:

- Property boundaries should be checked or established if needed. This should be done either by or with the aid of a knowledgeable professional.

- Roads should be properly established or at least marked. This should be done either by or with the aid of a knowledgeable professional. If any roadwork near drainages or wet areas is required, the Department of Environmental Quality (DEQ) should be contacted at (906) 346-8300. The condition of roads should be documented, preferably with photographs, so that there is recourse if the roads are left in unacceptable condition following the completion of logging.

- Prescription implementation should be conducted either by or with the aid of a knowledgeable professional. If the prescription involves timber management, an experienced consulting forester should be involved.

- If treatment is implemented and income tax assistance is needed, Jim Burns with Burns Forestry Consultants (906) 364-3238 or Susan Metcalfe with Metcalfe Forestry (989) 348-3596 can be contacted. More tax information can be seen in the Appendix of this plan.

The following sections will describe the characteristics of each unique forest type found on this ownership and the management recommendations that go along with them. Within each forest type are a number of forest stands that are separated based on the size and density of the trees present. These stands are delineated and numbered on the Stand Map found in Section I of this management plan. For each forest type the corresponding stand numbers will be provided in the header of the description.

Some individual stands within this property do not have any recommended harvest practices during the 20 year scope of this plan. Furthermore, other areas, most of which are currently non-productive, are designated as reserve areas in which the management recommendation is "no active management". These areas should continue to be monitored along with the rest of the property. If changes in forest composition or timber markets create a situation in which some of these areas become operable they should be considered for future management.

A list of dominant and co-dominant tree species will be provided in the description of each forest type present on this ownership. The tree species in each list will be noted as to whether or not they are predicted to show declines, little change, or increase due to the impacts of climate change. Species in which the models predict declines will be identified with a (-) following the species name, species that are predicted to show little change will be identified with a (=) and those that are predicted to increase will be identified with a (+). Trees in which there is a disagreement among models as to how they will be affected by climate change are identified with a (?). Species that were not studied and therefore no data exists for will be identified with a (U) for unknown. A copy of the list used to determine a tree species vulnerability to climate change can be found in the Appendix of this plan.

Forest Type:	**M (Northern Hardwoods)**
Acres:	**65.6**
Stands Included:	**1, 2, and 3**
Tree Quality and Potential:	**Average Quality with Average Potential**
Site Index:	**65 Feet Tall at Age 50**
Site Index Species:	**Sugar Maple**
Habitat Type:	**ATM**
Management Objective:	**Improve health, quality and productivity and maintain as a productive forest for the long term**
Treatment Year:	**See Activities Map**
Prescribed Management:	**Individual Tree Selection (ITS)**
NRCS Practice Name:	**Forest Stand Improvement**
NRCS Practice Code:	**666**

Stand Description:
The northern hardwood forest type found on this ownership is dispersed across three separate stands. All of these stands have been influenced by forest management in the past 10 to 15 years. This past management has been aimed at improving the quality and productivity of the forest and given the quality of the current forest these goals have been meet. The hardwood forest type found on this ownership does have some slight variation from stand to stand. Stand 1 is a very typical northern hardwood stand dominated by sugar maple with very few conifers present. Stand 2 is also dominated by sugar maple however it is displaying a more significant conifer component of hemlock and white pine. The variation unique to Stand 3 is the presence of red oak. Dominant and co-dominate tree species found throughout the northern hardwood forest type are listed below:

Dominant		**Co-Dominant**	
Sugar Maple (-)	Red Maple (?)	Basswood (+)	Red Oak (=)
		Beech (+)	White Ash (+)
		Hemlock (?)	White Pine (-)

The timber quality throughout the northern hardwood forest type is good to excellent with Stands 1 and 2 displaying very high quality sugar maple. Stand 3 is also displaying overall good quality however it is growing on a somewhat drier site than Stands 1 and 2 and therefore the sugar maple quality is slightly lower with very high quality red oak present.

The majority of the trees found in the northern hardwood forest type are in the poletimber size class ranging from five to ten inches in diameter at breast height (DBH).

Figure 4: Northern hardwood forest found on the property.

However, there is also a good representation of trees in the small sawlog size class ranging from 12 to 16 inches in DBH. The density of the quality trees in the poletimber size class indicated that this forest type has the potential to produce high quality sawtimber if managed properly.

The regeneration layer of the northern hardwood forest type is sparse due to deer browse and Pennsylvania sedge. The impacts of deer browse and Pennsylvania sedge are discussed in detail in the forest health section of this management plan. Currently the only species that were noted to be regenerating in the northern hardwood forest type are white ash and moosewood. The white ash seedlings present are very sparse and cannot be counted on to regenerate the forest.

Recommended Management:
The northern hardwood forest type should be managed as a working forest in order to improve forest health, quality and productivity while generating some revenue for the landowner. It is recommended that the northern hardwood forest types undergo an individual tree selection harvest once they reach a basal area ranging from 110 to 130 square feet per acre. Individual tree selection harvests in northern hardwoods help to accelerate the natural process of thinning, freeing up space for the most desirable trees in the stand and generating revenue for the landowner. Thinning hardwood stands also helps to create conditions more conducive to the establishment and growth of regeneration, thereby ensuring continued growth of the forest into the future. Foregoing timber harvests eventually leads to natural mortality of trees as they compete for space and other limited resources. Trees to be harvested should be designated by a forester adhering to the following order of removals:

1. Risk - Cut high risk trees that are likely to die or significantly decline in product grade between harvests. This includes diseased trees and those with tight “V” shaped forks that have a high risk of splitting and large trees with significant economic value that are at risk of declining in value in the next 15 years.
2. Release crop trees - Cut poorer quality competitors to provide crown growing space around 40-60 crop trees per acre in order to promote growth and quality development. Apply two-sided release in sawtimber sized trees and full release in pole and sapling sized trees.
3. Vigor - Cut low vigor trees, based on crown size and condition, crown class, and potential stem decay.
4. Stem form and quality - Cut poorly formed stems, based on usable log length and potential decay.
5. Undesirable species - Cut tree species that interfere with management objectives of landowner and species that interfere with growth of more desired species.
6. Improve Spacing - Create more uniform spacing between the healthiest trees to distribute growth more evenly throughout the stand.

Using an order of removals helps to ensure uniform tree selection throughout the stand. This will help the stand continue to grow in a relatively predictable fashion while providing a range of other benefits, including wildlife habitat, water quality preservation and carbon sequestration. Following the timber harvest, the average basal area of the northern hardwood forest type should be approximately 80 to 90 square feet per acre. This stocking level allows adequate amounts of sunlight to reach the forest floor to stimulate the growth of regeneration, and recruitment of

established regeneration into the poletimber size class. This stocking level also maintains enough overstory trees to prevent windthrow and loss of large limbs. The shade cast by the residual overstory will also help to limit the growth of brush that can outcompete regeneration of desirable tree species. All hemlocks, white pines, and red oaks present should be retained for diversity. Large snags and cull trees should also be retained, unless they appear to be harboring some significant insect or disease problem. The benefits of snags and culls are detailed in the wildlife section of this Forest Management Plan.

The installation of canopy gaps should be considered in addition to the individual tree selection harvest described above. Canopy gaps are used to help diversify forest structure by encouraging a new age class of regeneration. Canopy gaps within the northern hardwood forest type should be installed at a rate of one per every five to ten acres. These gaps should range from one-half to one acre in size and be placed in areas where the potential for natural regeneration is the greatest. If successful regeneration does occur within the canopy gaps the individual tree seedlings should be protected from deer browse by installing tree shelters around them or by using bud caps. The use of canopy gaps should be stressed in Stand 3 where the quality of the sugar maples is average to poor and the potential to regenerate red oak is the highest.

The management described above should be repeated every 10 to 15 years for the next two to three harvest entries. After two to three entries there will likely not be enough stocking to continue thinning this forest type due to the lack of regeneration that it is currently experiencing. Therefore, in roughly 20 to 40 years an alternate means of regenerating the forest will have to be explored. When it is determined that the forest can no longer support itself through natural regeneration the canopy should be removed and the site replanted. Tree species to consider planning include red maple, white oak, black cherry, red oak, and walnut. All of these species are expected increase in numbers given the predictions of the climate change models. Prior to planting it may be necessary to attempt to control the Pennsylvania sedge problem by implementing the methods described in the forest health section of this management plan. Once the planting is complete it will likely be necessary to protect the seedlings from deer browse by installing either tree shelters or bud caps. Prior to the planting the site conditions should be re-evaluated to ensure the recommended species to plant are still suitable or have become suitable to the site.

The upland soils found in the northern hardwood forest type should only be operated on with heavy logging equipment during dry periods of the summer and fall or during the winter. If harvesting occurs during summer or fall, care should be taken to keep soil rutting and compaction to an absolute minimum. Prior to the commencement of harvesting, access points for equipment and log trucks will need to be identified. Any new roads or skid trails constructed in the stand should be excluded from areas where hardwood regeneration is well established.

Forest Type:	**A (Aspen)**
Acres:	**174.7**
Stands Included:	**4 and 5**
Tree Quality and Potential:	**Average Quality with Average Potential**
Site Index:	**67 Feet Tall at Age 50**
Site Index Species:	**Quaking Aspen**
Habitat Type:	**PArV[w]**
Management Objective:	**Promote forest health and productivity**
Treatment Year:	**See Activities Map**
Prescribed Management:	**Modified Clearcut**
NRCS Practice Name:	**Early Successional Habitat Development/Management**
NRCS Practice Code:	**647**

Stand Description:
The vast majority of the aspen forest type is located in the southwest portion of Section 1 and throughout most of the ownership in Section 11. These areas are generally flat with somewhat dry sandy soils. Tree species that were noted during the field inspection include the following:

Dominant	**Co-Dominant**	
Quaking Aspen (-)	Big Toothed Aspen (?)	White Spruce (-)
	Balsam Fir (-)	Red Oak (=)
	White Pine (-)	Red Maple (?)

Of these species quaking aspen is by far the most common. Big toothed aspen is also somewhat common but only found in small localized patches. These two species of aspen are found almost exclusively in the sapling size class ranging from one to four inches in DBH. Also regenerating with the aspen are scattered white spruce, balsam fir, red oak, white pine, and red maple. The overstory of this forest type is very sparse, the result of a clearcut timber harvest that took place roughly 15 years ago. The only trees currently found in the overstory of this stand consist of scattered red oak, white pine and to a lesser extent red maple. One white oak was noted in the overstory of the stand during the field inspection.


Figure 5: White oak tree found in the aspen forest type.

The vast majority of the regenerating aspen trees found in this forest type are health and vigorously growing. However, in small localized areas the aspen regeneration is somewhat sparse and has a stunted appearance. These stunted areas seem to be concentrated in areas that likely received a lot of past human influence, such as the area along the railroad grade in Section 11. The cause of these stunted areas is uncertain, however it likely has to do with human impacts on soil quality such as compaction or intense fires resulting in the loss of soil nutrients.

Recommended Management:
The management objective for the aspen forest type is to diversify age classes and help mitigate the impacts of climate change. To meet this objective the aspen forest type should be treated with a three stage modified clearcut. In each phase of the modified clearcut roughly one-third of the overall forest type acreage should be harvested. The first harvest should occur in 2030 when the aspen is roughly 30 years old, the second harvest should occur in 2040 and the final harvest in 2050. Each harvest entry should be split into roughly three to five separate cutting units to further diversify forest structure and create more desirable habitat for wildlife. When planning the location of the initial cutting units it will be important to ensure that future harvest areas will be accessible without a significant amount of roadwork or damage to adjacent regeneration.

When harvesting each cutting unit the goal is to naturally regenerate the forest and increase the amount of food and cover available to wildlife, especially species such as grouse and woodcock. To meet this goal all cutting units should be treated with a modified clearcut when they are scheduled for harvest. The harvest will focus on cutting all trees two inches in DBH and larger with a few exceptions. All white pine, red pine and any oak trees that might be present should be retained for diversity and wildlife use. Furthermore, roughly one to two reserve areas per cutting unit should be delineated. The reserve areas should be roughly one-half acre in size. There should be no timber harvested within the reserve areas. These areas will provide diversity to the forest and be utilized by many species of wildlife for the cover they offer. Harvesting the aspen forest type in this fashion will open the canopy and allow full sunlight to reach the forest floor thus promoting the harvested aspen to regenerate through root sprouts.

All of the trees that are standing dead, have lost their merchantability due to excessive rot or contain an obvious active den should be left standing for wildlife use. Raptors use these trees to build their nests in or to perch and hunt from. Animals such as porcupines, bats, and owls use these trees for their dens. Once the trees die and fall over, other animals use the down logs for various purposes. Fishers, pine marten, raccoon, and fox are some of the species that use down logs for their dens. Grouse may use the logs as drumming logs during their mating season.

All timber harvesting conducted in the aspen forest type should be restricted to leaf off conditions. Aspen regeneration is much more vigorous when the adult stand is harvested during leaf off as opposed to leaf on. This is due to the fact that during leaf off the trees are storing their nutrients in their root systems. Since aspen regenerates vigorously from roots sprouts, the resulting regeneration is aided by the fact that the harvested trees nutrients are being stored in their root systems.

The aspen forest type and the tree species it consists of are not projected to do well as our climate continues to change. Following the management described above will help to mitigate the effects of climate change due to the age class diversity it will create. However, if the landowner would like to take a more aggressive approach to climate change mitigation there are a few things that could be considered. Since aspen is projected to decline due to climate change it might be beneficial to promote the establishment of other tree species better suited to the climate change predictions such as red oak and red pine. To promote these species it is recommended that the landowner develop a few test plots to determine the potential for natural regeneration.

Each test plot should be roughly one acre in size and adjacent to or centered around a red pine or red oak seed tree. Within each test plot all of the aspen should be cut part way through and hinged, which will kill them and discourage them from regenerating. If possible the test plots should be scarified to the best of the landowners ability to prepare a desirable seed bed for red oak and red pine. The landowner should try to establish at least three test plots; one where the current aspen regeneration is sparse, one where there is average aspen regeneration, and one in a spot with very vigorous regeneration. Once established the test plots should be monitored for successful regeneration. Any successful regeneration that does become established should be protected from browse with either a tree shelter or a bud cap. If the test plots prove successful the landowner will have established a management strategy to implement in the event that the aspen present begin to decline significantly in the future due to the impact of climate change.

Forest Type:	**P (Natural Mixed Pine)**
Acres:	**79.5**
Stands Included:	**6, 7, 8, 9, and 10**
Tree Quality and Potential:	**Average Quality with Average Potential**
Site Index:	**65 Feet Tall at Age 50**
Site Index Species:	**Sugar Maple**
Habitat Type:	**PArV**
Management Objective:	**Promote diversity and forest productivity.**
Treatment Year:	**See Activities Map**
Prescribed Management:	**TSI / Seed Tree**
NRCS Practice Name:	**Timber Stand Improvement / Early Successional Habitat Development**
NRCS Practice Code:	**666 / 647**

Stand Description:
The mixed pine stands are found scattered across this ownership concentrated primarily to the west of County Road 577. These stand are growing on relatively flat terrain with somewhat sandy soils. Dominant and co-dominant tree species found throughout this forest type include the following:

Dominant		**Co-Dominant**	
White Pine (-)	Red Pine (=)	Red Oak (=)	Red Maple (?)
		White Spruce (-)	Jack Pine (-)
		Balsam Fir (-)	

Of the species listed above white pine and red pine are by far the most common. The white and red pines are found throughout this forest type as both mature overstory trees ranging from ten to eighteen inches in DBH and as seedlings and saplings. In some spots the pine seedlings and saplings are very dense, creating excellent cover for wildlife. This dense natural regeneration also makes these areas susceptible to white pine blister rust. Of the stands found making up this forest type only Stand 6 is dominated by red pine. In all other stands white pine is more common. Mixed with the pines are varying frequencies of red oak, red maple, white spruce, balsam fir and jack pine. The majority of these tree species are found in the seedling and sapling size class. However, scattered red oaks can be found in the overstory of this forest type.

Recommended Management:
The management objective for the pine forest type is to promote the health and growth of the regeneration that is already established while promoting the establishment and recruitment of regeneration in areas where dense canopies exist. To meet this objective the young pine stands should be treated with a timber stand improvement (TSI) cut. The TSI cut will focus on two primary objectives. The first objective is to remove the less vigorous stems to concentrate the stands growth on the higher quality ones that remain. When selecting stems to retain preference should be given to red pine over white pine to help promote species diversity within the forest type. Furthermore, red pine is projected to be better suited to future climate change predictions. The second objective of the TSI is to remove the lower branches of the residual trees. Removing the lower branches of these trees will provide two important benefits, first it will help contribute to higher quality timber production second it will help facilitate air flow through the stand which will help decrease the risk of white pine blister rust.

Figure 6: Dense pine regeneration under a sparse pine overstory common throughout most of the mixed pine forest type.

Conducting a TSI like the one described above is very time consuming and costly. For these reasons this practice should be considered an optional practice to be completed when the landowner has the time and financial resources to carry it out. Additionally, the entire forest type does not need to be treated all at the same time. Instead, the landowner should implement what he can when time allows over a number of years.

Stands 6 and 9 should be treated with a seed tree harvest. These stands are comprised of a mature overstory with some established regeneration. The timing of each of these harvests is depicted on the Activities Map included in Section I of this management plan. The seed tree harvest in these stands will focus on removing most of the overstory to allow ample sunlight to reach the forest floor thus encouraging natural pine regeneration. Following the harvest roughly 10 to 15 seed trees should remain per acre. All other merchantable trees should be harvested. If possible, the timber harvest should occur during snow free conditions and the loggers should be instructed to scarify the soil to the best of their ability with their logging equipment. Scarifying the soil will help prepare a mineral soil seedbed which will drastically improve the chances for successful red and white pine regeneration.

Forest Type:	**Rp (Planted Red Pine)**
Acres:	**1.6**
Stands Included:	**11 and 12**
Tree Quality and Potential:	**Good Quality with Good Potential**
Site Index:	**65 Feet Tall at Age 50**
Site Index Species:	**Red Pine**
Habitat Type:	**PArV**
Management Objective:	**Promote forest productivity, health, and quality.**
Treatment Year:	**See Activities Map**
Prescribed Management:	**TSI**
NRCS Practice Name:	**Timber Stand Improvement**
NRCS Practice Code:	**666**

Stand Description:
There are two small red pine plantations found on this ownership. One is located in the northeast corner of the Section 6 ownership, the other in the northeast corner of the Section 31 ownership. These small plantations are located on moderate slopes with sandy loam soils. Common tree species noted during the field inspection include the following:

Dominant	**Co-Dominant**
Red Pine (-)	White Pine (-)

Red pine is by far the most common tree species found in these plantations. In fact, it was the only tree species observed in Stand 11. Mixed with the red pines in Stand 12 are scattered white pines regenerating naturally from seed.

While the species composition of the two red pine plantations is nearly the same the size class of the trees present are very different. Stand 11 consists of poletimber sized trees averaging roughly seven inches in DBH. Stand 12 is a young plantation, roughly five years old and therefore only consists of sapling sized trees.

Recommended Management:
The red pine plantations found on this ownership should be treated with periodic thinnings to promote productivity, health, and quality. The objective of thinning red pines is quite similar to that of thinning northern hardwoods, with a focus on removal of low quality and suppressed trees in order to promote growth of the best trees in the stand. The first thinning in most red pine plantations consists of a row thinning in which every third row of trees is removed in order to make space so that logging machinery can operate freely. However, due to the small size of the red pine plantations found on this property the row thinning will not be necessary. Instead each thinning will consist of an individual tree selection harvest. The red pine thinnings should be conducted when the individual stands reach a basal area of 160 to 180 square feet per acre. Like in northern hardwoods, there is an order of removals for the harvest of red pine plantations.

The order of removals is as follows:

1. Harvest trees that are likely to die before the next harvest (insect or disease problems, severely broken tops, other major defects) – retain selected trees to benefit wildlife provided that they are not harboring any significant insect or disease problems
2. Harvest trees that are directly competing with crop trees (the best formed and most vigorous trees in the stand)
3. Harvest trees with low vigor or poor canopy position (these trees are usually suppressed and have little chance to recruit into the canopy)
4. Harvest trees with the worst stem form (significant sweep or crook, low forks)
5. Harvest trees to promote uniform spacing and operability as needed when all other criteria have been met

Following the harvest, the residual basal area should be approximately 110-120 square feet per acre. Lower basal areas can make the residual trees more susceptible to wind damage, especially given the open conditions surrounding the plantations on this property. The small acreage of the plantations on this property dictate that they must be combined with harvests in other parts of the property to make an economically viable timber harvest. See the Activities Map located in Section I of this management plan for the timing of the recommended thinnings.

In addition to the recommended thinnings, both pine plantations should be continually monitored for the presence of annosum root rot. While not currently found on this property, annosum root rot has been observed just across the state line in Wisconsin. If infected these small plantations could be devastated by the disease. More information on annosum root rot can be found in the forest health section of this management plan.

Forest Type:	**L (Planted Larch)**
Acres:	**32.5**
Stands Included:	**13**
Tree Quality and Potential:	**Good Quality with Good Potential**
Site Index:	**65 Feet Tall at Age 50**
Site Index Species:	**Red Pine**
Habitat Type:	**PArV**
Management Objective:	**Promote forest productivity while naturally converting the forest back to native tree species.**
Treatment Year:	**See Activities Map**
Prescribed Management:	**TSI**
NRCS Practice Name:	**Timber Stand Improvement**
NRCS Practice Code:	**666**

Stand Description:
In October of 2000 the landowner planted part of the northwest portion of Section 1 with larch. The majority of this planting was successful and currently is stocked with vigorous growing larch trees ranging from three to five inches in DBH. Tree species noted during the field inspection include the following:

Dominant
Larch (U)

Co-Dominant
White Spruce (-) Balsam Fir (-)
White Pine (-)

Larch is by far the most common tree species observed in this forest type. All of the larch trees present were planted as seedlings. Mixed with the larch are lesser amounts of white spruce, balsam fir, and white pine all of which are regenerating naturally from seed in areas where there is a hole in the canopy created by a small group of larch seedlings that died.

Figure 7: Larch plantation located on the ownership.

Recommended Management:
The management objective for the larch forest type is to produce timber products from the planted larch trees while encouraging the site to convert back to native tree species. To meet this objective the larch plantation should be treated with a two phase harvest. The first phase of the harvest will consist of removing roughly 30 percent of larch stems in the year 2020. Given the current spacing, this will likely have to be done by removing every third row of trees similar to the initial thinning in a red pine plantation.

This initial thinning will accomplish two things, one is that it will provide more growing space for the residual larch trees thus encouraging maximum growth rates, second it will open canopy space to allow for more natural regeneration of native tree species to become established. The residual larch will also help "train" the native trees that are currently established to grow tall and straight therefore improving the future forest products they provide.

The second phase of the harvest in the larch forest type should occur roughly 20 years after the initial harvest described above. The second harvest will consist of an overstory removal in which all of the larch trees present will be cut. This will allow the native tree species that have already established from natural regeneration to take over the stand. Following these management recommendations will likely result in a future forest type that consists of aspen and mixed pine. Given the predictions of the climate change models it may be beneficial to encourage the development of the most resilient trees suited to the site; mainly red pine, red oak, and red maple though the implementation of a TSI similar to the one described for the natural mixed pine forest type.

The landowner has observed some minor mortality in this stand as a result of the eastern larch beetle. If an outbreak occurs and mortality becomes a significant problem the management guidelines recommended above should be accelerated.

Forest Type:	**F (Spruce/Fir)**
Acres:	**25.6**
Stands Included:	**14 and 15**
Tree Quality and Potential:	**Average Quality with Average Potential**
Site Index:	**65 Feet Tall at Age 50**
Site Index Species:	**Sugar Maple**
Habitat Type:	**AVVb**
Management Objective:	**Promote natural regeneration of tree species tolerant of the effects of climate change.**
Treatment Year:	**See Activities Map**
Prescribed Management:	**Modified Clearcut**
NRCS Practice Name:	**Early Successional Habitat Development/Management**
NRCS Practice Code:	**647**

Stand Description:
There are two stands dominated by the spruce/fir forest type on this ownership. One stand is located in the northeast corner of the property in Section 36, the other is situated as a long narrow strip running north and south along the border of Sections 1 and 6. The spruce/fir forest type is found growing on mainly sandy loam soils however the area in Section 36 has a very high water table and small pockets of muck inclusions. The terrain throughout this forest type is generally flat. Common tree species observed in the spruce/fir forest type include the following:

Dominant		**Co-Dominant**	
Balsam Fir (-)	White Spruce (-)	Red Maple (?)	White Birch (-)
White Pine (-)		Black Spruce (-)	Tamarack (-)
		Cedar (-)	

Balsam fir and white spruce are the most common tree species found in the overstory and understory of this forest type. They average about five inches in DBH. Most are healthy and vigorously growing. Mixed with the spruce and fir are lesser amounts of white pine, red maple, and white birch. White pine can be found scattered throughout the overstory of the stand. It is also well represented in the regeneration layer. The red maples and white birches are generally found as small co-dominant overstory trees. The black spruce, tamarack, and cedars present are found exclusively in the portion of the forest type located in Section 36. These species, which tolerate wet nutrient poor conditions are found primarily in and along the pockets of muck soil found in Section 36.

The wet soil conditions in Section 36 will make accessing this area with logging equipment difficult. This portion of the stand is bordered to the north by a property line and to the south, west, and east by an area of lowland brush. If harvesting does occur here special attention will have to be given to soil conditions to ensure they are not damaged.

Recommended Management:
The management objective for the spruce/fir forest type is to promote natural regeneration while pushing the forest type to a species composition more resilient to the effects of climate change. To meet this objective the spruce/fir forest type should be treated with a modified clearcut harvest. The modified clearcut will focus on removing all merchantable trees (trees greater than five inches in DBH) with a few exceptions. All white pine, red pine, and cedar shall be retained. The timing of the recommended harvest can be seen on the activities map included in Section I of this management plan. If possible harvesting should occur during snow free conditions and the loggers should be instructed to scarify the soils to the best of their ability. Scarifying the soils will expose mineral soil which is necessary for the successful establishment of seedlings of climate change resilient species such as white pine, red pine, and red oak.

The portion of the spruce/fir forest type found in Section 36 may have to be omitted from the management described above because of access. This portion of the stand is surrounded by an area of lowland brush on three sides and a property line on the fourth. The only chance to harvest this portion of the forest type would be during the winter assuming a skid trail could be frozen down crossing the stand of lowland brush. A winter harvest would be less effective in achieving the management goals because the loggers would not be able to scarify the soils.

Forest Type:	**C (Cedar)**
Acres:	**24.7**
Stands Included:	**16 and 17**
Tree Quality and Potential:	**Average Quality with Average Potential**
Site Index:	**46 Feet Tall at Age 50**
Site Index Species:	**Balsam Fir**
Habitat Type:	**TTS**
Management Objective:	**Encourage forest productivity while protecting soil quality and wildlife habitat**
Treatment Year:	**See Activities Map**
Prescribed Management:	**Individual Tree Selection**
NRCS Practice Name:	**Timber Stand Improvement**
NRCS Practice Code:	**666**

Stand Description:
There are two separate stands on this ownership that are dominated by the cedar forest type. The most significant acreage of this forest type is located in the central part of the ownership in Section 36. The other area of the property dominated by cedar is found in a small narrow strip in the southeast corner of the Section 31 ownership. This forest type is found growing on nearly flat terrain with wet mucky soils. These soils are very susceptible to damage caused by poor logging practices. Common tree species observed in the cedar forest type include the following:

Dominant	**Co-Dominant**	
Cedar (-)	Tamarack (-)	White Pine (-)
	White Birch (-)	White Spruce (-)
	Balsam Popular (?)	

Cedar is by far the most common tree species found in this forest type. The cedars are generally healthy and found primarily in the small poletimber size class ranging from roughly five to eight inches in DBH. They are very densely stocked and therefore they are providing and excellent source of thermal cover which benefits many species of wildlife during the cold winters. However, this dense stocking along with the soil conditions is also causing the trees present to display very slow growth rates. Mixed with the cedars are scattered tamarack, white pine, white birch, white spruce and balsam popular. None of these species make up a significant portion of the forest type's overall stocking, however they were noted as comprising a small component. There is very little regeneration present in the cedar forest type due to the dense stocking of the overstory.

Figure 8: Dense cedar found in the cedar forest type.

Recommended Management:

The management objective for the cedar forest type is to encourage forest productivity while protecting soil quality and wildlife habitat. To meet this objective the cedar forest type should be treated with an individual tree selection harvest. This harvest will be focused on removing the low quality suppressed trees to help focus the stands growth on the higher quality trees that remain. The order of removals is as follows:

1. Harvest trees that are likely to die before the next harvest (insect or disease problems, severely broken tops, other major defects) – retain selected trees to benefit wildlife provided that they are not harboring any significant insect or disease problems
2. Harvest trees with low vigor or poor canopy position (these trees are usually suppressed and have little chance to recruit into the canopy)
3. Harvest trees that are directly competing with crop trees (the best formed and most vigorous trees in the stand)
4. Harvest trees with the worst stem form (significant sweep or crook, low forks)
5. Harvest trees to promote uniform spacing and operability as needed when all other criteria have been met

All pine or hemlock that are encountered within this forest type should be reserved from harvest. Following the harvest, the residual basal area should be approximately 100-110 square feet per acre. In places it may be necessary to reduce the basal area to lower levels to create enough space to allow the logging equipment to move freely without a significant risk of damaging the residual trees. However, reducing the basal areas to low can make the residual trees more susceptible to wind damage, especially given the wet soil conditions. See the Activities Map located in Section I of this management plan for the timing of the recommended thinning.

To help preserve thermal cover no-harvest patches should be identified and reserved from cutting. These patches should range from one to two acres in size. One patch should be reserved for every ten acres of the forest type that is thinned. These patches should be randomly distributed and located in areas where a dense overstory of cedar exists. Reserving these patches will help maintain some thermal cover within the stand, benefiting many species of wildlife during the cold Upper Peninsula winters.

All harvesting activities conducted in the cedar forest type should be restricted to winter when the ground is frozen. Logging during frozen conditions will help protect soil quality by significantly reducing the risk of rutting and compaction.

The small acreage of the cedar forest type found in Section 31 may cause it to be infeasible to harvest due to economic reasons. Therefore it may have to be omitted from the management recommendations described above.

Forest Type:	**Q (Lowland Conifer)**
Acres:	**104.1**
Stands Included:	**18 and 19**
Tree Quality and Potential:	**Average Quality with Average Potential**
Site Index:	**40 Feet Tall at Age 50**
Site Index Species:	**Balsam Fir**
Habitat Type:	**TTS**
Management Objective:	**Encourage natural regeneration while protecting soil and water quality.**
Treatment Year:	**See Activities Map**
Prescribed Management:	**Patch Clearcut**
NRCS Practice Name:	**Early Successional Habitat Development/Management**
NRCS Practice Code:	**647**

Stand Description:
The lowland conifer forest type is found in two areas on this property. One is located in the southeast corner of the ownership in Section 6, the other is found in the west part of Section 6 and the east part of Section 1. The terrain across all of the lowland conifer stands is flat and the soils are wet and mucky. In some small, localized areas the soils are so saturated that they are inhibiting productive tree growth. Common tree species observed include:

Dominant		**Co-Dominant**	
Cedar (-)	Balsam Fir (-)	Hemlock (?)	Black Ash (-)
		Black Spruce (-)	Tamarack (-)
		White Pine (-)	Red Maple (?)

Cedar is found in the overstory throughout this forest type. Mixed with the cedars is a relatively good representation of black ash, black spruce, and tamarack. White pines and red maples are found as scattered individuals. They are typically displaying very poor growth rates due to the saturated soil conditions. Hemlocks are only found in the southeast corner of Section 6 within

this forest type. The vast majority of the trees in this forest type are found in the poletimber size class ranging from five to eight inches in DBH.

A timber harvest was conducted during the winter of 2013-2014 in this forest type. The harvest took place in the area located along the section line between Sections 1 and 6. This harvest was a patch clearcut harvest in which roughly 30 acres were cut. All merchantable trees within the harvest patches were removed with a few exceptions, all hemlock and pine were retained. The harvest patches were located in areas where the best productive timber was present. Those areas with very low productivity due to excessive soil moisture were omitted from harvest. The extremely cold weather that occurred during the harvest period caused the wet soils to freeze, allowing the operation of logging equipment without causing any significant soil damage.

A small stream flows through the portion of this forest type located in the southeast corner of Section 6. The location of this stream causes the majority of this area to fall within a no-harvest riparian buffer.

Recommended Management:
The management objective for this forest type is to encourage natural regeneration while protecting soil and water quality. This objective has already been meet through the implementation of the timber harvest that took place during the winter of 2013-2014. This harvest treated roughly 30 acres of the forest type. It was a patch clearcut harvest that fully opened the canopy in the cut patches. The cut patches were variable in size and shape depending on the productivity of the forest. The areas that were more productive and had higher volumes were harvested. The areas of low productivity did not produce enough timber to sustain an economically feasible timber harvest and therefore they were reserved. The open canopy in the harvested patches will encourage new seedlings to establish themselves and develop into the future forest. Given the pre-harvest species mix and the nature of the timber harvest the cut patches will likely regenerate with a mixture of tamarack, balsam fir and black spruce. Cedars will also likely regenerate however they will be very unlikely to grow out of the seedling size class due to the heavy deer browse problem in the area. The landowner plans to treat the remaining portion of this forest type with the same type of patch clearcut harvest during the winter of 2014-2015. This harvest will only be conducted if the weather is cold enough to freeze the soils and allow for the operation of heavy logging equipment without risking damage to the soils.

The cut patches should be periodically monitored for successful regeneration. If natural regeneration does become established no further management activities will be necessary. However, if there is not any new regeneration observed within five years of the harvest it would be beneficial to plant the cut patches. If planting is required the site should be re-evaluated just prior to planting to determine strategies to control competing vegetation, select the trees species to plant, and determined the density at which they should be planted.

The portion of the lowland conifer stand located in the southeast corner of Section 6 should be omitted from active management. This area falls almost entirely within a stream buffer. To ensure the water quality of the stream is protected this area should not be harvested. In the absence of active management this area will likely be impacted by some tree mortality,

especially as the balsam firs age and if the black ash trees become infested with EAB. As they die more space will be created for the residual trees to grow and for new regeneration to become established.

If the black ash trees become infested with EAB the landowner should consider conducting a salvage timber harvest. This harvest should be designed to have a minimal impact on the stand to ensure the nearby stream is protected. Only infested ash trees and those trees that must be removed to allow for equipment operations should be harvested. If this timber harvest does occur there may be an opportunity to micro manage some sites to encourage yellow birch regeneration. If yellow birch regeneration is desired small gaps should be created roughly 50 to 100 feet in diameter. Within these gaps a maximum of 30 percent canopy cover should be retained. Following the harvest the forest floor within the harvested gaps should be scarified to expose areas of bare mineral soil. Following these guidelines will create desirable light and seed bed conditions for the establishment of yellow birch seedlings.

Forest Type:	**T (Bog Conifer)**
Acres:	**13.5**
Stands Included:	**20, 21, and 22**
Tree Quality and Potential:	**Poor Quality with Poor Potential**
Site Index:	**35 Feet Tall at Age 50**
Site Index Species:	**Tamarack**
Habitat Type:	**PO**
Management Objective:	**Protect Soil and Water Quality**
Treatment Year:	**See Activities Map**
Prescribed Management:	**No Active Management**
NRCS Practice Name:	**Wetland Wildlife Habitat Management**
NRCS Practice Code:	**644**

Stand Description:
There are three areas in which the bog conifer forest type exists on this property. Two of them are located on the Section 31 ownership the other is found along the western property boundary of the Section 11 ownership. The soils within the swamp conifer forest type are saturated with water during most of the year. Tree species commonly observed in this forest type include the following:

Dominant	**Co-Dominant**
Tamarack (-) Black Spruce (-)	Cedar (-)

Tamarack and black spruce are the most common tree species observed in the bog conifer forest type. Mixed with them is varying amounts of cedar. All of the trees growing in this forest type are stunted and slowing growing due to the excessively wet soil conditions and the lack of soil nutrients. Growing conditions are so poor in two of the areas delineated as the bog conifer forest type that the trees there will not be able to obtain enough size or a high enough stocking level to support a commercial timber harvest. The remaining area typed as bog conifer is only marginally productive from a timber harvesting standpoint.

Recommended Management:
The management objective for the bog conifer forest type is to protect soil and water quality. To meet this objective there should not be any active management conducted at this time. The wetland soils of this forest type are very sensitive to rutting and compaction caused by equipment operation; as a result these areas should be clearly delineated on the ground with flagging or tree paint. Loggers should be instructed to not operate their equipment in these areas.

Wetland areas like the swamp conifer forest type play a very important role in protecting water quality. Excess rainwater that is not absorbed by plants or retained in the soil flows downhill into the lowest areas on the landscape. As this excess water moves into lowland stands, the vegetation and soils found here helps to catch and filter out contaminants such as soil particles and organic material before the water makes its way into groundwater or surface water bodies.

Forest Type:	**E (Lowland Hardwood)**
Acres:	**1.4**
Stands Included:	**23**
Tree Quality and Potential:	**Poor Quality with Poor Potential**
Site Index:	**40 Feet Tall at Age 50**
Site Index Species:	**Balsam Fir**
Habitat Type:	**FE**
Management Objective:	**Protect Soil and Water Quality**
Treatment Year:	**See Activities Map**
Prescribed Management:	**No Active Management**
NRCS Practice Name:	**Wetland Wildlife Habitat Management**
NRCS Practice Code:	**644**

Stand Description:
There is one small stand located on this property that is dominated by lowland hardwoods. This stand is located in the central part of the ownership in Section 11. The soils here are wet throughout most of the year and they are inhibiting quality tree growth. Tree species observed in this forest type include the following:

Dominant	**Co-Dominant**
Black Ash (-)	Red Maple (?) White Pine (-) White Spruce (-)

Black ash is the most common tree species observed in this forest type. Mixed with the black ash are lesser amounts of red maple, white pine, and white spruce. The trees that are present in this forest type are growing at very low densities with the average being roughly five to eight inches in DBH. The regeneration layer of this forest type is dominated by tag alder.

Recommended Management:
The site where the lowland hardwood forest type is located is not capable of producing economically timber. Therefore this forest type shall be omitted from active forest management.

The wetland soils of this forest type are very sensitive to rutting and compaction caused by equipment operation; as a result these areas should be clearly delineated on the ground with flagging or tree paint. Loggers should be instructed to not operate their equipment in these areas.


Figure 9: Sparse growing conditions found in the lowland hardwood forest type.

Wetland areas like the lowland hardwood forest type play a very important role in protecting water quality. Excess rainwater that is not absorbed by plants or retained in the soil flows downhill into the lowest areas on the landscape. As this excess water moves into lowland stands the vegetation and soils catch and filter out contaminants such as soil particles and organic material before the water makes its way into groundwater or surface water bodies.

Forest Type:	**XL (Lowland Brush)**
Acres:	**34.2**
Stands Included:	**24**
Tree Quality and Potential:	**Poor Quality with Poor Potential**
Site Index:	**N/A**
Site Index Species:	**N/A**
Habitat Type:	**N/A**
Management Objective:	**Protect Soil and Water Quality**
Treatment Year:	**See Activities Map**
Prescribed Management:	**No Active Management**
NRCS Practice Name:	**Wetland Wildlife Habitat Management**
NRCS Practice Code:	**644**

Stand Description:
There are a number of areas across the ownership that have been delineated as being dominated by lowland brush. Brush species such as tag alder and willow are common. Very few trees are present within these areas. Trees species that are present include black ash, white spruce, balsam fir, cedar, white pine, and aspen. The soils within the lowland brush forest type are extremely wet. The wet soil conditions are inhibiting the growth of desirable tree species. Given the current site conditions, it is likely that the areas that make up this forest type will continue to be non-productive from a timber standpoint into the foreseeable future.

Recommended Management:
The management objective for the lowland brush forest type is to protect soil and water quality. To meet this objective there should not be any active management conducted within this forest

type. The wetland soils of this forest type are very sensitive to rutting and compaction caused by equipment operation; as a result these areas should be clearly delineated on the ground with flagging or tree paint. Loggers should be instructed to not operate their equipment in these areas.

Wetland areas like these play a very important role in protecting water quality. Excess rainwater that is not absorbed by plants or retained in the soil flows downhill into the lowest areas on the landscape. As this excess water moves into lowland stands the vegetation and soils catch and filter out contaminants such as soil particles and organic material before the water makes its way into groundwater or surface water bodies. Therefore, these areas should be allowed to develop naturally thus preserving their important role in maintaining clean water.

Forest Type:	**XW (Water)**
Acres:	**3.3**
Stands Included:	**25**
Tree Quality and Potential:	**N/A**
Site Index:	**N/A**
Site Index Species:	**N/A**
Habitat Type:	**N/A**
Management Objective:	**Protect Water Quality and Wildlife Habitat**
Treatment Year:	**See Activities Map**
Prescribed Management:	**No Active Management**
NRCS Practice Name:	**Wetland Wildlife Habitat Management**
NRCS Practice Code:	**644**

Stand Description:
To improve wildlife habitat a wetland scrape was constructed in the northeast quarter of the Section 1 property. This scrape was developed as part of a wetland mitigation project conducted between the Menominee County road commission and the DEQ. This shallow scrape holds water most of the year however it has dried up following hot and dry summers. Runoff from spring snowmelt has always been sufficient enough to recharge this scrape. Within the scrape is a variety of emergent vegetation. The edges of the scrape are comprised of a mixture of grasses and lowland brush. When the scrape was developed the spoils were piled near its southeast corner. To help improve wildlife habitat and aesthetics the landowner has planted roughly 20 yellow birch and Norway spruce trees on the spoils. If this planting proves to be successful the landowner will likely plant more trees of the same species to fully reforest this area.

Recommended Management:
No active forest management should be conducted within the wetland scrape. Instead this area should be delineated on the ground and loggers should be instructed avoid operating equipment within it at all times. Furthermore, special care must be taken when timber harvesting occurs in areas adjacent to the scrape. Improper harvesting techniques in adjacent areas could lead to runoff and sedimentation that could negatively impact the habitat that the scrape provides. However, given the flat terrain that surrounds the scrape, it very unlikely that any significant amount of sedimentation could enter the scrape as a result of poor timber harvesting practices.

Forest Type:	**XU (Upland Brush)**
Acres:	**13.5**
Stands Included:	**26**
Tree Quality and Potential:	**N/A**
Site Index:	**N/A**
Site Index Species:	**N/A**
Habitat Type:	**N/A**
Management Objective:	**Protect Wildlife Habitat**
Treatment Year:	**See Activities Map**
Prescribed Management:	**No Active Management**
NRCS Practice Name:	**Brush Management**
NRCS Practice Code:	**314**

Stand Description:
Two areas of upland brush exist on this property: one small area in the southwest corner of the Section 1 ownership and another larger area along the old railroad grade in the Section 11 ownership. These areas are very sparsely stocked with trees including white spruce, white pine, pin cherry, and aspen. The majority of the vegetation found on these sites is comprised of bracken fern and sweet fern. It is unknown why these sites are not forested however it likely has to do with some sort of human influence that degraded the soil, such as compaction from grazing livestock or intense fires that depleted the soils of their nutrients.

Recommended Management:
No active forest management it recommended for the upland brush sites. These areas would likely be forested if they were capable of supporting the productive growth of timber. Even though these areas are not productive from a timber standpoint they do provide a unique habitat for wildlife. The edge habitat that occurs in the transition from the openings to the forest is utilized by a number of birds. Furthermore the openings themselves provide a unique habitat that is beneficial to a wide variety of wildlife species.

A practice to consider in these small openings would be to conduct a series of prescribed fires over a number of years to discourage the growth and further establishment of brush and tree species. In the absences of brush the areas could be planted with a variety of native grasses to establish a small prairie like habitat. Discouraging brush and planting native grasses may prove to be more beneficial to wildlife than allowing these areas to continue developing along their current path. If prescribed fire is used a knowledgeable fire professional should be consulted to help ensure the fire does not escape from the designated burn area. Furthermore, the fire professional will be able to help determine the optimal times to burn to achieve the goals described above.

Forest Type:	**O (Open)**
Acres:	**252.2**
Stands Included:	**27**
Tree Quality and Potential:	**N/A**
Site Index:	**N/A**
Site Index Species:	**N/A**
Habitat Type:	**N/A**
Management Objective:	**Continue Farming Practices**
Treatment Year:	**See Activities Map**
Prescribed Management:	**No Active Management**
NRCS Practice Name:	**Conservation Crop Rotation**
NRCS Practice Code:	**328**

Stand Description:
The areas delineated as open in this management plan consist of the agricultural fields and pastures. Currently these areas are used to produce crops such as hay and corn and to pasture cows and horses.

Recommended Management:
The landowner has indicated that it is his intent to continue farming the open areas of the property for the foreseeable future. Therefore, these areas shall not be impacted by any type of forest management activities. However, in the future the landowner may decide that he would like to convert some of the agricultural fields back to forest. If this is the case the sites in which he would like to convert to forest should be visited and the soil type and quality should be determined. Once the soil information is known the proper tree species should be selected for planting and a plan should be developed and followed.

Forest Type:	**HQ (Headquarters)**
Acres:	**21.6**
Stands Included:	**28**
Tree Quality and Potential:	**N/A**
Site Index:	**N/A**
Site Index Species:	**N/A**
Habitat Type:	**N/A**
Management Objective:	**Maintain Area to Suit Landowner Needs**
Treatment Year:	**See Activities Map**
Prescribed Management:	**No Active Management**
NRCS Practice Name:	**High Use Protection Area**
NRCS Practice Code:	**561**

Stand Description:
The headquarters consists of an area surrounding the landowner's home. This area is comprised of a house, barn, lawn, and a number of outbuildings. Various tree species are found within the headquarters area including:

Dominant		**Co-Dominant**	
White Pine (-)	Red Oak (=)	Red Pine (=)	Red Maple (?)
		Sugar Maple (-)	Aspen (-)

Recommended Management:
No active forest management is recommend for the area defined as the headquarters. However, since this area sees a high amount of human activity the landowner should continually monitor it for hazard trees. Hazard trees are those with excessive rot or a heavy lean that pose a significant threat to falling and potentially causing human injury or damage to property. When hazard trees are identified they should be removed, regardless of species, to ensure safety and the protection of property. When felling hazard trees extreme caution must be used to ensure the tree is brought down in a safe manner.

RECOMMENDED TREATMENT SCHEDULE

The following table lists each stand located on this property corresponding to the recommended treatments that were discussed above. A treatment schedule is described for each stand and treatment.

STAND	ACRES	TREATMENT DESCRIPTION	NRCS PRACTICE NAME/CODE	TARGET TREATMENT YEAR	RE-EVALUATION YEAR
1	33.5	Individual Tree Selection	Forest Stand Improvement	2029	2024
2	15.5	Individual Tree Selection	Forest Stand Improvement	2023	2024
3	16.6	Individual Tree Selection/Group Selection	Forest Stand Improvement	2030	2024
4	72.9	3 Stage Modified Clearcut	Early Successional Habitat Development/ Management	2030	2024
5	101.8	No Active Management	Early Successional Habitat Development/ Management	N/A	2024
6	7.0	Seed Tree Harvest	Early Successional Habitat Development/ Management	2030	2024
7	3.7	No Active Management	Forest Stand Improvement	N/A	2024
8	49.5	Timber Stand Improvement	Forest Stand Improvement	When Possible	2024
9	7.1	Seed Tree Harvest	Early Successional Habitat Development/ Management	2020	2024
10	12.2	No Active Management	Forest Stand Improvement	N/A	2024
11	0.7	Individual Tree Selection	Forest Stand Improvement	2029	2024
12	0.9	No Active Management	Forest Stand Improvement	N/A	2024
13	32.5	Row Thinning	Forest Stand Improvement	2020	2024

RECOMMENDED TREATMENT SCHEDULE CONT.

The following table lists each stand located on this property corresponding to the recommended treatments that were discussed above. A treatment schedule is described for each stand and treatment.

STAND	ACRES	TREATMENT DESCRIPTION	NRCS PRACTICE NAME/CODE	TARGET TREATMENT YEAR	RE-EVALUATION YEAR
14	23.7	Modified Clearcut	Early Successional Habitat Development/ Management	2029	2024
15	1.9	No Active Management	Wetland Wildlife Habitat Management	N/A	2024
16	23.8	Individual Tree Selection	Forest Stand Improvement	2015	2024
17	0.9	No Active Management	Wetland Wildlife Habitat Management	N/A	2024
18	17.5	No Active Management	Wetland Wildlife Habitat Management	N/A	2024
19	86.6	Patch Clearcut	Wetland Wildlife Habitat Management	2015	2024
20	8.4	No Active Management	Wetland Wildlife Habitat Management	N/A	2024
21	2.1	No Active Management	Wetland Wildlife Habitat Management	N/A	2024
22	3.0	No Active Management	Wetland Wildlife Habitat Management	N/A	2024
23	1.4	No Active Management	Wetland Wildlife Habitat Management	N/A	2024
24	34.2	No Active Management	Wetland Wildlife Habitat Management	N/A	2024
25	3.3	No Active Management	Wetland Wildlife Habitat Management	N/A	2024
26	13.5	No Active Management	Brush Management	N/A	2024
27	252.2	No Active Management	Conservation Crop Rotation	N/A	2024
28	21.6	Hazard Tree Removal	Heavy Use Area Protection	Continuous	2024

RECORDED TREATMENT ACTIVITY

The following table shows each stand located on this property. Actual treatment activity should be recorded as it takes place over time.

STAND	ACRES	ACTIVITY	ACTIVITY YEAR	NOTES
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

RECORDED TREATMENT ACTIVITY CONT.

The following table shows each stand located on this property. Actual treatment activity should be recorded as it takes place over time.

STAND	ACRES	ACTIVITY	ACTIVITY YEAR	NOTES
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				

RECORDED TREATMENT ACTIVITY CONT.

The following table shows each stand located on this property. Actual treatment activity should be recorded as it takes place over time.

STAND	ACRES	ACTIVITY	ACTIVITY YEAR	NOTES
25				
26				
27				
28				

SECTION IV- DEFINITIONS/APPENDIX

GLOSSARY

Basal Area- Measurement taken to evaluate forest density. Units expressed in square feet/acre. Represents the cross-sectional area of trees in the forest.

Canopy- The cover of branches and foliage formed collectively by the crowns of adjacent trees.

Co-dominant- Trees that are also in the overstory, usually right below the dominant trees.

Clay Soil- Soil class based on the size of mineral fragments (less than or equal to 0.002 millimeters in diameter). Clay soils are very fine and poorly drained. This means that they hold excessive water during wet times of the year.

Crop Trees- Upper-crown residual trees of higher quality that will eventually form the final tree community at the time of stand maturity.

DBH- Diameter of individual trees measured at breast height (4.5 feet from the ground).

Dendrochronology- The study of past forest fires using the scars and other evidence found in the current forest.

Ecosystem- The living and non-living components of an area that make up an environment.

Habitat Type- Particular ecosystem, which is classified based on soil type, forest type, and ground flora. Habitat types are used to help determine site management potential, limitations, and concerns.

Landscape Management- Consideration of the all the ecosystems within an area.

Loam- Soil that is made up of a mix of clay, silt and less than 50 percent sand particles.

Mature- The period of time that trees are fully developed and at their highest quality. The sized of the tree varies by species and site index.

Merchantable- Trees that are of a size and quality that can be harvested and sold.

Muck Soil- Soil type that is dark in color and fine in texture. It contains primarily well-decomposed organic material. It is poorly to very poorly drained and holds water throughout the year. This soil can be associated with wetlands.

Northern Hardwoods- A forest type including sugar maple, red maple, American basswood, yellow birch and white ash.

Old growth- An age class of a forest. Referring to a forest that is very old and unchanged by humans.

Over-mature- Trees that have grown beyond maturity and are beginning to decay.

Overstory- Trees within the forest forming the uppermost canopy layer.

Pole-sized tree- Usually immature or suppressed trees 6-12 inches in diameter (dbh).

Pre-Merchantable- Trees that are not of a size or quality to be harvested or sold

Pulp/Cord- A merchantable forest product measured in cords. One cord equals 128 cubic feet. Pulp logs are cut 100 inches long and must have a diameter of 4 inches or greater. They also must be reasonable straight and sound.

Regeneration- The smaller trees that establish on the forest floor

Release- Allow individual trees more room to expand their crowns. This increases tree production, health and vigor.

Residual- Forest volume or density after a timber harvest.

Sawlog-sized tree- Larger, usually older trees 12 + inches in diameter (dbh). These trees meet the minimum diameter specs. for sawlog products.

Sawtimber/MBF- A merchantable forest product measured in MBF (thousand board feet). One board foot equals 1ft by 1 ft by 1 inch.

Sandy Loam Soil- Soil class that is a little finer in texture than sand, containing some silt and clay mixed with sand.

Sandy Soil- Soil class based on the size of mineral fragments (0.05 - 2.0 millimeters in diameter). Sandy soils are considered to be coarse and well-drained.

Sapling- Small and young trees, 1 – 4 inches in diameter (dbh) and 6 – 20 feet tall.

Scarification- Lightly disturb forest floor to expose bare soil. Generally for the purpose of creating a seedbed for desired tree species that require such conditions.

Seedling- Small and young trees, less than 1 inch in diameter (dbh) and less than 5 feet tall.

Silt Soil- Soil class based on the size of mineral fragments (0.05 - 0.002 millimeters in diameter). Silt soils are considered to be fine but not as fine as clay. They are fair to poorly drained, meaning that they hold water during wet times of the year.

Site Index- A measure of productiveness based on the height of the dominant trees in a stand at a base age. Largely influenced by the soil composition and climate.

Stand- Land areas grouped together based on their forest and vegetative species structure, site quality, and current conditions. Stands are usually greater than 2 acres in size.

Succession- Refers to the natural evolution of a forest over time and can be measured by the species composition of the forest.

Tree Stocking- Term used to express the density of the trees in a forest.

Understory- Trees within the forest growing beneath the overstory.

Vernal Ponds- Pools of water that form in the forest during the wet seasons

APPENDIX

1. Pennsylvania Sedge in Northern Hardwood
2. How to Identify White Pine Blister Rust and Remove Cankers
3. White Pine Weevil
4. Reed Canary Grass
5. Spruce Budworm in the Eastern United States
6. Annosum Root Rot
7. Emerald Ash Borer Fact Sheet
8. Eastern Larch Beetle
9. Henslow's sparrow
10. Northern goshawk
11. NRCS Technical Guides:
    a. Forest Stand Improvement (666)
    b. Early Successional Habitat Development/Management (647)
    c. Wetland Wildlife Habitat Management (644)
    d. Brush Management (314)
    e. Conservation Crop Rotation (328)
    f. Heavy Use Area Protection (561)
12. Climate Change Projections for Individual Tree Species
13. Detailed NRCS Soils Information
14. Timber Tax Facts
15. GTCF Timber Type Guide
16. Green Timber Tree Farm Group Information