Forest Stewardship Plan

Prepared for N.D.C.S. Forestry Commission

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Signature:_____ **Signature:**_____

Date of Original Plan Completion: September 2014 **Plan Expiration**: August 2034

Signatures and Approvals

Forest Stewardship Program

I certify that this Forest Management Plan meets the requirements of the federal Forest Stewardship Program.

_____ _____

Plan Writer Date

I certify that this Forest Management Plan meets the requirements of the federal Forest Stewardship Program.

_____ _____

State Forestry Representative Date

Forest Stewardship Tracking Number: (if necessary) _____

NRCS Incentive Programs

I certify that this Forest Management Plan meets the requirements of the USDA Environmental Quality Incentives (EQIP) Program and/or the Quality Criteria for forest activity plans in Section III of the USDA NRCS Field Office Technical Guide.

_____ _____ _____

Technical Service Provider Number Date

_____ _____

District Conservationist Date

American Tree Farm Program

I certify that this Forest Management Plan meets the requirements of the American Forest Foundation's American Tree Farm System.

_____ _____ _____

ATFS Inspecting Forester Number Date

Certified Tree Farm Number: (e.g. AL 1234) _____ Date of ATFS Certification: _____

Michigan Qualified Forest Program

"I, _____, hereby acknowledge that I have reviewed this forest management plan and understand my responsibilities regarding conducting management practices and harvests as called for in the plan."

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American Forest Management, Inc. Mission Statement

Our mission describes our "purpose" and "what we do." Our vision depicts where we are striving to be. Our core values state how we conduct ourselves in our day-to-day business.

Mission

American Forest Management's mission is to maximize our client's objectives by consistently providing superior forest resource consulting and real estate brokerage services:

Vision

Our vision at American Forest Management, Inc. is to:

- Provide outstanding services to our clients and be recognized as setting the bar for others to follow;
- Exhibit integrity, business ethics, service quality, and stewardship of the natural resource which is unsurpassed;
- Continually seek growth opportunities in all areas of our business that result in increased stakeholder value;
- Be a preferred place of employment in our industry, where outstanding performance is expected, recognized and rewarded. Core Values
- Integrity - we do what we say and hold ourselves to the highest ethical standards.
- Professionalism - we are characterized by our dedication and motivation to be the best in our profession.
- Client Driven - we are committed to providing outstanding services; focused on individual client needs while building long-term relationships.
- Quality - we strive to always do it right the first time.
- Stewardship - we recognize that our future and future generations depend on sound and sustainable management of our natural resources.
- Employees - we truly believe our employees are our most valuable asset and continually strive to create a safe, productive and rewarding workplace environment.

Introduction

Forest Stewardship Program & Ethic

Stewardship is an ethic recognizing that the land and its natural inhabitants have an inherent worth and that we have a responsibility to consider the land as we protect, manage, utilize, and enjoy the forest. Stewardship guides us to conduct our activities to the utmost of our abilities, to insure the future health, productivity, diversity, and well-being of the land, its natural communities and species, and to provide opportunities to our successors that are at least equal to ours to use and enjoy the land and its resources.

This plan describes my goals and objectives for my forest. Participation in the Forest Stewardship Program is voluntary and only indicates my intent to practice sustainable forest management. I understand that enrolling forest land into the Commercial Forest program or the Qualified Forest program requires compliance with an approved forest management plan in exchange for the property tax reduction.

Property Description

Legal Description

Breen Township Schools

The SE ½ of the SE ¼ of Section 11 and the SW ¼ of the SW ¼ of Section 12, T41N-R28W **(80 acres)**. GIS acreage shows **79.8 acres** (based on PLSS Section file downloaded from state of Michigan, survey maps, and deed descriptions).

Nearest city or town: Foster City **Total plan acreage:** 80

Number of unique forested stands: 7 **Total Forested GIS Acres:** 69.8

Felch Township Schools

The W ½ of the SE ¼ and the W ½ excluding the NE ¼ of the NW ¼ of Section 8, the SE ¼ of the SE ¼ of Section 7 and the NW ¼ of the NW ¼ of Section 17, T42N-R28W **(440.6 acres)**. GIS acreage shows **443.4 acres** (based on PLSS Section file downloaded from state of Michigan, survey maps, and deed descriptions).

Nearest city or town: Felch **Total plan acreage:** 440.6

Number of unique forested stands: 24 **Total Forested GIS Acres:** 383.2

School Facilities

The W ½ of the NW ¼ lying south of State Highway 69 and lying north of the West Branch Sturgeon River, the E ½ of E ½ of the NW ¼ lying north of State Highway 69, and the W ½ of NE ¼ lying north of State Highway 69 of Section 29, T42N-R29W **(94.2 acres)**. GIS acreage shows **94.2 acres** (based on PLSS Section file downloaded from state of Michigan, survey maps, and deed descriptions).

Nearest city or town: Felch **Total plan acreage:** 94.2

Number of unique forested stands: 6 **Total Forested GIS Acres:** 46.0

Sagola Township Schools

The W ½ of the NW ¼ lying north of the Ford River of Section 15, the S ½ of Section 10, and the SW ¼ of the SW ¼, excluding: Commencing at the southwest corner of the said SW ¼ of SW ¼ of Section 28; thence cunning north on the section line between Sections 28 and 29 three hundred (300) feet to a point; thence from the said point cunning east parallel to the section line between Sections 28 and 33 three hundred (300) feet to a point; thence from the said point south parallel to the section line between Sections

28 and 29 three hundred (300) feet to a point on the section line between Sections 28 and 33; thence from the said point west on the section line between Sections 28 and 33, 300 feet to the place of beginning; and those portions lying within the Supervisors Plat of the Village of Sagola of Section 28, T43N-R30W (395.1 acres). GIS acreage shows **400.6 acres** (based on PLSS Section file downloaded from state of Michigan, survey maps, and deed descriptions).

Nearest city or town: Sagola & Channing **Total plan acreage:** 395.1

Number of unique forested stands: 19 **Total Forested GIS Acres:** 338.1

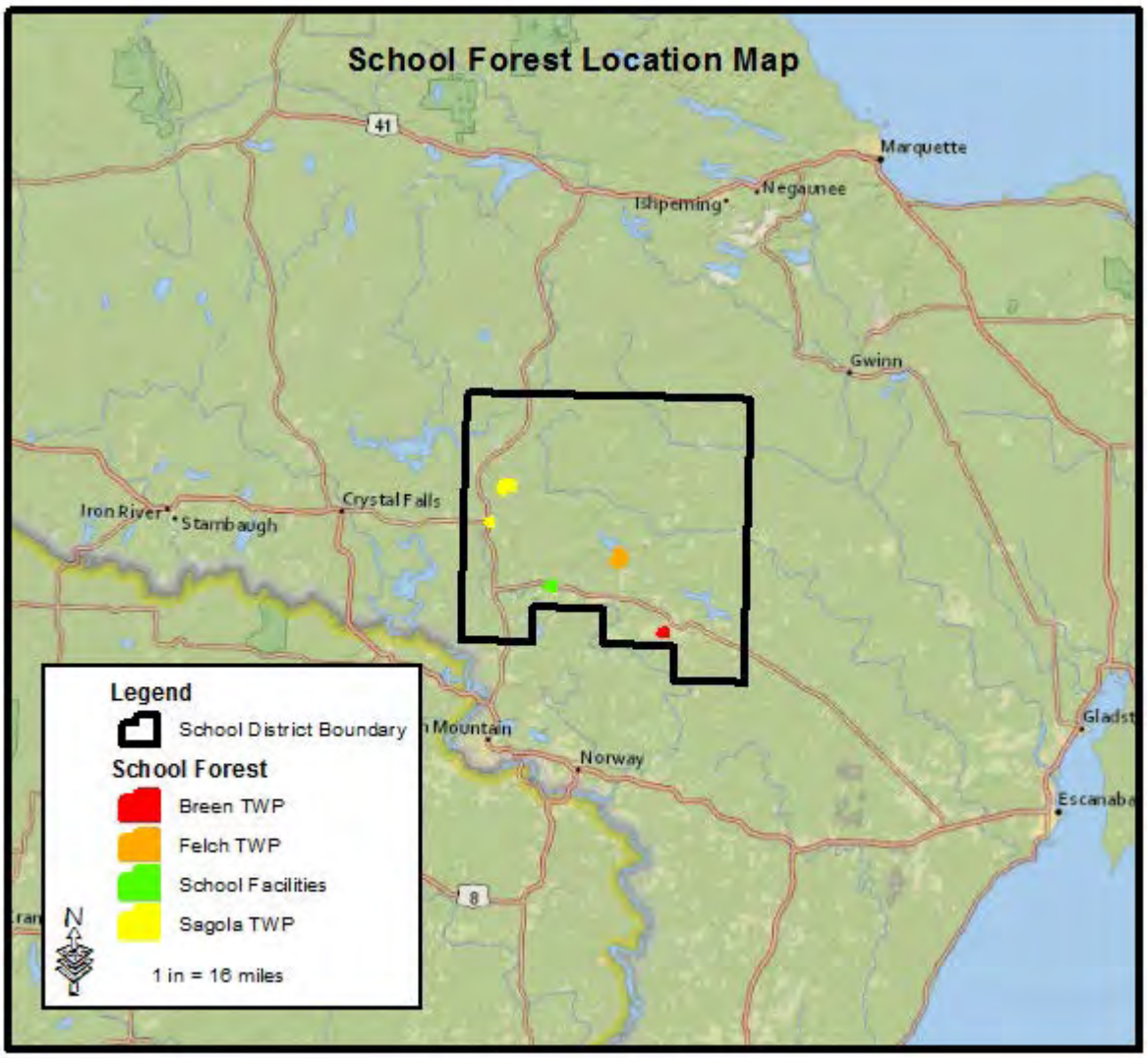
Property Narrative

The properties are located in northern Dickinson County and can generally be described as falling into the M95 and M69 corridors, parcels are located in Sagola, Felch and Breen Townships. The Felch and Sagola Township School Forests are both over 400 acres and are considerably larger than the smaller School Facility and Breen Township tracts. The primary Sagola tract is located off of the Turner Road just east of Channing, while a smaller block is located directly near the intersection of M95 & M69 in Sagola. The Felch tract is located off of Spring Hill Road. The School Facility tract is located on M69, and the Breen tract is located off of the Waucedah Road just south of Foster City. The plan is being written as an updated forest management plan for the school district, which will meet American Tree Farm System standards and the Forest Stewardship program. The properties have been actively managed by the school with plans dating back to the 1930's.

The properties are composed of a large diversity of forest types and species. The primary forest types are dry mesic conifers, plantation conifers, and aspen stands. The primary species located across the tracts are red pine, white pine, aspen and balsam fir along with small components of numerous other species. The red pine and white pine make up a large portion of the properties volumes including numerous white pine over 20" in diameter within the Felch Tract. Historical data shows the most common pre-settlement vegetation was Sugar Maple-Hemlock or Hemlock-Yellow Birch forests. There is some slight-to-severe elevation change across the property, however, typically it is somewhat flat, and the main operating season could be during summer for numerous stands. Nearly half of the property is well suited for harvest operations, while around 30 percent is poorly suited because of wetness or/and poor strength; these stands would/should be harvested during the frozen soil conditions of winter. The properties road conditions vary from one tract to another, as the larger Sagola and Felch tracts have good road systems already in place. The Breen and smaller Sagola tract are lacking a good harvest road setup. All of the tracts have access to county roads. Existing roads throughout the property, allow access for recreational use, however additional road work would be needed to access portions of the property for a timber harvest. The surrounding area is generally undeveloped as the State and industrial forest landowners own a majority of the lands in the area.

The Felch tract is located in the, "Menominee Drumlins and Ground Moraine ecoregion, which is characterized by flat to gently rolling ground moraines that are poorly drained, with most of the region growing over limestone and dolomite lying within 40 feet of the surface. Sandy loams on drumlin mounds are better drained, between drumlins are the poorly drained areas. Large areas of this ecoregion have been converted and cleared for agriculture, however, historical vegetation on the loamy better drained soils consisted of northern hardwoods, while the lowland areas between the drumlins were consisted of cedar swamps." The Breen and School Facility tracts are part of the, "Wisconsin-Michigan Pine Barrens ecoregion which is characterized by white pine, red pine, and sugar maple growing on thing soils over

bedrock as presettlement vegetation. The bedrock geology is granite, quartzite, and iron-bearing formations. This led the region to be one of the Upper Peninsula iron ranges and was a major mining center in the early 20th century." The Sagola tracts are part of the, "Winegar Dead Ice Moraine is characterized by its climate, topography, and coarse-textured sandy soils. The region has sections of ground moraine



and glacial outwash, but the characteristic topography is one of steep end moraine ridges containing a high distribution of deep kettle lakes. The kettle lakes are acidic and low in nutrients. As is true of other ice stagnation areas, the stream drainage system is undeveloped. Red sands and sandy loams are widespread across the ecoregion. Historically, northern hardwood forests of sugar maple, yellow birch, hemlock, and basswood grew on the uplands. Hemlock and white pine covered more fire prone areas on south and west slopes. Bogs and black spruce/tamarack swamps fill or surround kettle depressions. Today, after logging, sugar maple and red maple dominate and the representation of conifers is much lower. The region's inland location reduces any lake effect from the Great Lakes, resulting in very cold winters."

The previous ecoregion descriptions are from: Albert, Dennis A. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification. Gen. Tech. Rep. NC-178. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. Northern Prairie Wildlife Research Center Home Page.

http://www.npwrc.usgs.gov/resource/1998/rlandscp/rlandscp.htm.

Property Goals

Forest Management

The primary goal is to manage the property for sustained harvests optimizing growth and quality forest products. The primary timber type that will be focused on for timber production will be the red pine stands, especially within the Sagola Township and Felch tracts.

Other Goals

The secondary goal of the property is to use it as an educational tool along with the multiple use concept of improving wildlife habitat and recreational use.

Methods and Procedures

The property was surveyed to gather data for the various timber types found on the parcel. Notes and pictures were taken to gather information on the stands characteristics, geographic features, limitations, aesthetics, and wildlife features. This information was used to assist in the development of the Forest Management Plan to help the landowner achieve his goals and objectives.

Each productive stand was inventoried using a 15 BAF prism and volumes were calculated using TCruise, plot locations were created using the ArcGIS addon called Silvassist. Stands were originally typed from aerial photography using ArcGIS 10.1 and typed at a zoom level of 7,920 or lower. During the field work, plots were completed using Haglof© DME with built in prism factors to help identify borderline trees, along with a TruPulse© laser hypsometer for measuring heights.

Forest Cover Type Descriptions

Forest types reflect changes in climate, soil types, and past management. As a result sugar maple grows on all but the wettest and driest soils, while poorly drained areas contain black spruce, tamarack, and black ash for example. Past management could have shifted stands into a different types or species composition, based on past treatments. Wetlands vary greatly depending on how much water is present, how long water is present, how the water got there, the type of soil, and the kinds of vegetation present. All wetlands, regardless of size and water depth, provide important wildlife habitat.

Forested

Aspen-Birch (A,B,P)

These forests comprise about 3 million acres, or roughly 10 percent, of the state's land base. Not truly a forest type, it is an early growth stage within a variety of forests. Historically, less than 270,000 acres of aspen-birch forests were present in Michigan. These sun-loving, fast growing, relatively short-lived forests often grow with smaller components of balsam fir, pin cherry, red maple, white and red oak, and white and red pine. Aspen, often called poplar, regenerates best after it is clearcut by sending thousands of sprouts above the ground soon after the forest is harvested. Aspen and birch form open forests that allow many species of ground covers and fruiting shrubs to grow beneath the forest canopy, and these in turn attract a wide variety of wildlife.

At varying stages of growth, aspen-birch forests attract the chestnut-sided and mourning warbler, indigo bunting, least flycatcher, yellow-bellied sapsucker, ruby throated hummingbird, red-eyed vireo, ovenbird, and pileated woodpecker. Other species include the black bear, white-tailed deer, woodcock, snowshoe hare, cottontail rabbit, ruffed grouse, woodland jumping mouse, porcupine, whitefooted deer mouse, flying squirrel and, where evergreens are present, the American marten and fisher.

Dry Conifers (J,R)

These are northern Michigan forests containing stands of jack pine and red pine as well as mixtures of these species with northern pin oak, white pine, and aspen. They grow on very dry, sandy plains and ridges that are acidic and low in nutrients. Today, about 800,000 acres occur mainly in the high plains region from Mio to Vanderbilt and in flat, sandy areas of the Upper Peninsula. Historically, dry conifer forests were found in a mosaic of pine "barrens" and prairies. Only 100 acres of high quality pine barrens exist today. If presettlement maps show that historically there was a pine barren on your land, chances are it can be restored.

Common mammals found in dry conifer forests are the badger, coyote, snowshoe hare, and black bear. Birds include the upland sandpiper, northern harrier, red crossbill, hermit thrush, bluebird, red-tailed hawk, American kestrel, and raven. The Kirtland's warbler is the best known of the rare species, which include the prairie warbler, black-backed woodpecker, sharp-tailed, and spruce grouse. The frosted elfin butterfly and secretive locust are two other rare creatures that inhabit dry conifer forests. A large number of rare plant species are also found here.

Dry Mesic Conifers (W,MC,UM)

These are evergreens that grow on dry, sandy soils. The key tree species of this type is white pine. Because white pine was favored by loggers it no longer dominates dry mesic sites. Historically, white pine grew with red pine, white oak, beech, maple, and hemlock. These mixed stands include white pine-red pine forests in the high plains and rolling hills of the northern Lower Peninsula and white pine-white oak forests on the dry hills of west-central lower Michigan. White and red pine also mixed at times with combinations of red,

black, and white oak. Mixed hardwoods of beech, red maple, and red oak grew with white pine and hemlock. Today, mature stands of white pine dominated forest are very uncommon.

The wild turkey, white-tailed deer, porcupine, red and gray squirrel, chipmunk, and black bear favor white pine dominated forests. Bird species include woodpeckers, crossbill, redpoll, scarlet tanager, red-breasted nuthatch, black throated green warbler, black capped chickadee, great-crested flycatcher, and pine warbler. The blue racer, a snake, lives there, and the rare Karner blue butterfly is sometimes attracted to the forest edge of open oak-pine forests.

Lowland Conifers (C,Q,S,T,F)

These comprise about 4.4 million acres of Michigan forest. These evergreen forests of black spruce, white cedar, and tamarack grow in muck- or peat bottomed swamps and other poorly drained depressions mostly in the northern Lower and Upper Peninsulas. Sometimes these conifers mix with hemlock, white pine, and some hardwoods such as black ash. These forests often appear as a transition between wetland and upland habitats. Today, white cedar swamps have dramatically declined due to development, hydrologic alterations, roads, and over browsing by deer.

Spruce-tamarack bogs attract white-tailed deer, spruce grouse, snowshoe hare, bobcat, black bear, white-throated sparrow, ovenbird, red-eyed vireo, Nashville warbler, and common yellow-throat. Additional species that favor white cedar swamps include the Swainson's thrush, Tennessee warbler, and yellow-bellied flycatcher.

Lowland Hardwoods (E,LM,MD)

These are hardwood swamps and floodplain forests that comprise about five percent of Michigan and provide some of the state's largest remaining natural forest habitats. Red maple, black and red ash, and swamp white oak dominate in mixed hardwood swamps, and may include pin and black oak, and black gum. Black ash swamps also occur on flat, sandy plains in southern Michigan. In northern Michigan, black ash sometimes mixes with northern white cedar or tamarack. Canopies are typically dense in hardwood swamps as well as in floodplain forests whose rich soils tend to flood in spring and sometimes fall. Southern Michigan floodplain forests support silver and red maple, red ash, and cottonwood with minor components of swamp white oak, black willow, and black walnut also occurring. Several southern trees reach their northern ranges in these forests.

Songbirds that inhabit these forests include the warbling and red-eyed vireo, northern oriole, indigo bunting, gray catbird, and eastern wood pewee. Other species include the wood duck, raccoon, woodcock, white-tailed deer, wild turkey, bats, salamanders, frogs, snakes, and many species of migrant waterfowl. Uncommon species include the red-shouldered hawk, Indiana bat, smallmouth salamander, spotted turtle, Blanchard's cricket frog, several species of mussels, and the cerulean, prothonotary, and yellow throated warbler.

Mesic Conifers (H,C,F)

These are upland forests of evergreens that grow in moderately moist soils. There are two major types of mesic conifer forests. One type is dominated by eastern hemlock, while white spruce, balsam fir, and northern white cedar dominate the other type. These forests typically occur in northern Michigan along Great Lakes shorelines, along peatland edges, in narrow zones between wetlands and uplands, or in areas with seasonally wet soils. Historically, about 15 percent of Michigan's forests contained mesic conifers. Today, only a few small pockets of hemlock dominated forests still exist in Michigan, and very little hemlock can be found growing in northern hardwoods or other forest types.

Mesic conifer forests provide winter cover, thick branches for nesting, and seed food sources for many wildlife species. Such species include the Canada warbler, ruffed grouse, brown creeper, junco, veery, pine siskin, red crossbill, redpoll, black-capped chickadee, white-tailed deer, bobcat, red squirrel, and spotted and blue-spotted salamanders. Also, many species of birds migrating along the Great Lakes rely on early spring insect production from shallow bays bordering mesic conifer forests.

Mesic Hardwoods (M,MD)

These are Michigan's most common forest type because they grow in cool, moist soils that fall between drylands and wetlands. About 19 percent of the state's forest community are mesic hardwoods consisting mainly of beech and sugar maple. In southern Michigan, these forests occasionally include a component of conifers along with basswood, red oak, white ash, American and red elm, shagbark hickory, black walnut, bitternut hickory, and tuliptree. North of the tension zone, hemlock, white pine, and yellow birch replace tuliptree, bitternut hickory, and other more southern species. In the western Upper Peninsula, beech is rare and white pine, yellow birch, basswood, and hemlock become major components.

These forests are home to the ruffed grouse, woodcock, cottontail rabbit, snowshoe hare, elk, fox and Eastern gray squirrel, wild turkey, white-tailed deer, bobcat, fox, coyote, raccoon, black bear, American marten, fisher, gray wolf, barred owl, broad-winged hawk, wood frog, chorus frog, and vole. Uncommon animals include the northern goshawk, red-shouldered hawk, and black-throated blue and Black burnian warbler.

Plantation Conifers (J,R,W,F)

These are throughout Michigan containing pure stands typically of red pine or jack pine. Spruce and white pines are also inter-planted through some stands to increase diversity or along edges to protect crop trees from excessive branching. Typically plantation conifers are found in very dry, sandy plains and ridges that are acidic and low in nutrients.

Common mammals found in plantation conifer forests are the badger, coyote, snowshoe hare, and black bear. Birds include the upland sandpiper, northern harrier, red crossbill, hermit thrush, bluebird, red-tailed hawk, American kestrel, and raven. The Kirtland's warbler is the best known of the rare species, which include the prairie warbler, black-backed woodpecker, sharp-tailed, and spruce grouse. The frosted elfin butterfly and secretive locust are two other rare creatures that inhabit dry conifer forests. A large number of rare plant species are also found here.

Non-Forested Wetlands

Lowland Brush (L)

These have saturated soils, may have standing water during part of the year, and are dominated by buttonbush, alder, willow, and red-osier dogwood.

Marsh (N)

These are another type of wetland covered periodically by standing or slow-moving water. Soft stemmed plants such as cattails, sedges, and rushes dominate a marsh's nutrient-rich soils. Wet meadows, sedge meadows, and wet prairies are similar to marshes in that they also contain grass like vegetation. However, these wetlands typically have only seasonally saturated soils and little or no standing water.

Bogs and Fens (D,V)

These are wetlands with a thick accumulation of organic matter called peat. The acidic water of a bog is nutrient-poor because the bog is fed by rain water. Acid-loving plants include sphagnum moss, blueberries,

and tamarack. “Insect-eating” plants such as pitcher plant and sundew are also found only in bogs and fens. Fens are somewhat rare in Michigan. Unlike bogs, they are fed by groundwater that has passed through calcium and manganese rich mineral soils. Fens are typically more nutrient-rich than bogs, they support sedges, rushes, and some shrubs.

Grass/Openings (G,U)

These are openings of grass, old fields or shrubland. These openings were created by natural disturbances such as fire, ice storms, wind, disease, insect outbreaks, drought, and flooding. These disturbances provided more sunlight and moisture to the forest floor, reduced competing vegetation, and generated a suitable seed bed for colonizing grasses, shrubs, and trees. Over time, shrubs and small trees would dominate the site and often in 10 -15 years trees would once again cover the area. These temporary openings provided browse, food, and cover to a variety of wildlife such as ruffed grouse, white-tailed deer, elk, and rabbits. Examples of larger open areas that fit into Michigan’s highly forested landscape are native prairies, oak and pine savannas, and wetlands. These areas experienced more frequent disturbances, and thus had fewer trees.

The previous forest type descriptions are from:
Sargent, M.S and Carter, K.S., ed. 1999. Managing Michigan Wildlife: A Landowners Guide. Michigan United Conservation Clubs, East Lansing, MI. 297pp.

Silvicultural Systems and Harvest Methods

The main purpose of timber harvesting is to create conditions that will allow the forest to renew or reproduce itself. When trees are removed, the canopy is opened and new trees are allowed to regenerate. Also, removing trees creates more space for mast producing trees to grow. Since most seed is produced on exposed portions of tree crowns, fully exposed tree crowns offer potential for the greatest mast production.

There are basically two types of forest regeneration management practices to consider for your property: even-aged management and uneven-aged management. Evenaged management creates stands that consist of trees of the same age, and includes the "clearcutting technique", "seed tree technique", and various types of "shelterwood techniques". Forests with even-aged management will contain mostly shade intolerant trees, where all trees grow at approximately the same height. Uneven-aged management creates stands that consist of at least three different age and size classes, and includes various types of "selection techniques". Forests with uneven-aged management will contain mostly shade tolerant trees, where young trees grow in the shade of older trees. These management practices differ by the age distribution of trees left standing and the amount of sunlight that reaches the forest floor after a harvest. Another practice called "high-grading" is a profit-motivated method, which has little or no value to wildlife. Highgrading takes only the most economically valuable trees--regardless of size or quality--and leaves the rest. The undesirable trees left standing are genetically inferior, and it is their progeny that will regenerate the forest.

Even-aged Management

Clearcutting Technique

Clearcutting is the most common method of regeneration among the even-aged management practices. This technique involves one cut, which may remove the entire stand. Clearcutting is for landowners whose goals require a large amount of new growth seedlings, and young shade intolerant trees. These cuts will provide the highest level of forage, shade intolerant tree mast, and woody stem density, and will attract ruffed grouse, snowshoe hares, rabbits, deer, and edge-loving songbirds.

Clearcutting results in the best conditions for regenerating aspen as it responds to cutting with explosive root sprouting that can number 5,000 to 70,000 stems per acre. Aspen forests are early successional stages of many forest types and need clearcutting to regenerate. If they are not cut, they will be replaced by shade tolerant species.

This technique benefits edge-loving wildlife the most when the cuttings are from two to 10 acres in size and a different portion is cut every 10 to 20 years. Cuts of 20 acres or more will result in large proportions of shade intolerant trees such as aspen, pin cherry, black cherry, and red oak. Cutting in patches or narrow strips will produce more intermediately tolerant and tolerant trees. Best regeneration occurs when cuts are made in a north/south orientation to receive full amounts of sunlight.

Landowners that subscribe to this technique should consider leaving a buffer zone of trees of at least 100 feet around wet areas, and saving valuable snags and mast producing trees at the rate of one to five individuals per acre. Leaving small clumps of aspens and/or oaks, white pine, and hemlock in clearcuts larger than 5 acres is also encouraged to maintain diversity of vegetation and wildlife. It is suggested, in any forest management plan, to leave 1/4 to 1/3 of an acre uncut per 10 to 15 acres of timber harvested area to maintain diversity.

Overstory Removal

This technique is the most commonly used method to release two-aged stands. The technique is very similar to a clearcut, except it already has adequate regeneration established or two very distinct classes of sawtimber over poletimber. If there is two classes a complete removal of the overstory takes place.

Seedtree Technique

The seedtree technique involves removing nearly the entire stand in one cut, while leaving a number of trees, usually shade intolerant species, to provide seed for regeneration. These seedtrees can be left either alone, in small groups, or narrow strips. These trees do not provide enough cover to have any significant sheltering effect on the regeneration. The seed trees are then harvested after regeneration is established. This technique is most often used for conifers.

Shelterwood Technique

The shelterwood technique is the most complicated of the even-aged management practices. It is used to provide protection and shade for the regeneration area. This technique results in two to three even-aged classes of trees, and is used to regenerate trees that thrive in partial shade. It involves a series of two or more cuts over 15 to 30 years, in which the first cut removes 50 to 70 percent of the canopy. The rest of the stand, called the shelterwood, is left to provide a partial canopy that protects the regenerating stand. In the first cut, thickets of saplings or poles that are extensive enough to form a stand are left. After 5 to 10 years, when the new growth is well established, a second cut can either remove all or half of the shelterwood stand. If only half of the stand is removed on the second cut, then a third cut is used 10 to 20 years later to remove the last half. The final cut may leave trees that are long survivors such as sugar maple, oaks, white pine and hemlock.

There are three ways to implement the shelterwood technique. The "uniform" method harvests trees that are evenly scattered throughout the stand. The "group" method removes groups of trees at each cut. The "strip" method uses an alternating or progressing pattern that moves through a portion of the stand at each cut.

The shelterwood technique is used to regenerate moderately shade tolerant species. It is especially successful in regenerating oak. Oak rebounds in forests that allow some sunlight to enter, while maintaining some shade and shelter for seedlings to become established. By creating space for large oak trees, acorn production increases and oak regeneration from seed is successful.

Thinning/Improvement Technique

This type of selection harvest is targeted to reduce stocking and concentrate growth on more desirable trees. Typically these treatments are focused on increasing diameter growth, manipulating stand structure and quality. These treatments typically are also associated with another type of treatment in the future, at this stage they are typically a combination of a shelterwood and selection harvest.

Uneven-aged Management

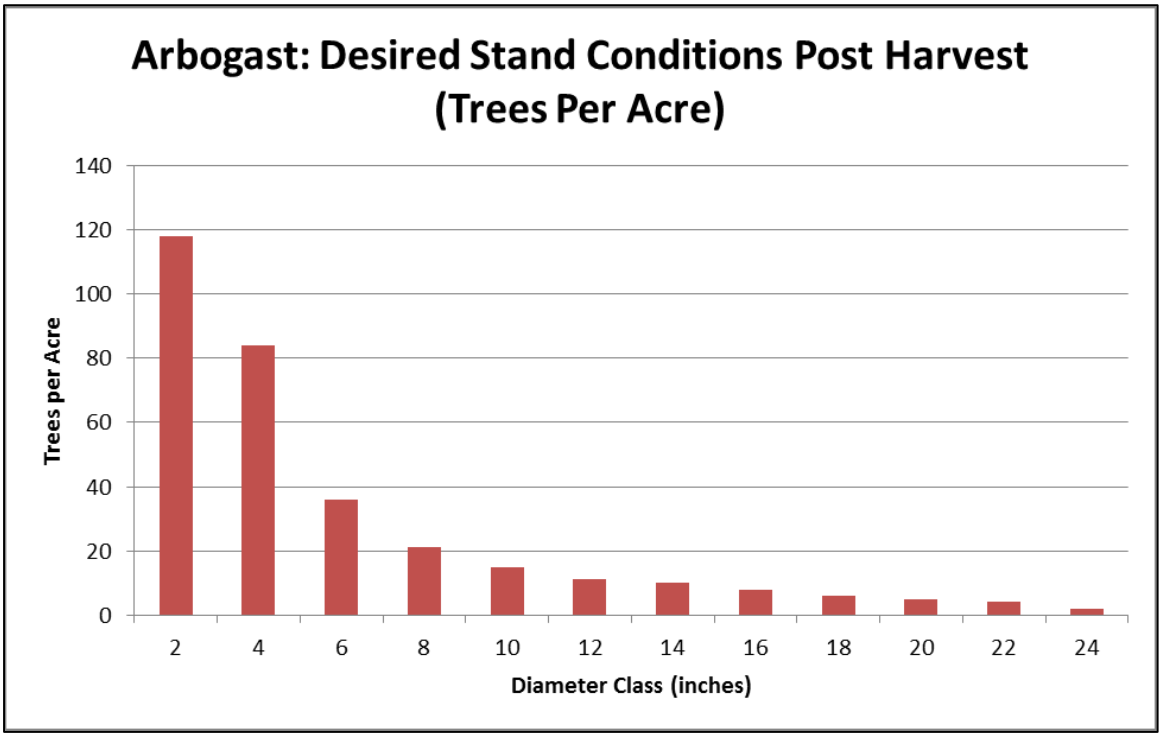
Selection Technique

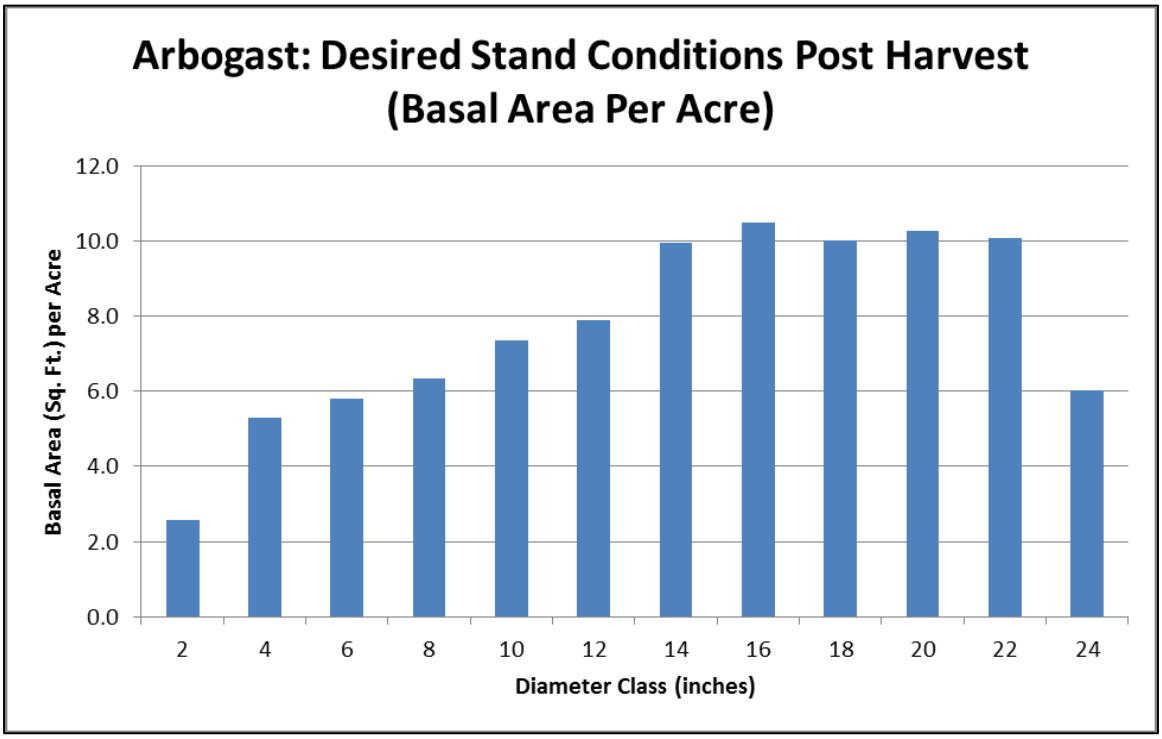
The selection technique is preferred for landowners who wish to maintain a small amount of edge, and manage a relatively mature, diverse forest with little amounts of disturbance. It is also a good technique to use when a long-term supply of quality sawlogs is an objective. This technique promotes regeneration of shade tolerant trees, such as sugar maple, basswood, beech, and ash. If trees selected for harvest are in groups more than 1/2 acre in size, then oaks, hickories, red maple, and other intermediately shade tolerant species will grow. The selection technique employs light cuts that remove 10 to 30 percent of the trees of all sizes at each cut. Trees are selected based on species, quality, biodiversity, and size. Selection sites should be areas that are too dense for optimum growth. The goal is to provide proper spacing to encourage rapid growth and reproduction. Thin lightly every 10 years or so to prevent severe disturbance and to encourage continuous rapid growth. The result will be a variety of species in many different size and age classes. In other words, the forest will be structurally and compositionally diverse. Literature from Arbogast

(USFS) recommended harvest intervals of 8 to 15 years, which would produce good yields of high-quality timber. Arbogast's suggestion for marking individual trees is based on risk, cull, quality, vigor, species, crown position, and size. The result will be a variety of species in many different size and age classes. In other words, the forest will be structurally and compositionally diverse. Looking more thoroughly at Arbogast's recommendations; a high percentage of logs is recommended with a merchantable basal area of 85 (square feet per acre) and a total basal area of 92 (square feet per acre) post-harvest. However, in most cases a modified version of this method is used, using a Q-Factor of 1.3 or 1.5 with a max diameter of 18 inches and a targeted basal area of 70 to 80 (square feet per acre). This modified version uses a smaller max diameter because of financial maturity.

Crown Class	Tree Size	DBH Range	Rec. Arbogast Stocking (Sq. Ft.)	Q-Factor 1.3-18" Max Stocking (Sq. Ft.)	Q-Factor 1.5-18" Max Stocking (Sq. Ft.)
Dominant	Sawtimber	10 +	65 to 75	59	53
Intermediate	Poles	5 to 9	10 to 20	16	22
Suppressed	Saplings	2 to 4	5 to 10	5	9

Summary of Recommendations from Arbogast for Northern Hardwoods		
Stand Condition	**Stand Description before Harvest**	**Recommended Treatment**
1. Fully regulated	All elements of structure stocked in excess of recommendations.	Harvest down to 85 (Sq. ft.) of BA, leaving 70 (sq. ft.) BA of sawtimber and 15 (sq. ft.) BA of poletimber.
2. Overstocked with sawtimber but understocked with smaller timber	Stand is parklife and free of "underbrush". Abundant small reproduction may be present. Commonly found in virgin stands.	Reduce dominant sawtimber portion of stand to 70 (sq. ft.) of BA. Remove poles that will not produce high-quality timber in the future.
3. Understocked with sawtimber but overstocked with smaller timber	Most commonly found in second-growth stands. Stand has even-aged appearance.	Reduce stand to 85 (sq. ft.) BA in poles and sawtimber together. Remove cull and defective overstory trees. Cut only poor growing stock in overstory. After defective overstory trees have been removed, reduce stand to desired stocking by cutting in poletimber portion of stand. IF no sawtimber is present, reduce poles to 75 to 85 (sq. ft.) BA.
4. Understocked throughout entire structure	Open, brushy stands. Grass, sod, or raspberries and other brush species predominant in understory.	No cutting recommended.
5. Overstocked with sawtimber; hemlock and/or yellow birch predominate	Stand structure similar to No. 2 above with either hemlock, yellow birch, or both predominant.	Make initial cut retaining 100 to 110 (sq. ft.) BA of sawtimber sized trees.





The crop-tree method is an example of selection management. The landowner decides what their primary wildlife improvement goal is and then inventories the property to see which trees meet the goal. In other words, trees are selected based on species, size, or age. For example, if you want to increase acorn production for deer and squirrels, you would need to cut trees that are competing with oaks. Cutting

competing trees will "release" the best oaks for growth. To determine which competing trees must be cut to release a crop tree, simply look up into the crop-tree crown and picture it divided into four separate sides. Evaluate each side for interference from neighboring crowns. Any crown that touches or is about to touch the crop tree will compete with it for growth and should be cut. There are two types of selection techniques: single tree selection and group selection. Single tree selections choose individual trees for cutting, and are used in stands dominated by shade tolerant trees such as beech and sugar maple. This method is good for wildlife that do not require openings or shade intolerant mast producing trees as it maintains a relatively continuous forest canopy. Single tree selection is also often used to obtain firewood. Group tree selections choose groups of trees for cutting, and are used to provide wildlife with shade intolerant mast producing trees and shrubs as it permits more sunlight. Another way of providing these trees and shrubs is to plant them along the forest edge, or along logging roads or trails.

The previous silvicultural guidelines are from:
Sargent, M.S and Carter, K.S., ed. 1999. Managing Michigan Wildlife: A Landowners Guide. Michigan United Conservation Clubs, East Lansing, MI. 297pp.

Reforestation

This is the practice of regenerating and growing new trees on previously forested stands. Regeneration can take place naturally or through artificial methods primarily being hand or machine planted trees.

Natural regeneration results from the forest being manipulated to mimic natural disturbances that allows natural regeneration to take place. Single-tree and group selection both rely on gaps to create new age classes of natural regeneration. Single-tree selection favors regeneration of shade-tolerant species while group selection favors less-tolerant tree species because of the increased light from larger gap sizes. The creation of gaps whether they are a single tree or small group selection areas allow light to reach the ground floor creating conditions favorable for regeneration and seedling establishment. The seed tree system relies on and cones from dispersal during the harvests to naturally regenerate the stand. Clear cutting and Seed tree methods favor regeneration of shade-intolerant species. Both of these methods will allow natural regeneration to take place.

Artificial regeneration takes proper planning to have the chance of success. Typically a planting plan should include details on species, number of trees, tree spacing, site-preparation, and nursery stock type. Typically in the Lake States, red pine and jack pine are the most commonly planted species, along with some spruce and white pine. Typically planting densities range from 500 to 1,500 seedlings per acre; dependent on species, goals of stand, survival expectations, and cost. Advantages of lower planting densities include lower cost and increased diameter growth; however the disadvantages are increased vegetation competition, doesn't self-prune as efficiently, and fewer potential crop trees. Advantages of higher densities include faster height growth which limits competing ground vegetation, self-prunes lower branches, and has a higher number of crop trees; however disadvantages include higher costs, early thinning's may be difficult to access during first harvest, and boles tend to be weaker which allows for potential damage during heavy snows. Site preparation is the creation of favorable growing conditions for the planted trees. This typically includes mechanical site preparation which uses equipment to create a planting site for the seedling along with some initial vegetation control. The other type of site preparation is chemical, which is used before/after planting to control competing vegetation. The Michigan BMP manual states, "Use of chemicals to control forest pests and to eliminate vegetative competition with desired tree species may be the most effective and efficient means of accomplishing those management functions. If you have any questions about pesticide application, please contact the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division at 517-373-1087, or online at www.michigan.gov/mda."

Forest Health

Health of trees and forests is a complicated matter as problems are rarely from a single factor. Typically forest or tree heath conditions arrive from a combination of conditions and factors including growing conditions, weather, stand structure, species diversity, insects, and diseases. A high percentage of diversity will help prevent the property from catastrophic damage if an insect or disease outbreak occurs. Along with maintaining a diverse set of stands on the property, species diversity should also be promoted. A more comprehensive description of recent Forest Health Highlights in Michigan can be found in the Appendix.

The largest future problem that lies within forest communities is an ever increasing number of invasive plants and insects. Invasive species are non-native (exotic) or native species that have the potential to become established and have the potential to spread widely and cause ecological damage. The Maryland DNR reports that most exotic species are beneficial; with only about 15% becoming an invasive problem species. Some invasive species will always be present, however harmful impacts can be controlled by regular monitoring and education. Early detection can minimize outbreaks. If Invasive species are identified they should be reported to Michigan Department of Natural Resources and groups like the Midwest Invasive Species Information Network (MISIN). This group is a regional effort to develop and provide an early detection and rapid response resource for invasive species.

The Michigan BMP manual states, "Use of chemicals to control forest pests and to eliminate vegetative competition with desired tree species may be the most effective and efficient means of accomplishing those management functions. If you have any questions about pesticide application, please contact the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division at 517-373-1087, or online at www.michigan.gov/mda."

Insects

Insects are a natural component of the forests, they provide food for wildlife, assist in culling poor quality trees, and help break down leaf litter. When insects begin attacking valuable trees and kill or weaken them they are considered pests. Proper forest management assists in managing insect populations by keeping a healthy vigorous forest, which is less likely to be attacked by insects. Typically insects attack weakened trees. Some pests to keep on the lookout for are listed below; some are future threats that aren't in the Western U.P. yet and some are existing threats that are known to be in the Western U.P. More information for each insect can be found in the appendix.

Asian Longhorned Beetle - FUTURE THREAT!

The Asian longhorned beetle is an exotic beetle native to Asia. The beetle accidently arrived in cargo from Asia and the first breeding populations were identified in New York in 1996, and is currently infesting sites in NY, NJ, MA, and OH. This beetle is a destructive wood boring pest that prefers maple as a host, but will also use other hardwoods as a host. Currently, the only effective control method is through quarantines and destroying infested trees by chipping or burning them.

Balsam Woolly Adelgid - FUTURE THREAT!

This exotic sap-feeding insect was accidently introduced into the southeastern Canada from Europe around 1900. This adelgid attacks weaken balsam fir trees and kills branches; after multiple years of attack death can occur. Michigan is under a BWA quarantine now (no nursery firs allowed into state).

Emerald Ash Borer - EXISTING THREAT!

This beetle was discovered in the Detroit area in 2002. This beetle feeds on the phloem of ash trees in its larvae stage causing damage that leads to death of the tree. Trees down to as little as 3" in diameter have been attacked. Currently, the only effective control method is through quarantines and destroying infested trees by chipping or burning them. Management guidelines have been produced to minimize the amount of ash phloem in stands to minimize large population build ups.

European Gypsy Moth - EXISTING THREAT!
These moths are defoliators that will feed on nearly all trees, however preference is for red oak and aspen. This species was introduced in the United States in 1869. Populations of this moth exist from Wisconsin to Maine to North Carolina.

Hemlock Woolly Adelgid - FUTURE THREAT!
This small aphid like insect feeds on several hemlock species. This species was introduced to North America in 1924. The Michigan DNR says, "The HWA injures hemlocks by sucking plant juices and by injecting a toxic saliva while feeding. This causes the needles on infested branches to desiccate, turn a grayish-green color, and fall. Buds are also killed, so little new growth is produced on infested branches. Dieback of major limbs usually occurs within two years and progresses from the bottom of the tree upwards."

Red-Headed Pine Sawfly - EXISTING THREAT!
This defoliating insect feeds on jack and red pine in the Lake States. It typically targets pines under 15 feet tall in plantations. Feeding damage from this insect results in stunted height growth and even mortality.

Spruce Budworm - EXISTING THREAT!
This insect feeds on balsam fir and spruce. Typically overmature stands are targeted by the insect, balsam fir is the species that is most severely damaged. Stands of mixed balsam fir and spruce a preferred over pure spruce stands, damage can lead to large stands of mortality.

Sugar Maple Borer - EXISTING THREAT!
This wood boring insect is a common pest of sugar maple. Mortality is rarely caused, however, infestations can lead to severe loss in timber value.

Pathogens

The U.S. Forest Service states, "Forest pathogens are usually, but not always, microscopic organisms that attack trees in ways that can be hard to see with the naked eye. Pathogens can destroy roots and so reduce water and nutrient uptake. They can cause cankers or wilt diseases that reduce the flow of water to the leaves or needles. They can cause leafspots and defoliation that reduce the tree's carbohydrate reserves and its likelihood of surviving a hard winter." More information can be seen on each of these pathogens in the appendix.

Annosum Root Rot - EXISTING THREAT!
This is one of the most destructive diseases of conifers in North America. In Michigan red pine, jack pine, and white pine are considered highly-favored hosts of this disease. Also called red pine pocket rot, pocket mortality, or Heterobasidion root rot, this disease is common in thinned stands as the leftover stumps become affected.

Armillaria Shoestring Root Rot - EXISTING THREAT!
This is a common fungus throughout the Lake States in red pine plantations. Typically severe damage can occur in stands that stress or have other health concerns. This fungus causes decay near ground level of the tree, this causes a girdling effect that kills the tree.

Eutypella Canker - EXISTING THREAT!
This fungus is common on maples throughout the Lake States. Mortality is rarely caused on trees larger than 4 inches in diameter, however, damage can lead to severe loss in timber value.

Hypoxylon Canker - EXISTING THREAT!
This fungus is spread throughout North American and targets aspen. This is the one of the most important killing agents of aspen.

Nectria Canker - EXISTING THREAT!
This canker is the most common canker of hardwoods throughout the Lake States. Mortality is rarely caused on trees, however, damage can lead to severe loss in timber value.

Oak Wilt - FUTURE THREAT!
This is a disease that infects and kills oak trees and is found in Michigan. The disease spreads rapidly and some trees die within 1 or 2 months, while most trees die within a year. More information can be found in the attached Forest Insect & Disease Leaflet.

Sirococcus Shoot Blight - EXISTING THREAT!
This fungus affects softwood species in North America, in Michigan it occurs in red pine. Typically a single infection kills seedlings, while multiple infections kill saplings, and older tree normally see lower branches killed.

White Pine Blister Rust - EXISTING THREAT!
This pathogen was introduced from Asia around 1900, and affects white pines in Michigan. This can cause mortality from seedlings to mature trees. Seedlings and saplings can be killed within a few years, while large trees would take multiple years.

Invasive Plants

The Michigan DNR states, "Invasive species have negative ecological, economic, social and public health impacts. They have been widely identified as a serious threat to global and local biodiversity. Once established, they often out-compete native species for limited resources such as food and habitat, alter and damage existing habitat, displace native species and in some cases prey directly upon native species. Their impacts are found in our waterways, along our roadsides, in our wilderness areas and in both rural and urban communities." Some plants to keep on the lookout for are listed below; some are future threats that aren't in the Western U.P. yet and some are existing threats that are known to be in the Western U.P.

Autumn Olive - FUTURE THREAT!
The Michigan DNR states, "A deciduous shrub native to Asia, autumn Olive was propagated as a source of food and cover for wildlife. It was later determined that autumn olive is a destructive force on the Michigan landscape. Its rapid reproduction and widespread distribution create monocultures, shading out native plants and reducing diversity." More information can be seen in the attached guide.

Common Buckthorn - EXISTING THREAT!
The Michigan DNR states, "A large tree native to Eurasia, Common Buckthorn was introduced to the United States as an ornamental plant. Common Buckthorn produces large quantities of fruits which are widely distributed by birds and contribute to the rapid spread of the species. The high nitrogen content of fruits and

leaves can alter soil chemistry inhibiting growth of native species and impacting the seed bank for many years."

Garlic Mustard - FUTURE THREAT!
The Michigan Tech Center for Exotic Species states, "Garlic mustard is a widespread weed species in Michigan. It is established but is not yet widely spread on the Upper Peninsula. It is capable of invading shaded forest areas as well as more open woodlands."

Glossy Buckthorn - EXISTING THREAT!
The Michigan DNR states, "More shrub-like than Common Buckthorn, Glossy Buckthorn was planted as a cover source for wildlife until its invasive potential was realized. The primary threat from Glossy Buckthorn is the dense branching structure which shades out native species and the potential to encroach on sensitive ecosystems including wetlands, prairies and fens throughout the state."

Japanese Barberry - FUTURE THREAT!
The Michigan DNR states, "This shrub native to Japan was introduced as an ornamental landscape plant in part for its resistance to deer herbivory. The dense structure of Japanese Barberry and the retention of leaves throughout much of the year allows the shrub to overtake forested sites, shading out plants that provide food resources for deer and other wildlife. Recently Japanese Barberry was also linked to increases in Lyme disease as the shrub hosts higher levels of insects and animals that carry the disease."

Japanese Knotweed - FUTURE THREAT!
The Michigan DNR states, "Also native to Japan, Japanese Knotweed was purposely introduced as an ornamental species. Japanese Knotweed forms extremely dense monocultures, spreads rapidly by roots, plant fragments and rhizomes and has substantial negative impacts on native ecosystems as it releases toxic chemicals into the soil. The plant has also been known to erode stream banks, crack drain pipes and destroy foundations as its roots spread. This plant is illegal to possess or introduce into Michigan due to its harmful impacts."

Oriental Bittersweet - FUTURE THREAT!
The Michigan DNR states, "A vine species native to parts of Southern Asia, Oriental Bittersweet was introduced as an ornamental plant. The vine attaches itself to trees, siphoning resources and if uncontrolled, eventually destroys the tree. Oriental Bittersweet spreads from tree to tree, creating safety hazards as standing dead trees become vulnerable to wind and ice."

Spotted Knapweed - EXISTING THREAT!
The Michigan Tech Center for Exotic Species states, "Spotted knapweed quickly invades native plant communities and can easily sustain its population once established through a very large seed production. A single spotted knapweed plant can produce 600-1000 seeds in a single flowering season. Wildlife and domestic grazers do not favor spotted knapweed because of irritating chemicals."

Swallow-wort - FUTURE THREAT!
The Michigan DNR states, "Native to the interior of Europe and parts of Russia these two herbaceous plants were introduced for unknown reasons. The plants commonly overtake forested areas and have numerous properties that inhibit growth and survival of other species. These plants can be toxic to mammals and produce negative effects that cascade throughout the forest food chain."

Other Damaging Agents

Earthworms - EXISTING THREAT!
The University of Minnesota Duluth's Great Lakes Worm Watch states, "Ask anyone on the street if earthworms are good for ecosystems and you will undoubtedly receive a resounding "YES!". When asked

why, they may say something like “earthworms mix and aerate the soil”. It is a basic ecological concept that we may have learned as early as kindergarten. However, recent research on invasion of these seemingly benevolent creatures into previously earthworm-free hardwood forests of the Great Lakes Region has seriously challenged that belief. Researchers at the University of Minnesota, and elsewhere, have documented dramatic changes in native hardwood forest ecosystems when exotic earthworms invade. These changes including losses of native understory plant species and tree seedlings, changes in soil structure and declines in nutrient availability. There is also fascinating evidence emerging that the changes caused by exotic earthworms may lead to a cascade of other changes in the forest that affect small mammal, bird and amphibian populations, increase the impacts of herbivores like white-tailed deer, and facilitate invasions of other exotic species such as European slugs and exotic plants like buckthorn and garlic mustard. These results suggest that exotic earthworms may pose a grave threaten the biodiversity and long term stability of hardwood forest ecosystems in the region.” See attached document for more information.

Maple Dieback - EXISTING THREAT!

Significant maple dieback has been seen in the Western Upper Peninsula within the past few years. Crown dieback typically begins at the terminal portion of a branch and proceeds downward and inward towards the stem. Dieback in crowns can be defined as dieback or decline. Dieback is typically caused from a single factor, while decline is reduced growth and increased mortality due to multiple factors. Factors attributed to this crown dieback include an abundance of earthworms, drought, lack of snowpack, heavy defoliation, and poor soil nutrients.

Disaster Planning

Any forest health issues, whether caused by extreme weather, insect, or disease, will be addressed on a case by case basis using appropriate salvage methods to effectively deal with the situation on both stand or tract level.

Fish, Wildlife, and Biodiversity

Forests provide essential habitat for a variety of species, however, no forest stand can provide the habitat requirements for all species. Silvicultural techniques will be used to enhance desired habitat types along with meeting other goals. The main wildlife management on the property will be done through timber harvesting/vegetation management.

Some techniques that should be utilized that will benefit a wide array of species include retaining/creating a mixture of stand-level attributes including vegetative species; stand size, stand shape and forest stand structure. Other stand level wildlife elements that can be direct or indirectly affected by forest management include maintaining high value wildlife trees. Beneficial trees can be alive or dead and depending on their characteristics can be utilized by a variety of animals for denning, nesting, perching, and foraging. Standing dead trees are important to consider leaving because they create additional structure in heavy cut stands and eventually will become coarse woody debris, while large live branchy/multigrown trees can produce either hard or soft mast. Typically 2-6 wildlife trees per acre are recommended. Retaining woody debris (either fine of coarse) provides cover, food or growing sites for a diverse group of organisms, along with retaining this debris some tops from timber harvests will be piled to create brush piles for small mammals and birds. Stand shape is also important to consider as numerous species prefer an irregular shaped stand because it greats more forest edge (where two stands meet) as compared to straight edged stands. Any component of softwood in the mesic hardwood stands is valuable for shelter and cover for numerous wildlife species.

Also forest openings are important for edge dependent species and it is recommended approximately 5-10% of forest should have openings. Typically, when creating openings it is best to size openings ½ acre to 2 acres, allowing both shade and shade intolerant species to thrive. Along with forest openings a beneficial practice for wildlife is to maintain ¼ acre of uncut forest within the harvest area for every 10 acres. Use snag or wildlife trees greater than 18” in diameter as centers for uncut areas. Within each of these mesic hardwood stands pockets of aspen and or white birch are found that should be clearcut to create these small openings.

Species Management

Whitetail Deer

Whitetail deer thrive in a combination of different forest types including young forests, brush land and agricultural areas. Deer cover a large area and you may not be able to provide all of the needed habitat types on your property; however your property will likely hold deer year round as it provides a high quality mixture of deer habitat. The best results may come at looking within about a one mile radius of your property and deciding which habitat components are in shortest supply, such as grassy openings, young regenerating hardwood forests, mast production from oaks, winter thermal cover. Determine which you can provide or improve and is lacking in the surrounding areas. Whitetail are similar to grouse, in which a mosaic of size and age classes of timber stands are desired, again 3 to 4 ages classes are desired. Some research has shown the best habitat has 25 % of young forests, grassy openings, and or food plots. In areas of mesic hardwoods, the best management is to select harvest no more than 30 percent canopy closure, and to create ½ acre to 2 acre forest openings in pockets of aspen. If no aspen is present still consider creating openings and allowing these small pockets of young forests to grow or convert to food plots.

Ruffed Grouse

Ruffed grouse are one of the few species where they can be sustained on only 10 to 20 acres if the habitat is ideal. The best grouse habitat is aspen stands that are clearcut approximately every 50 years in small patches creating a mosaic of different 3 to 4 different age classes of aspen, ideally 10 years apart. The

best habitat has young and old aspen stands within 5 to 15 acres. The optimum habitat includes brushy areas and young aspen stands to provide cover and supply summer and fall foods, mature aspen stands, and dense sapling stands. Coarse woody debris will provide drumming logs; typically logs are greater than 8 inches in diameter and more than 70 inches in length. Attempt to leave 1 to 2 drumming logs per acre, and a snag within 10 feet of log. In mesic and lowland hardwoods grouse management is limited, however pockets of aspen should be clearcut creating small pockets of young aspen and hardwood or even aged management is recommend in a mosaic approach, creating different age and size classes.

Fish/Stream Habitat

Streamside or lakeside zones are referred to as Riparian Management Zones (RMZs); they occur on each side of perennial and intermittent streams along with around the perimeter of bodies of water. According to Michigan's BMP's: "The RMZs are critical to watersheds, wildlife, fish, trees, and people for many different reasons. Adequate vegetation in a RMZ helps filter and trap pollutants such as sediment, excess nutrients, and other contaminants before they reach surface waters. Excessive disturbance of the forest floor within the RMZ minimizes its ability to prevent nonpoint source pollutants from reaching a stream or other water body." RMZ's are highly critical to fish habitat because small amounts of erosion can greatly effect spawning habitat and insect habitat (food).

Food Plots and Wildlife Plantings

Supplemental food plots can increase deer and other wildlife usage on this property, along with growing healthier and bigger wildlife. Former North Dickinson County graduate, Mike Pelletier from Hardcore Pursuit is partnered with Antler King, which recommends having 5 to 10 percent of a property in food plots; learn more online at www.antlerking.com. Refer to the book Ultimate Deer Food Plots by Ed Spinazzola for more specifics regarding food plot maintenance. This book can be purchased through the Quality Deer Management Association at (800) 209-3337 or online at www.QDMA.com.

Supplemental tree and shrub planting can also increase deer and other wildlife usage on this property. Trees and shrubs provide cover for wildlife and birds during all seasons, nesting and rearing sites, and additional food sources. Some species to consider planting in clumps along food plot edges or in openings can be seen in the table below.

Species	**Soil Type** S=Sand L=Loam C=Clay M=Muck	**Moisture** D=Dry M=Moist W=Wet	**Light Preference** S=Sun SH=Shade	**Height** S=Small M=Medium L=Large
Shrubs & Deciduous Trees				
Crabapples	S-L-C-M	D-M	S	S-M
Hawthorn	L-C	D-M-W	S-SH	S
Dogwood	L-C-M	M-W	S-SH	S
Elderberry	L-C-M	D-M-W	S-SH	S
American mountain-ash	L-C	D-M	S-SH	M
Apple	S-L-C	D-M	S	S-M
Wild Plum	S-L-C	D-M	S	S-M
Red Oak	S-L-C	M	S-SH	T
Conifers				
White Spruce	S-L-C	D-M	S-SH	T
White Pine	S-L	D-M	S	T

High Conservation Value Forests

These forests contain high-quality rare forest types that are important to biodiversity. There is no known high conservation forests/habitats. This was verified from the Michigan Natural Features Inventory. If any are ever noted, then care should be taken to preserve them. This information was acquired from Mike Smalligan, the Forest Stewardship Coordinator with the Michigan DNR located out of Lansing and during the on-site field visit.

Threatened and Endangered Species

Three species of concern were identified from the MNFI database; common loon, slippershell mussel, and osprey. This information was acquired from Mike Smalligan, the Forest Stewardship Coordinator with the Michigan DNR located out of Lansing and during the on-site field visit. Additional information can be found in the Appendix for each of these species.

The MNFI database showed an osprey located in Section 7, T42N-R28W, which has 40 acres of the Felch tract within it, no nests were identified during the field assessment. Osprey are ranked as a species of "Special Concern in Michigan", they are not listed under the Endangered Species Act. Osprey are a large birds that are fish eating specialists. Osprey typically build nest on tops of isolated, large, dead trees and on manmade structures. Osprey usually nest near water so following BMP's will protect their waterside habitat. Avoid active logging or road work operations within 660 feet of nest during active nesting season (May1 - August 15).

The MNFI database also showed a common loon in Section 7, T42N-R28W. This was likely identified in the southern portion of Gene's Pond, however, they are ranked as "Threatened in Michigan" and are legally protected. Loons require/prefer inland lakes greater than 40 acres in size with undeveloped shorelines, steady water levels, and small islands or bog mats for nesting. Loons usual nests are waterside and following BMP's will protect waterside habitat and nesting locations.

The MNFI database showed slippershell mussel in section 12, T41N-R28W, which has 40 acres of the Breen tract within it. Slippershell mussel are ranked as "Threatened in Michigan" and are legally protected. They typically occur in creeks and rivers in sand or gravel substrates, and occasionally occur in larger rivers and lakes in mud substrates. The last year observed in Dickinson County was in 2009.

One other potential species of concern is the Northern Long-Eared Bat. This bat has been proposed to be federally listed as an endangered species. The reason for the fear of this bat going extinct is the White-nose syndrome. The U.S.F.W. received a petition in January of 2010 to list the bat as endangered; it was than determined the listing was warranted and proposed listing was published in October of 2013. A six-month extension was given on a final listing determination in June of 2014. A final decision on listing the bat should be made no later than April 2, 2015. More information regarding the Northern Long-eared Bat can be seen in the attached fact sheet.

Cultural and Historical Sites

There is no known historical or cultural sites located on the property. This was verified from the Michigan Archeology database. If any are ever noted, then care should be taken to preserve them. This information was acquired from Mike Smalligan, the Forest Stewardship Coordinator with the Michigan DNR located out of Lansing and during the on-site field visit.

Special Sites to Owner

The school has no specific special sites throughout the property, however, special care and consideration should go to the actual high school facility and football field as special site, along with the tract across the road where it appears the school has some well sites.

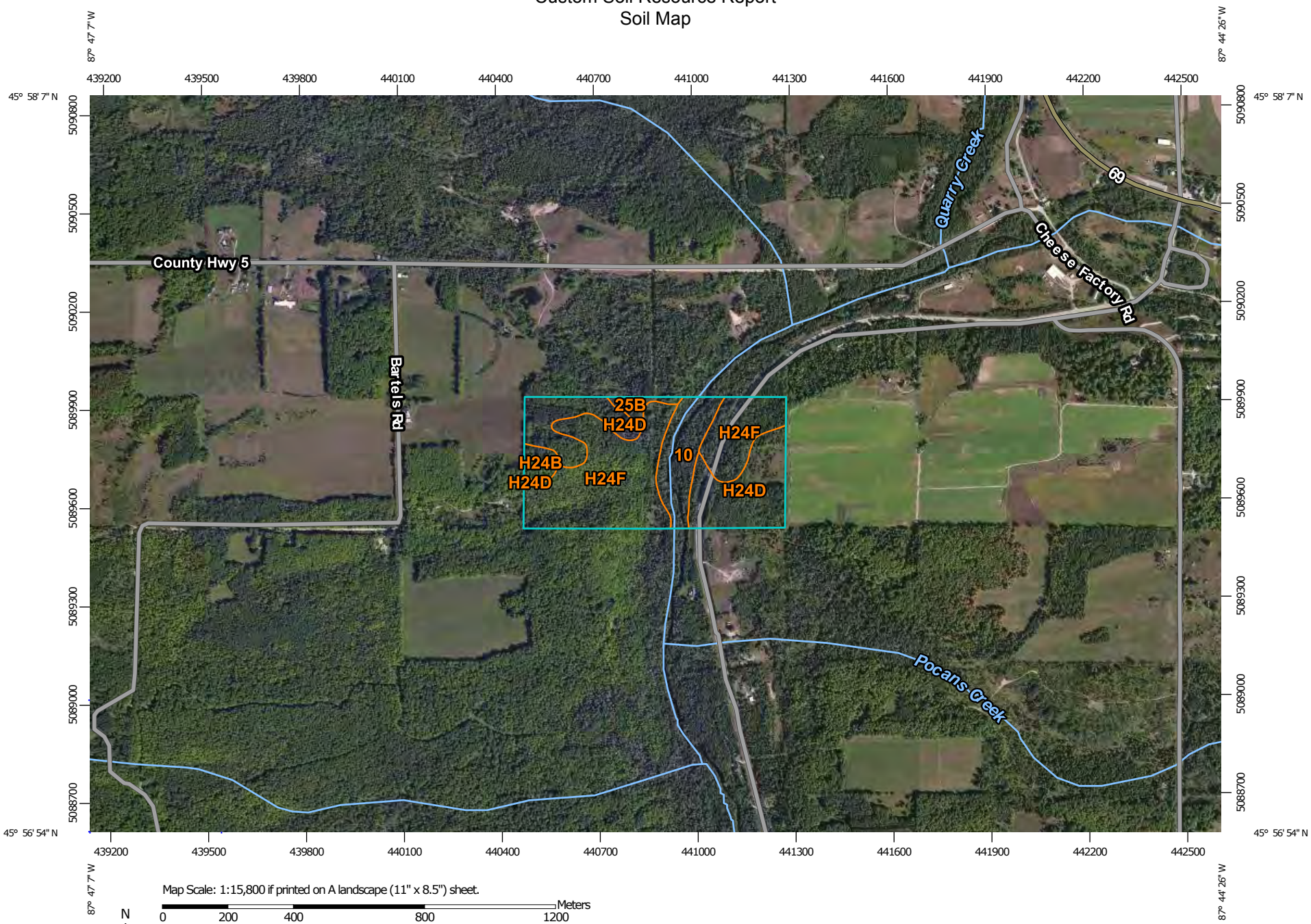
Soil Conservation

Soil is one of the fundamental resources of the forest, minimizing the disturbances is an essential part of sustainable forest management. Any management activities should be done in accordance with the state BMP manual. Best management practices help protect water quality, water temperature, nutrient balance, habitat diversity and hydrologic process. BMPs include proper location and construction of logging roads, the use of riparian management zones, installation of culverts and other stream crossings, proper use of pesticides and other chemicals, and site preparation for planting. BMPs also include the proper seasonal timing of activities to minimize the spread of insects or disease.

The best way to protect streams is to avoid crossing them, this is not always possible, and so it is important to minimize any negative impacts from crossing them. Any harvest or road plan should be set up by a professional forester, to minimize soil erosion and other damage. Riparian areas are transitional areas between terrestrial and aquatic areas. Riparian areas help filter sediment and nutrients from runoff, stabilize shorelines and stream banks, provide shade for streams, and provide food and habitat for aquatic organisms. Any forest management activities should minimize soil erosion near wetlands and surface water.

Additional soils information is available as part of a Custom Soil Reports completed on the property using the NRCS Web Soil Survey as seen in the Appendix and within the Stand Examinations. This information helps to determine soil productivity, site index, habitat type, and potential logging limitations. Each individual soil type is described in the attached soil report.

Custom Soil Resource Report
Soil Map



Map Scale: 1:15,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

Soil Map—Dickinson County, Michigan
(School Facilities)

Map Scale: 1:6,650 if printed on A landscape (11" x 8.5") sheet.

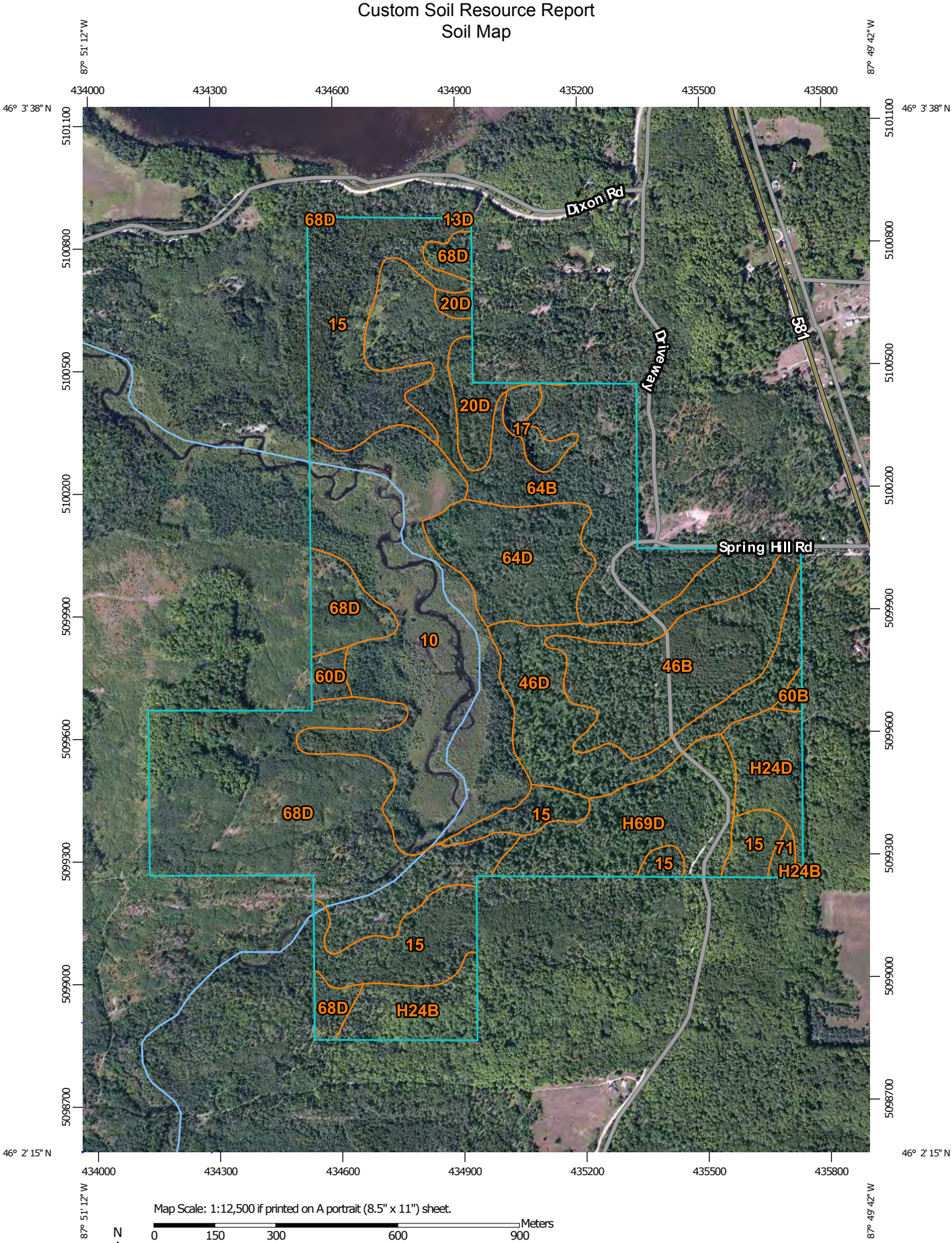
N

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

Custom Soil Resource Report
Soil Map



Map Scale: 1:12,500 if printed on A portrait (8.5" x 11") sheet.

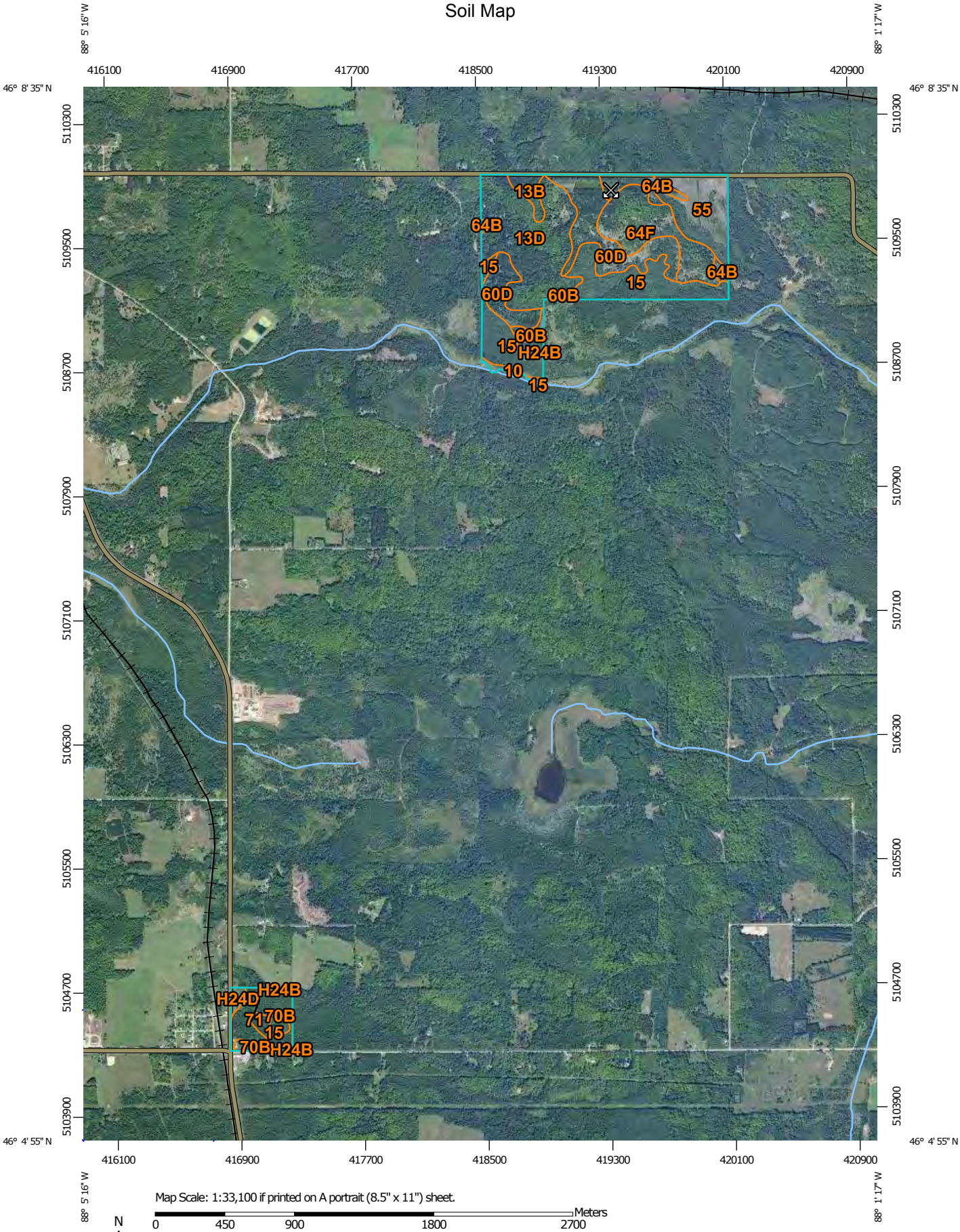
N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

Custom Soil Resource Report
Soil Map



Map Scale: 1:33,100 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 450 900 1800 2700

Feet: 0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

Other Resources

Access

Currently, all of the properties are very accessible as they all are boarded by county roads. The Breen tract has the poorest access, because it is split into thirds by the Waucedah Road and the East Branch Sturgeon River. Otherwise all the properties have easy access. This allows easy use for recreational hunting, fishing, and camping. The ease of access allows each of the tracts to be easily used in an educational setting and timber sales.

Aesthetics

The predominant silvicultural system that should be used is even-aged thinning and clearcut harvests, along with single tree selection harvests in northern hardwoods. By using multiple harvest types; this creates a more aesthetically pleasing property. Keeping a diversity of species is also considered to be beneficial. Plantations are typically viewed as not-aesthetically appealing, however, in the western U.P. they actually become aesthetically pleasing because they are not common in the area and it breaks up the monocultures of northern hardwoods. One key factor of aesthetics and the actual timber harvest is the type of equipment being used; typically a shortwood type of crew who uses a processor and forwarder have cleaner or better looking jobs to the public. Longwood crews who typically have a feller buncher or hand cutter, skidder, and slasher typically leave much more debris around landings and roadsides. Chipping/Biomass operations also leave a very clean looking aftermath; however, a better road system is needed for hauling chip vans.

Recreation

All of the properties are very accessible for the public to use. The forest is often a retreat for people to relax, observe nature, camp, fish, and hunt. Numerous deer blinds were found throughout the property. The recreational and educational use of the property could easily be increased by creating hiking/walking trails throughout the tracts. Some high schools use trail systems through properties like these for cross country running events if trails are present.

Fire

Prescribed fire is a management tool used to reduce hazardous fuels or unwanted understory plants (invasive, undesirable species, etc.). Prescribed fire should only be conducted by highly trained and properly insured professionals. More information about prescribed fire is available on the Michigan Prescribed Fire Council website at http://firecouncil.org. Wildfire is not a significant risk in the Western Upper Peninsula. Forests dominated by pines or on sandy soils are more prone to wildfire. However, more information about minimizing the risk of wildfire in Michigan can be found at http://firewise.msu.edu.

Carbon Cycle

Carbon dioxide is removed from the atmosphere through photosynthesis and decomposition of organic matter into the soil. Carbon dioxide is then released to the atmosphere through respiration, deforestation, and soil tillage. More than 63% of the terrestrial carbon stocks in Michigan's forests are in soil organic carbon while only 19% is in the above ground biomass (trunk, branches, leaves). Below ground biomass (roots), dead wood, and litter (dry leaves) make up the remaining 17% of the carbon stocks in Michigan's forests.

Agroforestry and Range

Agroforestry is a land-use system that combines both agriculture and forestry in one location. The five most common temperate agroforestry systems are alley cropping, forest farming, riparian forest buffers,

silvopasture, and windbreaks (see definitions in the glossary in the Appendix). The Landowners are not presently doing any agroforestry practices in their forest, but more information can be found at www.centerforagroforestry.org. Range refers to cattle grazing in natural landscapes. Free ranging cattle are more common in the national forests and other public land in the western United States, and the practice in rarely used in Michigan forests. Range animals may be used to control unwanted understory vegetation, but they can also be very damaging to the natural regeneration of desirable tree species too.

Education

Forest and forestry education helps increase ecosystem awareness and proactive forest management, especially in the face of changing forest systems due to climate change, management systems, disturbances, invasive species, or host of other factors. With minimal or inexpensive equipment students of all ages can investigate and conduct surveys or experiments outside and come away with a better appreciation for the forest. Many recent trends and publications note the importance of hands-on nature learning to increase student engagement in K-12 and above. Lesson ideas and activity guides are included in the appendix to assist educators in incorporating forestry topics into any standard biology, math, or social study disciplines. Active harvests should also be exposed to students to help understand why trees should be harvested.

An easy way to promote and educate students/public on forestry is to place a kiosk at each of the two large Felch and Sagola tracts and display a map of the property along with information regarding forest management. It also appeared the school facility has a walking trail with a tree idea along it, this trail should be improved and maintained along with the tree idea information (it appeared most if not all of them are missing the tree information). Attached is plans for a Kiosk.

Some easy forestry exercises would also include creating some permanent inventory plots, I would suggest doing these within the pine plantations.

Forest Economics

According to the Michigan Forest Product Council, “Each year, the Michigan forest products industry harvests about 12 million tons of wood. Each ton of wood generates about $100 worth of economic activity. That's a grand total of $1.2 billion worth of economic activity!”

Local Mills

Verso Paper

The Verso Paper Mill is located in Dickinson County in the town of Quinnesec, it is also the largest local employer. The mill was established in 1985, the mill produces coated free sheet paper and market hardwood pulp. The primary product the mill purchases is hardwood pulpwood. The mill also purchases woody biomass.

Louisiana Pacific

The Louisiana Pacific Mill is located in Dickinson County in the town of Sagola. The mill produces oriented strand board (OSB). The primary product the mill purchases is aspen and basswood pulpwood, along with softwood and hardwood pulpwood. The mill consumes approximately 800 cords per day of pulpwood.

New Page

The New Page Mill is located in Delta County in the town of Escanaba, it is also the largest local employer. The mill began in 1911 as the Escanaba Pulp and Paper Company, the mill produces coated free sheet paper, coated groundwood, specialty and uncoated papers. The mill has the capacity to produce 785,000 tons of paper. The mill purchases softwood, hardwood, and aspen pulpwood.

Besse Forest Group

The Besse Forest Group has over 10 saw mills located in Wisconsin and Michigan. These mills produce northern hardwood veneer, lumber, and specialty plywood. Besse is one of the largest producers of hardwood veneer in North America and is a leading exporter of North American hardwood products around the world. The mill purchases northern hardwood sawlogs and veneer.

Northern Hardwoods – Rossi Group

The Northern Hardwoods saw mill is located in South Range, Michigan. The mill produces northern hardwood lumber that is tailored to special architectural projects and industrial applications; the mill also specializes in “100% white maple strips”. The mill purchases northern hardwood sawlogs.

Florence Hardwoods

The Florence Hardwoods saw mill is located in Florence, Wisconsin. The mill produces hardwood cants and produces on average 70,000 board feet per day. The mill purchases northern hardwood sawlogs and northern hardwood bolts.

Sagola Hardwoods

The Sagola Hardwoods saw mill is located in Dickinson County in the town of Sagola. The mill was founded in 1997 and has 50 to 100 employees, producing pallet boards. The mill purchases northern hardwood and aspen boltwood.

Capital Gains Tax Information

Profits from timber sales are taxed as capital gains, rather than ordinary income, if you own the timber for more than twelve months. Expenses, including the cost of a management plan or a consulting forester’s fees for a timber sale, can be deducted from profits. There are many great tax related resources available on www.timbertax.org, including the most recent annual “Tax Tips for Forest Landowners.”

Financial Assistance/Tax Relief Programs

NRCS EQIP

The Natural Resources Conservation Service (NRCS) administers the Environmental Quality Incentives Program (EQIP) that may provide some financial assistance to forest owners to implement some "conservation practices" on their land in accordance with an approved forest management plan. Forest Stewardship Plans do not require the same level of detail as NRCS conservation activity plans, but they are accepted by the NRCS when applying for EQIP funding. You may need to work with your District Conservationist and forester to fill out supplemental "Job Sheets" if you apply for financial assistance to implement conservation practices in your plan. See www.mi.nrcs.usda.gov/technical/forestry.html

Some of the recommended activities in this plan may have potential for financial assistance. Common NRCS forestry practices include forest stand improvement, tree and shrub establishment, forest trails and landings, brush management, early succession habitat, and stream crossings. There are also many additional management practices not typically funded by NRCS including: surveying property lines and corners, enrolling in property tax programs, joining the Tree Farm, monitoring forest health, or other positive management activities where the activity produces income rather than an expense. NRCS conservation practices are funded to address "resource concerns" or problems in the environment (soil erosion, pollution, plant productivity, etc.). However, many forestry activities are simply good management of the forest (stewardship) rather than activities trying to fix some problem. Landowners often have significant economic, ecological, and enjoyment incentives for the stewardship of their forests even when government subsidies are not available.

Commercial Forest Program

The Commercial Forest Act gives property tax breaks for forest owners in Michigan. Landowners pay a specific rate of $1.25 per acre for property taxes and the State of Michigan pays counties another $1.25 per acre. Landowners must have at least 40 acres of contiguous forest, a management plan, and conduct commercial harvests as prescribed in the plan. Landowners must allow public foot access for hunting and fishing. Landowners must notify the DNR before they harvest commercial forest products. A Forest Stewardship Plan is an acceptable forest management plan for the Commercial Forest program. For more information and enrollment forms, see www.michigan.gov/commercialforest. The application deadline in April 1 for tax benefits in the following year.

Qualified Forest Program

The Qualified Forest property tax program exempts forest owners from paying school taxes up to 18 mills in each tax jurisdiction (township). Landowners must have between 20 and 640 acres, an approved forest management plan, and agree to comply with the prescriptions in their forest management plan. Landowners must report harvests to MDARD after they occur. A Forest Stewardship Plan is an acceptable forest management plan for the Qualified Forest program. See www.michigan.gov/qfp for more information and enrollment forms. The application deadline is September 1 for tax benefits in the following year.

American Tree Farm System

The Tree Farm System provides forest "certification" to verify that forests are sustainably managed. Certified forest products sometimes have a higher retail price, but often do not often generate higher prices for the forest owner. The minimum requirements are ten acres of forest, a current written management plan in compliance with the eight principles of the American Tree Farm System, and a free inspection by a certified Tree Farm Inspector. There is no additional cost for you entering the program.

TRACT MAP
Circa "1800"

NDCS - Breen Twp
Dickinsonn County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

Mapped by: Brandon J. Bal, CF
Coord. System: NAD 1983 UTM Zone 16N
Absolute Scale:1:15,840
Relative Scale:1 in = 1,320 ft 1 in = 0.25 mi

0 660 1,320
Feet

ATLANTIC MINE OFFICE
45815 Highway M-26
Atlantic Mine, MI 49905
P: 906-483-0820

QUINNESEC OFFICE
W6582 Highway US-2
Quinnesec, MI 49876
P: 906-563-7541

AFM
American Forest Management

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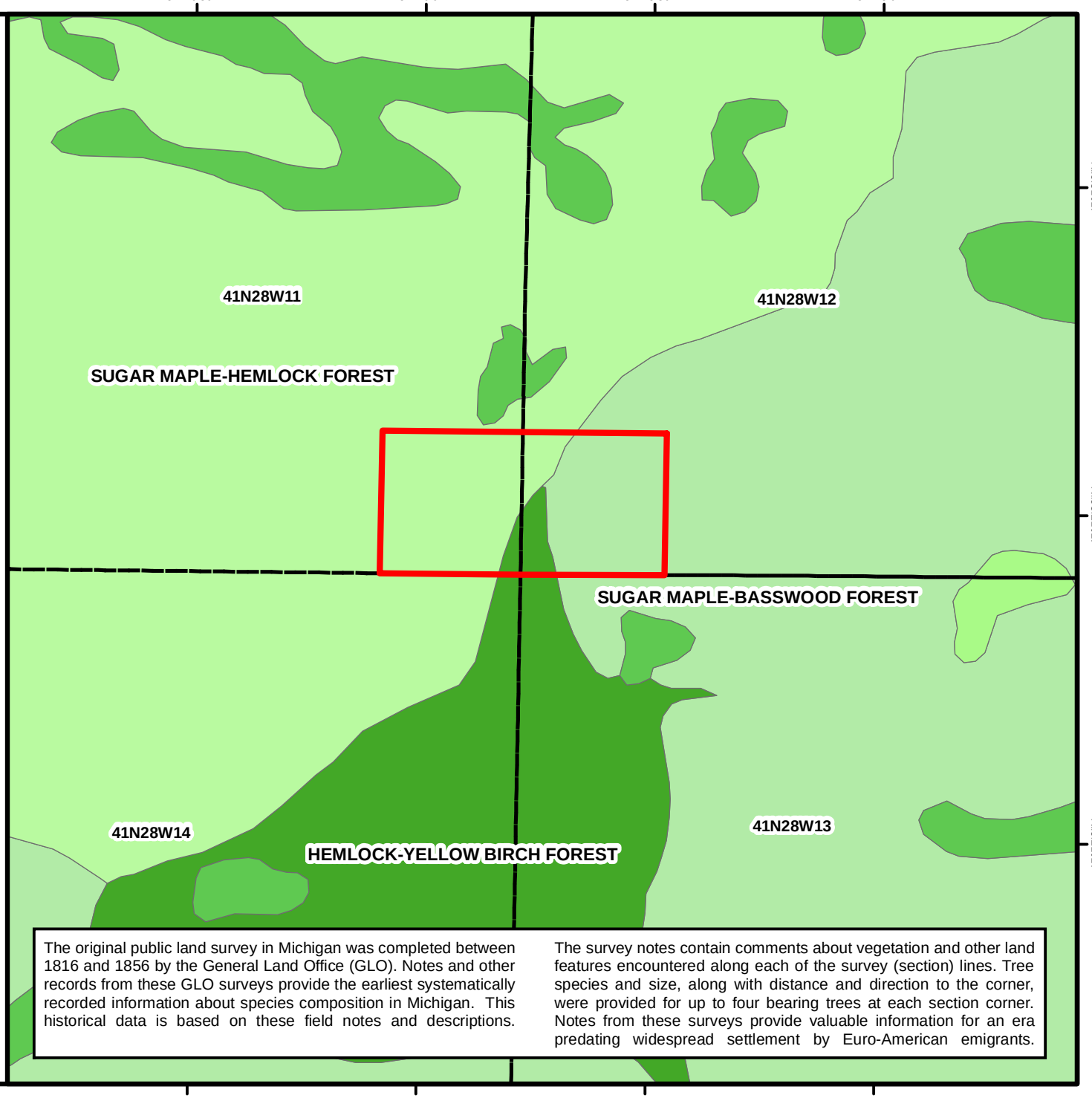

The original public land survey in Michigan was completed between 1816 and 1856 by the General Land Office (GLO). Notes and other records from these GLO surveys provide the earliest systematically recorded information about species composition in Michigan. This historical data is based on these field notes and descriptions.

The survey notes contain comments about vegetation and other land features encountered along each of the survey (section) lines. Tree species and size, along with distance and direction to the corner, were provided for up to four bearing trees at each section corner. Notes from these surveys provide valuable information for an era predating widespread settlement by Euro-American emigrants.

TRACT MAP
Circa "1800"

NDCS - School Facility
Dickinsonn County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

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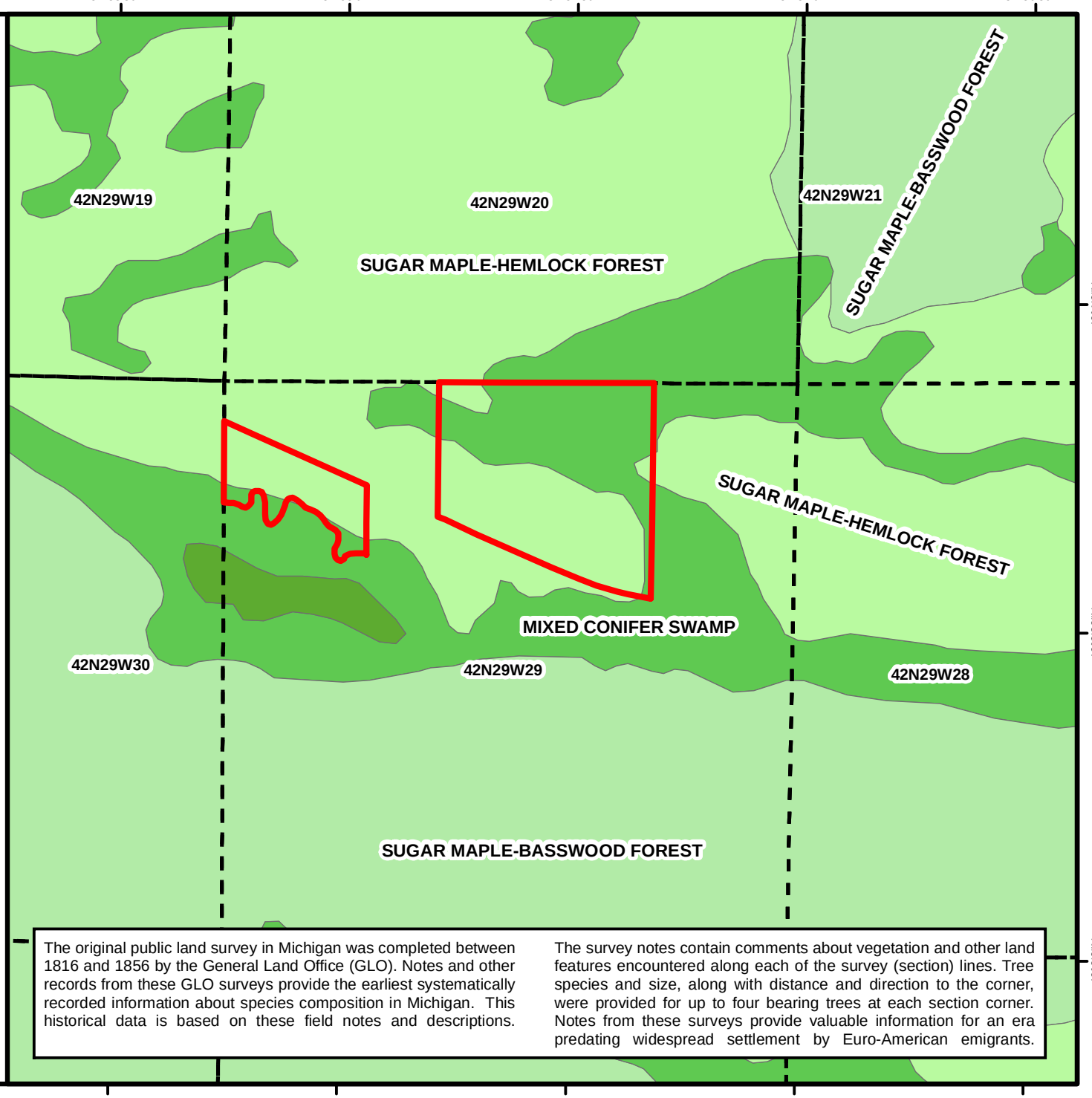

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TRACT MAP
Circa "1800"

NDCS - Felch Twp
Dickinsonn County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

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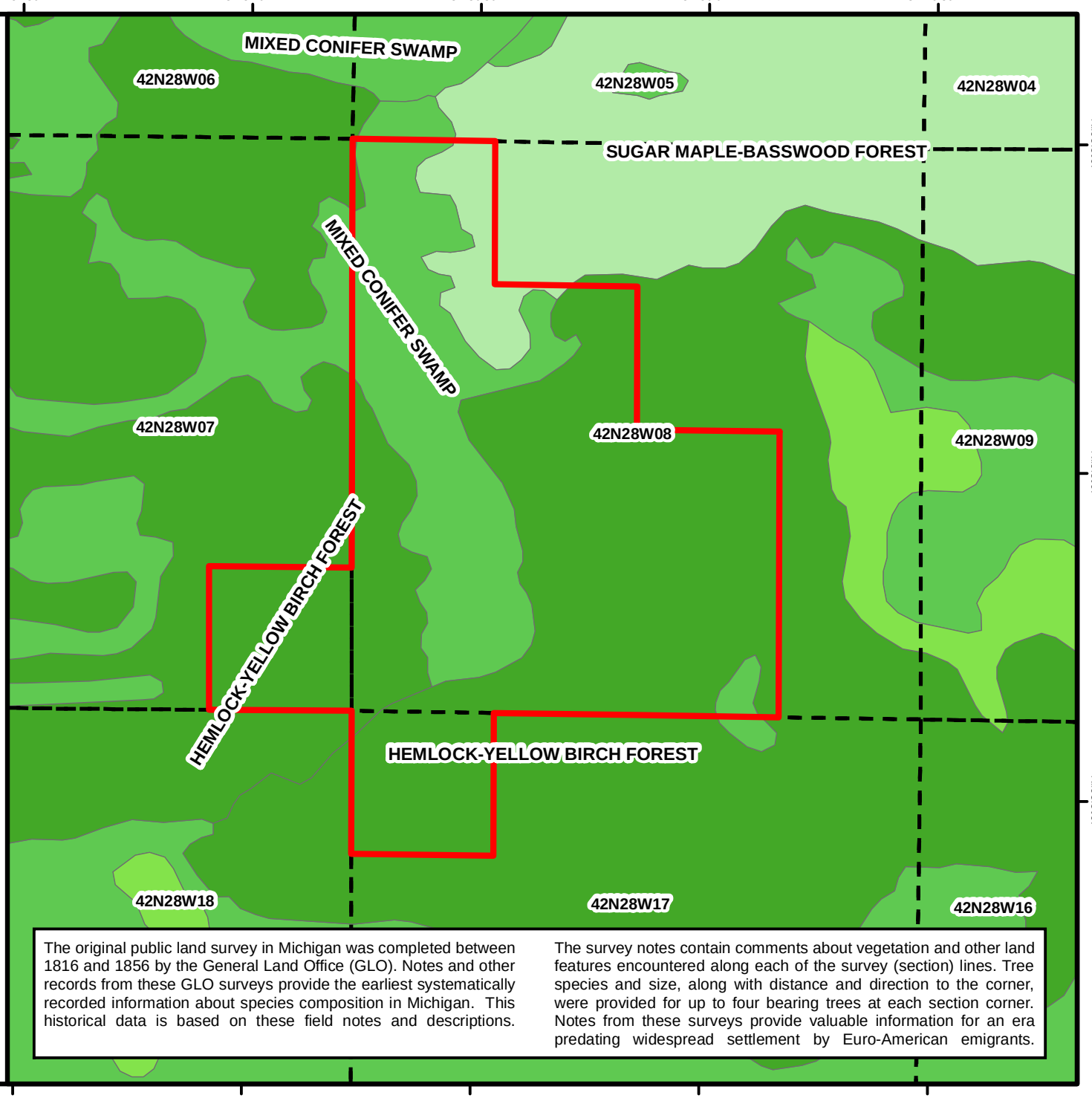

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TRACT MAP
Circa "1800"

NDCS - Sagola Twp - Sagola
Dickinsonn County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

Mapped by: Brandon J. Bal, CF
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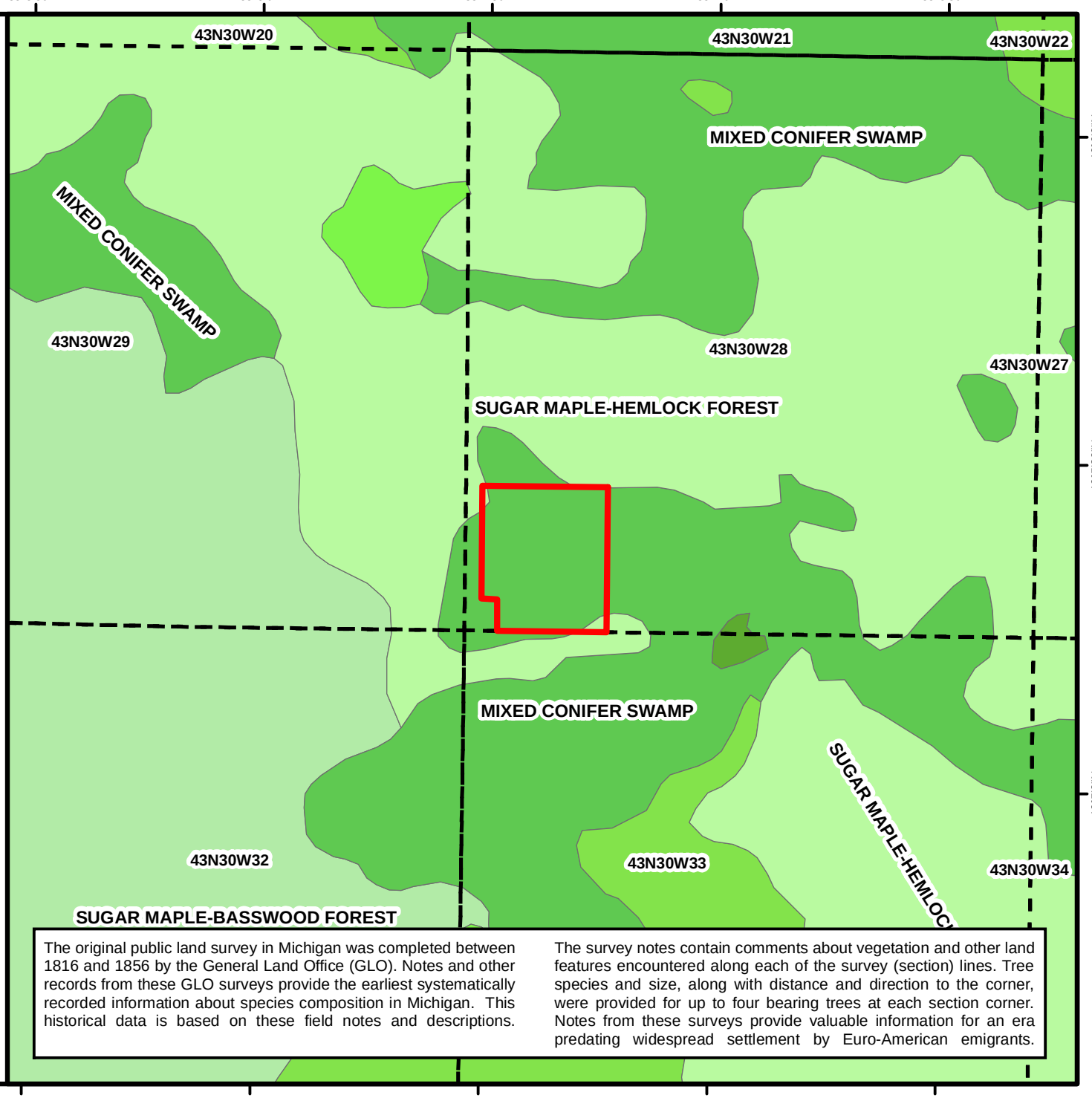

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TRACT MAP
Circa "1800"

NDCS - Sagola Twp - Turner Rd
Dickinsonn County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

Mapped by: Brandon J. Bal, CF
Coord. System: NAD 1983 UTM Zone 16N
Absolute Scale:1:15,840
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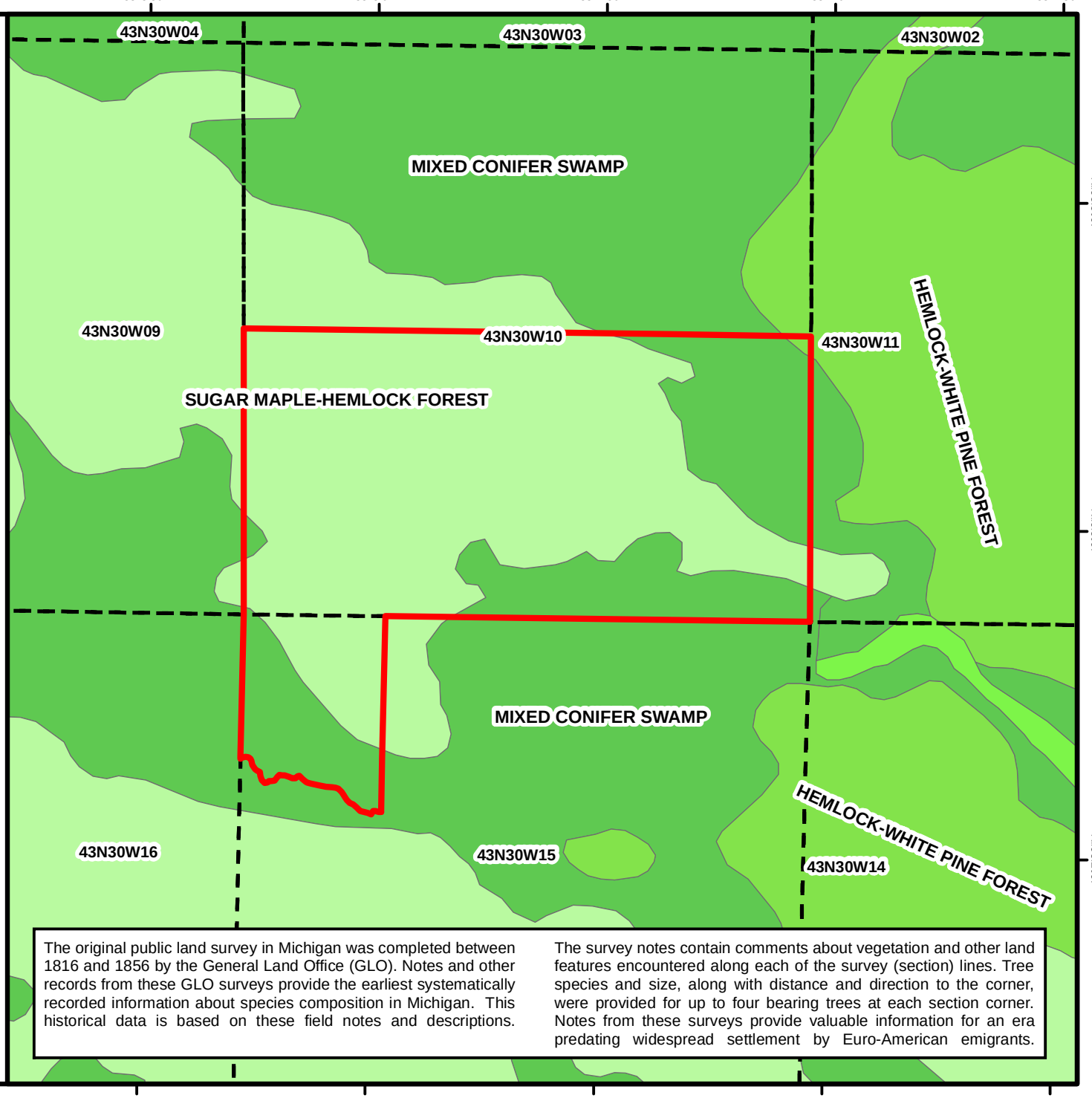

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STAND MAP
USGS

NDCS - Breen Twp
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

Mapped by: Brandon J. Bal, CF
Coord. System: NAD 1983 UTM Zone 16N
Absolute Scale: 1:7,920
Relative Scale:1 in = 660 ft 1 in = 0.125 mi

0 340 680
Feet

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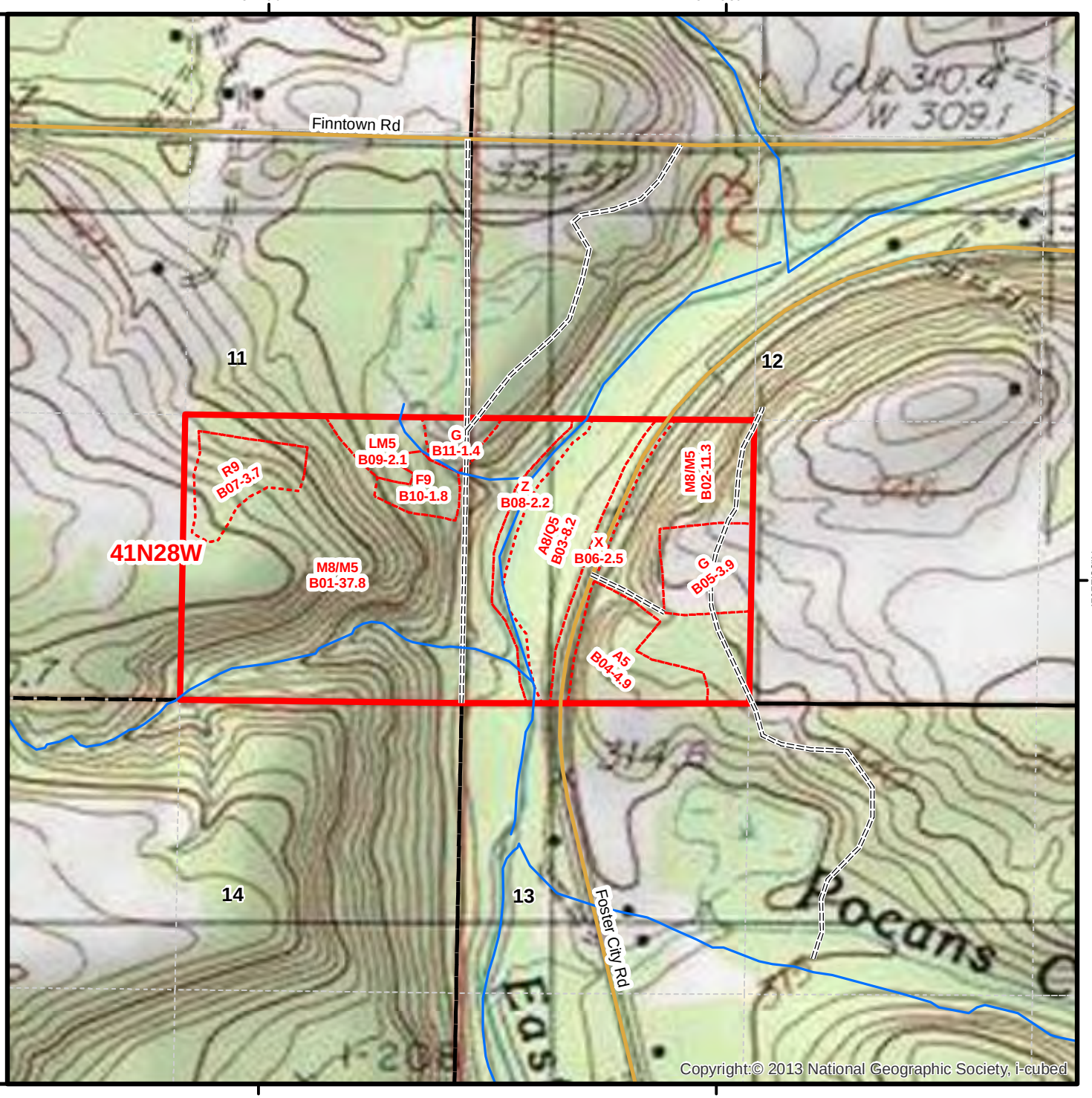

STAND MAP
USGS

NDCS - School Facility
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

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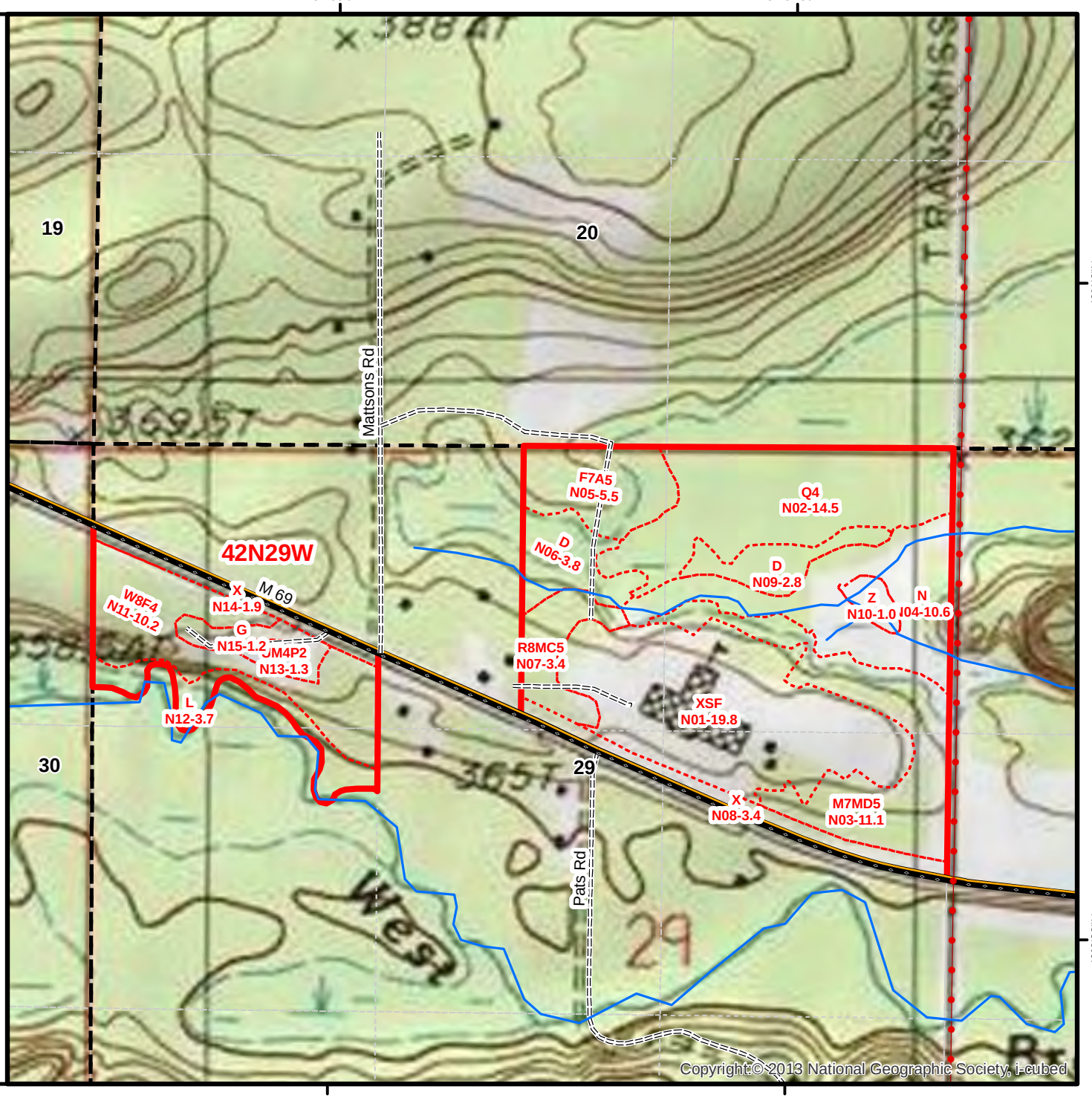

STAND MAP
USGS

NDCS - Felch Twp
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
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- County Road
- Woods Road
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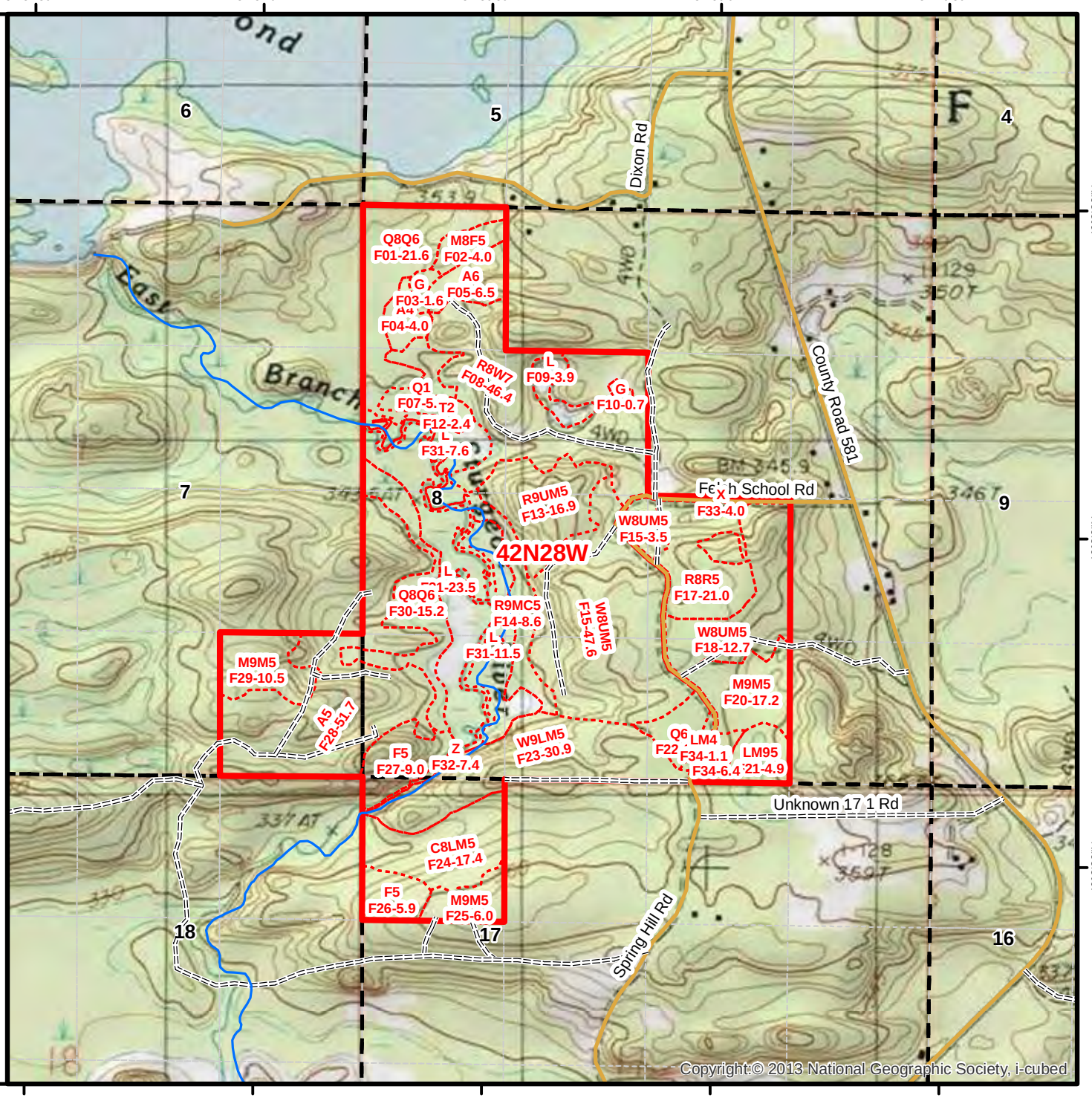

STAND MAP
USGS

NDCS - Sagola Twp - Sagola
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

Mapped by: Brandon J. Bal, CF
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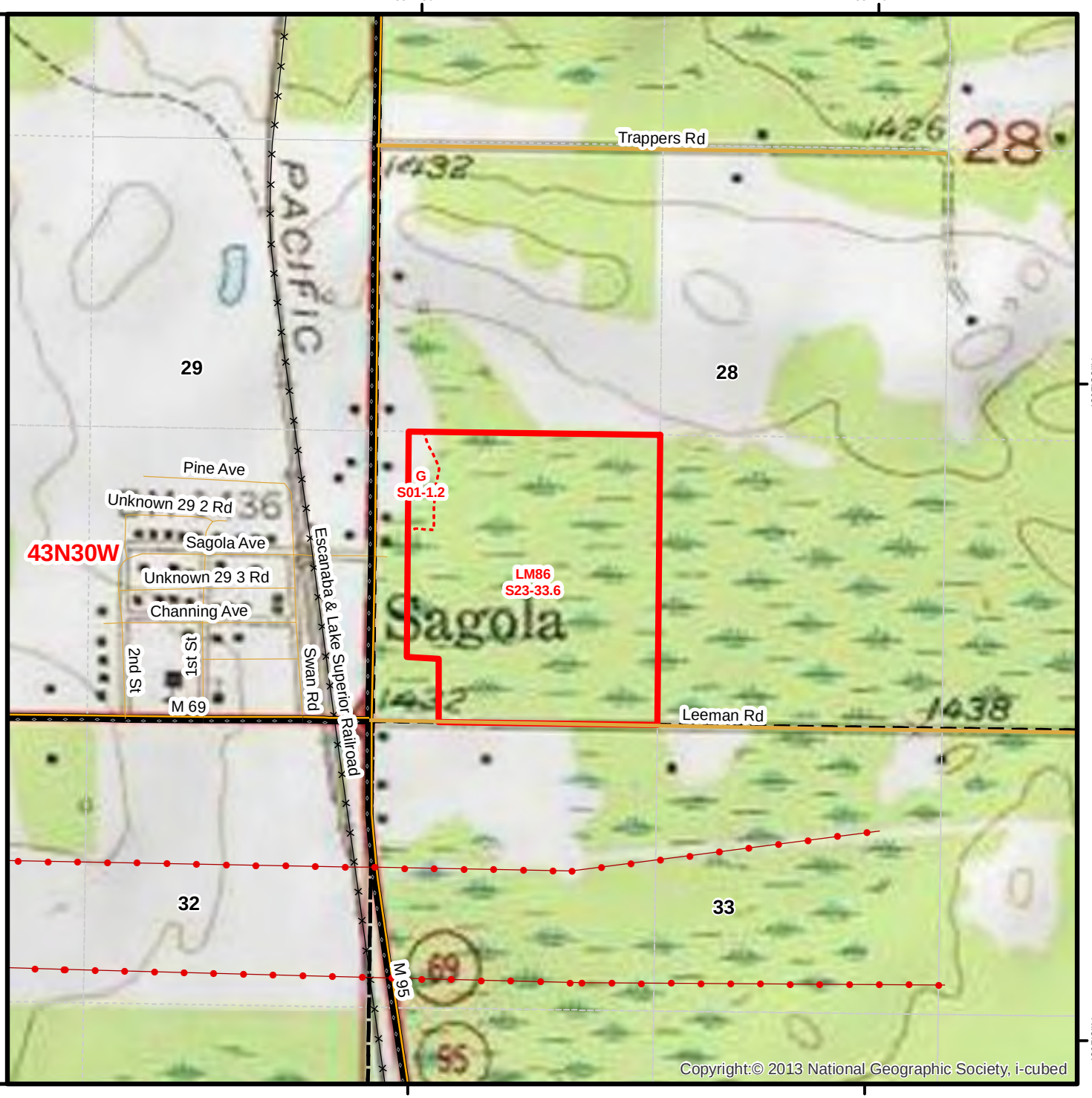

STAND MAP
USGS

NDCS - Sagola Twp - Turner Rd
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

Mapped by: Brandon J. Bal, CF
Coord. System: NAD 1983 UTM Zone 16N
Absolute Scale: 1:11,880
Relative Scale: 1 in = 990 ft 1 in = 0.188 mi

0 500 1,000
Feet

ATLANTIC MINE OFFICE
45815 Highway M-26
Atlantic Mine, MI 49905
P: 906-483-0820

QUINNESEC OFFICE
W6582 Highway US-2
Quinnesec, MI 49876
P: 906-563-7541

AFM
American Forest Management

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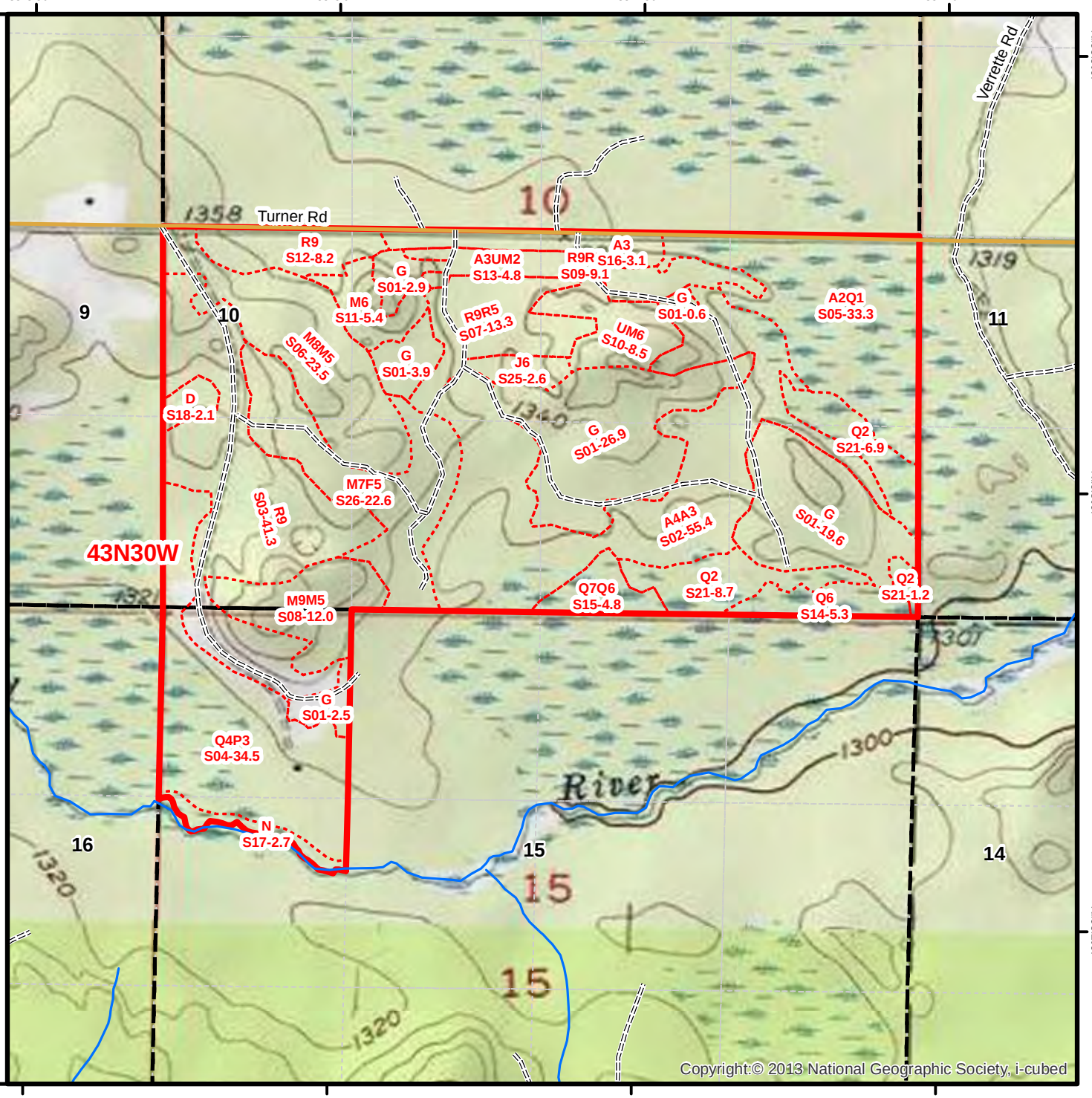

STAND MAP
State CIR "1998" Imagery

NDCS - Breen Twp
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

Mapped by: Brandon J. Bal, CF
Coord. System: NAD 1983 UTM Zone 16N
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Relative Scale:1 in = 660 ft 1 in = 0.125 mi

0 340 680
Feet

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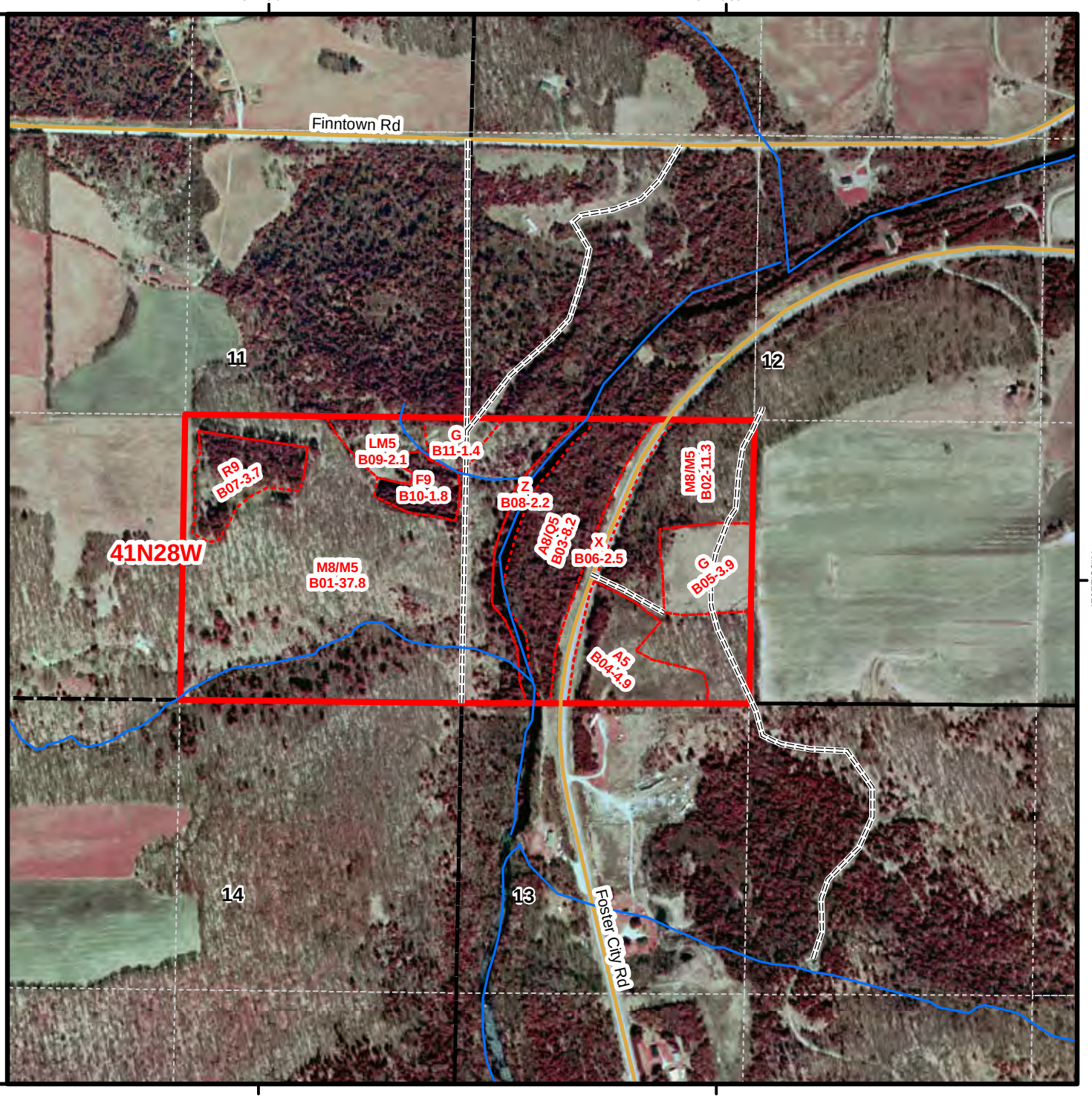

STAND MAP
State CIR "1998" Imagery

NDCS - School Facility
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
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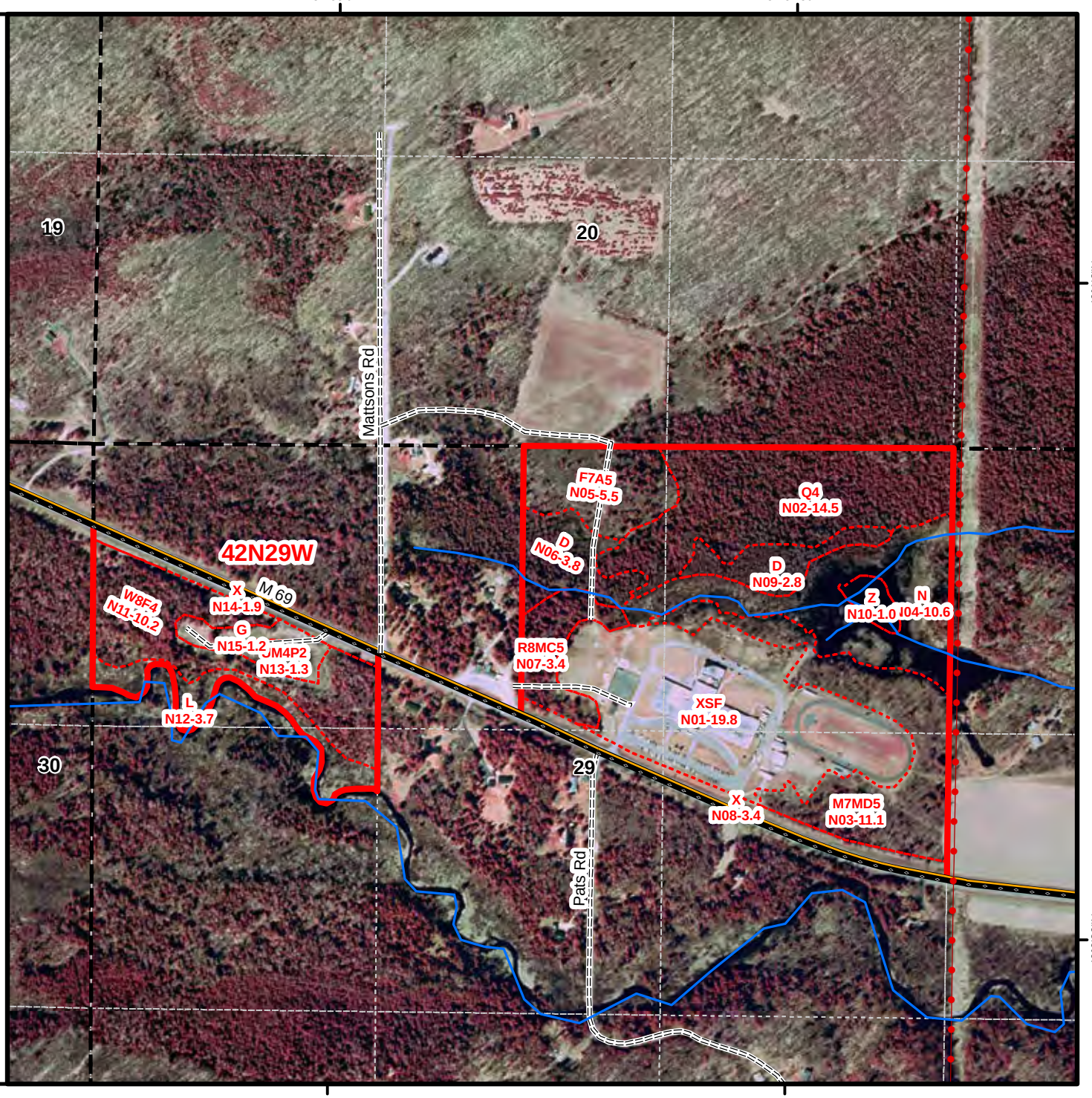

STAND MAP
State CIR "1998" Imagery

NDCS - Felch Twp
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
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- Streams

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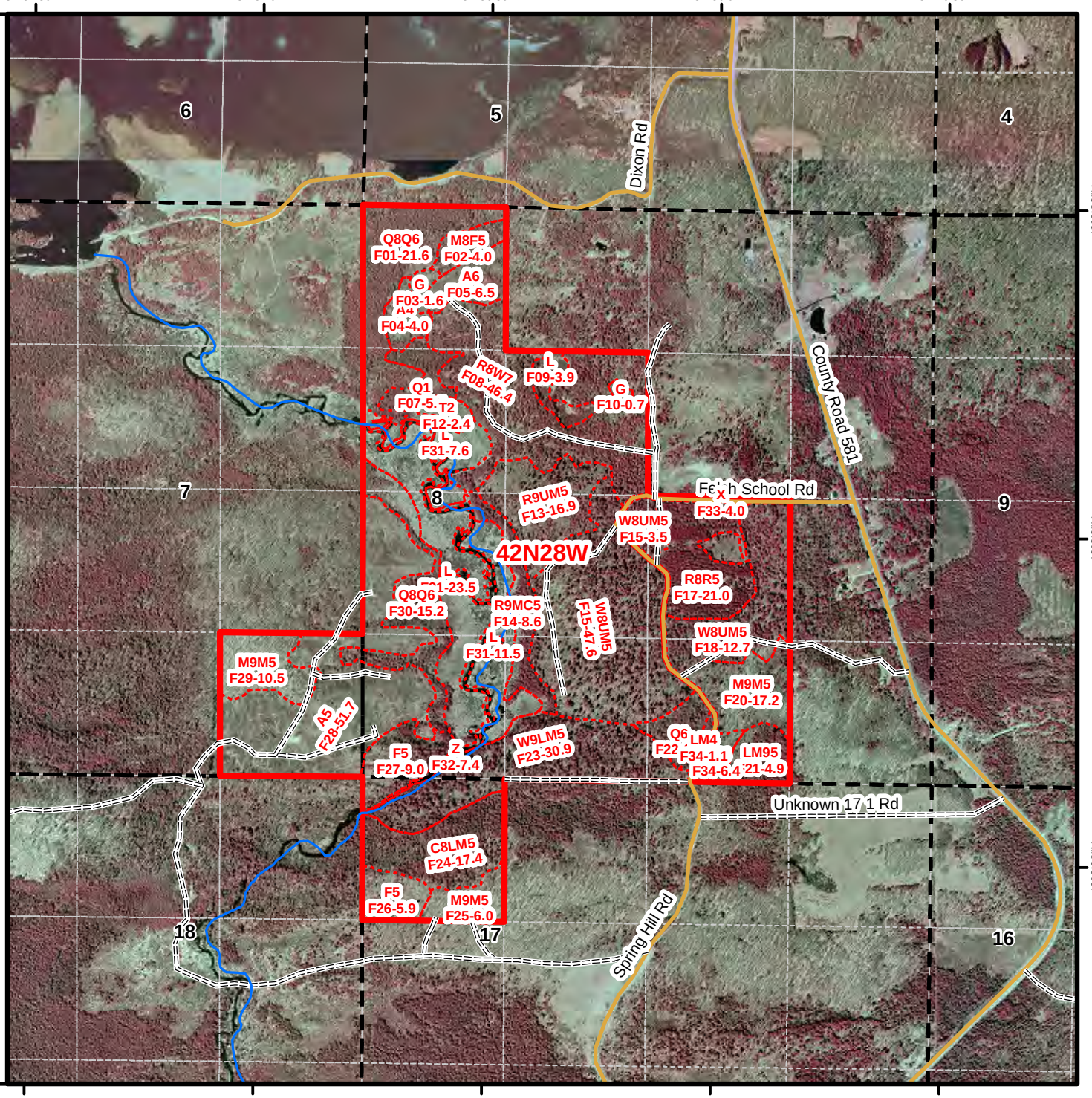

STAND MAP
State CIR "1998" Imagery

NDCS - Sagola Twp - Sagola
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
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- Streams

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STAND MAP
State CIR "1998" Imagery

NDCS - Sagola Twp - Turner Rd
Dickinson County, Michigan

Legend

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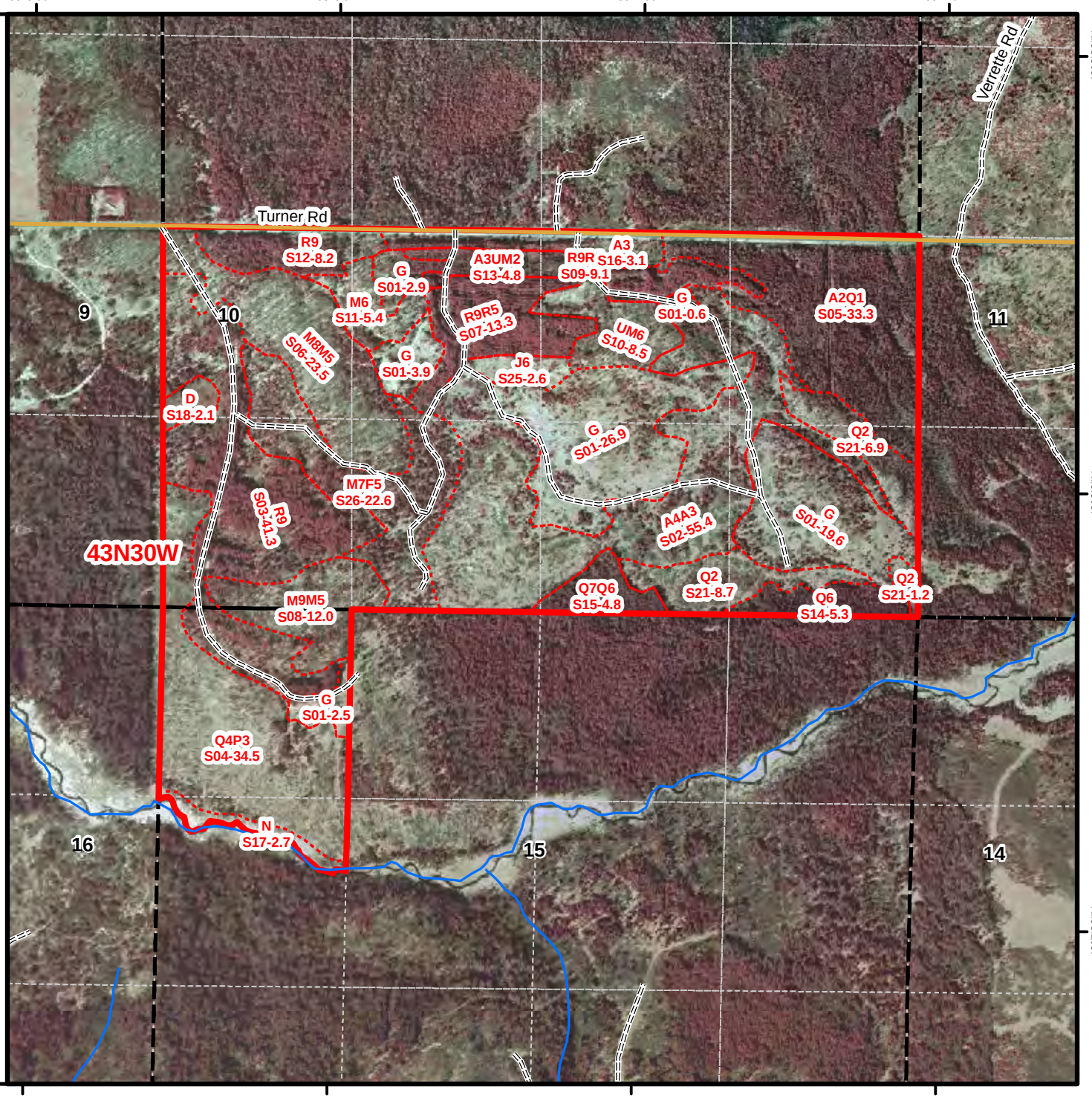

STAND MAP
NAIP "2012" Imagery

NDCS - Breen Twp
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

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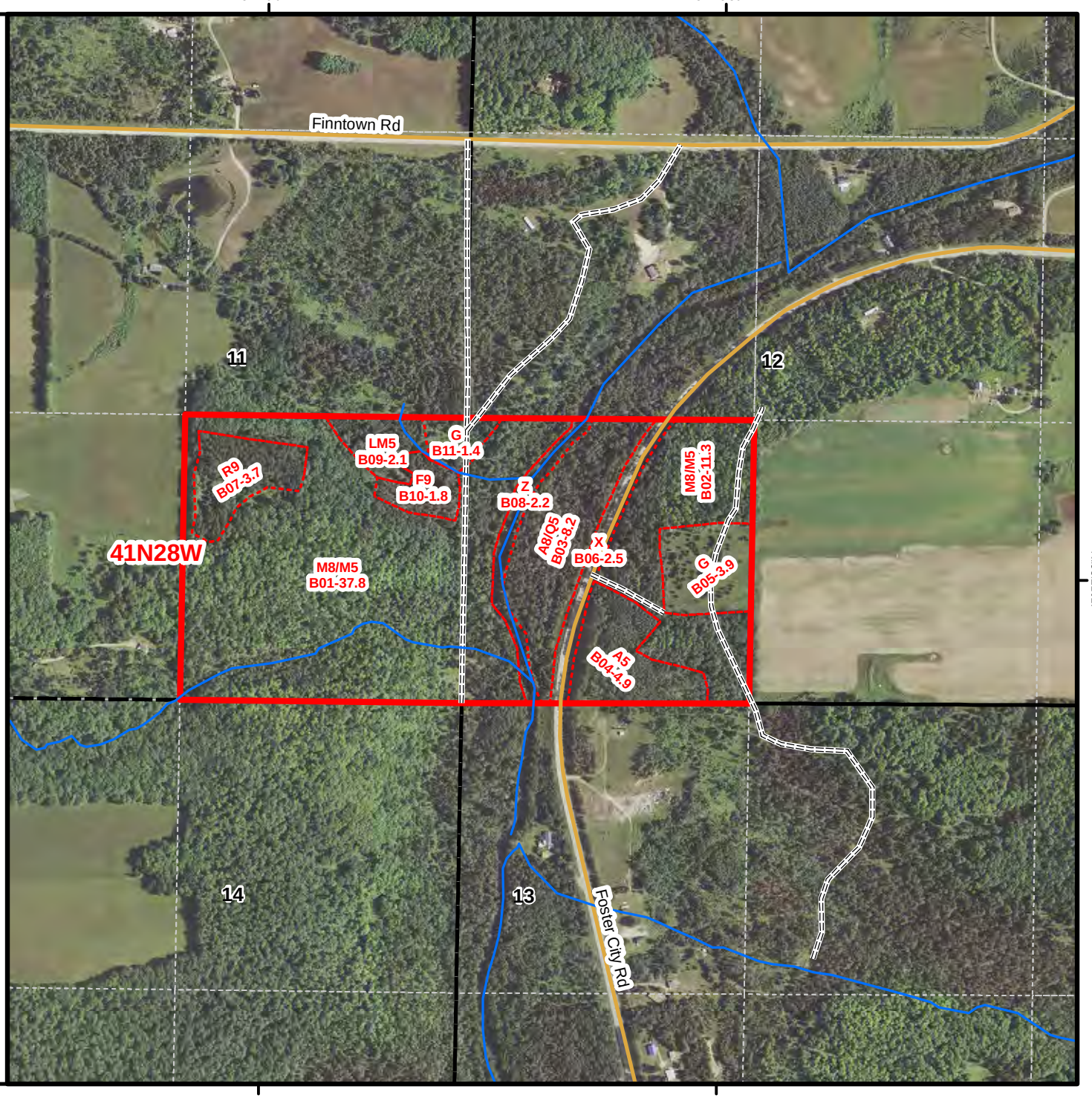

STAND MAP

NAIP "2012" Imagery

NDCS - School Facility
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

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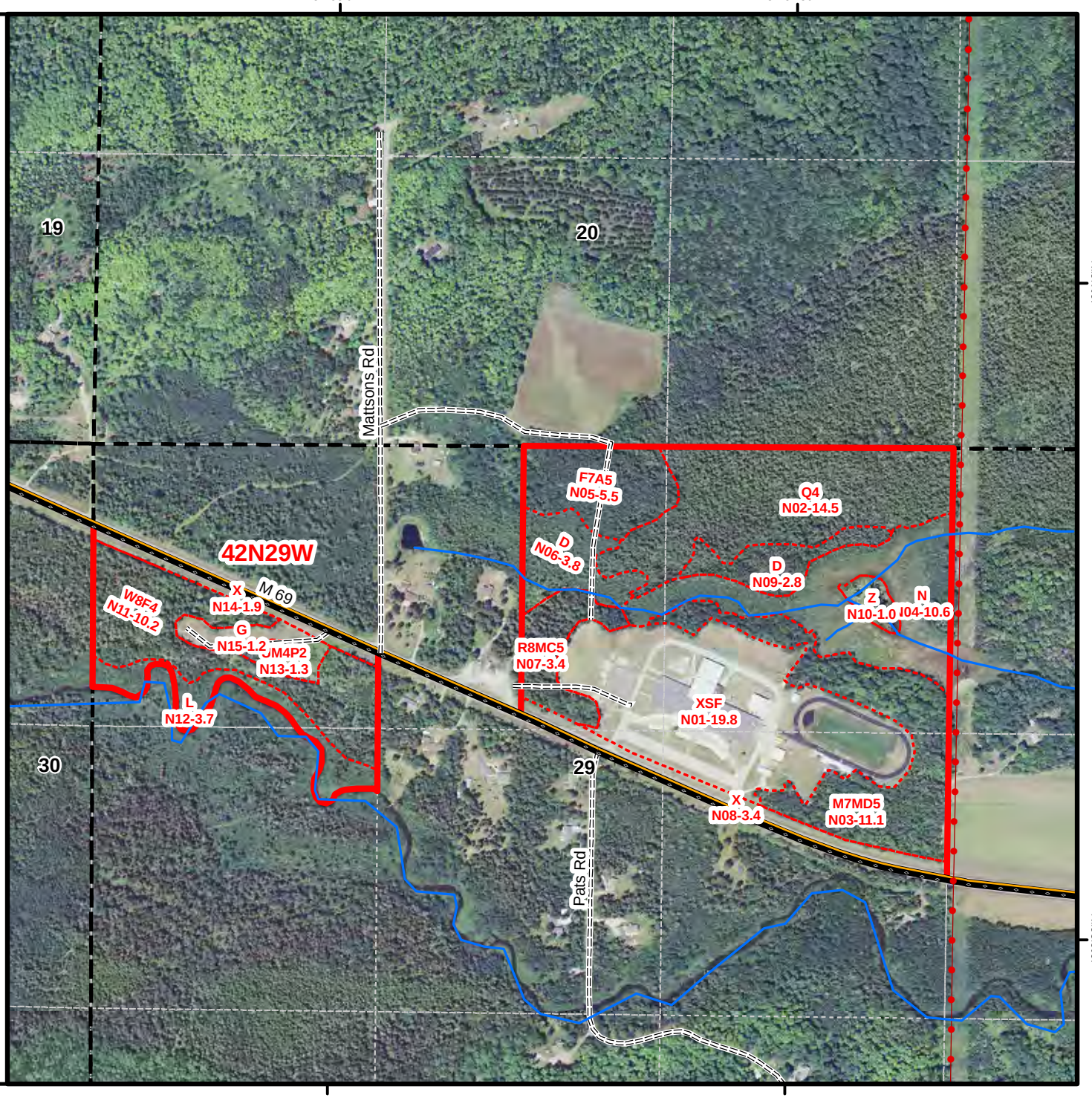

STAND MAP

NAIP "2012" Imagery

NDCS - Felch Twp
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

Mapped by: Brandon J. Bal, CF
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Absolute Scale:1:15,840
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0 660 1,320
Feet

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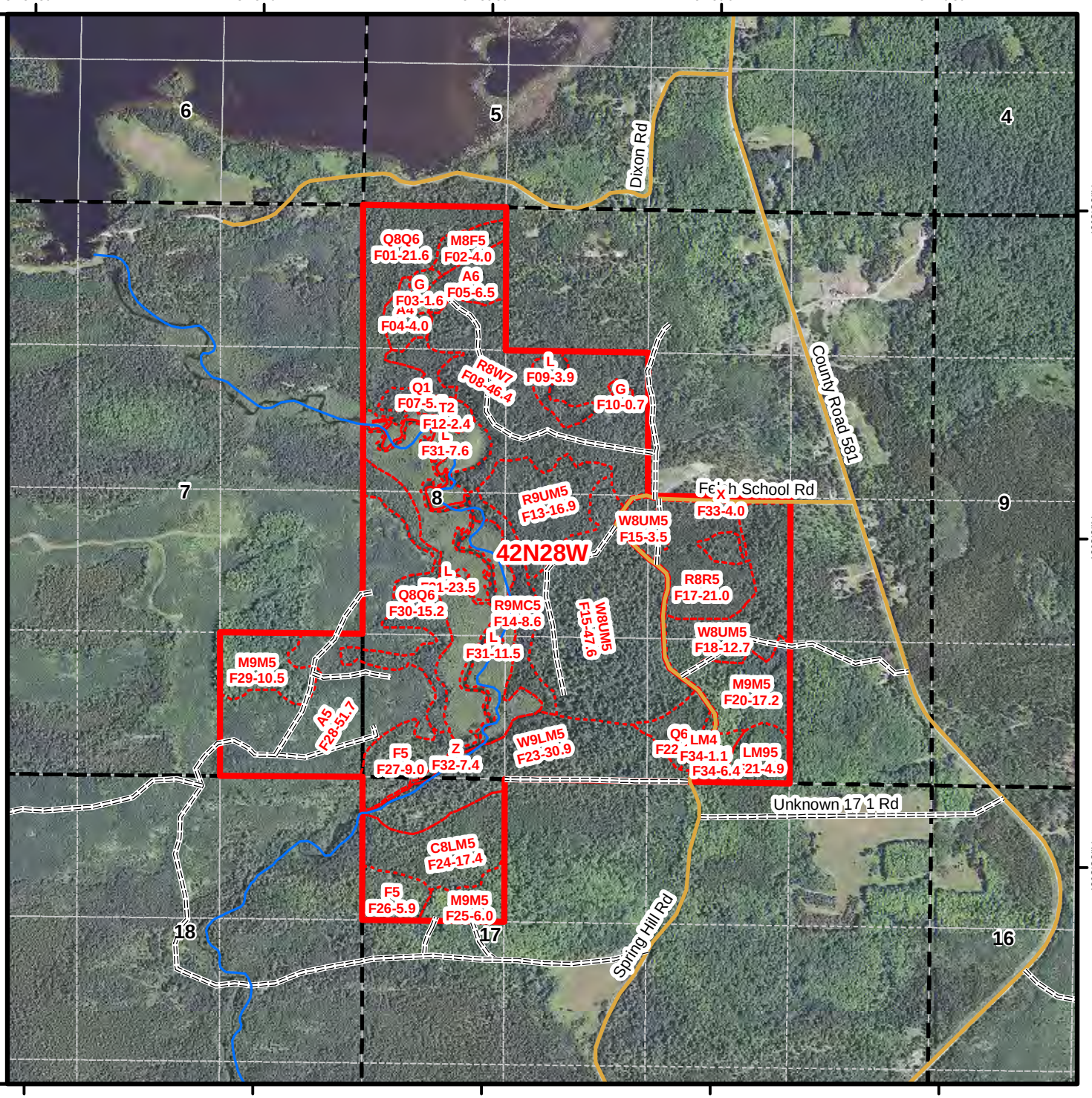

STAND MAP

NAIP "2012" Imagery

NDCS - Sagola Twp - Sagola
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
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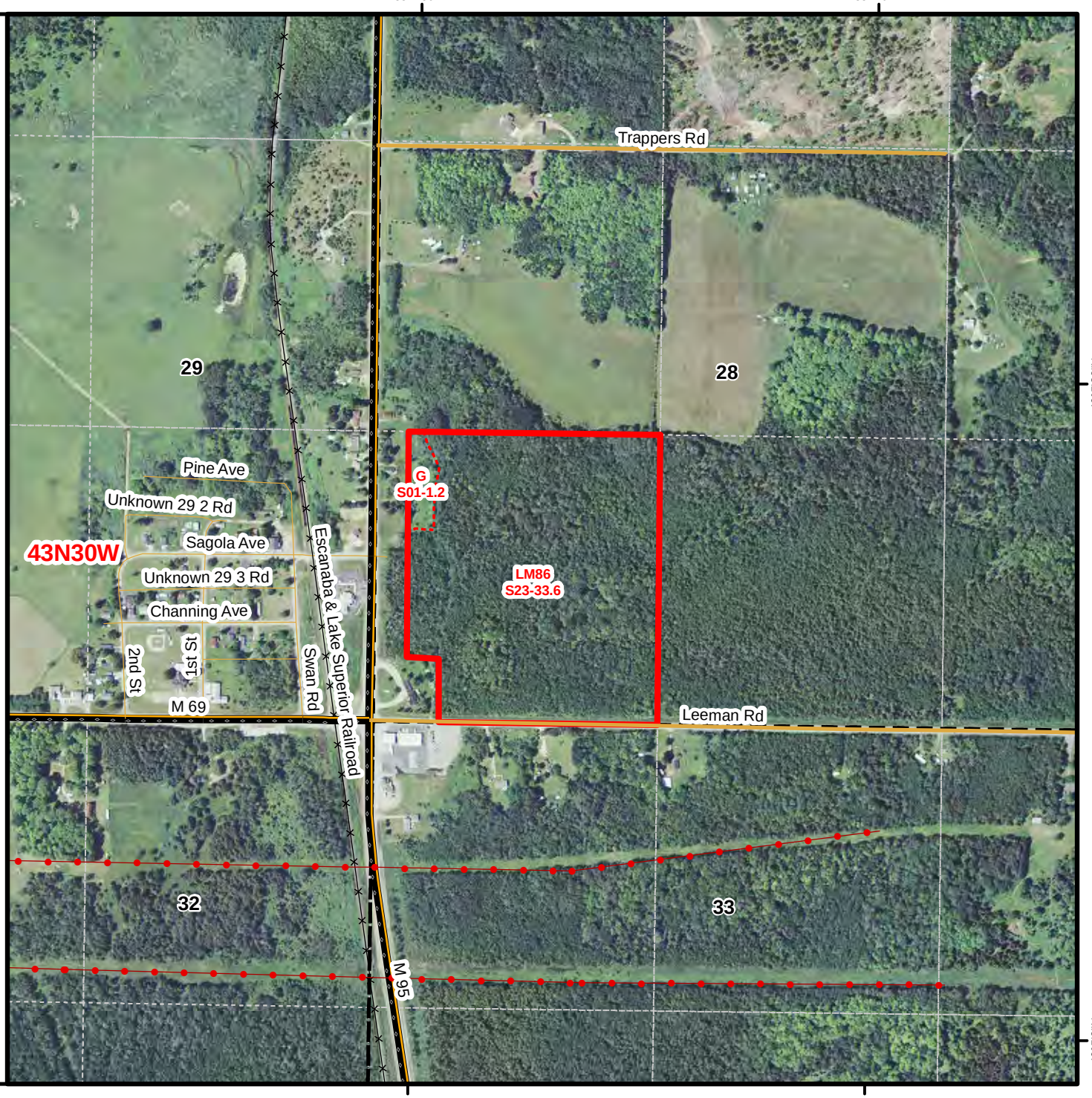

STAND MAP
NAIP "2012" Imagery

NDCS - Sagola Twp - Turner Rd
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
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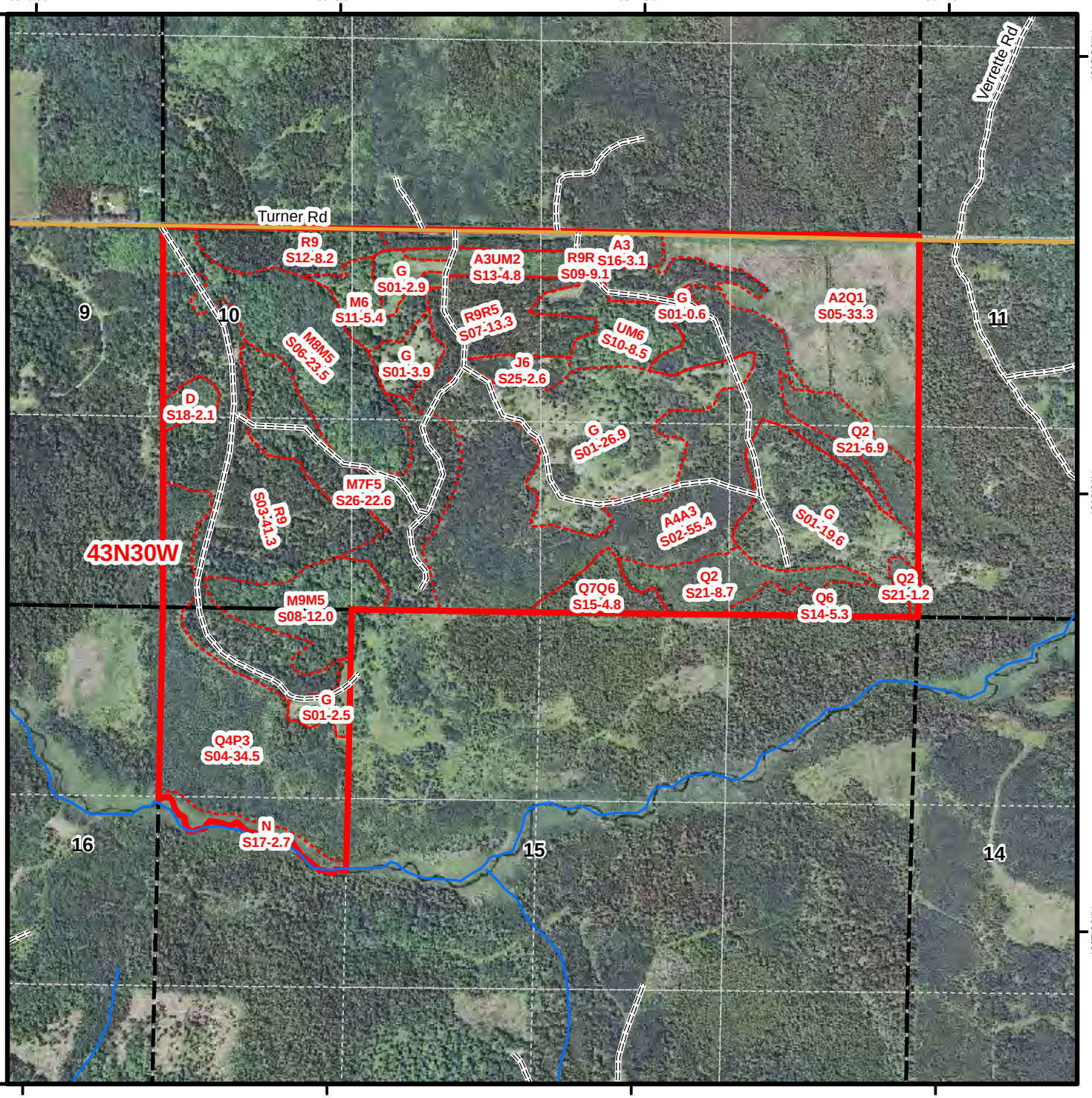

STAND MAP
Harvest Schedule

NDCS - Breen Twp
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

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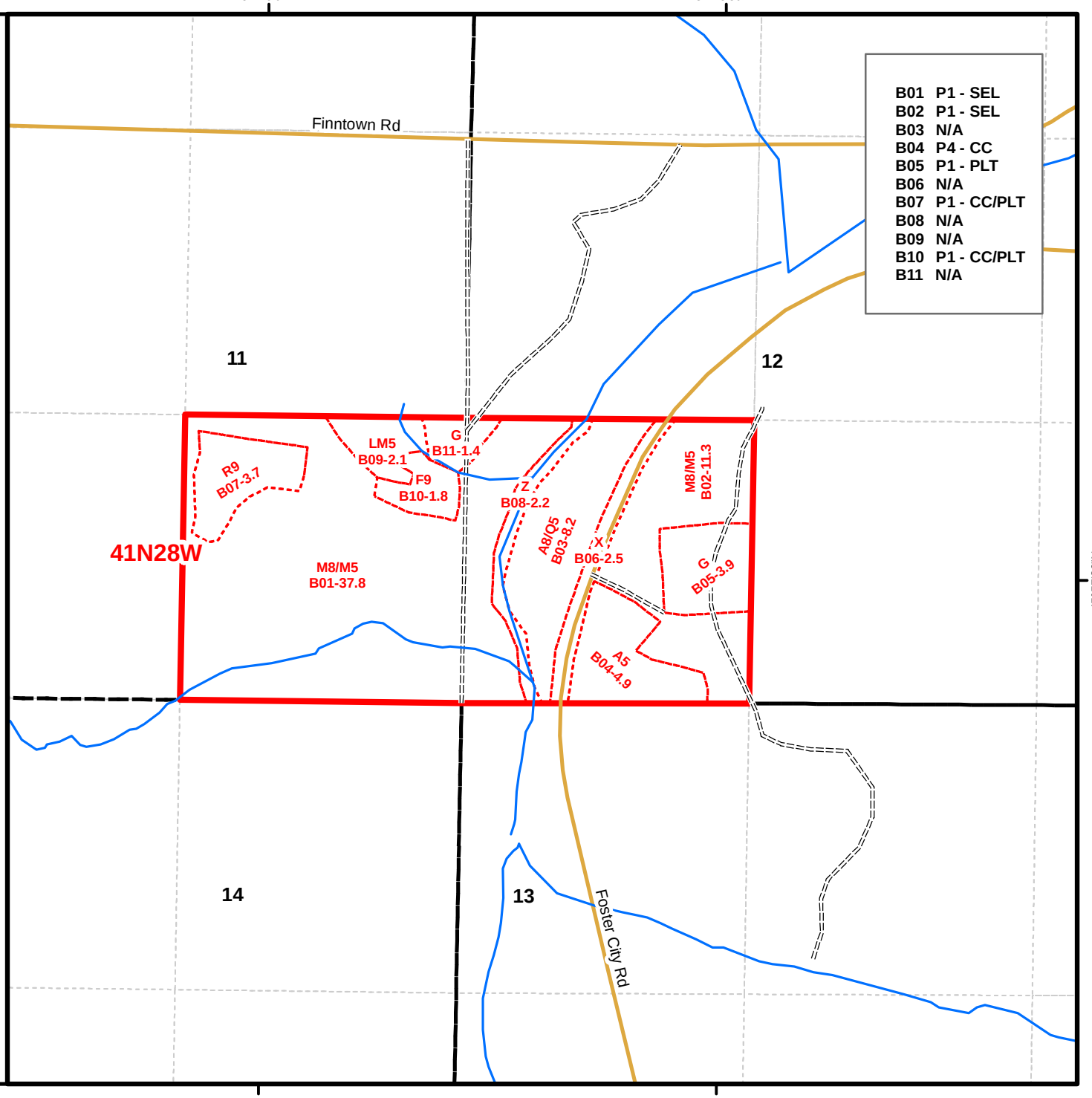

STAND MAP
Harvest Schedule

NDCS - School Facility
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
- Woods Road
- Utility ROW
- Streams

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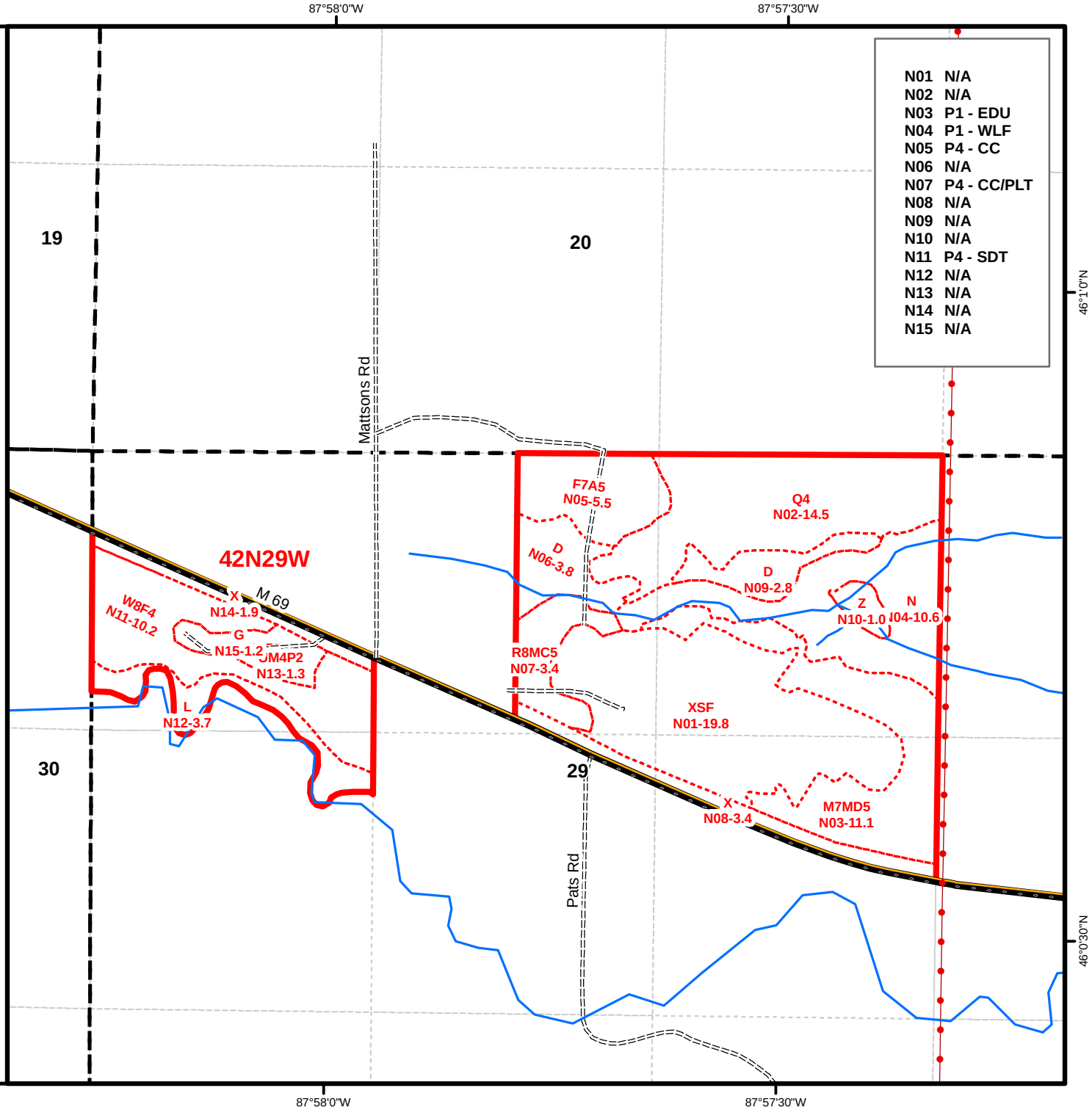

N01	N/A
N02	N/A
N03	P1 - EDU
N04	P1 - WLF
N05	P4 - CC
N06	N/A
N07	P4 - CC/PLT
N08	N/A
N09	N/A
N10	N/A
N11	P4 - SDT
N12	N/A
N13	N/A
N14	N/A
N15	N/A

STAND MAP
Harvest Schedule

NDCS - Felch Twp
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
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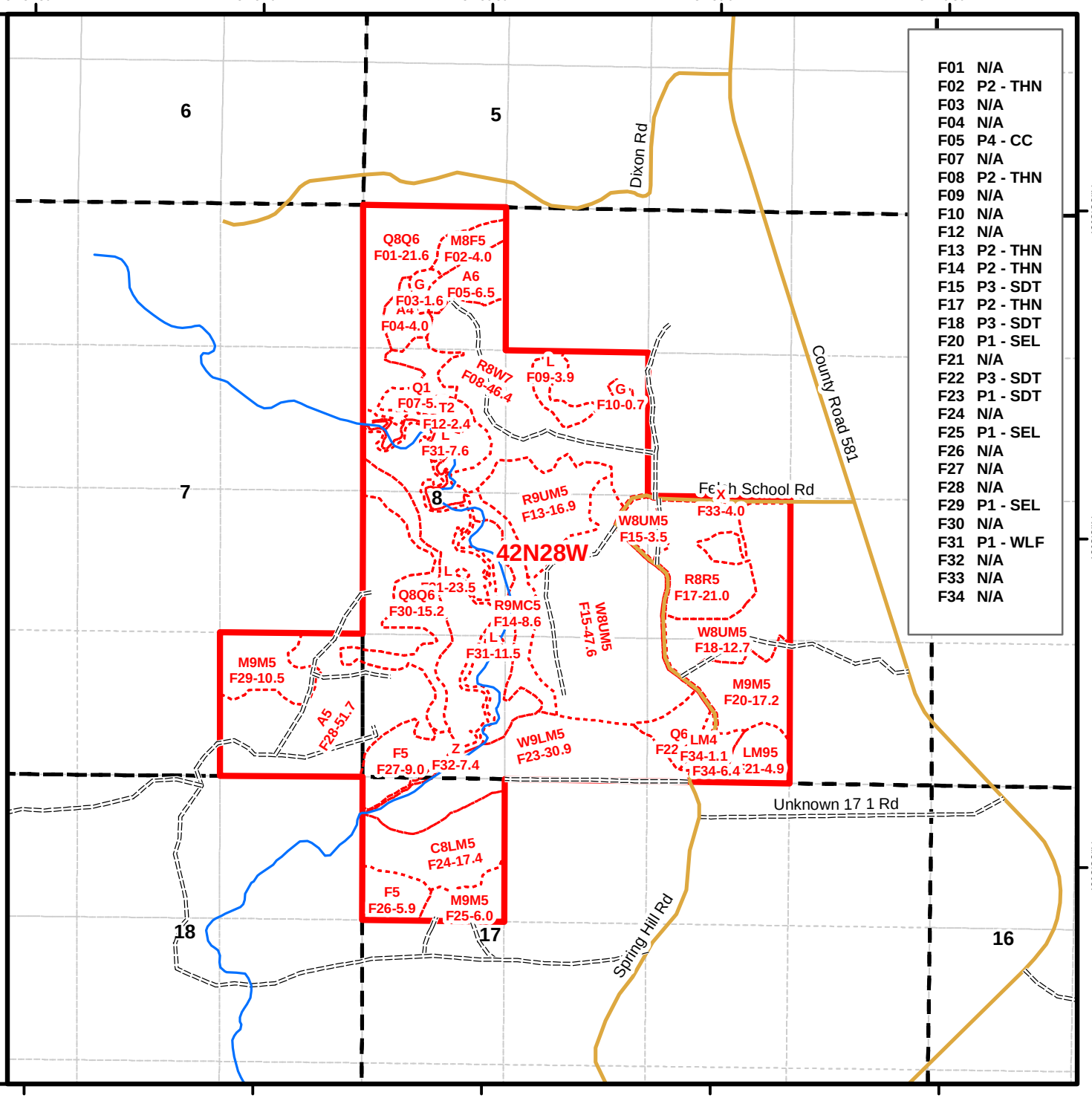

STAND MAP
Harvest Schedule

NDCS - Sagola Twp - Sagola
Dickinson County, Michigan

Legend

- Tract Boundary
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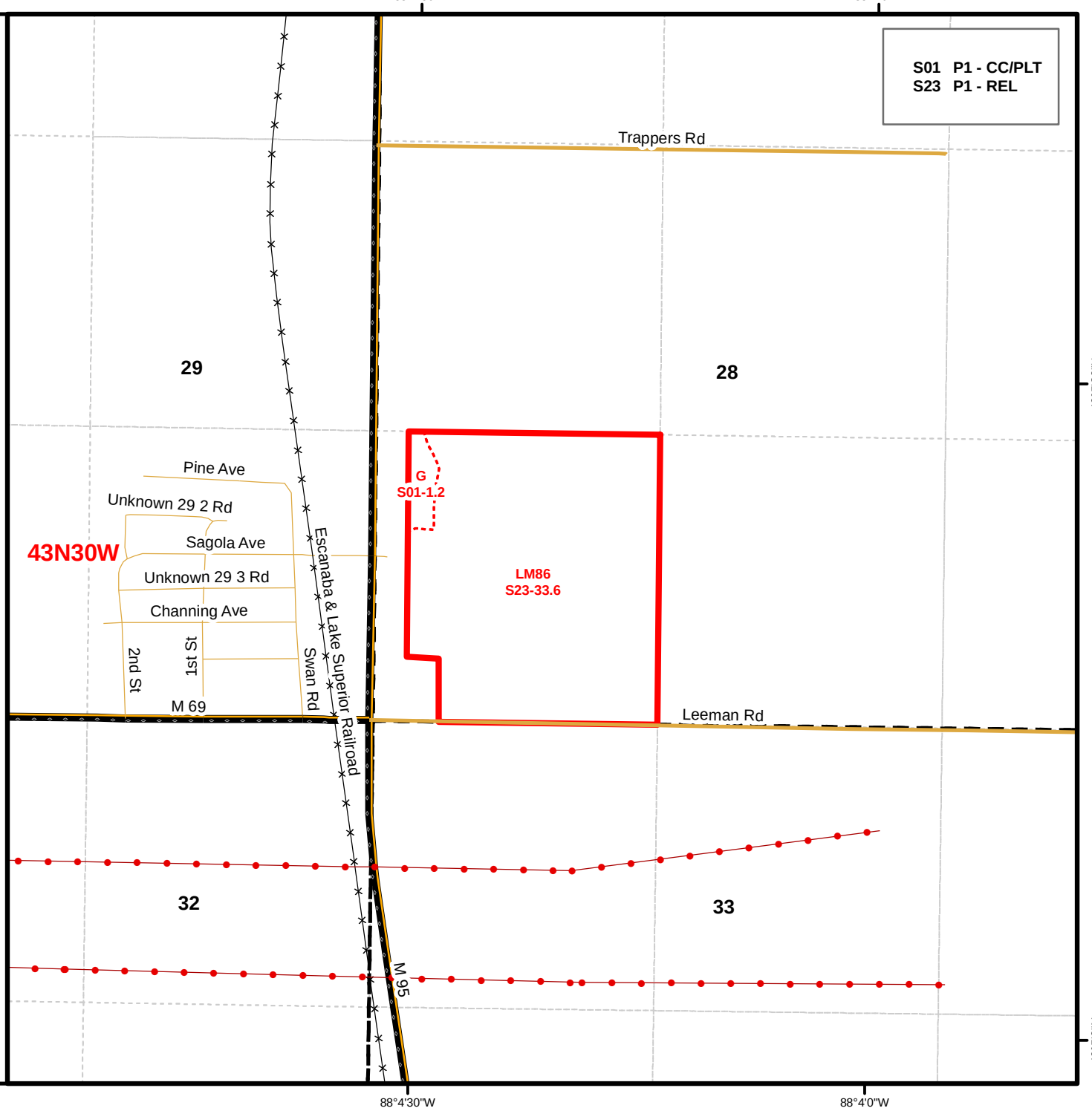

STAND MAP
Harvest Schedule

NDCS - Sagola Twp - Turner Rd
Dickinson County, Michigan

Legend

- Tract Boundary
- Stand Boundary
- PLSS Sections
- US/State Highway
- County Road
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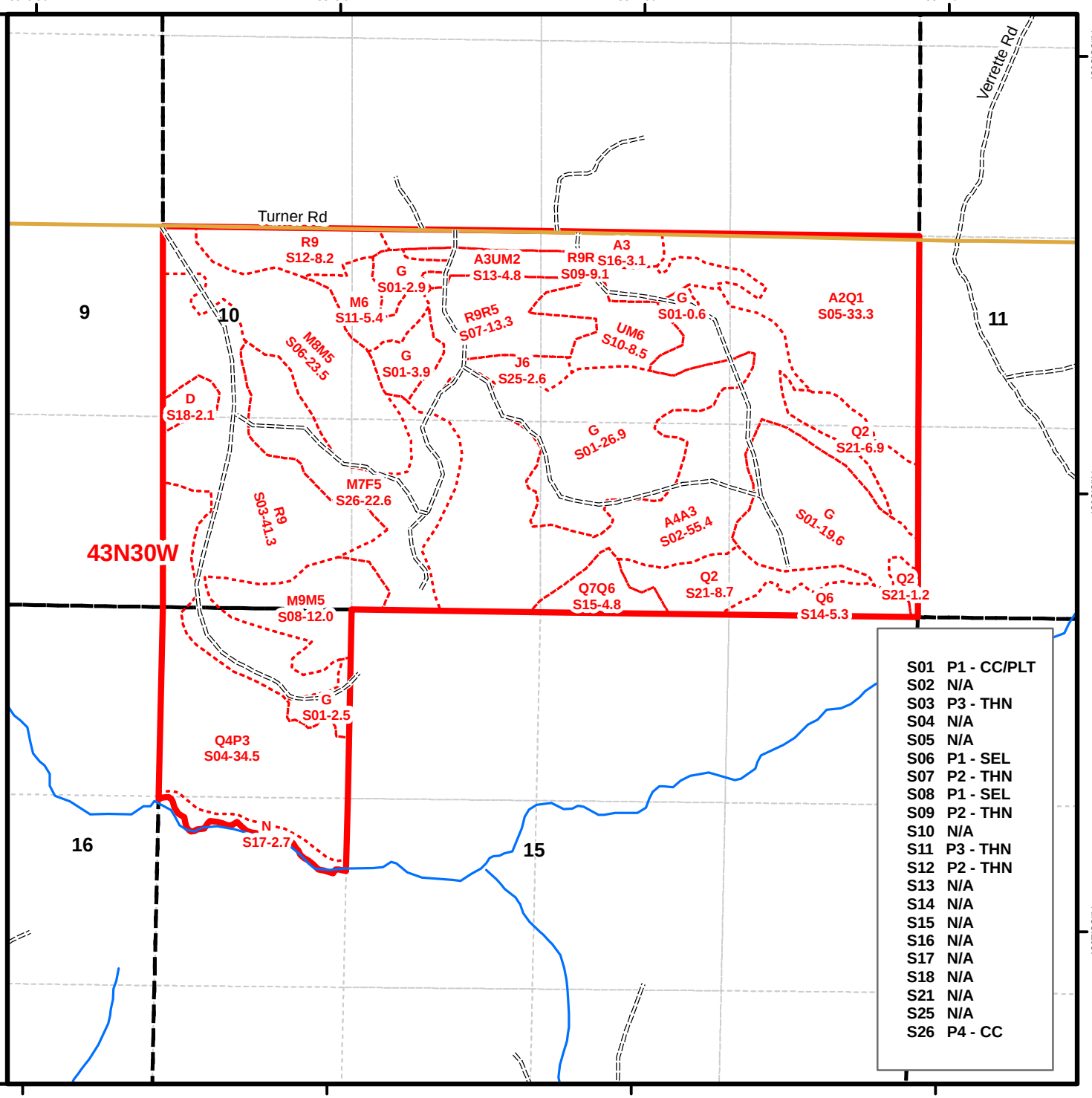


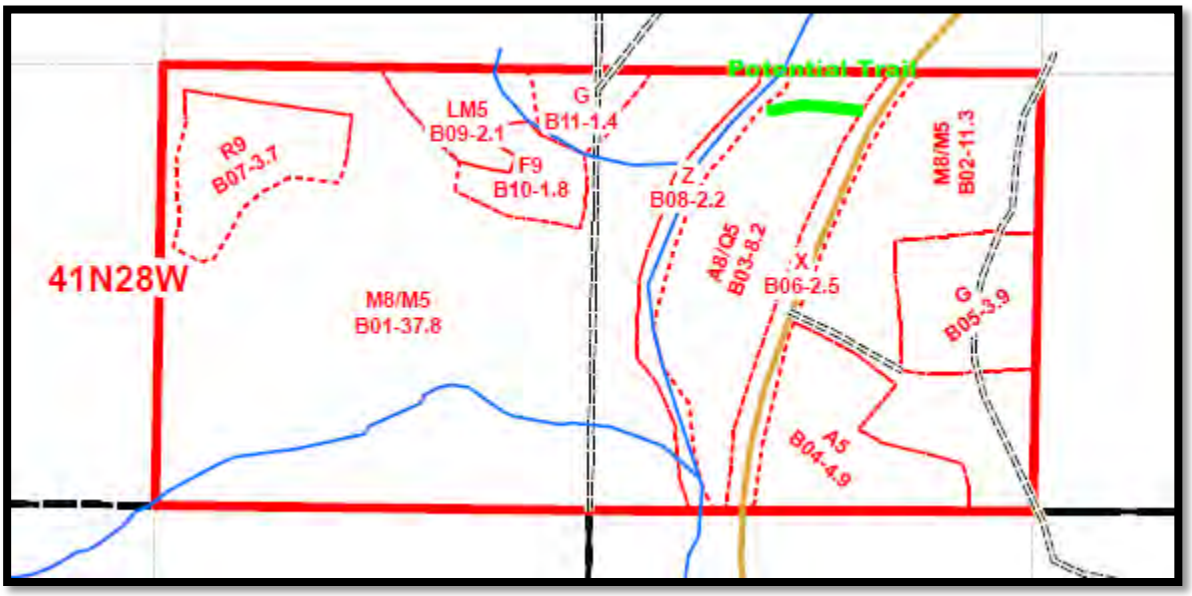
Stand Examination

This property was broken down into four 5-year management periods to help best achieve the landowner's forest management goals of a sustainable timber harvest management program, while being flexible. Typically the red pine plantations should be managed on 80 to 120 year rotations with multiple thinning's eventually targeting an average red pine diameter of 15", targeting 80 to 175 trees per acre. Typically the northern hardwoods will also be treated on a continual 12-15 year rotation, while the aspen should be managed on a 40-60 year rotation, to create multiple age classes.

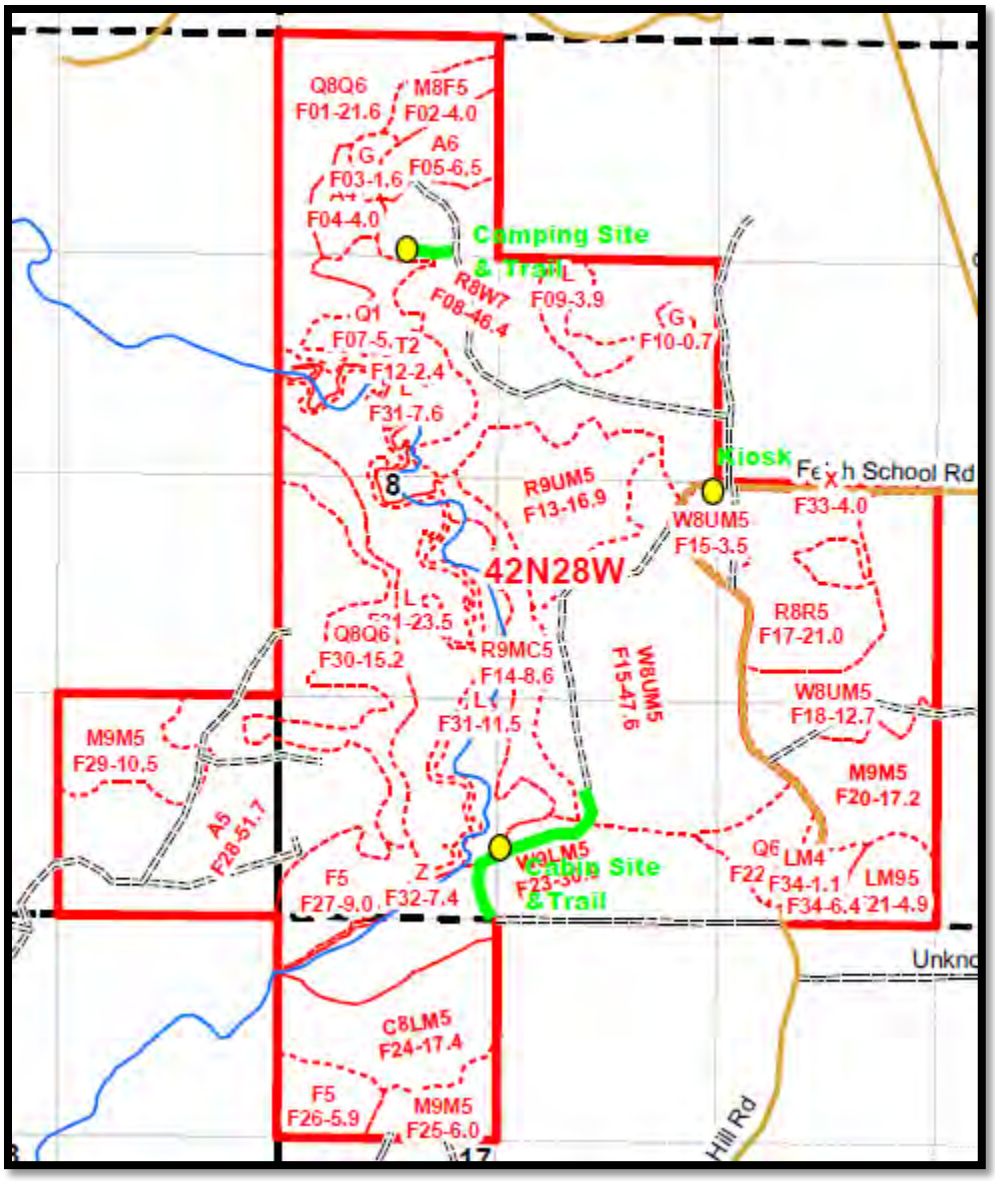
Harvest Period #1 – 2014 to 2019
Harvest Period #2 – 2019 to 2024
Harvest Period #3 – 2024 to 2029
Harvest Period #4 – 2029 to 2034

The successful implementation of this Forest Stewardship Plan is dependent upon frequent monitoring by the landowner. The landowner or their agent (consulting forester) should walk the entire forest at least annually to inspect the forest for changes and to evaluate the success of earlier management activities. Monitoring for forest health issues should occur more frequently, at least two or three times a year to look for signs and symptoms of insects or disease during different seasons. All Forest Stewardship Plans should also be adaptable and flexible enough to accommodate changes in landowner goals or forest resources over the ten to twenty year planning period. Please use the table at the end of this plan to record notes and make modifications to this plan as needed.

Some possible educational things to consider would be extending some of the woods roads as hiking/recreational trails, if the trails are larger they could be used for cross country skiing or for cross country running events. The Sagola Township Tract could also be used for any of these type of events as it already has a fantastic trail system. The larger Turner Road tract should have a Kiosk built near one of the entrances to the property. The first possible recreational trail would be to gain access to the river on the Breen Township Tract.



The Felch Township tract has lots of potential for sites for camping, a cabin, and kiosk. The two woods roads in the southern portion of the tract could be connected and establish a recreational loop. The loop could also lead to a potential cabin site, numerous locations would have fantastic views of the river and surrounding area with some tree removal. Further to the north in the tract you could have a nice designated camping site up on the rock outcrops overviewing the recent clearcut. Again this tract would be a great site for a kiosk displaying a tract map, forestry information, and displaying the School Tree Farm sign.



Stand(s):	B01	**Forest Type:**	Mesic Hardwoods	**Stand Label:**	M8/M5
Acres:	37.8	**Soil Type:**	24F	**Next Harvest:**	Period #1
Trees/acre:	268	**BA (ft^2/ac):**	104	**Volume (Cds/ac):**	25.6

Stand Description

This stand is a mesic hardwood stand that is dominated by sawtimber sized basswood, and poletimber sized hard maple. The primary species are hard maple, basswood, and yellow birch; 89% of the stand is hardwood and 9% is softwood with an average diameter of 7.9 inches. The stand is overstocked in the smaller 6 to 10 inch diameter ranges, while being understocked in sawtimber. Nearly all of the sawtimber is basswood with a small amount of hard maple; the stand averages just under 1,000 feet per acre of hardwood. A harvest will primarily produce hardwood pulp and a small amount of basswood sawtimber. Very little to no regeneration is present within the stand. Two streams flow through this stand and should be buffered during harvest, along with bordering the East Branch Sturgeon River. A presence of aspen is located on the hillside, along with some hemlock and other softwood along the streams and river. The stand has no really adequate road system for logging, there is an old powerline right of way it appears running through it, and however, the access to Finntown Road appears to be winter only.

Stand Objective(s)

The landowner's objective is to manage for timber (increasing the percentage of sawlogs and veneer) by a selection harvest and development of wildlife habitat.

Soils & Habitat Type

24F – Emmet fine sandy loam & *Acer-Viola-Osmorhiza* (AVO)

This hilly sandy-loam soil slopes from 18 to 35 percent and is well drained and is moderately suited for logging equipment because of slope. The soil is poorly suited for logging haul roads because of slope. This soil is typically found on hills and ridges in the uplands. The use of logging equipment can be briefly restricted in the spring and other wet periods because unsurfaced roads become slippery and rut easily; graveled roads can facilitate year round use. The site index for sugar maple is 66 feet and has an annual growth capable of producing .519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

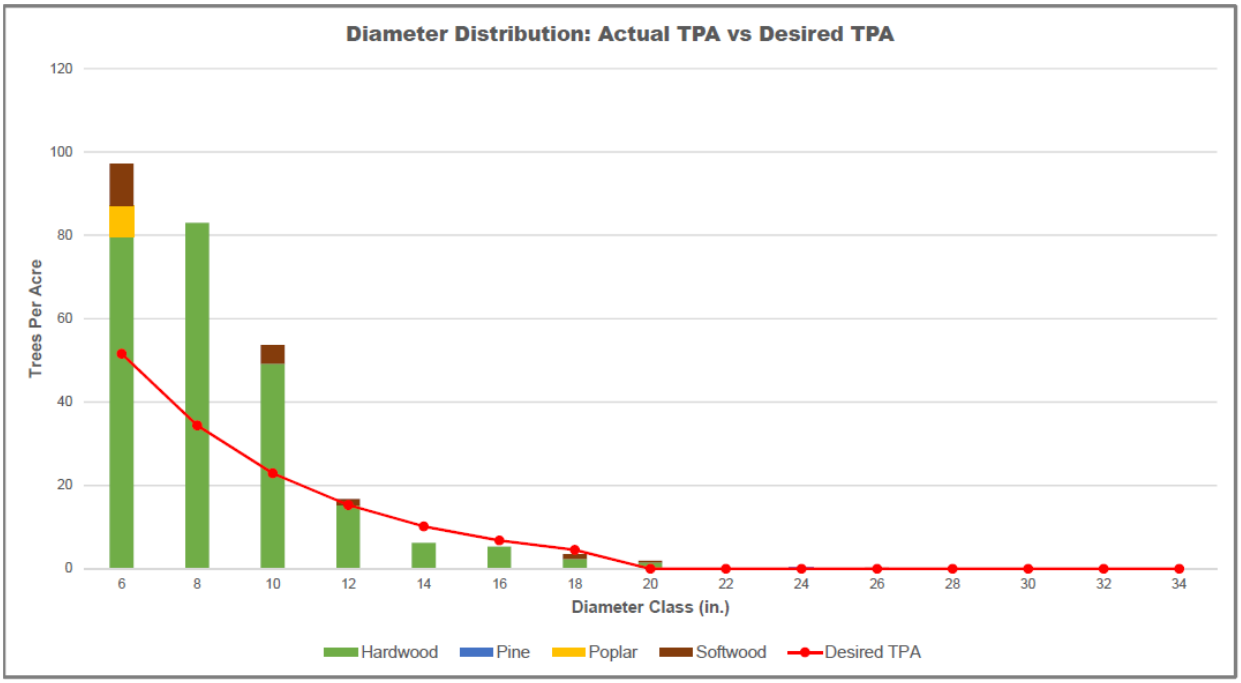
The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using an uneven-aged crop tree method. The desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The harvest should concentrate on releasing potential crop trees by removing poor quality, defective, storm damaged, and undesirable trees in all age and size classes; trees in the 6, 8 and 10 inch diameter classes are the most heavily overstocked; where nearly 1 out of 2 trees could be removed. Remove cull

and defective overstory trees. Cut only poor growing stock in overstory as it is at desired stocking levels or below. This stand should continue to be managed in a similar fashion using 12-15 year cutting cycles.



The small opening in the southwest corner of the stand should be maintained for wildlife, while the RMZ on the river be retained as no harvest zone to minimize damage and protect fish habitat in the stream. The two other streams should be buffered according the BMP manual. Any snags should be retained for wildlife, along with any softwood over 18 inches in diameter.

Stand(s):	B02	**Forest Type:**	Mesic Hardwoods	**Stand Label:**	M8/M5
Acres:	11.3	**Soil Type:**	24F	**Next Harvest:**	Period #1
Trees/acre:	219	**BA (ft^2/ac):**	103	**Volume (Cds/ac):**	26.7

Stand Description

This stand is a mesic hardwood stand that is dominated by sawtimber sized basswood and hard maple, and poletimber sized hard maple. The primary species are hard maple, basswood, and aspen; 83% of the stand is hardwood and 10% is aspen with an average diameter of 8.6 inches. The stand is overstocked in nearly all diameter classes. Nearly all of the sawtimber is basswood with a small amount of hard maple; the stand averages just over 2,300 feet per acre of hardwood. The next harvest will primarily produce basswood sawlogs and pulpwood, along with some hardwood pulpwood. Very little to no regeneration is present within the stand. A presence of aspen is located on the hillside in the center of the stand. The

stand has a woods road running along the eastern edge of the stand, or wood could be decked in the grass opening and hauled out on the road that splits the stand in half.

Stand Objective(s)

The landowner's objective is to manage for timber (increasing the percentage of sawlogs and veneer) by a selection harvest and development of wildlife habitat.

Soils & Habitat Type

24F – Emmet fine sandy loam & *Acer-Viola-Osmorhiza* (AVO)

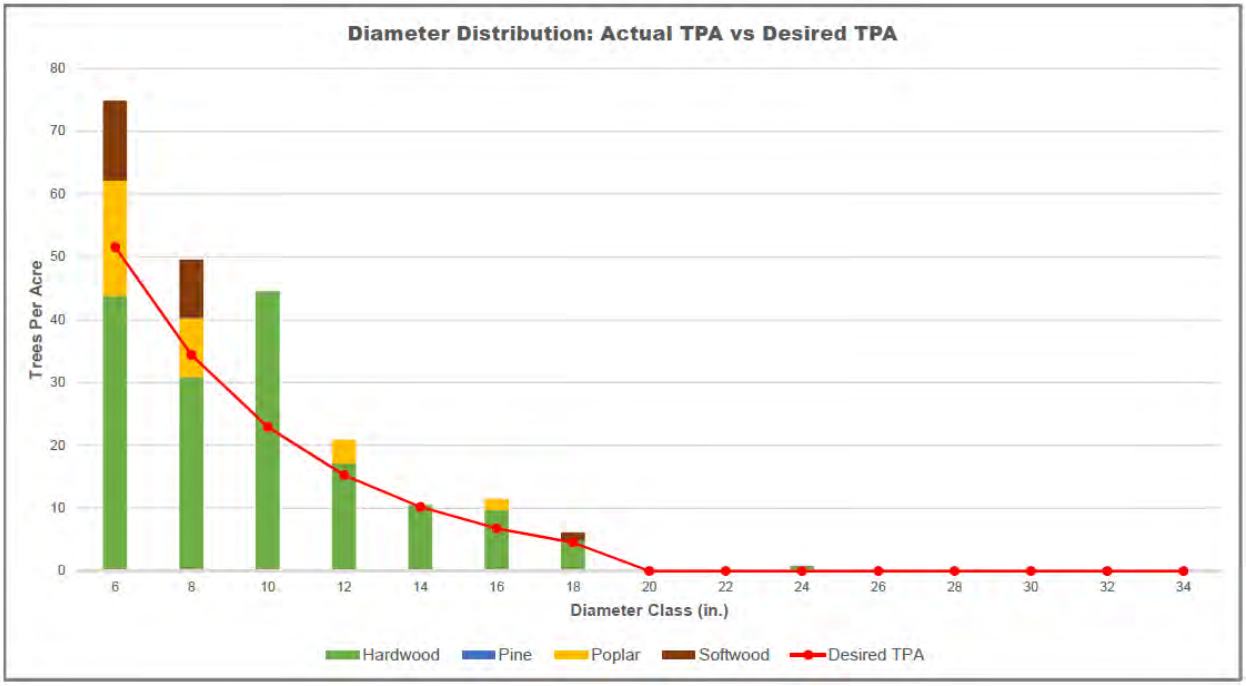
This hilly sandy-loam soil slopes from 18 to 35 percent and is well drained and is moderately suited for logging equipment because of slope. The soil is poorly suited for logging haul roads because of slope. This soil is typically found on hills and ridges in the uplands. The use of logging equipment can be briefly restricted in the spring and other wet periods because unsurfaced roads become slippery and rut easily; graveled roads can facilitate year round use. The site index for sugar maple is 66 feet and has an annual growth capable of producing .519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high, this soil is also well suited for red pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using an uneven-aged crop tree method. The desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The harvest should concentrate on releasing potential crop trees by removing poor quality, defective, storm damaged, and undesirable trees in all age and size classes; trees in the 6, 8 and 10 inch diameter classes are the most heavily overstocked. Remove cull and defective overstory trees. Cut only poor growing stock in overstory as it is at desired stocking levels or below. This stand should continue to be managed in a similar fashion using 12-15 year cutting cycles.



Any snags should be retained for wildlife, along with any softwood over 18 inches in diameter.

Stand(s):	B03	**Forest Type:**	Aspen	**Stand Label:**	A8/Q5
Acres:	8.2	**Soil Type:**	10	**Next Harvest:**	N/A
Trees/acre:	358	**BA (ft^2/ac):**	100	**Volume (Cds/ac):**	20.6

Stand Description

This stand is an aspen stand that is dominated by sawtimber sized aspen and poletimber sized spruce. The primary species are aspen, balsam fir, and red maple; 43% of the stand is aspen and 45% is softwood with nearly all of it coming from the 6 inch diameter class. The average stand diameter is 6.7 inches. The aspen makes up more than 65% of the total volume in the stand. The spruce and balsam fir within the stand have spruce bud worm damage. The stand would be recommended for a clearcut harvest if it wasn't for the steepness of the bank of the Waucedah Road sloping down into the stand, along with the rivers RMZ. It would be in best interest to maintain the stand as it is. If harvested the stand would produce aspen boltwood and pulpwood along with softwood pulpwood.

Stand Objective(s)

The landowner's objective is to manage for educational use, wildlife habitat and stream protection.

Soils & Habitat Type

10 – Waucedah-Cathro complex & *Fraxinus-Mentha-Carex* (FMC)

This mucky soil is nearly level and is poorly drained and is poorly suited for logging equipment because of wetness and strength. The soil is poorly suited for logging haul roads because of strength and wetness. The use of logging equipment is restricted to use during winter months when frozen conditions exist

because of the wetness and strength. The site index for aspen is 40 feet and has an annual growth capable of producing .367 cords per acre per year of wood fiber. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Fraxinus-Mentha-Carex* (FMC). This habitat type has a climax overstory dominated by black ash and American elm. Other common species include red maple and balsam fir. The dominant ground flora includes wild mint, sedge, jewelweed, and tag alder. Potential productivity for timberlands is rather poor.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

Passive management is recommended to protect the stream and maintain this area for wildlife. A recreational/educational trail could be developed from the northeast portion of the stand to the river's edge on the western edge of the stand. This could be used recreationally for fishing access and educational to view a riparian zone and river.

Stand(s):	B04	**Forest Type:**	Aspen	**Stand Label:**	A5
Acres:	4.9	**Soil Type:**	24D	**Next Harvest:**	Period #4
Trees/acre:	264	**BA (ft^2/ac):**	41	**Volume (Cds/ac):**	5.5

Stand Description

This stand is an aspen stand that is dominated by poletimber and large sapling sized aspen. Nearly all of the merchantable aspen is located in the 6 diameter class currently. A small patch of red pine is growing in the stand directly adjacent to the county road, approximately 3 to 4 rows of it, this should be left to help stabilize soil along the steep slope leading to the county road. When harvested the stand will produce aspen boltwood and pulpwood. The stand is bordered by the Waucedah Road and runs along a woods road that enters the property from the county road.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

24D – Emmet fine sandy loam & *Acer-Viola-Osmorhiza* (AVO)

This hilly sandy-loam soil slopes from 6 to 18 percent and is well drained and is well suited for logging equipment with the only concern being slope. The soil is moderately suited for logging haul roads because of slope. This soil is typically found on hills and ridges in the uplands. The use of logging equipment can be briefly restricted in the spring and other wet periods because unsurfaced roads become slippery and rut easily; graveled roads can facilitate year round use. The site index for sugar maple is 66 feet and has an annual growth capable of producing .519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high, this soil is also well suited for red pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

The stand should be clearcut, cutting all merchantable trees. The red pine should be maintained to help prevent erosion on the steep slope heading down to the county road. The clearcut will allow the aspen to naturally regenerate through stump sprouting.

The timing of this harvest should be in conjunction with the second or third harvest in Stands B01 and B02. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle.

Stand(s):	B05	**Forest Type:**	Grass/Opening	**Stand Label:**	G
Acres:	3.9	**Soil Type:**	24D	**Next Harvest:**	Period #1
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

This stand is currently an open area with grasses and some scattered red pine growing.

Stand Objective(s)

The landowner's objective is to manage for timber production and convert to red pine.

Soils & Habitat Type

24D – Emmet fine sandy loam & *Acer-Viola-Osmorhiza* (AVO)

This hilly sandy-loam soil slopes from 6 to 18 percent and is well drained and is well suited for logging equipment with the only concern being slope. The soil is moderately suited for logging haul roads because of slope. This soil is typically found on hills and ridges in the uplands. The use of logging equipment can be briefly restricted in the spring and other wet periods because unsurfaced roads become slippery and rut easily; graveled roads can facilitate year round use. The site index for sugar maple is 66 feet and has an annual growth capable of producing .519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high, this soil is also well suited for red pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be should be planted to red pine and converted back to timber production. As it is bordered by a large field, the pine plantation would actually increase diversity in the area for wildlife while minimizing the impact of a plantation on wildlife activities. Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations.

Planting

The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Future Harvest

It typically takes 15 to 30 years for red pine seedlings to reach poletimber size of 5 inches in diameter. The first thinning should occur when the red pine basal area reaches approximately 140 to 160 square feet approximately 25-35 years old, with an average stand diameter of 5 to 8 inches in diameter. This initial thinning should be a row thinning where every third row is harvested. Row harvesting helps facilitate logging equipment movement and reduces damage to residual trees. The subsequent thinning harvest should be marked trees, targeting poor quality and poor formed trees for removal. The first thinning after the initial row thinning should occur approximately 10 years later or when basal areas reach 140 to 180 square feet and harvested down to 100 square feet of basal area. Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the stand should be clearcut once the average stand diameter of red pine is 15 inches in diameter and replanted.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	B06	**Forest Type:**	Right-of-Way	**Stand Label:**	X
Acres:	2.5	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

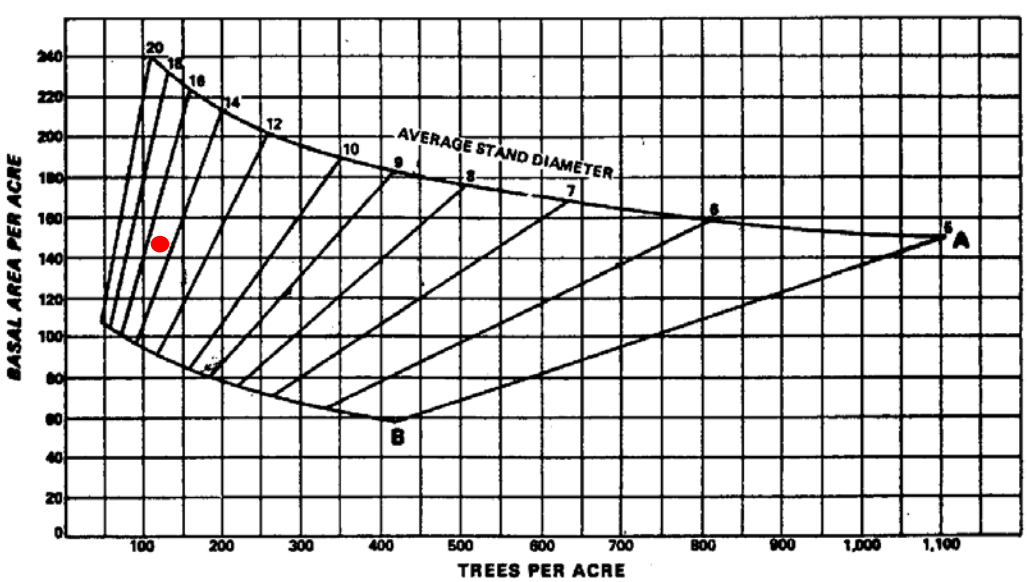
This stand is the current right-of-way for Waucedah Road, this road runs north/south directly through the property. The eastern portion of the tract has woods road entering it.

Stand(s):	B07	**Forest Type:**	Plantation Conifer	**Stand Label:**	R9
Acres:	3.7	**Soil Type:**	24D	**Next Harvest:**	Period #1
Trees/acre:	114	**BA (ft^2/ac):**	145	**Volume (Cds/ac):**	53.5

Stand Description

This stand is a red pine dominated by sawtimber sized red pine with a few scattered ash within the stand. Red pine is nearly the only species in the stand. The average stand diameter is 14.9 inches in diameter, red pine averaged over 10,000 feet of sawtimber per board foot per acre and totaled over 50 cords per acre. The stand is made up of 48% large sawtimber and 48% small sawtimber. The stand is relatively flat and should be harvested in conjunction with stands B01 and B02 during period 1. The stand will produce some quality utility poles, red pine bolts and pulpwood. Most of the volume would actually likely be sold as bolts.

RED PINE STOCKING GUIDE



From: Managers Handbook for Red Pine in the North Central States.

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Stand Objective(s)
The landowner's objective is to manage for timber production.

Soils & Habitat Type

24D – Emmet fine sandy loam & *Acer-Viola-Osmorhiza* (AVO)

This hilly sandy-loam soil slopes from 6 to 18 percent and is well drained and is well suited for logging equipment with the only concern being slope. The soil is moderately suited for logging haul roads because of slope. This soil is typically found on hills and ridges in the uplands. The use of logging equipment can be briefly restricted in the spring and other wet periods because unsurfaced roads become slippery and rut easily; graveled roads can facilitate year round use. The site index for sugar maple is 66 feet and has an annual growth capable of producing .519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high, this soil is also well suited for red pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
This stand should be clearcut, harvesting all trees within the stand. The stand than should be replanted back to red pine for timber production. As it is bordered by a large field, the pine plantation would actually increase diversity in the area for wildlife while minimizing the impact of a plantation on wildlife activities. When trenching the existing pines can be left, or removed if trenching equipment requires a bare site.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Future Harvest

It typically takes 15 to 30 years for red pine seedlings to reach poletimber size of 5 inches in diameter. The first thinning should occur when the red pine basal area reaches approximately 140 to 160 square feet approximately 25-35 years old, with an average stand diameter of 5 to 8 inches in diameter. This initial thinning should be a row thinning where every third row is harvested. Row harvesting helps facilitate logging equipment movement and reduces damage to residual trees. The subsequent thinning harvest should be

marked trees, targeting poor quality and poor formed trees for removal. The first thinning after the initial row thinning should occur approximately 10 years later or when basal areas reach 140 to 180 square feet and harvested down to 100 square feet of basal area. Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the stand should be clearcut once the average stand diameter of red pine is 15 inches in diameter and replanted.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	B08	**Forest Type:**	Water	**Stand Label:**	Z
Acres:	2.2	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

This stand is the East Branch Sturgeon River. Any management in the surrounding stands and road building near it should be done in accordance with the state BMP manual.

Stand(s):	B09	**Forest Type:**	Lowland Hardwoods	**Stand Label:**	LM5
Acres:	2.1	**Soil Type:**	25B	**Next Harvest:**	N/A
Trees/acre:	211	**BA (ft^2/ac):**	53	**Volume (Cds/ac):**	6.7

Stand Description

This stand is a small lowland mixed stand of small poletimber sized balsam poplar and balsam fir. Thick tag alder is also growing within it. This stand has the start of the small creek that eventually flows into the East Brach of the Sturgeon River. Currently this stand will only produce a very small amount of pulpwood.

Stand Objective(s)
The landowner's objective is to maintain the stand to protect the beginning of the creek.

Soils & Habitat Type
25B – Pence fine sandy loam & *Tsuga-Maianthemum-Vaccinium* (TMV)

This flat sandy-loam soil slopes from 0 to 6 percent and is well drained and is well suited for logging equipment and logging haul roads. The use of logging equipment can be briefly restricted in the spring and other wet periods because unsurfaced roads become slippery and rut easily; graveled roads can facilitate year round use. The site index for sugar maple is 59 feet and has an annual growth capable of producing .544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum-Vaccinium* (TMV). This habitat type has a climax overstory dominated by eastern hemlock. Other common species include sugar maple, eastern white pine, balsam fir, white spruce, and northern red oak. The dominant ground flora includes Canada blueberry, wild sarsaparilla, bracken fern, wild lily-of-the-valley, low sweet blueberry, yellow beadlily and betony. Potential productivity for northern hardwoods is considered to be moderately high, this soil is also well suited for red pine and jack pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
No management is recommended at during the course of this plan. The stand needs more time to grow and creates a layer of protection around the creek. Leaving un-harvested areas like this is also beneficial to wildlife.

Stand(s):	B10	**Forest Type:**	Plantation Conifer	**Stand Label:**	F9
Acres:	1.8	**Soil Type:**	24D	**Next Harvest:**	Period #1
Trees/acre:	367	**BA (ft^2/ac):**	158	**Volume (Cds/ac):**	46.6

Stand Description
This stand is a small spruce plantation that has balsam fir growing along the stream bank edge. The average stand diameter is 8.5 inches, with an estimated volume of 46.6 cords per acre. Most of this volume should be able to be sold as boltwood. The main concern with this stand is the tops appear to have some significant spruce budworm damage, these should be harvested before multiple years of defoliation can occur and lead to mortality.

Stand Objective(s)
The landowner's objective is to manage for timber production.

Soils & Habitat Type
24D – Emmet fine sandy loam & *Acer-Viola-Osmorhiza* (AVO)

This hilly sandy-loam soil slopes from 6 to 18 percent and is well drained and is well suited for logging equipment with the only concern being slope. The soil is moderately suited for logging haul roads because of slope. This soil is typically found on hills and ridges in the uplands. The use of logging equipment can be briefly restricted in the spring and other wet periods because unsurfaced roads become slippery and rut easily; graveled roads can facilitate year round use. The site index for sugar maple is 66 feet and has an annual growth capable of producing .519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high, this soil is also well suited for red pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be clearcut, harvesting all trees within the stand. A 100 foot buffer should be placed on the creek and a maximum of 40 percent of the trees should be harvested within the buffer. The stand than should be replanted with red pine for timber production. As it is bordered by other hardwood forest types, the pine plantation would actually increase diversity in the area for wildlife while minimizing the impact of a plantation on wildlife activities.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Future Harvest

It typically takes 15 to 30 years for red pine seedlings to reach poletimber size of 5 inches in diameter. The first thinning should occur when the red pine basal area reaches approximately 140 to 160 square feet approximately 25-35 years old, with an average stand diameter of 5 to 8 inches in diameter. This initial thinning should be a row thinning where every third row is harvested. Row harvesting helps facilitate logging equipment movement and reduces damage to residual trees. The subsequent thinning harvest should be marked trees, targeting poor quality and poor formed trees for removal. The first thinning after the initial row thinning should occur approximately 10 years later or when basal areas reach 140 to 180 square feet and harvested down to 100 square feet of basal area. Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the

stand should be clearcut once the average stand diameter of red pine is 15 inches in diameter and replanted.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	B11	**Forest Type:**	Grass/Opening	**Stand Label:**	G
Acres:	1.4	**Soil Type:**	24D	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

This stand is currently an open upland area that was possible used as a landing at some time and is now becoming over grown with numerous species including, spruce, balsam fir, aspen, red pine, and red maple for example.

Stand Objective(s)

The landowner's objective is to maintain the area for wildlife habitat.

Prescription

No management is recommended at this time, however, this stand could be utilized as a future landing or decking area. Upon completion of forest harvesting and hauling of logs, the landing area in this stand should be seeded with DNR mix or natural grasses.

School Facility

Stand(s):	N01	**Forest Type:**	School Facility	**Stand Label:**	XSF
Acres:	19.8	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description
This stand is the location of the school facility and football field.

Prescription
No management is recommended at this time, as management of the school vicinity is outside the scope of the forest management plan.

Stand(s):	N02	**Forest Type:**	Lowland Conifer	**Stand Label:**	Q4
Acres:	14.5	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	87	**BA (ft^2/ac):**	27	**Volume (Cds/ac):**	5.0

Stand Description
This stand is a lowland conifer stand that is poorly stocked with merchantable sized trees. The stand is however very thick with an excessive amount of tag alder growing. The most common species are cedar, tamarack, and balsam fir, with almost all of the trees in the poletimber size class. Lots of standing water was present throughout the stand. Numerous deer where kicked up in this stand, largely because of the thick protection of the tag alder.

Stand Objective(s)
The landowner's objective is to maintain the stand for wildlife habitat.

Soils & Habitat Type
15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
No management is recommended at during the course of this plan. The stand needs more time to grow and this poor quality timber stand is more valuable for wildlife than as a timber production resource.

Stand(s):	N03	**Forest Type:**	Mesic Hardwoods	**Stand Label:**	M7MD5
Acres:	11.1	**Soil Type:**	57B	**Next Harvest:**	Period #1
Trees/acre:	264	**BA (ft^2/ac):**	75	**Volume (Cds/ac):**	14.9

Stand Description
This is a mixed stand of hardwoods, aspen, and softwood. Each of these types make up approximately 1/3 of the trees per acre. The average stand diameter is 6.9 inches, a majority of the softwood and aspen make up the smaller diameter classes while the hardwood is located throughout all diameter classes that are present. The most common species are aspen, balsam fir, white birch and red maple. The stand borders the football field and large beaver flowage. An existing hiking/walking trail existing throughout this stand even with some benches, some tree ID signs also appeared on the trail. Excessive amounts of beaked hazelnut is located in the stand. Large amounts of balsam fir regeneration is coming up between the football field and the highway.

Stand Objective(s)
The landowner's objective is to maintain the stand for educational purposes and aesthetics.

Soils & Habitat Type
57B – Vilas loamy sand & *Acer-Quercs-Vaccinium* (AQVac)

This nearly level soil is excessively drained and is well suited for logging equipment and logging haul roads. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. The site index for red pine is 57 feet and has an annual growth capable of producing 1.08 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
No timber harvest are recommended during the course of this plan, as the stand could use more time to grow and a buffer around the marsh and streams would eliminate a large portion of the stand. Harvesting wouldn't be aesthetically appealing around the football field.

The main focus of this stand should be educational use. A hiking/walking trail system is already in place and should be better maintained to clear/clean up over growth of the trail, along with updating, maintaining, and adding Tree ID placards with information. A map and answer key could be made as a project for students, along with a small Kiosk or brochure holder at the trail entrance near the football field.

Stand(s):	N04	**Forest Type:**	Marsh	**Stand Label:**	N
Acres:	10.6	**Soil Type:**	N/A	**Next Harvest:**	Period #1
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

This stand is non-forested marsh, which is made up of cattails, sedges, and tag alder. A stream flows through the center of the stand is damned by beavers creating a beaver pond (stand N10), this causes the acreage of this stand to change from year to year depending on beaver activity, as you can see comparing the 1998 State CIR Map versus the 2012 NAIP map.

Stand Objective(s)

The landowner's objective is to preserve the wetland.

Prescription

The stand should be enhanced for wildlife habitat, especially wood duck habitat. Duck boxes are easy to build and should be maintained yearly. Approximately 6 boxes should be built and established around the marsh. Boxes shouldn't be placed in the shade and not closer than 50 feet from one box to another. Boxes should be placed facing open water, and on poles approximately 4 to 6 feet off the ground. Attached in the appendix is more information regarding wood duck box design and placement.

Stand(s):	N05	**Forest Type:**	Aspen	**Stand Label:**	F7A5
Acres:	5.5	**Soil Type:**	60B	**Next Harvest:**	Period #4
Trees/acre:	247	**BA (ft^2/ac):**	78	**Volume (Cds/ac):**	16.6

Stand Description

This stand is an aspen stand that is dominated by poletimber sized aspen and has a patch of spruce and balsam on the eastern edge of the stand. The balsam if found in all diameter classes, while the aspen in primarily in the 6 and 8 inch classes. The average stand diameter is 7.3 inches. The most common species are aspen and balsam fir. The stand will mainly produce aspen pulpwood and boltwood along with some softwood pulpwood.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

60B – Zimmerman fine sand & *Tsuga-Maianthemum-Vaccinium* (TMV)

This nearly flat sand soil slopes from 0 to 6 percent and is excessively drained and is well suited for logging equipment and logging haul roads. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. The site index for aspen is 70 feet and has an annual growth capable of producing 1.127 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum-Vaccinium* (TMV). This habitat type has a climax overstory dominated by eastern hemlock. Other common species include sugar maple, eastern white pine, balsam fir, white spruce, and northern red oak. The dominant ground flora includes Canada blueberry, wild sarsaparilla, bracken fern, wild lily-of-the-valley, low sweet blueberry, yellow beadlily and betony. Potential productivity for aspen and northern hardwoods is considered to be moderately high, this soil is also well suited for red pine and jack pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

The stand should be clearcut, cutting all merchantable trees. The clearcut will allow the aspen to naturally regenerate through stump sprouting. Aspen is better suited to be harvested during winter, however, the soils would accommodate summer harvesting. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle.

Stand(s):	N06 & N09	**Forest Type:**	Treed Bog	**Stand Label:**	D
Acres:	6.6	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

These stands are forested wetlands, composed of thick tag alder with some tamarack, cedar, balsam fir scattered throughout the stands. These stands have large amounts of standing water between little humps. A small drainage flows through stand 06 into the large marsh that is eventually damned up by beavers.

Stand Objective(s)

The landowner's objective is to preserve them for wildlife habitat.

Prescription

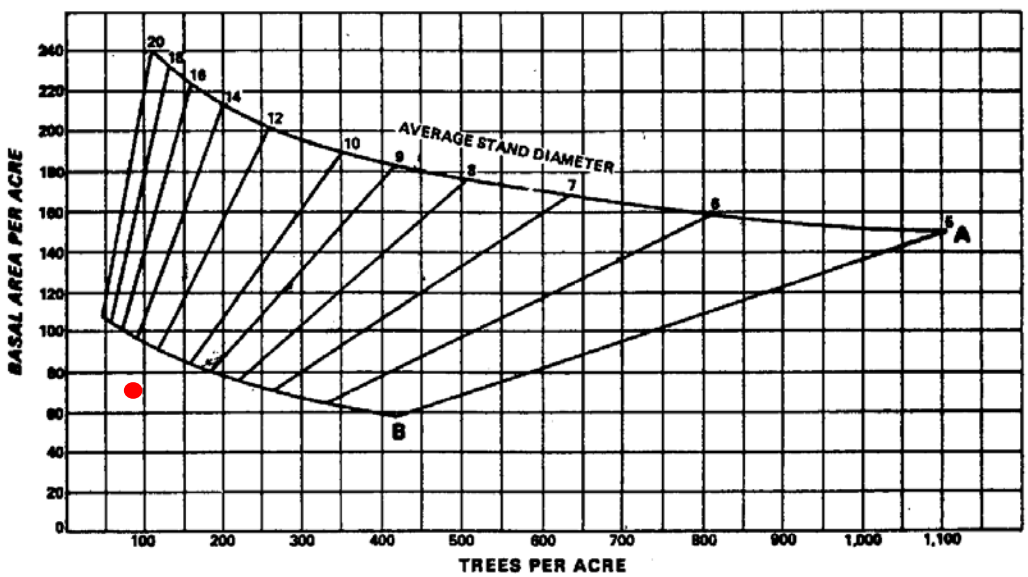
No management is recommended at this time. These stands hold more value for wildlife and forest health if left alone as they provide a diverse landscape and habitat when adjacent areas are harvest.

Stand(s):	N07	**Forest Type:**	Plantation Conifer	**Stand Label:**	R8MC5
Acres:	3.4	**Soil Type:**	57B	**Next Harvest:**	Period #4
Trees/acre:	270	**BA (ft^2/ac):**	150	**Volume (Cds/ac):**	38.9

Stand Description

This is a mixed stand with a pocket of red pine and white pine plantation. The most common species are red pine, balsam fir, and white pine. Nearly half of the basal area is red pine. The stand is made up of approximately 60% of sawtimber and 40% of poletimber with red pine making up nearly all of the sawtimber volume. Balsam fir is primarily found in the mid poletimber size classes. A large amount of balsam fir is coming up as advanced regeneration. The primary timber products will be red pine bolts and potentially some utility poles. The stocking guide below shows only the red pine in the stand.

RED PINE STOCKING GUIDE



From: Managers Handbook for Red Pine in the North Central States.

Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

57B – Vilas loamy sand & *Acer-Quercs-Vaccinium* (AQVac)

This nearly level soil is excessively drained and is well suited for logging equipment and logging haul roads. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. The site index for red pine is 57 feet and has an annual growth capable of producing 1.08 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant

ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be clearcut, harvesting all trees within the stand. The stand than should be replanted with red pine for timber production. As it is bordered by other forest types, the pine plantation would actually increase diversity in the area for wildlife while minimizing the impact of a plantation on wildlife activities.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Future Harvest

It typically takes 15 to 30 years for red pine seedlings to reach poletimber size of 5 inches in diameter. The first thinning should occur when the red pine basal area reaches approximately 140 to 160 square feet approximately 25-35 years old, with an average stand diameter of 5 to 8 inches in diameter. This initial thinning should be a row thinning where every third row is harvested. Row harvesting helps facilitate logging equipment movement and reduces damage to residual trees. The subsequent thinning harvest should be marked trees, targeting poor quality and poor formed trees for removal. The first thinning after the initial row thinning should occur approximately 10 years later or when basal areas reach 140 to 180 square feet and harvested down to 100 square feet of basal area. Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the stand should be clearcut once the average stand diameter of red pine is 15 inches in diameter and replanted.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should

be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	N08, N14	**Forest Type:**	Right-of-Way	**Stand Label:**	X
Acres:	3.4	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

This stand is the current right-of-way for State Highway 69.

Stand(s):	N10	**Forest Type:**	Water	**Stand Label:**	Z
Acres:	1.0	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

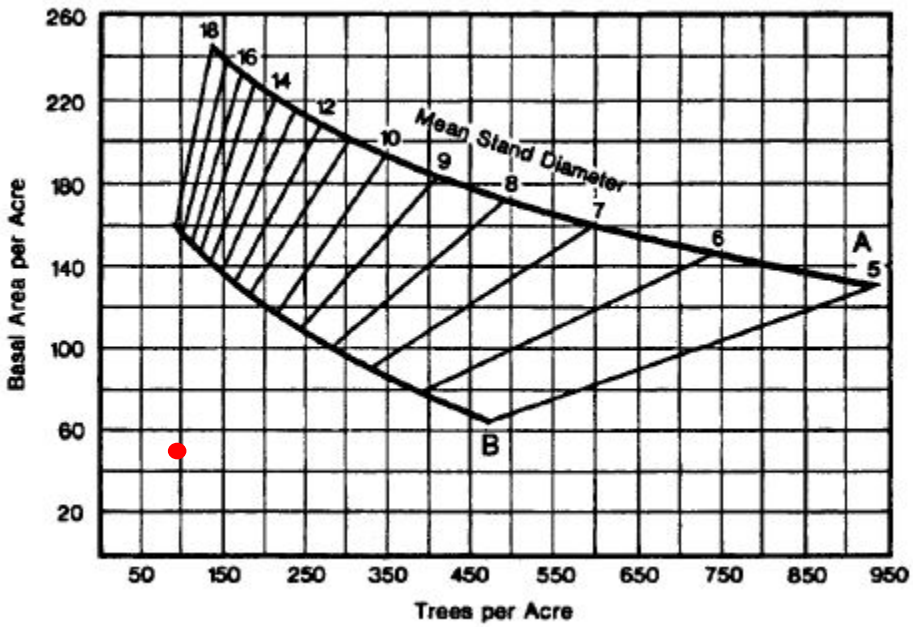
Stand Description

This stand is the beaver pond that has formed within the marsh. The area that is ponded can vary greatly depending on beaver activity and water levels in the creek. You can see a significant difference from 1999 to 2012 in the aerial photos. Any management in the surrounding stands and road building near it should be done in accordance with the state BMP manual.

Stand(s):	N11	**Forest Type:**	Dry Mesic Conifer	**Stand Label:**	W8F4
Acres:	10.2	**Soil Type:**	57B	**Next Harvest:**	Period #4
Trees/acre:	195	**BA (ft^2/ac):**	99	**Volume (Cds/ac):**	38.9

Stand Description

This is a white pine stand with thick balsam regeneration coming up under it. White pine is found throughout all age classes. The stand is made up of nearly 60% of pine and remainder is a mix of softwood, hardwood, and aspen. The stand is made up of over 60% percent of sawtimber, the average diameter of the stand is 9.1 inches. As a pure white pine stand it is severely understocked. The primary timber products will be white pine sawtimber and softwood pulpwood; the stand averages over 2,000 feet of pine sawtimber per acre. The stocking guide below shows only the white pine in the stand.



Objective(s)
The landowner's objective is to manage for timber production.

Soils & Habitat Type

57B – Vilas loamy sand & *Acer-Quercs-Vaccinium* (AQVac)

This nearly level soil is excessively drained and is well suited for logging equipment and logging haul roads. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. The site index for red pine is 57 feet and has an annual growth capable of producing 1.08 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
This stand should be harvested using a seed tree system, harvesting all trees within the stand to naturally regenerate a stand of predominately white pine along with a mix of balsam fir, red maple, white birch, and aspen.

The seed tree harvest should harvest all trees not desired as seed trees. All regeneration harvests should be from below and all vegetation should be cut, except existing white pine regeneration. The most vigorous trees between the diameters of 16 to 20 inches should be kept as seed trees, approximately 4 to 10 trees

per acre should be retained. During the harvest soil scarification is also recommend, typically enough scarification is generated from tracked harvesters or longwood operations.

After two years monitor regeneration, if not satisfied with white pine regeneration (desired target is 700 stems per acre), monitor seed crop throughout spring and summer. If a healthy, and high seed crop is present perform site preparation during late summer by scarifying the soil to create a favorable seed bed for the white pine seed trees. Expose approximately 50% of the area, while trying to avoid favorable established regeneration.

All operations should follow state BMPs.

Pruning

Pruning is essential if managing for white pine sawlogs as it doesn't naturally prune well. Pruning will increase the value of white pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter.

Stand(s):	N12	**Forest Type:**	Lowland Brush	**Stand Label:**	L
Acres:	3.7	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

This stand is composed of lowland brush that borders the West Branch Sturgeon River. The bank leading down to the stand is rather steep. These stands of brush are valuable resources for a variety of wildlife.

Stand(s):	N13	**Forest Type:**	Lowland Poplar	**Stand Label:**	UM4P2
Acres:	1.3	**Soil Type:**	57B	**Next Harvest:**	N/A
Trees/acre:	148	**BA (ft^2/ac):**	23	**Volume (Cds/ac):**	0.7

Stand Description

This stand is a regenerating stand that was clearcut. It is mainly composed of aspen, balsam poplar, and red pine. Most of the stand is still non-merchantable sized aspen and balsam poplar regeneration.

Stand Objective(s)
The landowner's objective is to manage for timber production.

Soils & Habitat Type
57B – Vilas loamy sand & *Acer-Quercs-Vaccinium* (AQVac)

This nearly level soil is excessively drained and is well suited for logging equipment and logging haul roads. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. The site index for red pine is 57 feet and has an annual growth capable of producing 1.08 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
The stand should be clearcut, cutting all merchantable trees, however, the stand still needs time to grow before it is ready and will fall outside of the time frame of the plan. The clearcut will allow the aspen and balsam poplar to naturally regenerate through stump sprouting. Aspen and balsam poplar is better suited to be harvested during winter, however, the soils would accommodate summer harvesting. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle.

Stand(s):	N15	**Forest Type:**	Grass/Opening	**Stand Label:**	G
Acres:	1.2	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description
This stand is an open/grassy area that could be used as a future landing during future timber harvests. The opening is filled with spotted knapweed. There is no easy removal method of knapweed other than manually pulling them out. It appears the schools well heads are also located in this opening and should always be protected during any type of operation.

Felch Township

Stand(s):	F01	**Forest Type:**	Lowland Conifer	**Stand Label:**	Q8Q6
Acres:	21.6	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	486	**BA (ft^2/ac):**	182	**Volume (Cds/ac):**	41.2

Stand Description

This stand is a lowland conifer stand that is well stocked with poletimber and moderately stocked for sawtimber. Pockets of tag alder are interspersed throughout the stand. This stand is a great wildlife wintering area, especially for deer. The large amount of cedar provides good cover and protection from the elements. The stand is predominately cedar, with small components of numerous other species including spruce and balsam fir. The stand has an average diameter of 7.9 inches, with approximately 65% of the basal area of poletimber sized trees. The primary products if the stand were harvested would be cedar pulp, bolts and sawtimber.

Stand Objective(s)

The landowner's objective is to maintain the stand for wildlife habitat.

Soils & Habitat Type

15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the course of this plan. The stand is more valuable for wildlife than as a timber production resource, especially for deer during the winter months.

Stand(s):	F02	**Forest Type:**	Mesic Hardwoods	**Stand Label:**	M8F5
Acres:	4.0	**Soil Type:**	68D	**Next Harvest:**	Period #2
Trees/acre:	408	**BA (ft^2/ac):**	143	**Volume (Cds/ac):**	28.1

Stand Description

This is a small mixed stand that is moderately stocked with sawtimber and poletimber. Red maple and yellow birch make up the large sawtimber sized diameters, while the poletimber is made up of a mix of spruce, balsam fir, and red maple. The most common species is red maple and spruce. The stand is nearly split 50/50 between softwood and hardwood based on trees per acre. The average diameter of the stand is 7.6 inches. The primary products when harvested will be hardwood and softwood pulp, along with a small amount of poor quality hardwood sawlogs.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

68D – Pemene Rock outcrop & *Tsuga-Maianthemum* (TM)

This gently rolling soil slopes from 6 to 18 percent and is a well-drained sandy loam with rock outcrops. It is well suited for logging equipment and logging haul roads, it is slightly limited for landings because of slope. The main management concern with this soils is rock outcrops which can be difficult when building/designing roads. The site index for sugar maple is 60 feet and has an annual growth capable of producing 0.544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using an even-aged two-cut shelterwood system, the first cut will be thinning. This thinning is targeted to release future seed trees, retaining 50-60 percent crown closure. The harvest should concentrate on thinning from below. Trees for removal should include poor quality, defective, storm damaged, and undesirable trees in all age and size classes, however, removal trees during this first harvest should be targeted from below. This thinning harvest will focus on removing trees at risk to survive until the next harvest, vigor, quality, and spacing. Sawlog removal in this stand will focus on removing large defectives. Total stand densities should not be reduced below 50-60 percent crown cover (50-80 square feet of basal area). After this initial harvest the final step of the shelterwood is the overstory removal, once adequate regeneration is met. Typically, a minimum of 5,000 seedlings or 1,000 saplings per acre desired before the overstory removal.

Stand(s):	F03 & F10	**Forest Type:**	Grass/Opening	**Stand Label:**	G
Acres:	2.3	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description
This is a small grassy opening that is starting to be encroached upon the adjacent stands.

Stand Objective(s)
The landowner's objective is to maintain this opening for wildlife.

Prescription
These grass/openings should be maintained as they provide more benefit to wildlife by creating a more diverse habitat with multiple height structures.

Stand(s):	F04	**Forest Type:**	Aspen	**Stand Label:**	A4
Acres:	4.0	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	83	**BA (ft^2/ac):**	15	**Volume (Cds/ac):**	1.2

Stand Description
This stand is a young aspen stand that is just starting to meet the requirements of merchantability, the stand has an average diameter of 5.7 inches. The most common species is aspen, however, some balsam fir is also located within the stand. The stand is well stocked with sapling sized aspen regeneration.

Stand Objective(s)
The landowner's objective is to manage for timber production.

Soils & Habitat Type
15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
No management is recommended during the plan, as the aspen needs more time to grow. Eventually, the stand should be clearcut, cutting all merchantable trees. The clearcut will allow the aspen to naturally regenerate through stump sprouting. Aspen is best suited to be harvested during winter. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle.

Stand(s):	F05	**Forest Type:**	Aspen	**Stand Label:**	A6
Acres:	6.5	**Soil Type:**	64B	**Next Harvest:**	Period #4
Trees/acre:	721	**BA (ft^2/ac):**	170	**Volume (Cds/ac):**	35

Stand Description
This stand is a young aspen stand that has an average diameter of 6.4 inches. The most common species is aspen, however, some balsam fir and spruce is also located within the stand. Nearly all of the stand is poletimber other than some large spruce. This stand will begin to start self-thinning itself out and gaining diameter. The stand will primarily produce aspen pulpwood and boltwood when harvested.

Stand Objective(s)
The landowner's objective is to manage for timber production.

Soils & Habitat Type
64B – Rubicon sand & *Acer-Quercus-Vaccinium* (AQVac)

This flat sandy soil slopes from 0 to 6 percent and is excessively drained. The soil is moderately suited for logging equipment and logging haul roads, the main concern comes from the soil being too sandy. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. The site index for aspen is 60 feet and has an annual growth capable of producing .722 cords per acre per year of wood fiber, red maple has a site index of 57 and has an annual growth capable of producing .367 cords per acre per year of wood fiber, and red pine has a site index of 53 and has an annual growth capable of producing 1.09 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
The stand should be clearcut, cutting all merchantable trees. The clearcut will allow the aspen to naturally regenerate through stump sprouting. Aspen is better suited to be harvested during winter, however, the soils would accommodate summer harvesting. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle.

Stand(s):	F07	**Forest Type:**	Lowland Conifer	**Stand Label:**	Q1
Acres:	5.5	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	0	**BA (ft^2/ac):**	0	**Volume (Cds/ac):**	0

Stand Description

This stand is a lowland conifer stand that was just recently harvested and doesn't have any merchantable trees growing yet, some smaller tamarack, balsam fir and scattered throughout the stand. The stand was clearcut a couple years ago. Currently it is poorly stocked with regeneration.

Stand Objective(s)

The landowner's objective is for timber production.

Soils & Habitat Type

15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

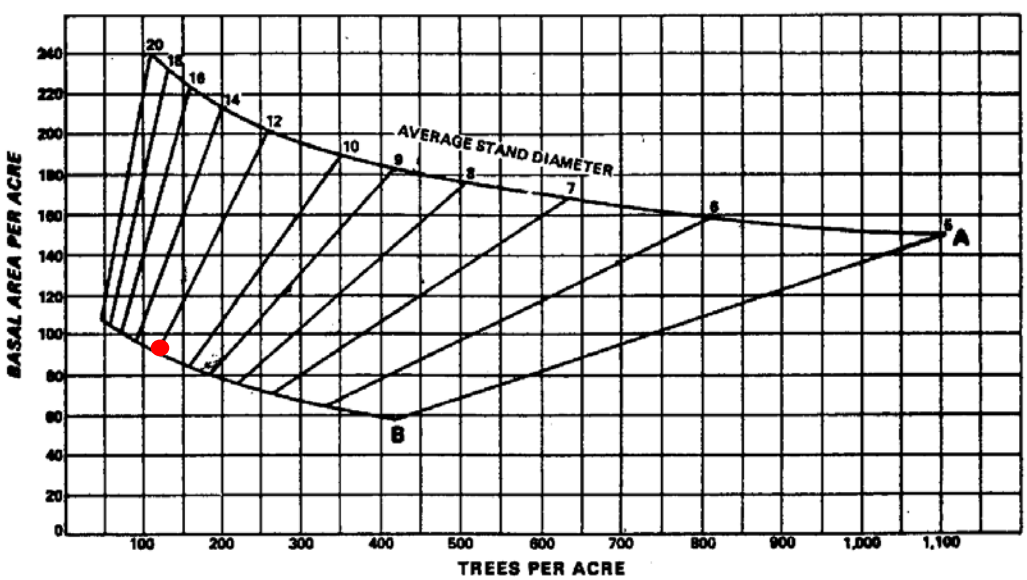
No management is recommended during the course of this plan, the stand needs more time to grow. This stand should be monitored for regeneration when harvests are taking place in nearby stands. It will likely be 40 to 60 years before it is ready for harvest again.

Stand(s):	F08	**Forest Type:**	Plantation Conifer	**Stand Label:**	R8W7
Acres:	46.4	**Soil Type:**	64B	**Next Harvest:**	Period #2
Trees/acre:	141	**BA (ft^2/ac):**	100	**Volume (Cds/ac):**	31.3

Stand Description

This is a conifer plantation primarily made up of red pine with a moderate component of white pine. The stand also has a couple pockets of aspen within it. The average stand diameter is 10.7 inches, while the average diameter of the pine is 11.9 inches. The stands basal area is made up of nearly 80% of sawtimber sized pine. The stand has an estimated total volume of 31.3 cords per acre.

RED PINE STOCKING GUIDE



From: Managers Handbook for Red Pine in the North Central States.

Red pine averaged nearly 4,000 feet of sawtimber per board foot per acre. White pine averaged nearly 1,500 feet of sawtimber per board foot per acre. The stand will produce some quality utility poles, red pine bolts and pulpwood. The stocking chart above is showing only the pine densities, this shows the stand is lightly stocked currently because of its recent harvest. Most of the volume would actually likely be sold as bolts.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

64B – Rubicon sand & *Acer-Quercus-Vaccinium* (AQVac)

This flat sandy soil slopes from 0 to 6 percent and is excessively drained. The soil is moderately suited for logging equipment and logging haul roads, the main concern comes from the soil being too sandy. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. The site index for aspen is 60 feet and has an annual growth capable of producing .722 cords per acre per year of wood fiber, red maple has a site index of 57 and has an annual growth capable of producing .367 cords per acre per year of wood fiber, and red pine has a site index of 53 and has an annual growth

capable of producing 1.09 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be thinned towards the end of period 2 when the basal area reaches 140 to 180 square feet of red and white pine. The stand should be thinned down to 110 square feet of basal area, targeting poor quality and poor formed trees for removal along with improving spacing of dominate crop trees; typically the thinning should be from below. All non-pine species should be harvested from stand. Trees should be harvested before they reach 24 inches in diameter, as they become oversized for nearly all timber markets.

Future Harvest

Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the stand should be clearcut once the average stand diameter of red and white pine is 15 inches in diameter and replanted.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of

the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	F09 & F31	**Forest Type:**	Lowland Brush	**Stand Label:**	L
Acres:	46.5	**Soil Type:**	N/A	**Next Harvest:**	Period #1
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

These stands are composed of lowland brush. Stand F09 is wedged in a low spot between pine plantations, while stand F31 is located along the East Branch Sturgeon River. These stands of brush/shrub species are valuable resources for a variety of wildlife.

Stand Objective(s)

The landowner's objective is to preserve the wetland.

Prescription

Stand F31 should be enhanced for wildlife habitat, especially wood duck habitat. Duck boxes are easy to build and should be maintained yearly. Approximately 12 boxes should be built and established around the stream edge and lowland brush area. Boxes shouldn't be placed in the shade and not closer than 50 feet from one box to another. Boxes should be placed facing open water, and on poles approximately 4 to 6 feet off the ground. Attached in the appendix is more information regarding wood duck box design and placement.

Stand(s):	F12	**Forest Type:**	Lowland Conifer	**Stand Label:**	T2
Acres:	2.4	**Soil Type:**	10	**Next Harvest:**	N/A
Trees/acre:	0	**BA (ft^2/ac):**	0	**Volume (Cds/ac):**	0

Stand Description

This stand is a lowland conifer stand that has a moderate level of advanced tamarack regeneration growing along with tag alder. The stand had no merchantable trees. A significant amount of standing water was present in the stand.

Stand Objective(s)

The landowner's objective is for timber production.

Soils & Habitat Type

10 – Waucedah-Cathro complex & *Fraxinus-Mentha-Carex* (FMC)

This mucky soil is nearly level and is poorly drained and is poorly suited for logging equipment because of wetness and strength. The soil is poorly suited for logging haul roads because of strength and wetness. The use of logging equipment is restricted to use during winter months when frozen conditions exist because of the wetness and strength. The site index for aspen is 40 feet and has an annual growth capable of producing .367 cords per acre per year of wood fiber. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Fraxinus-Mentha-Carex* (FMC). This habitat type has a climax overstory dominated by black ash and American elm. Other common species include red maple and balsam fir. The dominant ground flora includes wild mint, sedge, jewelweed, and tag alder. Potential productivity for timberlands is rather poor.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

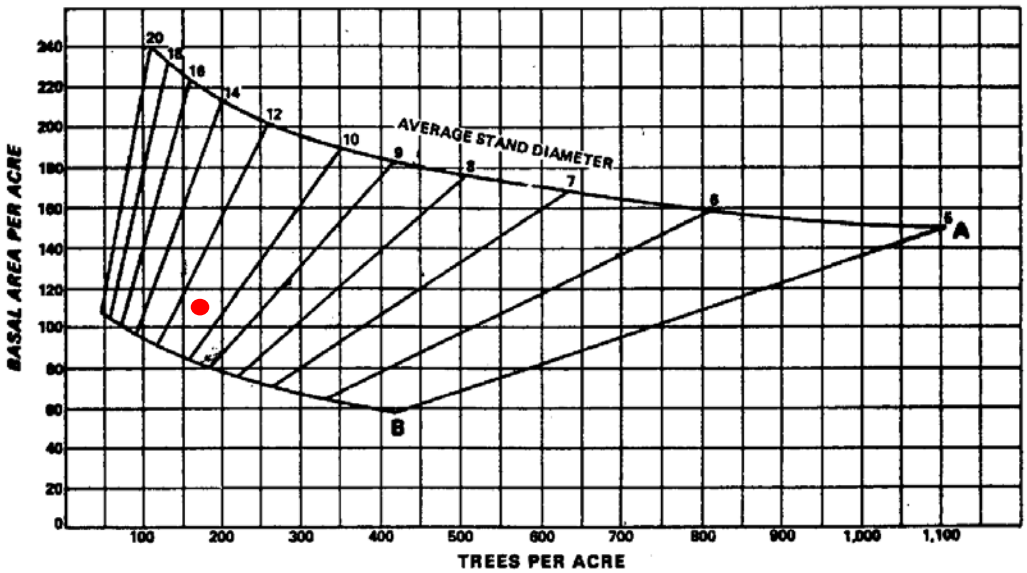
No management is recommended during the course of this plan, the stand needs more time to grow. It will likely be 40 to 60 years before it is ready for harvest.

Stand(s):	F13	**Forest Type:**	Plantation Conifer	**Stand Label:**	R9UM5
Acres:	16.9	**Soil Type:**	64D	**Next Harvest:**	Period #2
Trees/acre:	320	**BA (ft^2/ac):**	133	**Volume (Cds/ac):**	36.7

Stand Description

This is an overgrown conifer plantation primarily made up of red pine with a moderate component of white pine. The stand also has a couple pockets of aspen within it, along with red maple and spruce, along with an extensive amount of beaked hazelnut regeneration. Pockets of advanced aspen regeneration exists throughout the stand. The average stand diameter is 7.9 inches, while the average diameter of the pine is 10.4 inches. The stands basal area is made up of nearly 60% of sawtimber sized pine. The stand has an estimated total volume of 36.7 cords per acre. Red pine averaged nearly 5,000 feet of sawtimber per board foot per acre. White pine averaged nearly 1,000 feet of sawtimber per board foot per acre. The stand will produce some quality utility poles, red pine bolts and pulpwood. The stocking chart below is showing only the pine densities, this shows the stand is relatively lightly stocked. Most of the volume would actually likely be sold as bolts.

RED PINE STOCKING GUIDE



From: Managers Handbook for Red Pine in the North Central States.

Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

64D – Rubicon sand & *Acer-Quercus-Vaccinium* (AQVac)

This sandy soil slopes from 6 to 18 percent and is excessively drained. The soil is moderately suited for logging equipment and logging haul roads, the main concern comes from the soil being too sandy and slope. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. The site index for aspen is 60 feet and has an annual growth capable of producing .722 cords per acre per year of wood fiber, red maple has a site index of 57 and has an annual growth capable of producing .367 cords per acre per year of wood fiber, and red pine has a site index of 53 and has an annual growth capable of producing 1.09 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be thinned towards the end of period 2 when the basal area reaches 140 to 180 square feet of red and white pine. The stand should be thinned down to 120 square feet of basal area, targeting poor quality and poor formed trees for removal along with improving spacing of dominate crop trees;

typically the thinning should be from below. All non-pine species should be harvested from stand if they are merchantable. Some of the aspen regeneration will have to be skipped around.

Future Harvest

Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the stand should be clearcut once the average stand diameter of red and white pine is 15 inches in diameter and replanted. Trees should be harvested before they reach 24 inches in diameter, as they become oversized for nearly all timber markets.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	F14	**Forest Type:**	Plantation Conifer	**Stand Label:**	R9MC5
Acres:	8.6	**Soil Type:**	64D	**Next Harvest:**	Period #2
Trees/acre:	216	**BA (ft^2/ac):**	135	**Volume (Cds/ac):**	42.1

Stand Description

This is an overgrown conifer plantation primarily made up of red pine, white pine and white spruce. The stand also has a couple pockets of pure species groups than back to a mix. It appears this stand has been used as a buffer to the lowland brush and river in the past. Harvesting can occur in this stand, only a 50 foot buffer is needed in most cases to buffer the non-forested lowland, while a 100 foot buffer for the river only would occur in a few spots. The average stand diameter is 9.7 inches. The stands basal area is made up of nearly 70% of sawtimber sized pine. The stand has an estimated total volume of 42.1 cords per acre. Red pine averaged nearly 5,000 feet of sawtimber per board foot per acre. White pine averaged nearly 800 feet of sawtimber per board foot per acre. The stand will produce some quality utility poles, red pine bolts and mixed softwood pulpwood. Most of the volume would actually likely be sold as bolts.

Objective(s)

The landowner's objective is to manage for timber production and protection of the river and wetlands.

Soils & Habitat Type

64D – Rubicon sand & *Acer-Quercus-Vaccinium* (AQVac)

This sandy soil slopes from 6 to 18 percent and is excessively drained. The soil is moderately suited for logging equipment and logging haul roads, the main concern comes from the soil being too sandy and slope. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. The site index for aspen is 60 feet and has an annual growth capable of producing .722 cords per acre per year of wood fiber, red maple has a site index of 57 and has an annual growth capable of producing .367 cords per acre per year of wood fiber, and red pine has a site index of 53 and has an annual growth capable of producing 1.09 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be thinned towards the end of period 2 when the basal area reaches 140 to 180 square feet of red and white pine. The stand should be thinned down to 110 square feet of basal area, targeting poor quality and poor formed trees for removal along with improving spacing of dominate crop trees; typically the thinning should be from below. All non-pine species should be harvested from stand if they are merchantable. The larger pine should be maintained for nesting sites for predatory birds like osprey, and bald eagles that like to nest in large pines located along water. Buffers should be set in accordance with the state BMP manual. During the clearcut harvest the buffer should become a no harvest area, along with the trees large than 24 inches being left as reserve trees.

Future Harvest

Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the stand should be clearcut once the average stand diameter of red and white pine is 15 inches in diameter and replanted.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	F15	**Forest Type:**	Dry Mesic Conifer	**Stand Label:**	W8UM5
Acres:	51.1	**Soil Type:**	46B	**Next Harvest:**	Period #3
Trees/acre:	176	**BA (ft^2/ac):**	105	**Volume (Cds/ac):**	32.1

Stand Description

This is a mixed white and red pine stand with very thick layer of beaked hazelnut growing in understory. The understory is a mixed bunch of white birch, red maple, balsam fir and spruce. The red maple is very poor quality. There are some pockets of nice white pine regeneration coming up along with thickets of balsam regeneration as well. There is nearly 10 trees per acre, larger than 20 inches in diameter. The stand has an average diameter of 9.4 inches. Approximately 60% of the basal area is made up of pine with

65% being made up of sawtimber, the stand appears very open because of the large number of large diameter trees; including multiple 30 plus inch diameter trees. The primary timber products will be white and red pine sawtimber and softwood pulpwood; the stand averages over 6,000 feet of pine sawtimber per acre.

Objective(s)
The landowner's objective is to manage for timber production and retaining this uncommon stand type.

Soils & Habitat Type

46B – Oconto fin sandy loam & *Tsuga-Maianthemum* (TM)

This flat soil slopes from 0 to 6 percent and is a well-drained sandy loam. It is well suited for logging equipment and moderately suited for logging haul roads, it is slightly limited for haul roads because of low strength. The site index for sugar maple is 70 feet and has an annual growth capable of producing 0.544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
This stand should be harvested using a seed tree system, harvesting all trees within the stand to naturally regenerate a stand of predominately white pine along with a mix of balsam fir, red maple, white birch, and aspen.

The seed tree harvest should harvest all trees not desired as seed trees. All regeneration harvests should be from below and all vegetation should be cut, except existing white pine regeneration. The most vigorous trees between the diameters of 16 to 20 inches should be kept as seed trees, approximately 4 to 10 trees per acre should be retained; additionally all trees over 28 inches should be kept as reserve and legacy trees. During the harvest soil scarification is also recommend, typically enough scarification is generated from tracked harvesters or longwood operations.

After two years monitor regeneration, if not satisfied with white pine regeneration (desired target is 700 stems per acre), monitor seed crop throughout spring and summer. If a healthy, and high seed crop is present perform site preparation during late summer by scarifying the soil to create a favorable seed bed for the white pine seed trees. Expose approximately 50% of the area, while trying to avoid favorable established regeneration.

All operations should follow state BMPs.

Pruning

Pruning is essential if managing for white pine sawlogs as it doesn't naturally prune well. Pruning will increase the value of white pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is

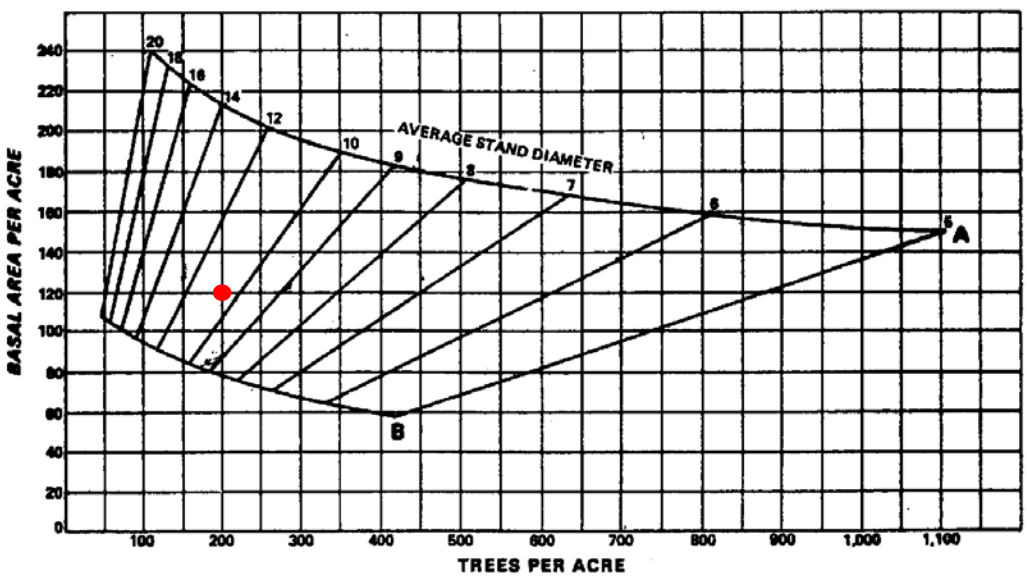
recommended, however, proper techniques must be used in order to not lose value or injure trees. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter.

Stand(s):	F17	**Forest Type:**	Plantation Conifer	**Stand Label:**	R8R5
Acres:	21.0	**Soil Type:**	46B	**Next Harvest:**	Period #2
Trees/acre:	205	**BA (ft^2/ac):**	122	**Volume (Cds/ac):**	40.5

Stand Description

This is a conifer plantation primarily made up of red pine with a component of white pine. The average stand diameter is 10.2 inches. The stands basal area is made up of approximately 50% of sawtimber sized pine. The stand has an estimated total volume of 40.5 cords per acre. Red pine averaged approximately 3,500 feet of sawtimber per board foot per acre. The stand will produce some quality utility poles, red pine

RED PINE STOCKING GUIDE



From: Managers Handbook for Red Pine in the North Central States.

bolts and pulpwood. Most of the volume would actually likely be sold as bolts. The stand was recently harvested.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

46B – Oconto fin sandy loam & *Tsuga-Maianthemum* (TM)

This flat soil slopes from 0 to 6 percent and is a well-drained sandy loam. It is well suited for logging equipment and moderately suited for logging haul roads, it is slightly limited for haul roads because of low strength. The site index for sugar maple is 70 feet and has an annual growth capable of producing 0.544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be thinned towards the end of period 2 when the basal area reaches 140 to 180 square feet of red and white pine. The stand should be thinned down to 130 square feet of basal area, targeting poor quality and poor formed trees for removal along with improving spacing of dominate crop trees; typically the thinning should be from below. All non-pine species should be harvested from stand. Trees should be harvested before they reach 24 inches in diameter, as they become oversized for nearly all timber markets.

Future Harvest

Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the stand should be clearcut once the average stand diameter of red and white pine is 15 inches in diameter and replanted.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately

800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	F18	**Forest Type:**	Dry Mesic Conifer	**Stand Label:**	W8UM5
Acres:	12.7	**Soil Type:**	46B	**Next Harvest:**	Period #3
Trees/acre:	205	**BA (ft^2/ac):**	90	**Volume (Cds/ac):**	24.6

Stand Description

This is a white stand with a smaller component of red pine compared to stand F15. The understory is a mixed bunch of white birch, red maple, aspen, balsam fir and spruce. A small pocket of aspen is located in the northern portion of this stand. There are some pockets of nice white pine regeneration coming up along with thickets of balsam fir regeneration as well. There is nearly 10 trees per acre, larger than 20 inches in diameter. The stand has an average diameter of 7.9 inches. Approximately 65% of the basal area is made up of pine with 59% being made up of sawtimber, the stand appears very open because of the large number of large diameter trees; including some 30 plus inch diameter trees. The primary timber products will be white and red pine sawtimber and softwood pulpwood; the stand averages nearly 5,000 feet of pine sawtimber per acre.

Objective(s)

The landowner's objective is to manage for timber production and retaining this uncommon stand type.

Soils & Habitat Type

46B – Oconto fin sandy loam & *Tsuga-Maianthemum* (TM)

This flat soil slopes from 0 to 6 percent and is a well-drained sandy loam. It is well suited for logging equipment and moderately suited for logging haul roads, it is slightly limited for haul roads because of low strength. The site index for sugar maple is 70 feet and has an annual growth capable of producing 0.544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using a seed tree system, harvesting all trees within the stand to naturally regenerate a stand of predominately white pine along with a mix of balsam fir, red maple, white birch, and aspen.

The seed tree harvest should harvest all trees not desired as seed trees. All regeneration harvests should be from below and all vegetation should be cut, except existing white pine regeneration. The most vigorous trees between the diameters of 16 to 20 inches should be kept as seed trees, approximately 4 to 10 trees per acre should be retained; additionally all trees over 28 inches should be kept as reserve and legacy trees. During the harvest soil scarification is also recommend, typically enough scarification is generated from tracked harvesters or longwood operations.

After two years monitor regeneration, if not satisfied with white pine regeneration (desired target is 700 stems per acre), monitor seed crop throughout spring and summer. If a healthy, and high seed crop is present perform site preparation during late summer by scarifying the soil to create a favorable seed bed for the white pine seed trees. Expose approximately 50% of the area, while trying to avoid favorable established regeneration.

All operations should follow state BMPs.

Pruning

Pruning is essential if managing for white pine sawlogs as it doesn't naturally prune well. Pruning will increase the value of white pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter.

Stand(s):	F20	**Forest Type:**	Mesic Hardwoods	**Stand Label:**	M9/M5
Acres:	17.2	**Soil Type:**	24D	**Next Harvest:**	Period #1
Trees/acre:	245	**BA (ft^2/ac):**	108	**Volume (Cds/ac):**	28.6

Stand Description

This stand is a mesic hardwood stand that is dominated by sawtimber sized basswood and hard maple, and poletimber sized hard maple. The primary species based on basal area are hard maple, basswood, and red maple; 89% of the stand is hardwood and 11% is softwood with an average diameter of 8.1 inches. The stand is overstocked in nearly every other diameter class, while being understocked in the others; the desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The sawtimber volume is nearly 3,500 board feet per acre, with hard maple and basswood making up most of that volume. The hard maple sawtimber is mainly 12-16 inches

in diameter, while the basswood volume comes from trees 16 inches in diameter or greater. The next harvest will primarily produce basswood sawlogs and pulpwood, along with some hardwood pulpwood. Very little to no regeneration is present within the stand.

Stand Objective(s)

The landowner's objective is to manage for timber (increasing the percentage of sawlogs and veneer) by a selection harvest and development of wildlife habitat.

Soils & Habitat Type

24D – Emmet fine sandy loam & *Acer-Viola-Osmorhiza* (AVO)

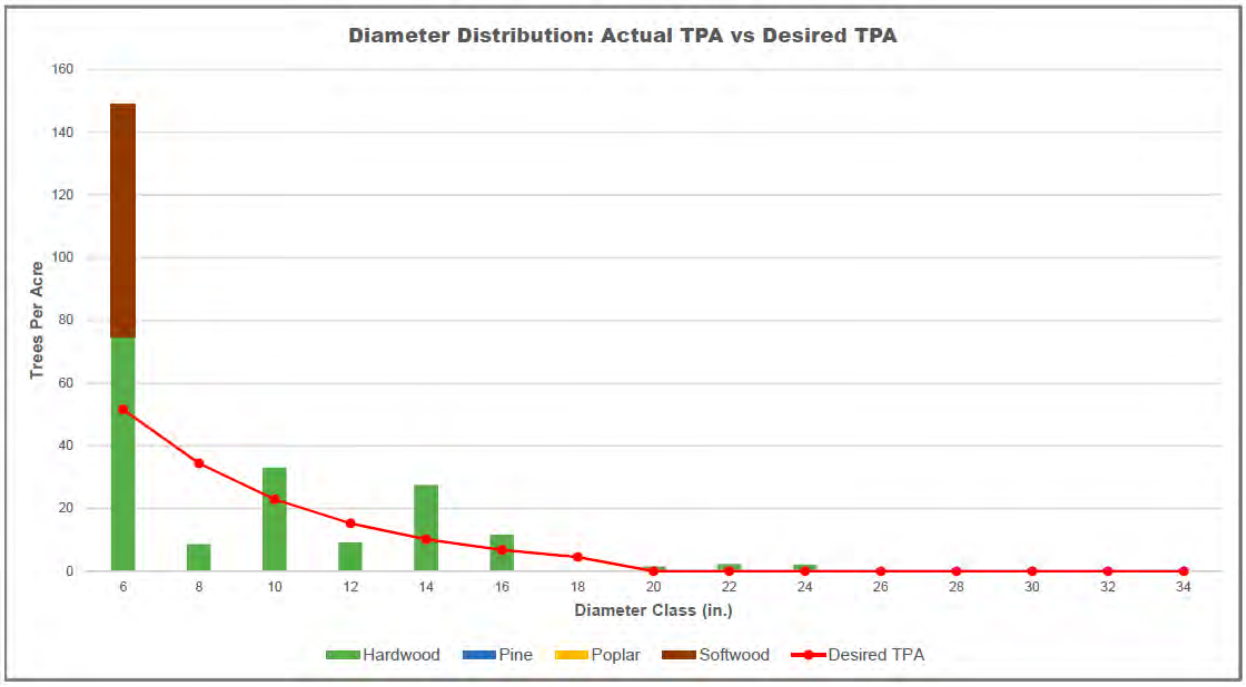
This hilly sandy-loam soil slopes from 6 to 18 percent and is well drained and is well suited for logging equipment with the only concern being slope. The soil is moderately suited for logging haul roads because of slope. This soil is typically found on hills and ridges in the uplands. The use of logging equipment can be briefly restricted in the spring and other wet periods because unsurfaced roads become slippery and rut easily; graveled roads can facilitate year round use. The site index for sugar maple is 66 feet and has an annual growth capable of producing .519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high, this soil is also well suited for red pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using an uneven-aged crop tree method. The desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The harvest should concentrate on releasing potential crop trees by removing poor quality, defective, storm damaged, and undesirable trees in all age and size classes; trees in the 6, 8 and 10 inch diameter classes are the most heavily overstocked. Remove cull and defective overstory trees. Cut only poor growing stock in overstory as it is at desired stocking levels or below. This stand should continue to be managed in a similar fashion using 12-15 year cutting cycles.



Any snags should be retained for wildlife, along with any softwood over 18 inches in diameter.

Stand(s):	F21	**Forest Type:**	Lowland Hardwoods	**Stand Label:**	LM9/LM5
Acres:	4.9	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	262	**BA (ft^2/ac):**	160	**Volume (Cds/ac):**	42.4

Stand Description

This stand is a lowland stand that is dominated by sawtimber sized hemlock, and poletimber sized red maple, yellow birch, spruce, and balsam fir. The primary species based on basal area are hemlock, white pine, red maple and spruce; 63% of the stand is softwood and 25% is hardwood with an average diameter of 10.1 inches. The stand was very wet during the assessment. A pocket of nice spruce was located in the stand. The stand is going to primarily produce hardwood, and hemlock and mixed softwood pulpwood.

Stand Objective(s)

The landowner's objective is to manage for wildlife habitat by retaining the stand as it is, the stand is of poor quality and is on a poor soil.

Soils & Habitat Type

15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of

producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
No management is recommended during the course of this plan. The stand is more valuable for wildlife than as a timber production resource, especially for deer during the winter months. This stand also creates a more diverse set of stand throughout the property.

Stand(s):	F22	**Forest Type:**	Lowland Conifer	**Stand Label:**	Q6
Acres:	6.4	**Soil Type:**	69D	**Next Harvest:**	Period #3
Trees/acre:	238	**BA (ft^2/ac):**	90	**Volume (Cds/ac):**	42.4

Stand Description
This stand is a lowland conifer stand that is dominated by poletimber sized tamarack, spruce, and balsam fir. The stands average diameter is 8.1 inches, the stand consist of approximately 90% of poletimber. The stand was very wet during the assessment. The stand is going to primarily produce softwood pulpwood.

Stand Objective(s)
The landowner's objective is to manage for timber production.

Soils & Habitat Type
69D – Emmet Rock outcrop & *Acer-Viola-Osmorhiza* (AVO)

This gently rolling soil slopes from 6 to 18 percent and is a well-drained sandy loam with rock outcrops. It is well suited for logging equipment and logging haul roads, it is slightly limited for landings because of slope. The main management concern with this soils is rock outcrops which can be difficult when building/designing roads. The site index for sugar maple is 66 feet and has an annual growth capable of producing 0.519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using a seed tree system, harvesting all trees within the stand to naturally regenerate a stand of tamarack, spruce, and balsam fir.

The seed tree harvest should harvest all trees not desired as seed trees. All regeneration harvests should be from below and all vegetation should be cut. The most vigorous trees between the diameters of 8 to 12 inches should be kept as seed trees, approximately 4 to 10 trees per acre should be retained. This should allow natural regeneration to take place.

Stand(s):	F23	**Forest Type:**	Dry Mesic Conifer	**Stand Label:**	W9LM5
Acres:	30.9	**Soil Type:**	69D	**Next Harvest:**	Period #1
Trees/acre:	146	**BA (ft^2/ac):**	118	**Volume (Cds/ac):**	38.5

Stand Description

This is a white pine stand with components of softwood and hardwood. White pine is found throughout the sawtimber size classes. The stand is made up of nearly 60% of pine and remainder is a mix of hardwood and softwood. The stand is made up of over 75% percent of sawtimber, the average diameter of the stand is 11.2 inches, while the white pine average diameter is 17.5 inches. The stand has some nice pockets of white pine regeneration, along with balsam fir regeneration. Pockets of wet areas had some components of cedar and ash. Beaked hazelnut is also widely spread throughout the stand. Some pockets of aspen regeneration are also located within the stand. The primary timber products will be white pine sawtimber and softwood pulpwood; the stand averages over 6,500 feet of white pine sawtimber per acre. This stand has some great potential building sites for a cabin/structure to look over the East Branch Sturgeon River.

Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

69D – Emmet Rock outcrop & *Acer-Viola-Osmorhiza* (AVO)

This gently rolling soil slopes from 6 to 18 percent and is a well-drained sandy loam with rock outcrops. It is well suited for logging equipment and logging haul roads, it is slightly limited for landings because of slope. The main management concern with this soils is rock outcrops which can be difficult when building/designing roads. The site index for sugar maple is 66 feet and has an annual growth capable of producing 0.519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using a seed tree system, harvesting all trees within the stand to naturally regenerate a stand of predominately white pine along with a mix of existing species.

The seed tree harvest should harvest all trees not desired as seed trees. All regeneration harvests should be from below and all vegetation should be cut, except existing white pine regeneration. The most vigorous trees between the diameters of 16 to 20 inches should be kept as seed trees, approximately 4 to 10 trees per acre should be retained; additionally all trees over 28 inches should be kept as reserve and legacy trees. During the harvest soil scarification is also recommend, typically enough scarification is generated from tracked harvesters or longwood operations.

After two years monitor regeneration, if not satisfied with white pine regeneration (desired target is 700 stems per acre), monitor seed crop throughout spring and summer. If a healthy, and high seed crop is present perform site preparation during late summer by scarifying the soil to create a favorable seed bed for the white pine seed trees. Expose approximately 50% of the area, while trying to avoid favorable established regeneration.

All operations should follow state BMPs.

Pruning

Pruning is essential if managing for white pine sawlogs as it doesn't naturally prune well. Pruning will increase the value of white pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter.

Stand(s):	F24	**Forest Type:**	Lowland Conifer	**Stand Label:**	C8LM5
Acres:	17.4	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	284	**BA (ft^2/ac):**	144	**Volume (Cds/ac):**	38.9

Stand Description

This stand is a lowland conifer stand that is moderately stocked with poletimber and sawtimber. Pockets of tag alder are interspersed along the fringes of the stand along with other components of ash, red maple, and white birch. This stand is a great wildlife wintering area, especially for deer. The large amount of cedar provides good cover and protection from the elements. The stand is predominately cedar, with small components of numerous other species including spruce and balsam fir. The stand has an average diameter of 9.1 inches, with approximately 50% of the basal area of poletimber sized trees. The primary products if the stand were harvested would be cedar pulp, bolts and sawtimber.

Stand Objective(s)
The landowner's objective is to maintain the stand for wildlife habitat.

Soils & Habitat Type
15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
No management is recommended during the course of this plan. The stand is more valuable for wildlife than as a timber production resource, especially for deer during the winter months.

Stand(s):	F25	**Forest Type:**	Mesic Hardwoods	**Stand Label:**	M9/M5
Acres:	6.0	**Soil Type:**	24B	**Next Harvest:**	Period #1
Trees/acre:	209	**BA (ft^2/ac):**	115	**Volume (Cds/ac):**	34.1

Stand Description
This stand is a mesic hardwood stand that is dominated by sawtimber sized hard maple, and poletimber sized hard maple. The primary species based on basal area are hard maple, basswood, and yellow birch; 96% of the stand is hardwood and 4% is pine with an average diameter of 9.2 inches. The stand is overstocked in nearly every diameter class; the desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The sawtimber volume is nearly 3,000 board feet per acre of hard maple and nearly 900 board feet per acre of basswood. The hard maple sawtimber is mainly 12-16 inches in diameter. The next harvest will primarily produce hard maple sawlogs and pulpwood, along with some hardwood pulpwood. Very little to no regeneration is present within the stand.

Stand Objective(s)
The landowner's objective is to manage for timber (increasing the percentage of sawlogs and veneer) by a selection harvest and development of wildlife habitat.

Soils & Habitat Type

24B – Emmet fine sandy loam & *Acer-Viola-Osmorhiza* (AVO)

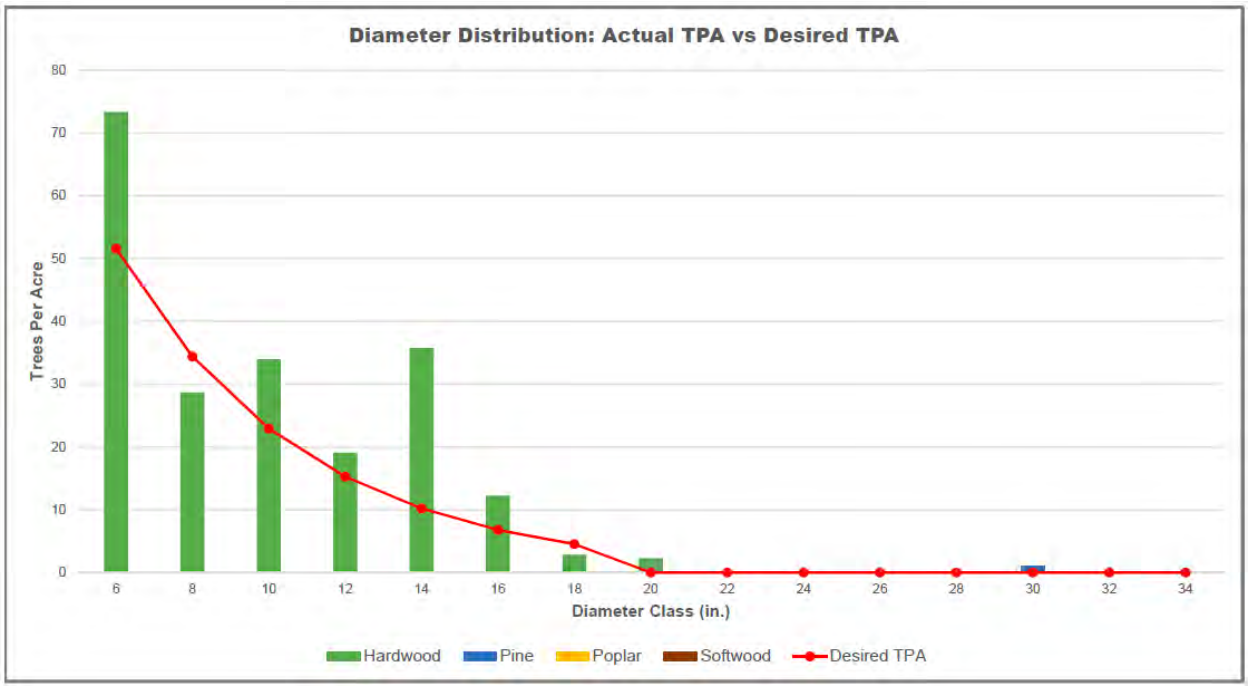
This flat sandy-loam soil slopes from 0 to 6 percent and is well drained and is well suited for logging equipment and logging haul roads. This soil is typically found on hills and ridges in the uplands. The use of logging equipment can be briefly restricted in the spring and other wet periods because unsurfaced roads become slippery and rut easily; graveled roads can facilitate year round use. The site index for sugar maple is 66 feet and has an annual growth capable of producing .519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high, this soil is also well suited for red pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using an uneven-aged crop tree method. The desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The harvest should concentrate on releasing potential crop trees by removing poor quality, defective, storm damaged, and undesirable trees in all age and size classes; trees in the 6 and 14 inch diameter classes are the most heavily overstocked. Remove cull and defective overstory trees. This stand should continue to be managed in a similar fashion using 12-15 year cutting cycles.



Any snags should be retained for wildlife, along with any softwood over 18 inches in diameter.

Stand(s):	F26	**Forest Type:**	Mesic Conifers	**Stand Label:**	F5
Acres:	5.9	**Soil Type:**	68D	**Next Harvest:**	N/A
Trees/acre:	165	**BA (ft^2/ac):**	45	**Volume (Cds/ac):**	8.2

Stand Description

This stand is a mesic conifer stand that is composed of mainly of spruce and balsam fir. Most of the trees growing are not of merchantable size yet. The stand has an average diameter of 6.9 inches, with nearly all of the stand being in the poletimber size class. The stand does have some spruce bud worm defoliation. A high number of these trees have poor form and have only 1 to 3 sticks of merchantable wood; a rapid taper.

Stand Objective(s)

The landowner's objective is for timber production.

Soils & Habitat Type

68D – Pemene Rock outcrop & *Tsuga-Maianthemum* (TM)

This gently rolling soil slopes from 6 to 18 percent and is a well-drained sandy loam with rock outcrops. It is well suited for logging equipment and logging haul roads, it is slightly limited for landings because of slope. The main management concern with this soils is rock outcrops which can be difficult when building/designing roads. The site index for sugar maple is 60 feet and has an annual growth capable of producing 0.544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the course of this plan, the stand needs more time to grow. It will likely be 30 to 50 years before it is ready for harvest again.

Stand(s):	F26	**Forest Type:**	Mesic Conifers	**Stand Label:**	F5
Acres:	9.0	**Soil Type:**	68D	**Next Harvest:**	N/A
Trees/acre:	264	**BA (ft^2/ac):**	60	**Volume (Cds/ac):**	9.5

Stand Description

This stand is a mesic conifer stand that is composed of mainly of spruce and balsam fir with components of aspen and cedar. Most of the trees growing are not of merchantable size yet. The stand has an average diameter of 6.3 inches, with nearly all of the stand being in the poletimber size class. The stand does have some spruce bud worm defoliation. A high number of these trees have poor form and have only 1 to 3 sticks of merchantable wood; a rapid taper.

Stand Objective(s)

The landowner's objective is for timber production.

Soils & Habitat Type

68D – Pemene Rock outcrop & *Tsuga-Maianthemum* (TM)

This gently rolling soil slopes from 6 to 18 percent and is a well-drained sandy loam with rock outcrops. It is well suited for logging equipment and logging haul roads, it is slightly limited for landings because of slope. The main management concern with this soils is rock outcrops which can be difficult when building/designing roads. The site index for sugar maple is 60 feet and has an annual growth capable of producing 0.544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the course of this plan, the stand needs more time to grow. It will likely be 30 to 50 years before it is ready for harvest again.

Stand(s):	F28	**Forest Type:**	Aspen	**Stand Label:**	A4
Acres:	51.7	**Soil Type:**	68D	**Next Harvest:**	N/A
Trees/acre:	341	**BA (ft^2/ac):**	58	**Volume (Cds/ac):**	7.0

Stand Description

This stand is a young aspen stand that is just starting to meet the requirements of merchantability, the stand has an average diameter of 5.5 inches. The most common species is aspen, however, some balsam poplar is also located within the stand. The stand is well stocked with sapling sized aspen regeneration.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

68D – Pemene Rock outcrop & *Tsuga-Maianthemum* (TM)

This gently rolling soil slopes from 6 to 18 percent and is a well-drained sandy loam with rock outcrops. It is well suited for logging equipment and logging haul roads, it is slightly limited for landings because of slope. The main management concern with this soils is rock outcrops which can be difficult when building/designing roads. The site index for sugar maple is 60 feet and has an annual growth capable of producing 0.544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the plan, as the aspen needs more time to grow. Eventually, the stand should be clearcut, cutting all merchantable trees. The clearcut will allow the aspen to naturally regenerate through stump sprouting. Aspen is best suited to be harvested during winter. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle.

Stand(s):	F29	**Forest Type:**	Mesic Hardwoods	**Stand Label:**	M9/M5
Acres:	10.5	**Soil Type:**	68D	**Next Harvest:**	Period #1
Trees/acre:	211	**BA (ft^2/ac):**	116	**Volume (Cds/ac):**	36.8

Stand Description

This stand is a mesic hardwood stand that is dominated by sawtimber sized hard maple, and poletimber sized hard maple. The primary species based on basal area are hard maple and basswood; the average diameter of the stand is 9.6 inches. The stand is overstocked in nearly every diameter class; the desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The sawtimber volume is nearly 3,000 board feet per acre of hard maple and basswood. The hard maple sawtimber is mainly 12-16 inches in diameter, while the basswood volume is primarily from 16 inch and up. The next harvest will primarily produce hard maple and basswood sawlogs, along with some hardwood pulpwood. Very little to no regeneration is present within the stand.

Stand Objective(s)

The landowner's objective is to manage for timber (increasing the percentage of sawlogs and veneer) by a selection harvest and development of wildlife habitat.

Soils & Habitat Type

68D – Pemene Rock outcrop & *Tsuga-Maianthemum* (TM)

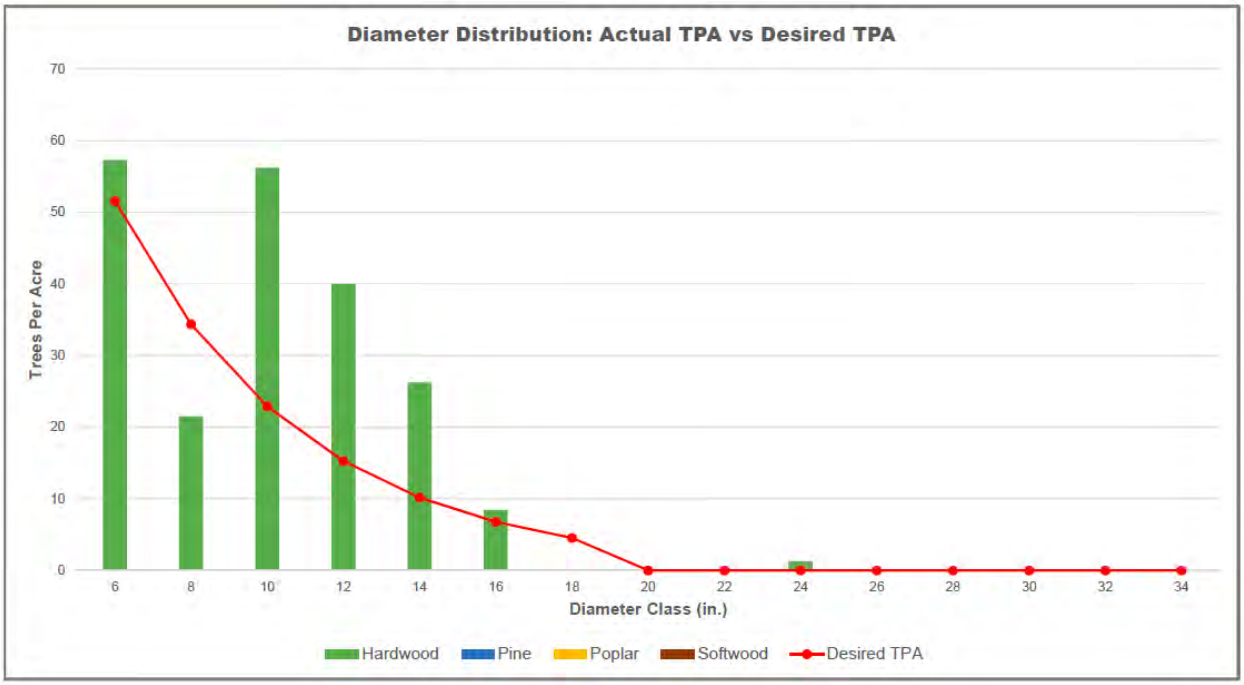
This gently rolling soil slopes from 6 to 18 percent and is a well-drained sandy loam with rock outcrops. It is well suited for logging equipment and logging haul roads, it is slightly limited for landings because of slope. The main management concern with this soils is rock outcrops which can be difficult when building/designing roads. The site index for sugar maple is 60 feet and has an annual growth capable of producing 0.544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using an uneven-aged crop tree method. The desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The harvest should concentrate on releasing potential crop trees by removing poor quality, defective, storm damaged, and undesirable trees in all age and size classes; trees in the 10 to 14 inch diameter classes are the most heavily overstocked. Remove cull and defective overstory trees. This stand should continue to be managed in a similar fashion using 12-15 year cutting cycles.



Any snags should be retained for wildlife, along with any softwood over 18 inches in diameter.

Stand(s):	F30	**Forest Type:**	Lowland Conifer	**Stand Label:**	Q8Q6
Acres:	15.2	**Soil Type:**	10	**Next Harvest:**	N/A
Trees/acre:	322	**BA (ft^2/ac):**	114	**Volume (Cds/ac):**	29.3

Stand Description

This stand is a lowland conifer stand that is dominated by poletimber sized tamarack, cedar, and white birch. The stands average diameter is 7.7 inches, the stand consists of approximately 74% of poletimber based on basal area. The stand was very wet during the assessment. The stand is going to primarily produce softwood pulpwood. Thick pockets of tag alder are present throughout the stand.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

10 – Waucedah-Cathro complex & *Fraxinus-Mentha-Carex* (FMC)

This mucky soil is nearly level and is poorly drained and is poorly suited for logging equipment because of wetness and strength. The soil is poorly suited for logging haul roads because of strength and wetness. The use of logging equipment is restricted to use during winter months when frozen conditions exist because of the wetness and strength. The site index for aspen is 40 feet and has an annual growth capable of producing .367 cords per acre per year of wood fiber. The site index for balsam fir is 40 feet and has an

annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Fraxinus-Mentha-Carex* (FMC). This habitat type has a climax overstory dominated by black ash and American elm. Other common species include red maple and balsam fir. The dominant ground flora includes wild mint, sedge, jewelweed, and tag alder. Potential productivity for timberlands is rather poor.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the plan, as the stand needs more time to grow. Eventually, the stand should be seed tree harvested in concurrence with stand F028. This stand should be harvested using a seed tree system, harvesting all trees within the stand to naturally regenerate a stand of tamarack, spruce, and balsam fir.

The seed tree harvest should harvest all trees not desired as seed trees. All regeneration harvests should be from below and all vegetation should be cut. The most vigorous trees between the diameters of 8 to 12 inches should be kept as seed trees, approximately 4 to 10 trees per acre should be retained. This should allow natural regeneration to take place.

Stand(s):	F32	**Forest Type:**	Water	**Stand Label:**	Z
Acres:	7.4	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

This stand is the West Branch Sturgeon River. Any management in the surrounding stands and road building near it should be done in accordance with the state BMP manual.

Stand(s):	F33	**Forest Type:**	Right-of-Way	**Stand Label:**	X
Acres:	4.0	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description

This stand is the current right-of-way for Spring Hill Road.

Stand(s):	F34	**Forest Type:**	Lowland Mixed	**Stand Label:**	LM4
Acres:	7.5	**Soil Type:**	69D	**Next Harvest:**	N/A
Trees/acre:	85	**BA (ft^2/ac):**	25	**Volume (Cds/ac):**	6.8

Stand Description

This stand is a lowland mixed stand that is composed of poletimber sized hard maple, white pine, balsam fir, and hemlock. The stands average diameter is 6.8 inches, the stand consist of approximately 60% of poletimber based on basal area. The stand was very wet during the assessment. The stand is going to primarily produce softwood and hardwood pulpwood. The maple was very poor quality.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

69D – Emmet Rock outcrop & *Acer-Viola-Osmorhiza* (AVO)

This gently rolling soil slopes from 6 to 18 percent and is a well-drained sandy loam with rock outcrops. It is well suited for logging equipment and logging haul roads, it is slightly limited for landings because of slope. The main management concern with this soils is rock outcrops which can be difficult when building/designing roads. The site index for sugar maple is 66 feet and has an annual growth capable of producing 0.519 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Viola-Osmorhiza* (AVO). This habitat type has a climax overstory dominated by sugar maple. Other common species include American basswood, white ash, yellow birch, ironwood, eastern hemlock, and American elm. The dominant ground flora includes downy yellow violet, sweet cicely, spinulose shield fern, lady fern, hairy solomon's seal and rosy twistedstalk. Potential productivity for northern hardwoods and aspen is considered to be high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the plan, as the stand needs more time to grow.

Stand(s):	S01	**Forest Type:**	Grass/Opening	**Stand Label:**	G
Acres:	57.7	**Soil Type:**	64F	**Next Harvest:**	Period #1
Trees/acre:	94	**BA (ft^2/ac):**	28	**Volume (Cds/ac):**	4.6

Stand Description

This is an open grown area that has pockets of trees growing throughout the various openings. Trees throughout the open grown areas vary from aspen, spruce, jack pine, balsam fir, and red maple. Most of these trees are all poletimber sized. A high percentage of the spruce and balsam fir had spruce budworm defoliation.

Stand Objective(s)

The landowner's objective is to manage for timber production and wildlife habitat.

Soils & Habitat Type

64F – Rubicon sand & *Acer-Quercus-Vaccinium* (AQVac)

This hilly sandy soil slopes from 18 to 35 percent and is excessively drained. The soil is moderately suited for logging equipment and logging haul roads, the main concern comes from the soil being too sandy and slope. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. Erosion on logging roads can become a management concern. The site index for aspen is 60 feet and has an annual growth capable of producing .722 cords per acre per year of wood fiber, red maple has a site index of 57 and has an annual growth capable of producing .367 cords per acre per year of wood fiber, and red pine has a site index of 53 and has an annual growth capable of producing 1.09 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

The first recommendation would be to leave all of open grown areas under 5 acres as they are, these openings are valuable to wildlife. Within the openings under 5 acres, approximately 6 to 12 shrub or wildlife trees should be planted.

In the two large openings, the existing trees should be harvested to salvage before spruce budworm damage worsens and begins causing mortality. This should be done in combination with stand S06 and S08; a whole tree chipping operation would be preferred within this area as a lot of these trees are small in diameter and height. They should be planted to jack pine or red pine; if looking more at timber production red pine should be chosen as the higher value species, however, that is looking at a rotation of 80 to 120 years with multiple thinning operations, on the other side jack pine would create a more diverse tract since it already has approximately 70 acres of red pine plantations. On the timber production side of it, jack pine

doesn't need to be thinned or pruned and normally is clearcut around 50 years after planting for pulpwood production.

Planting – Red Pine

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be placed in a north/south direction to facilitate forwarding in the future to the trail that runs along the south edge of the stand. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Planting – Jack Pine

Trees should be planted using a 6 feet by 8 feet spacing scheme at a density of 908 trees per acre. The 6 feet refers to the spacing between the trees while the 8 feet is the distance between the rows. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 8 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Stand(s):	S02	**Forest Type:**	Aspen	**Stand Label:**	A4A3
Acres:	55.4	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	232	**BA (ft^2/ac):**	38	**Volume (Cds/ac):**	3.4

Stand Description

This stand is a young aspen stand that is just starting to meet the requirements of merchantability, the stand has an average diameter of 5.4 inches. The most common species is aspen, however, some balsam fir, cedar, spruce, and tamarack is also located within the stand. The stand is well stocked with sapling sized aspen regeneration.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

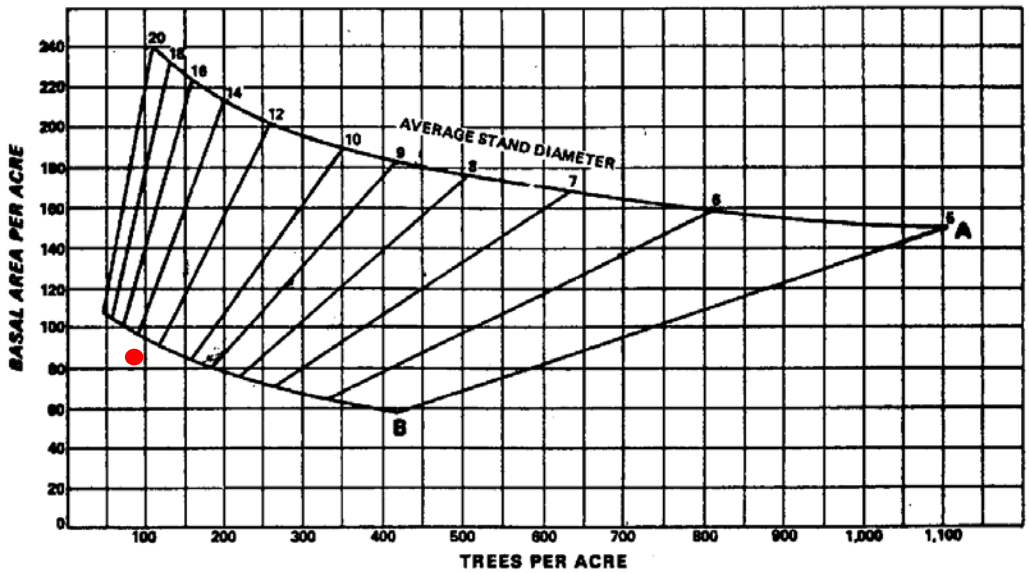
No management is recommended during the plan, as the aspen needs more time to grow. Eventually, the stand should be clearcut, cutting all merchantable trees. The clearcut will allow the aspen to naturally regenerate through stump sprouting. Aspen is best suited to be harvested during winter. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle.

Stand(s):	S03	**Forest Type:**	Plantation Conifer	**Stand Label:**	R9
Acres:	41.3	**Soil Type:**	13D	**Next Harvest:**	Period #3
Trees/acre:	158	**BA (ft^2/ac):**	104	**Volume (Cds/ac):**	32.3

Stand Description

This is a conifer plantation primarily made up of red pine with a component of small poletimber sized balsam fir and aspen. The average stand diameter is 10.0 inches. The stands basal area is made up of approximately 80% of sawtimber sized red pine. The stand has an estimated total volume of 32.3 cords per acre. Red pine averaged approximately 7,000 feet of sawtimber per board foot per acre. The stand will produce some quality utility poles, red pine bolts and pulpwood. Most of the volume would actually likely be sold as bolts.

RED PINE STOCKING GUIDE



From: Managers Handbook for Red Pine in the North Central States.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

13D – Pemene fine sandy loam & *Tsuga-Maianthemum* (TM)

This hilly sandy-loam soil slopes from 6 to 18 percent and is well drained and is well suited for logging equipment and logging haul roads. This soil is typically found on hills and ridges in the uplands. One concern for management is erosion potential. The site index for sugar maple is 60 feet and has an annual growth capable of producing .544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be thinned towards the end of period 3 when the basal area reaches 140 to 180 square feet of red pine. The stand should be thinned down to 100 square feet of basal area, targeting poor quality and poor formed trees for removal along with improving spacing of dominate crop trees; typically the thinning should be from below. All non-pine species should be harvested from stand. Trees should be harvested before they reach 24 inches in diameter, as they become oversized for nearly all timber markets.

Future Harvest

Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the stand should be clearcut once the average stand diameter of red pine is 15 inches in diameter and replanted.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	S04	**Forest Type:**	Aspen	**Stand Label:**	Q4P3
Acres:	34.5	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	228	**BA (ft^2/ac):**	34	**Volume (Cds/ac):**	7.6

Stand Description

This stand is a young balsam poplar/aspen stand that is just starting to meet the requirements of merchantability, the stand has an average diameter of 5.2 inches. The most common merchantable species is tamarack, aspen, and balsam poplar, however, some balsam fir and spruce is also located within the stand. The stand is well stocked with sapling sized aspen and balsam poplar regeneration.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the plan, as the aspen needs more time to grow. Eventually, the stand should be clearcut, cutting all merchantable trees. The clearcut will allow the aspen and balsam poplar to naturally regenerate through stump sprouting. Aspen and balsam poplar is best suited to be harvested during winter. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle.

Stand(s):	S05	**Forest Type:**	Aspen	**Stand Label:**	A2Q1
Acres:	33.3	**Soil Type:**	55	**Next Harvest:**	N/A
Trees/acre:	0	**BA (ft^2/ac):**	0	**Volume (Cds/ac):**	0

Stand Description

This stand is a young aspen stand that has no merchantable species yet. The stand was likely a mix of aspen and lowland conifers prior to being clearcut. Large patches within the stand have no advanced regeneration. Aspen regeneration is well stocked to poorly stocked within the stand, however, the lowland conifer regeneration if poor throughout the stand.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

55 – Kinross mucky fine sand & *Picea-Chamadaphne-Sphagnum* (PCS)

This flat soil is a mucky sand that is poorly drained and commonly ponds. Typically this soil is found in flats and drainageways. It is poorly suited for logging equipment and logging haul roads because of wetness and ponding. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for aspen is 45 feet and has an annual growth capable

of producing .367 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Picea-Chamadaphne-Sphagnum* (PCS). This habitat type has a climax overstory dominated by black spruce. Other common species include tamarack and cedar. The dominant ground flora includes leatherleaf, bog rosemary, pale laurel, Labrador tea, Canada blueberry, and sphagnum. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the plan, as the stand needs more time to grow. Eventually, the stand should be clearcut, cutting all merchantable trees. The clearcut will allow the aspen and lowland conifers to naturally regenerate through stump sprouting (aspen) or seed (lowland conifer). Aspen is best suited to be harvested during winter. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle, each cycle will lead to a more pure stand of aspen.

Stand(s):	S06	**Forest Type:**	Mesic Hardwoods	**Stand Label:**	M8/M5
Acres:	23.5	**Soil Type:**	13D	**Next Harvest:**	Period #1
Trees/acre:	259	**BA (ft^2/ac):**	105	**Volume (Cds/ac):**	28.2

Stand Description

This stand is a mesic hardwood stand that is dominated by sawtimber sized hard maple, and poletimber sized hard maple. The primary species based on basal area are hard maple, red maple, and white birch; the average diameter of the stand is 8.2 inches. The stand is overstocked in nearly every diameter class except the two larger sawtimber size classes (16 & 18); the desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The sawtimber volume is nearly 1,000 board feet per acre of hard maple. The hard maple sawtimber is mainly 12-14 inches in diameter. The next harvest will primarily produce hardwood pulpwood. Very little to no regeneration is present within the stand.

Stand Objective(s)

The landowner's objective is to manage for timber (increasing the percentage of sawlogs and veneer) by a selection harvest and development of wildlife habitat.

Soils & Habitat Type

13D – Pemene fine sandy loam & *Tsuga-Maianthemum* (TM)

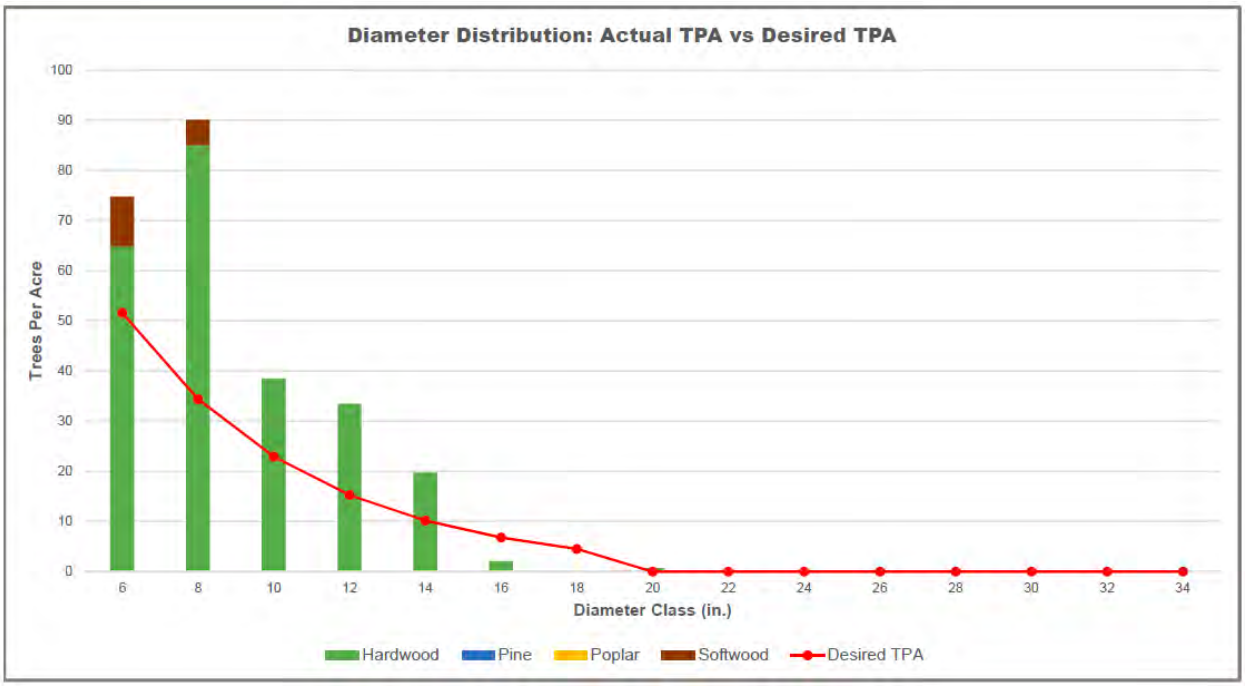
This hilly sandy-loam soil slopes from 6 to 18 percent and is well drained and is well suited for logging equipment and logging haul roads. This soil is typically found on hills and ridges in the uplands. One concern for management is erosion potential. The site index for sugar maple is 60 feet and has an annual growth capable of producing .544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using an uneven-aged crop tree method. The desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The harvest should concentrate on releasing potential crop trees by removing poor quality, defective, storm damaged, and undesirable trees in all age and size classes; trees in the 6 to 8 inch diameter classes are the most heavily overstocked. Remove cull and defective overstory trees. This stand should continue to be managed in a similar fashion using 12-15 year cutting cycles.



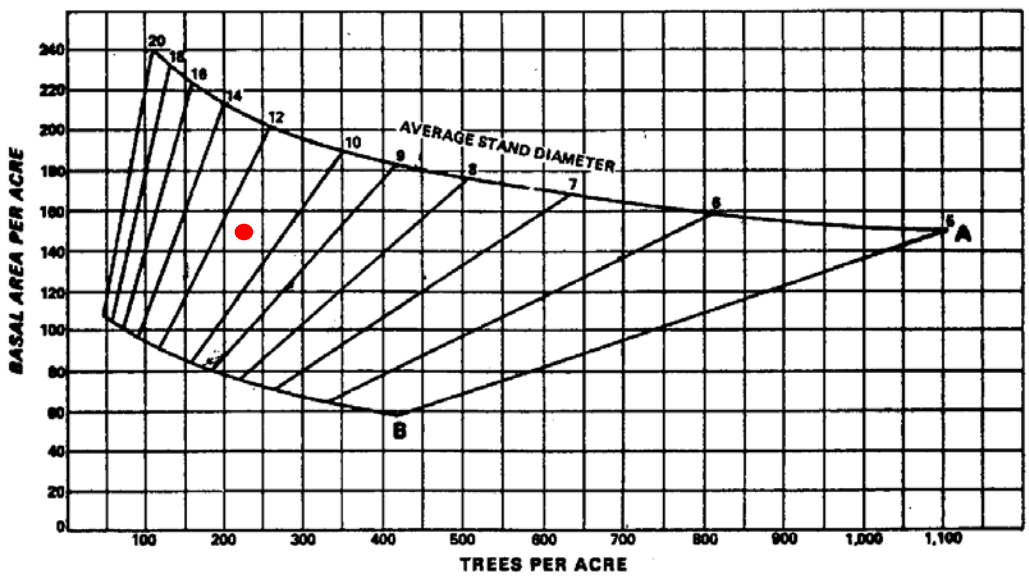
Any snags should be retained for wildlife, along with any softwood over 18 inches in diameter.

Stand(s):	S07	**Forest Type:**	Plantation Conifer	**Stand Label:**	R9R5
Acres:	13.3	**Soil Type:**	60D	**Next Harvest:**	Period #2
Trees/acre:	246	**BA (ft^2/ac):**	160	**Volume (Cds/ac):**	50.0

Stand Description

This is a conifer plantation primarily made up of red pine with a component of small poletimber sized spruce and white birch. The average stand diameter is 10.5 inches, the average red pine average is 10.9. The stands basal area is made up of approximately 70% of sawtimber sized red pine. The stand has an estimated total volume of 49.4cords per acre of red pine. Red pine averaged approximately 6,000 feet of sawtimber per board foot per acre. The stand will produce some quality utility poles, red pine bolts and pulpwood. Most of the volume would actually likely be sold as bolts.

RED PINE STOCKING GUIDE



From: Managers Handbook for Red Pine in the North Central States.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

60D – Zimmerman fine sand & *Tsuga-Maianthemum-Vaccinium* (TMV)

This hilly sand soil slopes from 6 to 18 percent and is excessively drained and is well suited for logging equipment and logging haul roads. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand and slope. The site index for aspen is 70 feet and has an annual growth capable of producing 1.127 cords per acre per year of wood fiber and red pine has a site index of 64 and produces 1.44 cords per acre per year of wood fiber.. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum-Vaccinium* (TMV). This habitat type has a climax overstory dominated by eastern hemlock. Other common species include sugar maple, eastern white pine, balsam fir, white spruce, and northern red oak. The dominant ground flora includes Canada blueberry, wild sarsaparilla, bracken fern, wild lily-of-the-valley, low sweet blueberry, yellow beadlily and betony. Potential productivity for aspen and northern hardwoods is considered to be moderately high, this soil is also well suited for red pine and jack pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be thinned towards the start of period 2 when the basal area reaches 140 to 180 square feet of red pine. The stand should be thinned down to 110 square feet of basal area, targeting poor quality and poor formed trees for removal along with improving spacing of dominate crop trees; typically the thinning should be from below. All non-pine species should be harvested from stand. Trees should be harvested before they reach 24 inches in diameter, as they become oversized for nearly all timber markets.

Future Harvest

Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the stand should be clearcut once the average stand diameter of red pine is 15 inches in diameter and replanted.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	S08	**Forest Type:**	Mesic Hardwoods	**Stand Label:**	M9/M5
Acres:	12.0	**Soil Type:**	13D	**Next Harvest:**	Period #1
Trees/acre:	293	**BA (ft^2/ac):**	132	**Volume (Cds/ac):**	36.3

Stand Description

This stand is a mesic hardwood stand that is dominated by sawtimber sized basswood, and poletimber sized hard maple and red maple. The primary species based on basal area are hard maple, basswood, and red maple; the average diameter of the stand is 8.6 inches. The stand has a large component of small balsam fir, which accounts for 11% of the basal area. The stand is overstocked primarily in the poletimber and small sawtimber size classes); the desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The sawtimber volume is nearly all basswood with over 1,500 board feet per acre. The next harvest will primarily produce hardwood pulpwood and some hardwood sawlogs. Overall quality of the sawtimber is average to poor.

Stand Objective(s)

The landowner's objective is to manage for timber (increasing the percentage of sawlogs and veneer) by a selection harvest and development of wildlife habitat.

Soils & Habitat Type

13D – Pemene fine sandy loam & *Tsuga-Maianthemum* (TM)

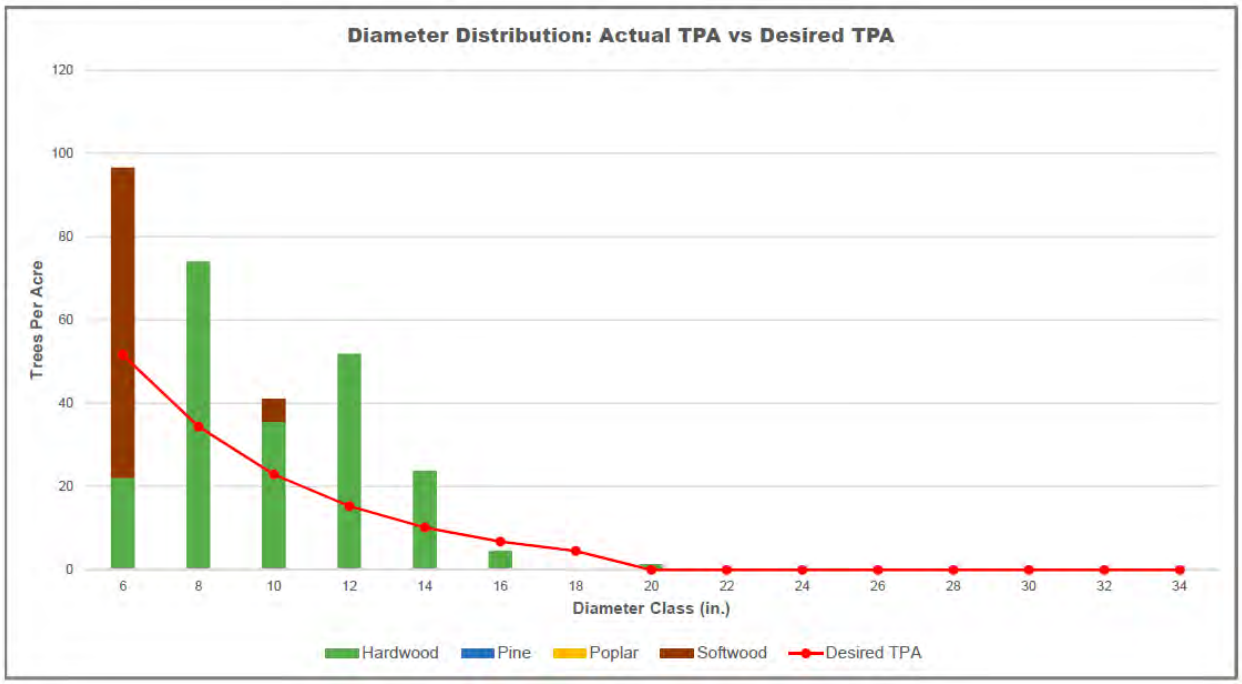
This hilly sandy-loam soil slopes from 6 to 18 percent and is well drained and is well suited for logging equipment and logging haul roads. This soil is typically found on hills and ridges in the uplands. One concern for management is erosion potential. The site index for sugar maple is 60 feet and has an annual growth capable of producing .544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using an uneven-aged crop tree method. The desired conditions are based on a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet. The harvest should concentrate on releasing potential crop trees by removing poor quality, defective, storm damaged, and undesirable trees in all age and size classes; trees in the 6 to 8 inch diameter classes are the most heavily overstocked, while only the poorest quality trees over 16 inches should be removed. This stand should continue to be managed in a similar fashion using 12-15 year cutting cycles.



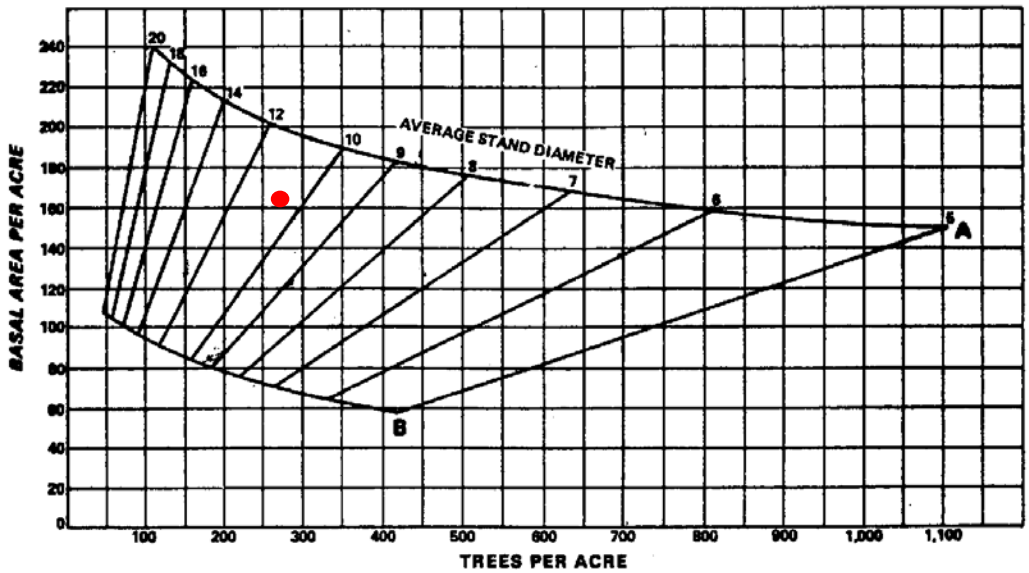
Any snags should be retained for wildlife, along with any softwood over 18 inches in diameter.

Stand(s):	S09	**Forest Type:**	Plantation Conifer	**Stand Label:**	R9R5
Acres:	9.1	**Soil Type:**	60D	**Next Harvest:**	Period #2
Trees/acre:	319	**BA (ft^2/ac):**	171	**Volume (Cds/ac):**	52.7

Stand Description

This is a conifer plantation primarily made up of red pine with a component of small poletimber sized balsam fir and red maple. The average stand diameter is 9.5 inches, the average red pine average is 10.2. The stands basal area is made up of approximately 66% of sawtimber sized red pine. The stand has an estimated total volume of 51.7 cords per acre of red pine. Red pine averaged approximately 5,000 feet of sawtimber per board foot per acre. The stand will produce some quality utility poles, red pine bolts and pulpwood. Most of the volume would actually likely be sold as bolts.

RED PINE STOCKING GUIDE



From: Managers Handbook for Red Pine in the North Central States.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

60D – Zimmerman fine sand & *Tsuga-Maianthemum-Vaccinium* (TMV)

This hilly sand soil slopes from 6 to 18 percent and is excessively drained and is well suited for logging equipment and logging haul roads. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand and slope. The site index for aspen is 70 feet and has an annual growth capable of producing 1.127 cords per acre per year of wood fiber and red pine has a site index of 64 and produces 1.44 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum-Vaccinium* (TMV). This habitat type has a climax overstory dominated by eastern hemlock. Other common species include sugar maple, eastern white pine, balsam fir, white spruce, and northern red oak. The dominant ground flora includes Canada blueberry, wild sarsaparilla, bracken fern, wild lily-of-the-valley, low sweet blueberry, yellow beadlily and betony. Potential productivity for aspen and northern hardwoods is considered to be moderately high, this soil is also well suited for red pine and jack pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be thinned towards the start of period 2 when the basal area reaches approximately 160 to 200 square feet of red pine. The stand should be thinned down to 120 square feet of basal area, targeting poor quality and poor formed trees for removal along with improving spacing of dominate crop trees; typically the thinning should be from below. All non-pine species should be harvested from stand. Trees

should be harvested before they reach 24 inches in diameter, as they become oversized for nearly all timber markets.

Future Harvest

Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 160; the stand should be clearcut once the average stand diameter of red pine is 15 inches in diameter and replanted.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	S10	**Forest Type:**	Dry Mesic Conifers	**Stand Label:**	UM6
Acres:	8.5	**Soil Type:**	64F	**Next Harvest:**	N/A
Trees/acre:	375	**BA (ft^2/ac):**	79	**Volume (Cds/ac):**	14.0

Stand Description

This stand is a small poor quality mixed upland stand. The stand is primarily composed of red maple, balsam fir, and aspen based on basal area. The stand has a good stocking of aspen regeneration also coming up. The stand will produce primarily aspen and hardwood pulpwood in the future.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

64F – Rubicon sand & *Acer-Quercus-Vaccinium* (AQVac)

This hilly sandy soil slopes from 18 to 35 percent and is excessively drained. The soil is moderately suited for logging equipment and logging haul roads, the main concern comes from the soil being too sandy and slope. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. Erosion on logging roads can become a management concern. The site index for aspen is 60 feet and has an annual growth capable of producing .722 cords per acre per year of wood fiber, red maple has a site index of 57 and has an annual growth capable of producing .367 cords per acre per year of wood fiber, and red pine has a site index of 53 and has an annual growth capable of producing 1.09 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the plan, as the stand needs more time to grow. Eventually, the stand should be clearcut, cutting all merchantable trees. The clearcut will allow the aspen to naturally regenerate through stump sprouting. Aspen is best suited to be harvested during winter. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle, each cycle will lead to a more pure stand of aspen.

A secondary option would be to clearcut the stand when stands S07 and S09 are clearcut, and convert the stand to a red pine plantation. If this stand is clearcut and converted, the stand will need to be chemically sprayed to help minimize competition during the trenching and then followed up likely 1 or 2 years after planting.

Red pine should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This

spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Stand(s):	S11	**Forest Type:**	Mesic Hardwoods	**Stand Label:**	M6
Acres:	5.4	**Soil Type:**	13D	**Next Harvest:**	2024-28
Trees/acre:	432	**BA (ft^2/ac):**	128	**Volume (Cds/ac):**	29.6

Stand Description

This stand is a mesic hardwood stand that is dominated by poletimber sized red maple. The primary species based on basal area are red maple, balsam fir, and hard maple; the average diameter of the stand is 7.1 inches. The stand has a large component of small balsam fir, softwood accounts for nearly 25% of the basal area. The next harvest will primarily produce hardwood pulpwood and some hardwood sawlogs. Overall quality of the sawtimber is average to poor.

Stand Objective(s)

The landowner's objective is to manage for timber (increasing the percentage of sawlogs and veneer) by a selection harvest and development of wildlife habitat.

Soils & Habitat Type

13D – Pemene fine sandy loam & *Tsuga-Maianthemum* (TM)

This hilly sandy-loam soil slopes from 6 to 18 percent and is well drained and is well suited for logging equipment and logging haul roads. This soil is typically found on hills and ridges in the uplands. One concern for management is erosion potential. The site index for sugar maple is 60 feet and has an annual growth capable of producing .544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

This stand should be harvested using an uneven-aged crop tree method. Reduce stand to 85 square feet of basal area in poletimber and sawtimber together. Remove cull and defective overstory trees. Cut only poor growing stock in overstory. After defective overstory trees have been removed, reduce stand to desired stocking by cutting in poletimber portion of stand. If no sawtimber is present, reduce poles to 75 to 85 (sq. ft.) BA. This stand should continue to be managed in a similar fashion using 12-15 year cutting cycles. After two or three harvests, the desired conditions will adjust to a Q-Factor of 1.5 with a maximum diameter of 18 inches and a target residual basal area of 75 square feet.

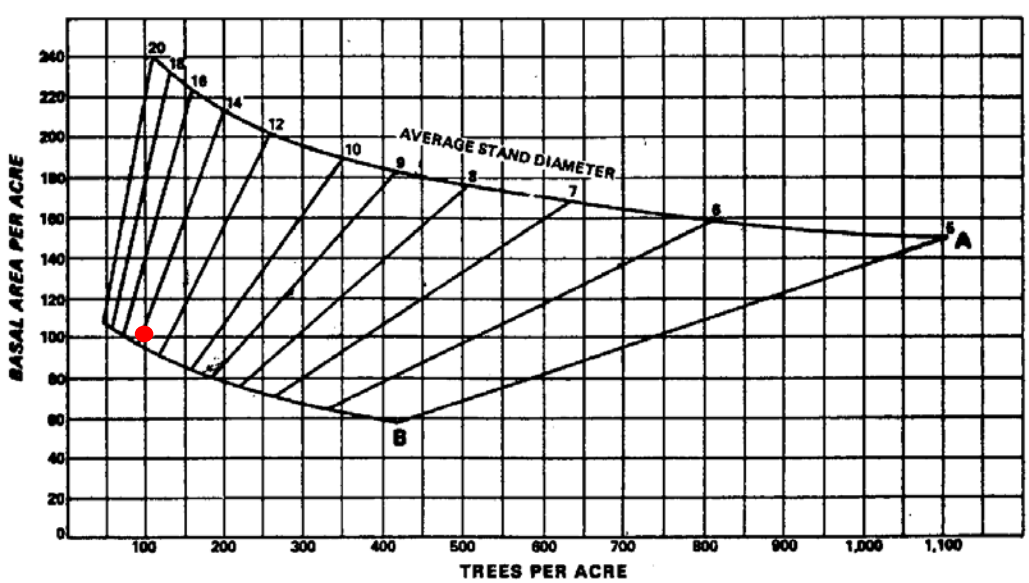
Any snags should be retained for wildlife, along with any softwood over 18 inches in diameter.

Stand(s):	S12	**Forest Type:**	Plantation Conifer	**Stand Label:**	R9
Acres:	8.2	**Soil Type:**	13B	**Next Harvest:**	Period #2
Trees/acre:	154	**BA (ft^2/ac):**	120	**Volume (Cds/ac):**	39.9

Stand Description

This is a conifer plantation primarily made up of red pine with a component of small poletimber sized red maple. The average stand diameter is 11.4 inches, the average red pine average is 13.6. The stands basal area is made up of approximately 65% of sawtimber sized red pine, while the red maple is primary component in the poletimber size class. The stand has an estimated total volume of 36.6 cords per acre of red pine. Red pine averaged approximately 8,000 feet of sawtimber per board foot per acre. The stand will produce some quality utility poles, red pine bolts and pulpwood. Most of the volume would actually likely be sold as bolts.

RED PINE STOCKING GUIDE



From: Managers Handbook for Red Pine in the North Central States.

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Stand Objective(s)
The landowner's objective is to manage for timber production.

Soils & Habitat Type

13B – Pemene fine sandy loam & *Tsuga-Maianthemum* (TM)

This flat sandy-loam soil slopes from 0 to 6 percent and is well drained and is well suited for logging equipment and logging haul roads. This soil is typically found on hills and ridges in the uplands. The site index for sugar maple is 60 feet and has an annual growth capable of producing .544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
This stand should be thinned towards the start of period 2 when the basal area reaches approximately 140 to 180 square feet of red pine. The stand should be thinned down to 100 square feet of basal area, targeting poor quality and poor formed trees for removal along with improving spacing of dominate crop trees; typically the thinning should be from below. All non-pine species should be harvested from stand. Trees should be harvested before they reach 24 inches in diameter, as they become oversized for nearly all timber markets.

Future Harvest

Each subsequent harvest should occur approximately 10 years later, retaining an additional 10 square feet of basal area until a max of 150; the stand should be clearcut once the average stand diameter of red pine is 15 inches in diameter and replanted.

Planting

Trees should be planted using a 6 feet by 10 feet spacing scheme at a density of 726 trees per acre. The 6 feet refers to the spacing between the trees while the 10 feet is the distance between the rows. This spacing helps keep a stand dense enough for production based red pine, along with creating large enough rows to help modern day logging equipment navigate. Planting this many trees also gives managers more flexibility over choosing future crop trees during thinning operations. The initial action of planting is preparing the site, which is intended to help improve the growing conditions for regeneration of planted seedlings. A trencher should be used to create rows with 10 feet of spacing between them, rows should be in a direction to facilitate forwarding normally in a perpendicular direction compared to an adjacent road. Site prep is generally recommended to occur during the fall prior to planting. Once the site has been trenched, trees should be planted in the spring (bare root or containerized). Bare root stock is less expensive, however, containerized seedlings are known to have better survival and initial growth rates. Trees should be planted at a distance of 6 feet apart.

Pruning

Pruning will increase the value of red pine sawtimber by promoting knot free wood in the lower portion of the tree, which is where the highest amount of value is. However, pruning is expensive (the cost to hire contractors) and can take up to 60 years to recoup the cost. If it can be done by volunteers or students that is recommended, however, proper techniques must be used in order to not lose value or injure trees. The simplest way to prune trees is to plant at very high densities so trees can self-prune (approximately 800 trees per acre). This prescription calls for a high enough density in which this should occur. Manual pruning should be done in the late fall or early spring, otherwise bark can strip away from the bole, causing damage. Never remove more than 1/3 of the live crown ratio and keep live branches in the upper half of the tree. Dead branches should be removed. Every tree doesn't need to be pruned, but the focus should be on crop trees that have the best potential for increased value in the future. Pruning can begin once trees reach a minimum of 4 to 6 inches in diameter. Pruning activities should be planned in accordance with thinning operations, preferably after the first row thinning to accommodate stimulated growth.

Stand(s):	S13	**Forest Type:**	Aspen	**Stand Label:**	A3UM2
Acres:	4.8	**Soil Type:**	60D	**Next Harvest:**	N/A
Trees/acre:	0	**BA (ft^2/ac):**	0	**Volume (Cds/ac):**	0

Stand Description

This stand is a young aspen stand that has no merchantable species yet. The stand has a diverse mixture of aspen, red maple, balsam fir, and red pine coming up. Aspen regeneration is well stocked within the stand, the aspen will likely be the dominate species in the future once the trees become merchantable.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

60D – Zimmerman fine sand & *Tsuga-Maianthemum-Vaccinium* (TMV)

This hilly sand soil slopes from 6 to 18 percent and is excessively drained and is well suited for logging equipment and logging haul roads. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand and slope. The site index for aspen is 70 feet and has an annual growth capable of producing 1.127 cords per acre per year of wood fiber and red pine has a site index of 64 and produces 1.44 cords per acre per year of wood fiber.. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum-Vaccinium* (TMV). This habitat type has a climax overstory dominated by eastern hemlock. Other common species include sugar maple, eastern white pine, balsam fir, white spruce, and northern red oak. The dominant ground flora includes Canada blueberry, wild sarsaparilla, bracken fern, wild lily-of-the-valley, low sweet blueberry, yellow beadlily and betony. Potential productivity for aspen and northern hardwoods is considered to be moderately high, this soil is also well suited for red pine and jack pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
No management is recommended during the plan, as the stand needs more time to grow. Eventually, the stand should be clearcut, cutting all merchantable trees. The clearcut will allow the aspen to naturally regenerate through stump sprouting. Aspen is best suited to be harvested during winter. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle, each cycle will lead to a more pure stand of aspen.

Stand(s):	S14	**Forest Type:**	Lowland Conifer	**Stand Label:**	Q6
Acres:	5.3	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	528	**BA (ft^2/ac):**	135	**Volume (Cds/ac):**	35.8

Stand Description
This stand is a lowland conifer stand that is dominated by poletimber sized spruce. The three most common species based on basal area are spruce, cedar, and balsam fir. The stands average diameter is 6.7 inches, the stand consists of approximately 95% of poletimber based on basal area. The stand was very wet during the assessment. The stand is going to primarily produce softwood pulpwood and boltwood. Thick pockets of tag alder are present throughout the stand. A moderate stocking of tamarack and spruce regeneration was present but scattered.

Stand Objective(s)
The landowner's objective is to manage for timber production and wildlife habitat.

Soils & Habitat Type
15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
No management is recommended during the plan, as the stand needs more time to grow and currently it provides a good wintering location for wildlife especially deer. This stand provides the tract a nice variety of stand types. Eventually, the stand should be seed tree harvested. This stand should be harvested using

a seed tree system, harvesting all trees within the stand to naturally regenerate a stand of tamarack, spruce, and balsam fir.

The seed tree harvest should harvest all trees not desired as seed trees. All regeneration harvests should be from below and all vegetation should be cut. The most vigorous trees between the diameters of 8 to 12 inches should be kept as seed trees, approximately 4 to 10 trees per acre should be retained. This should allow natural regeneration to take place.

Stand(s):	S15	**Forest Type:**	Lowland Conifer	**Stand Label:**	Q6
Acres:	4.8	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	256	**BA (ft^2/ac):**	80	**Volume (Cds/ac):**	19.4

Stand Description

This stand is a lowland conifer stand that is dominated by poletimber sized spruce. The three most common species based on basal area are spruce, cedar, and tamarack. The stands average diameter is 7.3 inches, the stand consists of approximately 70% of poletimber based on basal area, nearly all of the larger sized trees were cedar. The stand was very wet during the assessment. The stand is going to primarily produce softwood pulpwood and boltwood. Thick pockets of tag alder are present throughout the stand.

Stand Objective(s)

The landowner's objective is to manage for timber production and wildlife habitat.

Soils & Habitat Type

15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the plan, as the stand needs more time to grow and currently it provides a good wintering location for wildlife especially deer. This stand provides the tract a nice variety of stand types. Eventually, the stand should be seed tree harvested. This stand should be harvested using

a seed tree system, harvesting all trees within the stand to naturally regenerate a stand of tamarack, spruce, and cedar.

The seed tree harvest should harvest all trees not desired as seed trees. All regeneration harvests should be from below and all vegetation should be cut. The most vigorous trees between the diameters of 8 to 12 inches should be kept as seed trees, approximately 4 to 10 trees per acre should be retained. This should allow natural regeneration to take place.

Stand(s):	S16	**Forest Type:**	Aspen	**Stand Label:**	A3
Acres:	3.1	**Soil Type:**	64B	**Next Harvest:**	N/A
Trees/acre:	182	**BA (ft^2/ac):**	30	**Volume (Cds/ac):**	1.2

Stand Description
This stand is a young aspen stand that is just starting to meet the requirements of merchantability, the stand has an average diameter of 5.4 inches. The most common merchantable species is aspen with some red maple also located within the stand. The stand is well stocked with sapling sized aspen.

Stand Objective(s)
The landowner's objective is to manage for timber production.

Soils & Habitat Type
64B – Rubicon sand & *Acer-Quercus-Vaccinium* (AQVac)

This flat sandy soil slopes from 0 to 6 percent and is excessively drained. The soil is moderately suited for logging equipment and logging haul roads, the main concern comes from the soil being too sandy. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand. The site index for aspen is 60 feet and has an annual growth capable of producing .722 cords per acre per year of wood fiber, red maple has a site index of 57 and has an annual growth capable of producing .367 cords per acre per year of wood fiber, and red pine has a site index of 53 and has an annual growth capable of producing 1.09 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as an *Acer-Quercs-Vaccinium* (AQVac). This habitat type has a climax overstory dominated by red maple and red oak. Other common species include eastern hemlock and white pine with minor components of balsam fir and white spruce. The dominant ground flora includes low sweet blueberry, bracken fern, Canada blueberry, wintergreen, large leaved aster, beaked hazelnut, and grasses. Potential productivity for northern hardwoods is moderately low, aspen is moderate, and red and jack pine plantations are moderately high.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription
No management is recommended during the plan, as the aspen needs more time to grow. Eventually, the stand should be clearcut, cutting all merchantable trees. The clearcut will allow the aspen to naturally

regenerate through stump sprouting. Aspen is best suited to be harvested during winter. Once clearcut the stand should be harvested on a 40 to 60 year cutting cycle.

Stand(s):	S17	**Forest Type:**	Marsh	**Stand Label:**	N
Acres:	2.7	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description
This stand is non-forested marsh, which is made up of cattails, sedges, and tag alder.

Stand Objective(s)
The landowner's objective is to preserve the wetland.

Prescription
No management is recommended at this time. These stands hold more value for wildlife and forest health if left alone as they provide a diverse landscape and habitat when adjacent areas are harvest.

Stand(s):	S18	**Forest Type:**	Treed Bog	**Stand Label:**	D
Acres:	2.1	**Soil Type:**	N/A	**Next Harvest:**	N/A
Trees/acre:	N/A	**BA (ft^2/ac):**	N/A	**Volume (Cds/ac):**	N/A

Stand Description
These stands are forested wetlands, composed of thick tag alder with some aspen, balsam poplar, tamarack, cedar, balsam fir scattered throughout the stands.

Stand Objective(s)
The landowner's objective is to preserve them for wildlife habitat.

Prescription
No management is recommended at this time. These stands hold more value for wildlife and forest health if left alone as they provide a diverse landscape and habitat when adjacent areas are harvest.

Stand(s):	S21	**Forest Type:**	Lowland Conifer	**Stand Label:**	Q2
Acres:	16.8	**Soil Type:**	15	**Next Harvest:**	N/A
Trees/acre:	0	**BA (ft^2/ac):**	0	**Volume (Cds/ac):**	0

Stand Description

This stand is a lowland conifer stand that is currently moderately stocked with regeneration. The stand has tamarack, balsam fir, and spruce established as saplings. The stand also has large pockets of tag alder. The stand is going to primarily produce softwood pulpwood eventually.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

15 – Carbondale and Cathro mucks & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils. The site index for balsam fir is 40 feet and has an annual growth capable of producing .911 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the plan, as the stand needs more time to grow. Eventually, this stand should be harvested using a seed tree system, harvesting all trees within the stand to naturally regenerate a stand of tamarack, spruce, and balsam fir.

The seed tree harvest should harvest all trees not desired as seed trees. All regeneration harvests should be from below and all vegetation should be cut. The most vigorous trees between the diameters of 8 to 12 inches should be kept as seed trees, approximately 4 to 10 trees per acre should be retained. This should allow natural regeneration to take place.

Stand(s):	S23	**Forest Type:**	Lowland Hardwood	**Stand Label:**	LM8LM6
Acres:	33.6	**Soil Type:**	71	**Next Harvest:**	Period #1
Trees/acre:	320	**BA (ft^2/ac):**	123	**Volume (Cds/ac):**	31.2

Stand Description

This stand is a lowland mixed stand that is dominated by poletimber sized black ash and sawtimber sized cedar. The most common species based on basal area are black ash, cedar, balsam fir, and red maple. The stands average diameter is 7.7 inches, the stand consist of approximately 55% of poletimber based on basal area. The stand was very wet during the assessment, a winter harvest would need to occur. Small little trails of pure black muck run through this smaller tract. There is a couple pockets of higher ground where the volume is considerably higher than in the lower wet areas. The stand is going to primarily produce softwood and hardwood pulpwood. Ash and balsam fir regeneration is moderate.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

71 – Ensley fine sandy loam & *Tsuga-Thuja-Mitella* (TTM)

This flat muck soil is very poorly drained and is poorly suited for logging equipment and logging haul roads. Trees tend to be shallow rooted in these soils because of the wetness and lends itself to blow down during strong wind events. The use of logging equipment is limited to the frozen season of winter because of low strength and wet soils; rutting is also a major management concern because of the wetness and low strength. The site index for balsam fir is 60 feet and has an annual growth capable of producing 1.44 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Thuja-Mitella* (TTM). This habitat type has a climax overstory dominated by cedar and eastern hemlock. Other common species include balsam fir and red maple. The dominant ground flora includes sedges, wild lily-of-the-valley, starflower, naked miterwort and twinflower. Potential productivity for timber production is low.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

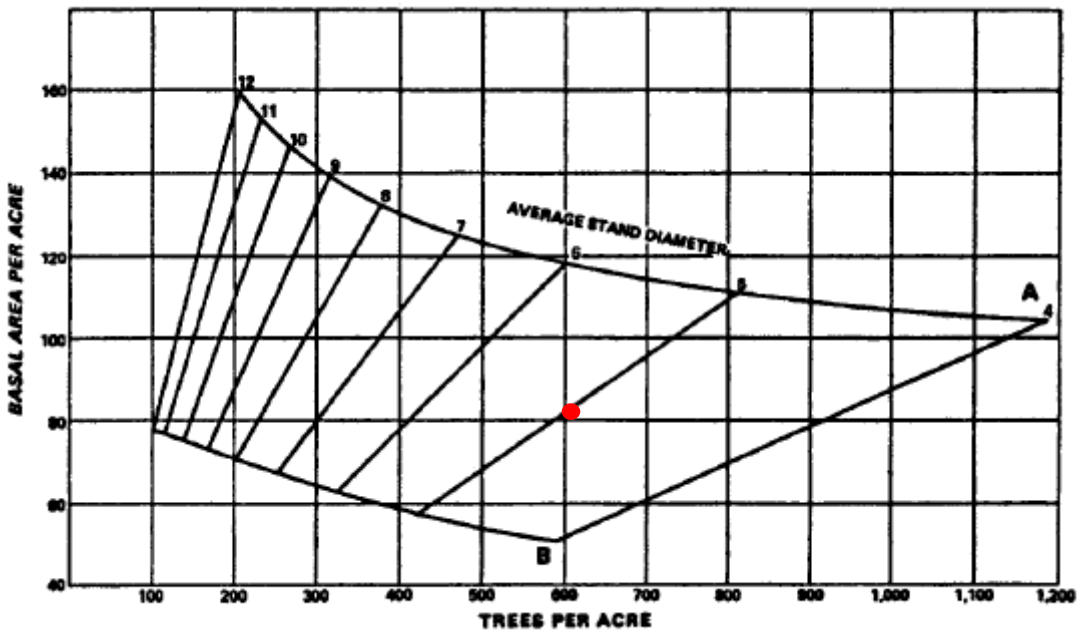
Prescription

An overstory removal should performed releasing and minimizing harvest damage to existing regeneration. This will allow the stand to naturally regenerate from the existing regeneration, along with from stump sprouting. This stand will regenerate to a lowland mixed stand.

Stand(s):	S25	**Forest Type:**	Plantation Conifer	**Stand Label:**	J6
Acres:	2.6	**Soil Type:**	60D	**Next Harvest:**	N/A
Trees/acre:	605	**BA (ft^2/ac):**	83	**Volume (Cds/ac):**	10.3

Stand Description

This is a conifer plantation primarily made up of jack pine, which was planted around 2000. The average diameter is 5.0. This stand is just reaching merchantability. The stand is currently growing well.



Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

60D – Zimmerman fine sand & *Tsuga-Maianthemum-Vaccinium* (TMV)

This hilly sand soil slopes from 6 to 18 percent and is excessively drained and is well suited for logging equipment and logging haul roads. During the dry summer or drought conditions can cause difficulties for wheeled equipment because of the loose sand and slope. The site index for aspen is 70 feet and has an annual growth capable of producing 1.127 cords per acre per year of wood fiber and red pine has a site index of 64 and produces 1.44 cords per acre per year of wood fiber.. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum-Vaccinium* (TMV). This habitat type has a climax overstory dominated by eastern hemlock. Other common species include sugar maple, eastern white pine, balsam fir, white spruce, and northern red oak. The dominant ground flora includes Canada blueberry, wild sarsaparilla, bracken fern, wild lily-of-the-valley, low sweet blueberry, yellow beadlily and betony. Potential productivity for aspen and northern hardwoods is considered to be moderately high, this soil is also well suited for red pine and jack pine plantations.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

No management is recommended during the plan, as the stand needs more time to grow. Eventually, this stand should be harvested by clearcutting, when it reaches an average diameter of 8 to 12 inches in diameter. Typically jack pine is managed on 40 to 60 year rotations for pulpwood.

Stand(s):	S26	**Forest Type:**	Lowland Hardwood	**Stand Label:**	LM8LM6
Acres:	22.6	**Soil Type:**	13D	**Next Harvest:**	Period #4
Trees/acre:	298	**BA (ft^2/ac):**	85	**Volume (Cds/ac):**	17.7

Stand Description

This stand is an uplant mixed stand that is dominated by poletimber sized spruce and balsam fir and sawtimber sized northern hardwoods. The most common species based on basal area are balsam fir, spruce, and red maple. The stands average diameter is 6.8 inches, the stand consist of approximately 70% of poletimber based on basal area. The stand is going to primarily produce softwood and hardwood pulpwood, the hardwood was poor quality.

Stand Objective(s)

The landowner's objective is to manage for timber production.

Soils & Habitat Type

13D – Pemene fine sandy loam & *Tsuga-Maianthemum* (TM)

This hilly sandy-loam soil slopes from 6 to 18 percent and is well drained and is well suited for logging equipment and logging haul roads. This soil is typically found on hills and ridges in the uplands. One concern for management is erosion potential. The site index for sugar maple is 60 feet and has an annual growth capable of producing .544 cords per acre per year of wood fiber. Any management activities should be done in accordance with the state BMP manual.

The typical habitat type found on this soil type is classified as a *Tsuga-Maianthemum* (TM). This habitat type has a climax overstory dominated by eastern hemlock, sugar maple, and red maple. Other common species include yellow birch, white spruce, balsam fir, eastern white pine, northern red oak, cedar and basswood. The dominant ground flora includes wild lily-of-the-valley, bracken fern, starflower, and wild sarsaparilla. Potential productivity for aspen, red pine, and jack pine is high, while northern hardwoods is considered to be moderate.

This information was gathered from the USDA Websoil Survey and Field Guide Habitat Classification System for Upper Peninsula of Michigan and Northeast Wisconsin.

Prescription

A merchantable clearcut should occur, harvest all merchantable trees. This will allow the stand to naturally regenerate from the existing regeneration, along with from stump sprouting. This stand will regenerate to an upland mixed stand.

Forest Cover Type/Map Symbols

Productive Forest Types

Code	Type	Code	Type
A	Aspen	B	Paper Birch
C	Cedar	E	Lowland Hardwoods
F	Spruce/Fir	H	Hemlock
J	Jack Pine	M	Northern Hardwoods
O	Oak	P	Lowland Poplar
Q	Mixed Lowland Conifers	R	Red Pine
T	Tamarack	W	White Pine
LM	Lowland Mixed	MC	Upland Mixed Conifers
MD	Mixed Deciduous	UM	Upland Mixed

Non-Productive Types

Code	Type	Code	Type
D	Treed Bog	G	Grass/Opening
K	Rock	L	Lowland Brush
N	Marsh	U	Upland Brush
V	Bog	X	Right-of-Way
Y	Sand Dunes/Pit	Z	Water

Forest Size Classes and Stocking Levels

Symbol	Primary Size Class	Stocking Level
0	Non-stocked	Non-stocked
1	Regeneration	Poor
2	Regeneration	Medium
3	Regeneration	Well
4	Poletimber	Poor
5	Poletimber	Medium
6	Poletimber	Well
7	Sawtimber	Poor
8	Sawtimber	Medium
9	Sawtimber	Well

*Basal area indicates density within size class.

Management Activity Tracking & Summary

Stand #	Acres or Unit	Label	Activity	Date		Incentive Program(s) Used?	NRCS Practice Code
				Planned	Completed		

									Most Common Species (TPA)			Highest Density Species (BA)		
Stand	**Forest Type**	**Stand Label**	**Acres**	**Soil Type**	**Next Harvest / Treatment**	**Trees/acre**	**BA (ft2/ac)**	**Volumes (cds/ac)**	**1**	**2**	**3**	**1**	**2**	**3**
	Breen Township Schools													
B01	Northern Hardwoods	M8/M5	37.8	24F	P1 - SEL	268	104	25.6	Hard Maple	Basswood	Yellow Birch	Hard Maple	Basswood	Yellow Birch
B02	Northern Hardwoods	M8/M5	11.3	24F	P1 - SEL	219	103	26.7	Hard Maple	Aspen	Basswood	Hard Maple	Basswood	Aspen
B03	Aspen	A8/Q5	8.2	10	N/A	358	100	20.6	Balsam Fir	Aspen	Red Maple	Aspen	Balsam Fir	Red Maple
B04	Aspen	A5	4.9	24D	P4 - CC	264	41	5.5	Aspen	Red Pine		Aspen	Red Pine	
B05	Grass/Opening	G	3.9	24D	P1 - PLT									
B06	Right-of-Way	X	2.5	N/A	N/A									
B07	Red Pine	R9	3.7	24D	P1 - CC/PLT	114	145	53.5	Red Pine	Ash		Red Pine	Ash	
B08	Water	Z	2.2	N/A	N/A									
B09	Lowland Mixed	LM5	2.1	25B	N/A	211	53	6.7	Balsam Poplar	Balsam Fir		Balsam Fir	Balsam Poplar	
B10	Spruce/Fir	F9	1.8	24D	P1 - CC/PLT	367	158	46.6	Balsam Fir	Spruce		Spruce	Balsam Fir	
B11	Grass/Opening	G	1.4	24F	N/A									
	School Facility													
N01	School Facility	XSF	19.8	N/A	N/A									
N02	Lowland Conifer	Q4	14.5	15	N/A	87	27	5.0	Balsam Fir	Tamarack	Cedar	Cedar	Tamarack	Balsam Fir
N03	Mixed Decidous	M7MD5	11.1	57B	P1 - EDU	264	75	14.9	Aspen	Balsam Fir	White Birch	Aspen	Red Maple	Balsam Fir
N04	Marsh	N	10.6	N/A	P1 - WLF									
N05	Aspen	F7A5	5.5	60B	P4 - CC	247	78	16.6	Aspen	Balsam Fir	Red Maple	Aspen	Balsam Fir	Red Maple
N06	Treed Bog	D	3.8	15	N/A									
N07	Mixed Conifer	R9MC5	3.4	57B	P4 - CC/PLT	270	150	38.9	Balsam Fir	Red Pine	Spruce	Red Pine	Balsam Fir	White Pine
N08	Right-of-Way	X	3.4	N/A	N/A									
N09	Treed Bog	D	2.8	15	N/A									
N10	Water	Z	1.0	N/A	N/A									
N11	White Pine	W8F4	10.2	57B	P4 - SDT	195	99	25.4	White Pine	Balsam Fir	White Birch	White Pine	White Birch	Balsam Fir
N12	Lowland Brush	L	3.7	N/A	N/A									
N13	Lowland Poplar	UM4P2	1.3	57B	N/A	148	23	0.7	Balsam Fir	Red Pine		Balsam Fir	Red Pine	
N14	Right-of-Way	X	1.9	N/A	N/A									
N15	Grass/Opening	G	1.2	N/A	N/A									

									Most Common Species (TPA)			Highest Density Species (BA)		
Stand	**Forest Type**	**Stand Label**	**Acres**	**Soil Type**	**Next Harvest / Treatment**	**Trees/acre**	**BA (ft2/ac)**	**Volumes (cds/ac)**	**1**	**2**	**3**	**1**	**2**	**3**
	Felch Township Schools													
F01	Lowland Conifer	Q8Q6	21.6	15	N/A	486	182	41.2	Cedar	Spruce	Balsam Fir	Cedar	Spruce	Balsam Fir
F02	Mesic Hardwood	M8F5	4.0	68D	P2 - THN	408	143	28.1	Red Maple	Spruce	Balsam Fir	Red Maple	Spruce	Balsam Fir
F03	Grass/Opening	G	1.6	N/A	N/A									
F04	Aspen	A4	4.0	15	N/A	83	15	1.2	Aspen	Balsam Fir		Aspen	Balsam Fir	
F05	Aspen	A6	6.5	64B	P4 - CC	721	170	35.0	Aspen	Balsam Fir	Spruce	Aspen	Balsam Fir	Spruce
F07	Lowland Conifer	Q1	5.5	15	N/A									
F08	Red/White Pine	R8W7	46.4	64B	P2 - THN	141	100	31.3	Red Pine	White Pine	Aspen	Red Pine	White Pine	Aspen
F09	Lowland Brush	L	3.9	N/A	N/A									
F10	Grass/Opening	G	0.7	N/A	N/A									
F12	Tamarack	T2	2.4	10	N/A				Tamarack			Tamarack		
F13	Red Pine	R9UM5	16.9	64D	P2 - THN	320	133	36.7	Red Pine	Aspen	White Pine	Red Pine	White Pine	Aspen
F14	Red Pine	R9MC5	8.6	64D	P2 - THN	216	135	42.1	Spruce	White Pine	Red Pine	Red Pine	White Pine	Spruce
F15	White Pine	W8UM5	51.1	46B	P3 - SDT	176	105	32.1	Red Maple	Red Pine	Balsam Fir	White Pine	Red Pine	Red Maple
F17	Red Pine	R8R5	21.0	46B	P2 - THN	205	122	40.5	Red Pine	White Pine		Red Pine	White Pine	
F18	White Pine	W8UM5	12.7	46B	P3 - SDT	205	90	24.6	Aspen	White Pine	White Birch	White Pine	Red Pine	Aspen
F20	Northern Hardwoods	M9M5	17.2	24D	P1 - SEL	245	108	28.6	Balsam Fir	Hard Maple	Ironwood	Hard Maple	Basswood	Red Maple
F21	Lowland Mixed	LM9LM5	4.9	15	N/A	262	160	42.4	Hemlock	Spruce	Yellow Birch	Hemlock	White Pine	Red Maple
F22	Lowland Conifer	Q6	6.4	69D	P3 - SDT	238	90	31.0	Tamarack	Balsam Fir	Spruce	Tamarack	Spruce	Red Maple
F23	White Pine	W9LM5	30.9	69D	P1 - SDT	146	118	38.5	White Pine	Cedar	Ash	White Pine	Cedar	Hemlock
F24	Cedar	C8LM5	17.4	15	N/A	284	144	38.9	Cedar	Ash	Red Maple	Cedar	Ash	White Birch
F25	Northern Hardwoods	M9M5	6.0	24B	P1 - SEL	209	115	34.1	Hard Maple	Yellow Birch	Basswood	Hard Maple	Basswood	Yellow Birch
F26	Spruce/Fir	F5	5.9	68D	N/A	165	45	8.2	Spruce	Balsam Fir	Hard Maple	Spruce	Balsam Fir	Hard Maple
F27	Spruce/Fir	F5	9.0	68D	N/A	264	60	9.5	Balsam Fir	Spruce	Aspen	Spruce	Balsam Fir	Cedar
F28	Aspen	A5	51.7	68D	N/A	341	58	7.0	Aspen	Balsam Poplar		Aspen	Balsam Poplar	
F29	Northern Hardwoods	M9M5	10.5	68D	P1 - SEL	211	116	36.8	Hard Maple	Basswood	Yellow Birch	Hard Maple	Basswood	Yellow Birch
F30	Lowland Conifer	Q8Q6	15.2	10	N/A	322	114	29.3	Tamarack	Cedar	White Birch	Tamarack	Cedar	White Birch
F31	Lowland Brush	L	42.6		P1 - WLF									
F32	Water	Z	7.4		N/A									
F33	Right-of-Way	X	4.0		N/A									
F34	Lowland Mixed	LM4	7.5	69D	N/A	85	25	6.8	White Pine	Hard Maple	Balsam Fir	Hard Maple	Hemlock	Balsam Fir

									Most Common Species (TPA)			Highest Density Species (BA)		
Stand	**Forest Type**	**Stand Label**	**Acres**	**Soil Type**	**Next Harvest / Treatment**	**Trees/acre**	**BA (ft2/ac)**	**Volumes (cds/ac)**	**1**	**2**	**3**	**1**	**2**	**3**
	Sagola Township Schools													
S01	Grass/Opening	G	57.7	64F	P1 - CC/PLT	94	28	4.6	Aspen	Balsam Fir	Red Maple	Balsam Fir	Spruce	Jack Pine
S02	Aspen	A4A3	55.4	15	N/A	232	38	3.4	Aspen	Balsam Fir	Spruce	Aspen	Balsam Fir	Spruce
S03	Red Pine	R9	41.3	13D	P3 - THN	158	104	32.3	Red Pine	Balsam Fir	Aspen	Red Pine	Balsam Fir	Spruce
S04	Lowland Poplar	Q4P3	34.5	15	N/A	228	34	7.6	Tamarack	Aspen	Balsam Poplar	Tamarack	Aspen	Balsam Poplar
S05	Aspen	A2Q1	33.3	55	N/A				Aspen	Spruce				
S06	Northern Hardwoods	M8M5	23.5	13D	P1 - SEL	259	105	28.2	Hard Maple	Red Maple	White Birch	Hard Maple	Red Maple	White Birch
S07	Red Pine	R9R5	13.3	60D	P2 - THN	246	160	50.0	Red Pine	White Birch	Spruce	Red Pine	Spruce	White Birch
S08	Northern Hardwoods	M9M5	12.0	13D	P1 - SEL	293	132	36.3	Hard Maple	Balsam Fir	Red Maple	Hard Maple	Basswood	Red Maple
S09	Red Pine	R9R5	9.1	60D	P2 - THN	319	171	52.7	Red Pine	Red Maple	Balsam Fir	Red Pine	Red Maple	Balsam Poplar
S10	Upland Mixed	UM6	8.5	64F	N/A	375	79	14.0	Red Maple	Balsam Fir	Aspen	Red Maple	Balsam Fir	Aspen
S11	Northern Hardwoods	M6	5.4	13D	P3 - THN	432	128	29.6	Red Maple	Balsam Fir	Hard Maple	Red Maple	Balsam Fir	Hard Maple
S12	Red Pine	R9	8.2	13B	P2 - THN	154	120	39.9	Red Pine	Red Maple		Red Pine	Red Maple	
S13	Aspen	A3UM2	4.8	60D	N/A				Aspen	Red Maple	Red Pine			
S14	Lowland Conifer	Q6	5.3	15	N/A	528	135	35.8	Spruce	Cedar	Balsam Fir	Spruce	Cedar	Balsam Fir
S15	Lowland Conifer	Q7Q6	4.8	15	N/A	256	80	19.4	Spruce	Cedar	Tamarack	Spruce	Cedar	Tamarack
S16	Aspen	A3	3.1	64B	N/A	182	30	1.2	Aspen	Red Maple		Aspen	Red Maple	
S17	Marsh	N	2.7		N/A									
S18	Treed Bog	D	2.1		N/A									
S21	Lowland Conifer	Q2	16.8	15	N/A				Tamarack	Balsam Fir	Spruce			
S23	Lowland Mixed	LM8LM6	33.6	71	P1 - REL	320	123	31.2	Ash	Balsam Fir	Cedar	Ash	Cedar	Red Maple
S25	Jack Pine	J6	2.6	60D	N/A	605	83	10.3	Jack Pine			Jack Pine		
S26	Upland Mixed	M7F5	22.6	13D	P4 - CC	298	85	17.7	Balsam Fir	Spruce	Aspen	Balsam Fir	Spruce	Red Maple

Glossary – Common Forestry Terms

The following glossary is adapted from www.dnr.state.md.us/forests/gloss.html.

Alley Cropping - widely spaced rows of trees with annual crops growing in between the rows.

Basal Area (of a Tree) - the cross sectional area of a tree trunk at 4.5 feet off the ground and expressed in units of square feet (ft^2).

Basal Area (of a Forest) - the basal area of all trees on an acre of land is summed up for the basal area of a forest and expressed in ft^2/acre; used as a measure of forest density.

Board Foot – a measure of volume 1 foot by 1 foot by 1 inch or 144 cubic inches of wood.

Bole - the trunk of a tree.

Bolt – 8 foot long log

Browse - parts of woody plants, including twigs, shoots, and leaves, eaten by forest animals.

Canopy - the continuous cover formed by tree crowns in a forest.

Clearcut - the harvest of all the trees in an area to reproduce trees that require full sunlight.

Codominant Tree - a tree that extends its crown into the canopy and receives direct sunlight from above but limited sunlight from the sides.

Commercial Forestland - forest capable of producing 20 ft^3 of timber per acre per year.

Commercial Treatments - timber stand improvements that generate income from sale of trees.

Cord - a unit of wood cut for fuel that is equal to a stack 4 x 4 by 8 feet or 128 cubic feet

Cordwood - small diameter or low quality wood suitable for firewood, pulp, or chips.

Crop Tree - a young tree of a desirable species with certain desired characteristics.

Crown - the uppermost branches and foliage of a tree.

Crown Classes - see dominant, co-dominant, intermediate, and suppressed.

Crown Cover or Crown Closure - the percentage of a given area covered by tree crowns.

Crown Ratio - the ratio of the leaved portion of a tree's height to its total height.

Cruise - a forest survey used to obtain inventory information and develop a management plan.

Cull - a sawtimber size tree that has no timber value as a result of poor shape or damage.

Diameter at Breast Height (DBH) - measurement of a tree's diameter taken at 4 1/2 feet.

Diameter-Limit Sale - a timber sale in which all trees over a specified DBH may be cut. Diameter-limit sales often result in high grading and is a very poor forestry practice.

Dominant Trees - trees that extend their crown above surrounding individuals.

Even-Aged Stand - a stand in which the age difference between the oldest and youngest trees is minimal, usually no greater than ten to twenty years.

Forest Farming - cultivating high value specialty crops in the shade of natural forests.

Forest Types - associations of tree species that have similar ecological requirements.

Group Selection - a process of harvesting patches of trees to open the forest canopy and encourage the reproduction of uneven aged stands.

Growth Rings - the layers of wood a tree adds each season; also called annual rings.

Habitat -the ecosystem in which a plant or animal lives and obtains food and water.

Hardwoods - a general term encompassing broadleaf, deciduous trees.

Harvest - the cutting, felling, and gathering of forest timber.

High Grading - to remove all good quality trees from a stand and leave only inferior trees.

Improvement Cut - a weeding done in stands of pole-size or larger trees.

Intermediate Tolerance - a characteristic of certain tree species that allows them to survive, though not necessarily thrive, in relatively low light conditions.

Intolerance - a characteristic of certain tree species that does not permit them to survive in the shade of other trees.

Landing - a cleared area within a timber harvest where harvested logs are processed, piled, and loaded for transport to a sawmill or other facility.

Log Rule - a method for calculating wood volume in a tree or log by using its diameter and length. Scribner, Doyle and the International 1/4-inch rule are common log rules.

Lump-Sum Sale - a timber sale in which an agreed-on price for marked standing trees is set before the wood is removed (as opposed to a mill tally or unit sale).

Mast - nuts and seeds such as acorns, beechnuts, and chestnuts that serve as food for wildlife.

Merchantable Height - the point on a tree stem to which the stem is salable.

Old-Growth Forest - a wooded area, usually greater than 200 years of age, that has never been altered or harvested by humans.

Overmature - a quality exhibited by trees that have declined in growth rate because of old age and loss of vigor.

Overstocked - the situation in which trees are so closely spaced that they compete for resources and do not reach full growth potential.

Overstory - forest canopy that includes dominant, co-dominant, and intermediate trees.

Overtopped - a tree cannot sufficiently reach the overstory and receive direct sunlight.

Patch Cut - a clearcut on a small area.

Pole Stand - a stand of trees whose average DBH is between 4 and 10 inches.

Pole Timber - trees 4 to 10 inches DBH.

Pre-Commercial Operations - cutting to remove wood too small to be sold.

Pulpwood - wood suitable for use in paper manufacturing.

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

Regeneration Cut - a timber harvest designed to promote natural establishment of trees.

Release - to remove overtopping trees that compete with understory or suppressed trees.

Residual Stand - the trees remaining intact following any cutting operation.

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

Rotation - the number of years required to grow a stand to a desired size or maturity.

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

Sapling - a tree at least 4 1/2 feet tall and up to 4 inches in diameter.

Sapling Stand - a stand of trees whose average DBH is between 1 and 4 inches.

Sawbolt – an 8 foot long sawlog

Sawlog - log large enough to be sawed economically, usually >8”diameter and 16’ long.

Sawlog Tree - a tree at least 11 inches DBH and suitable for conversion to lumber.

Sawtimber - trees from which sawlogs can be made.

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

Scale Stick - a calibrated stick used to estimate wood volume in a log.

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

Seed Tree - a mature tree left uncut to provide seed for regeneration of a harvested stand.

Seed-Tree Harvest - the felling of all the trees in an area except for a few desirable individuals that provide seed for the next forest.

Selection Harvest - the harvest of individual trees or small groups at regular intervals to maintain an uneven-aged forest.

Shelterwood Harvest - the harvest of all mature trees in an area in a series of two or more cuts, leaving enough trees of other sizes to provide shade and protection for forest seedlings.

Silvopastures - trees and improved forages to provide suitable pasture for grazing livestock.

Silviculture - the art and science of growing forest trees.

Site - the combination of biotic, climatic, topographic, and soil conditions of an area.

Site Index - a measure of the quality of a site based on the height of dominate trees at a specified age (usually fifty years), depending on the species.

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

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

Skidding - the act of moving trees from the site of felling to a leading area or landing.

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

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

Softwood - any tree in the gymnosperm group, including pines, hemlocks, larches, spruces, firs, and junipers. **Stand** - a group of forest trees of sufficiently uniform species composition, age, and condition to be considered a homogeneous unit for management purposes.

Stand Density - the quantity of trees per unit area, usually evaluated in terms of basal area, crown cover and stocking.

Stocking - the number and density of trees in a forest stand. Stands are often classified as under-stocked, well-stocked or overstocked.

Stumpage Price - the price paid for standing forest trees.

Succession - the natural replacement of one plant (or animal) community by another over time in the absence of disturbance.

Suppressed - a tree condition characterized by low growth rate and low vigor as a result of competition with overtopping trees. See overtopped.

Sustained Yield - an ideal forest management objective in which the volume of wood removed equals growth within the total forest.

Thinning - a partial cut in an immature, overstocked stand of trees used to increase the stand's value growth by concentrating on individuals with the best potential.

Threatened Species - a species or subspecies whose population is so small or is declining so rapidly that it may become endangered in all or a significant portion of its range.

Timber Stand Improvement (TSI) - any practice that increases the value or rate of value growth in a stand of potential sawtimber trees. Pruning and thinning are considered TSI. **Tolerance** – the capacity of a tree species to grow in shade

Under-stocked - a stand of trees so widely spaced, that even with full growth potential realized, crown closure will not occur.

Understory - the level of forest vegetation beneath the canopy.

Uneven-Aged Stand - Three or more age classes of trees represented.

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

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

Well-Stocked - the situation in which a forest stand contains trees spaced widely enough to prevent competition yet closely enough to utilize the entire site.

Wildlife Habitat - native environment of an animal that includes food, water, cover and space.

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

Appendix

Educational Resources

Wood Duck Boxes and Kiosk Instructions

Whitetails Unlimited – Guides

USDA NRCS Plant Guides

Michigan Natural Features Inventory – Western U.P. Rare Species Explorer

Historical Plans

Michigan Forest Health Highlights

Additional Forest Health Information

USDA NRCS Custom Soil Report

Forest Inventory Reports