

Forest Management Plan

(CPA-106, NRCS-EQIP)



Prepared for Clare County 4-H Properties

Start Date: 2024

End Date: 2033

Hunter Fodor, Consulting Forester
Hunters Land Management, LLC
517-425-2192; HLMforestry@gmail.com
HLMforestry.com

This Forest Management Plan meets the required criteria for the NRCS EQIP CPA-106

Participants Contact Information		Technical Service Provider (TSP) Contact Information	
Name: Clare County 4-H		Name: Hunter Fodor, Hunters Land Management LLC	
Phone: 989-429-3921		Phone: 517-425-2192	
Email: leeschunk@rocketmail.com		Email: HLMforestry@gmail.com	
Address: 5503 S. Cornwell Avenue, Clare, MI, 48617		Address: 3012 Grant Street, Coleman, MI 48618	
Contact Name: Lee Schunk (current president)		Website: www.HLMforestry.com	
EQIP Contract #:		TSP #: TSP-19-22775, exp. date - 04/28/26	
Property Information			
Client I.D.#: 0160	Job I.D. #: 23-076	Number of Stands in FMP: 5 (2 forested)	
Total Acres: 308.4	Forested Acres: 286.0	Acres in Plan: 308.4	Tax ID: 010-022-100-01
Town: T18N	Range: R5W	Section: 22	Township: Lincoln County: Clare
Property Legal Description (Quarter-Quarter Section, Quarter Section, Section, Town, Range, Township, County): 320 a. in W 1/2, 22, T18N, R5W, Lincoln Township, Clare County, MI			
Property Coordinates (North Entrance): 043.936009°N, 084.899041°W (decimal degrees)			
<u>How to Find Property from (Nearest Town)</u> , from the intersection of: (see Location Map, page #16)			
Renewal or revision of a prior Forest Management Plan? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Participation in Related Forestry Programs			
<input type="checkbox"/> I intend to enroll this parcel in the Qualified Forest Program (QF). (www.Michigan.gov/QFP) <input type="checkbox"/> I intend to enroll this parcel in the Commercial Forest Program (CF). (www.Michigan.gov/CommercialForest) <input checked="" type="checkbox"/> I intend to enroll this parcel in the American Tree Farm System. (www.TreeFarmSystem.org) <input checked="" type="checkbox"/> I intend to apply to the NRCS for financial assistance. (www.nrcs.usda.gov)			
Michigan's Stewardship Ethic and Approval Signature(s)			
<p><i>Stewardship is an ethic recognizing that the land and its natural inhabitants have an inherent worth. We acknowledge that we have a responsibility to consider the current and far distant future value of the land as we manage, protect, and enjoy the forest. Stewardship guides us to conduct our activities to the utmost of our abilities and to ensure the future health, productivity, diversity, and well-being of the land, its natural communities, and native species. Stewardship today provides opportunities for future generations to use and enjoy the land and its resources.</i></p> <p>Participant: I accept the completed CPA-106 deliverables as thorough and satisfying my objectives. I understand that enrolling forest land into separate property tax programs like the Commercial Forest program or the Qualified Forest program requires my compliance with an approved forest management plan in exchange for the reduction in property taxes.</p> <p>Technical Service Provider: I certify the work completed and delivered in this CPA 1) Complies with all applicable Federal, State, Tribal, and local laws and regulations; 2) Meets the general and technical requirements for this CPA; 3) The planned practices are based on NRCS Conservation Practice Standards (CPSs) in the State Field Office Technical Guide where the practices are to be implemented; 4) Is consistent with and meets the conservation goals and objectives for which the program contract was entered into by the participant; 5) Incorporates alternatives that are both cost effective and appropriate to address the resource issue(s) and participants objective(s)</p>			
Participant:		Date:	
Technical Service Provider:		Date:	
NRCS:		Date:	

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Introduction

Preface

Thank you for choosing Hunters Land Management LLC to develop the following management plan and assist you in the management of your property and forest. Within this plan you will find documentation of the current conditions of the property/forest and the management recommendations to achieve your goals. **Please note that the completion of ALL recommended activities (and the order in which they are recommended) are crucial to the success of this management plan and your goals.** Refer to the Appendix for additional information on the various terminology, resources, science, and management criteria of the information within this plan. As always, feel free to reach out to me if you ever have any questions regarding this plan or other questions/services on your property!

Sincerely,

Hunter Fodor
Registered Forester #47000
Hunters Land Management LLC

Environmental Quality Incentive Program (EQIP)

With most of the state's forestland privately owned, proper management of this resource is important. No matter how a landowner uses forestland, a forest management plan is essential. A forest management plan helps the landowner protect soil, water and wildlife resources and identifies other threats such as invasive species and disease. A forest management plan is designed to optimize the resources that are important to the landowner be it specific game species, sustainable timber production or general recreation. NRCS provides financial assistance for forest management plans through the Environmental Quality Incentives Program (EQIP). Assistance is provided for plans developed by certified Technical Service Providers. Developing a forest management plan is a requirement for receiving EQIP assistance for implementing forest conservation practices.

Property Description

This property was sold (donated) to the Clare County 4-H organization in 1939 for a total of \$10. The property has had minor use in the last 80 years with plans to increase opportunity for recreational use by the members of the Clare County 4-H moving into the future. Planned recreational opportunities will include lake access, pavilion, and camping available for the membership. The roughly 308-acre property consists of 1 tax parcel. The forested acreage is made up mainly of upland hardwood species. The property will serve as an excellent location for recreational use and sustainable timber production for the organization with proper management. Within this management plan the property is divided into 5 stands: 2 of which are forested.

Goals and Objectives

Primary Goal		
Goal	Objective	Description
G1 Commercial Value	Promote valuable species/stems to provide current/future commercial timber value	Increase and recruit commercially valuable species and individual stems that will become high quality trees that will produce high quality/value commercial timber.

Additional Goals		
Goal	Objective	Description
G2 Physical Recreation, Non-Hunting (hiking, biking, camping, etc.)	Maintain abundant/safe physical recreational opportunity	Provide an extensive/safe trail system that has appropriate opportunity for recreational hiking/camping and is clear of overhead hazards
G3 Education	Provide educational opportunities to learn more about trees, forest, and silviculture	Incorporate educational tools and activities for participants to learn more about topics such as plant identification, forest ecology, wildlife/ecosystems, and silviculture.

Goals Addressed in Stand Management

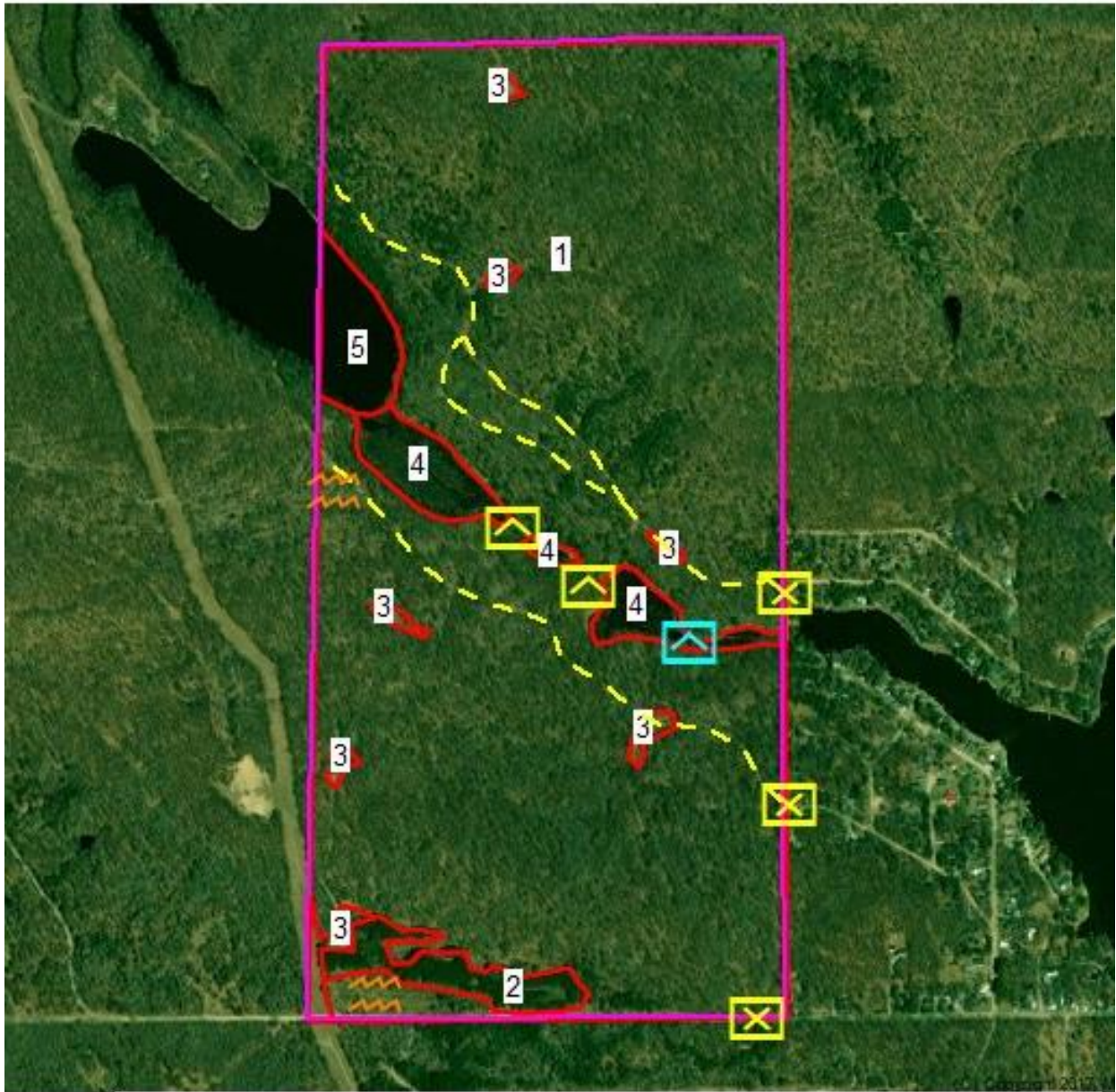
Stand	1	2	3	4	5
G1	Management of various species for long term commercial value	Management of red pine and future forest products	Location sites for equipment/material staging	-	-
G2	Trail system for hiking and proposed camp locations (Stand 1 near Stand 5)		Parking locations and recreational areas	-	Recreational water use
G3	All stands provide educational opportunities through field days				

Important Resource Contacts

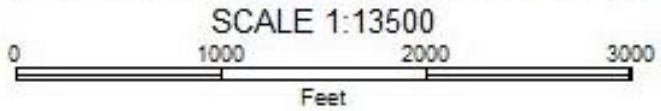
Below you will find the current (as of 2024) contact information for various organizations that can assist you with management.

Organization	Your Local Contact Information	Assistance Type	Important Dates
Natural Resource Conservation Service (NRCS)	GLADWIN SERVICE CENTER 1501 N STATE ST GLADWIN, MI 48624-1663 (989) 426-9461	The NRCS has various programs (EQIP & CSP) that can provide financial cost/share for a variety of management projects.	<u>LATE FALL</u> for the upcoming years funding
MI Department of Natural Resources, Wildlife Division	Gladwin Field Office 801 North Silverleaf Gladwin, MI 48624 517-284-9453	The MI-DNR Wildlife Division is the contact to discuss any questions or concerns pertaining to local wildlife and to obtain DMAP permits	DMAP: Must submit by <u>August</u> for upcoming Fall season
MI Department of Natural Resources, Forest Resource Division	Gladwin Forest Management Unit 801 N Silverleaf Gladwin, MI 48624 989-426-9205	The MI-DNR Forest Resource Division is the contact to apply for Rx Burn Permits and discuss any questions or concerns pertaining to forest and forest health	Prescribed Burning Permits must be issued prior to burning
Michigan Sportsman's Against Hunger	https://www.sportsmenagainsthunger.org/ Nearest Processor: Tony's Processing 1400 Joy Bell Ln. West Branch, MI. 48661 Phone: 989-345-7454	A great outlet for excess deer harvested beyond your need. Deer can be donated to participating deer processors across the state free of charge	Donated deer must be legally tagged and gutted
American Tree Farm System	District 7 - Josh Shields 989-220-9236 Joshua.Shields@macd.org https://www.treefarmssystem.org/	This organization has great information, connections with other ATFS landowners, and workshops to help you improve your forest	A renewal inspection is required every 5 years.
Conservation District Forester	CLARE Joe Nash 989-539-6401 Ext. 5043	This forester is a great resource for local knowledge, current issues, and limited cont. support	-

General Use Map



- Legend**
- Property Line
 - Stand Boundary
 - - - Main Trail
 - Entrance
 - Crossing
 - Beaver Dam
 - ~ ~ ~ Wind Throw Area



Clare County 4-H, Prepared with assistance from USDA-Natural Resources Conservation Service, Assisted by Hunter Fodor/ Hunters Land Management LLC, Gladwin Service Center, Clare County, Michigan, prepared January 2024. Property Coordinates (North Entrance): 043.936009°N, 084.899041°W (decimal degrees)

Management Stand Summary

(Refer to “Management Stand Descriptions/ Recommendations” section for additional information)

Entire Property

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>Acres</u>
2024	American Tree Farm System Enrollment/Initial Inspection		
2024	Apply for NRCS EQIP Funding		
2024	Begin White-tailed Deer Population Reduction (possible hunting lease?)		
Aug. 2025	Forest Trail Establishment (655-2)	0a	-
Description: Create/maintain an extensive trail system through the property			
Objective: Increase access for management, monitoring, & recreation			
Aug. 2025	Construct Observational Deer Enclosures (612-73)	0c	5,000'
Description: Construct multiple 12’x12’ (5’ tall) deer enclosures across the property.			
Objective: Remove deer impact as comparison to surrounding area to assess browse impacts.			
2029	American Tree Farm System Inspection		
2033	Update Forest Management Plan		

Stand 1

Description Summary: This stand consists of a moderately/well stocked overstory dominated by Northern red oak and white oak.

Management Activities:

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>Acres</u>
July 2026	Midstory Removal, Brush Management (314-9)	1a	~180.0
July 2027	Ground Scarification, Tree Site Preparation (490-1)	1b	~100.0
Feb. 2029	Clear Cut, Commercial Forest Stand Improvement (666-11)	1c	~80.0
Feb. 2029	Overstory Removal/Thinning – Non-Commercial FSI (666-9)	1d	~40.0
July 2030	Broad Herbicide Treatment (315-4)	1e	~80.0
Aug. 2030	Planting Furrows, Tree Site Preparation (490-1)	1f	~80.0
Aug. 2030	Ground Scarification, Tree Site Preparation (490-1)	1g	~40.0
May 2031	Red Pine Plantation Planting, Tree Establishment (612-1)	1h	~80.0

Stand 2

Description Summary: This stand consists of a red pine plantation in the sawtimber/poletimber size class.

Management Activities:

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>Acres</u>
July 2028	Midstory /Understory Thinning, Brush Management (314-9)	2a	6.7

Stand 3

Description Summary: This stand is comprised of a section of the powerline in the southwest corner and various small forest openings already present across the property.

Management Activities:

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>Acres</u>
Aug. 2029	Midstory/Understory Removal, Brush Management (314-4)	3a	~10.0
July 2030	Broad Herbicide Treatment (315-4)	3b	~10.0
May 2031	Herbaceous Planting, Conservation Cover (327-2, 327-4)	3c	~10.0

Stand 4

Description Summary: This stand consists of lowland soils/wetland corridor moving east from Bungo Lake (Stand 5) towards Bertha Lake.

Management Activities:

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>Acres</u>
2033	No Practice	-	-

Stand 5

Description Summary: This stand is made up of Bungo Lake.

Management Activities:

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>Acres</u>
2033	No Practice	-	-



Figure 1. A small area where wind throw/salvage harvest occurred in Stand 1

Plan Preparation

Planning Process

The Technical Service Provider (TSP, Forester), Participant (Organization President), and NRCS Contact completed an in-person to discuss the management plan creation process. The TSP and Participant met on site to complete the required documents (contract, questionnaire, etc.) and perform a walk-through (consultation) of the property. The Participant provided the information required to the TSP for the CPA-106 Forest Management Plan. The TSP delineated stand types and cruised/inventoried the property to gather necessary information to complete the NRCS EQIP CPA-106 Forest Management Plan.

Activity Tracking (site visits, landowner interaction, etc.)

Date	Type	Notes	Initial
7/12/2023	Meeting	Contract signing, consultation, etc.	HF
7/12/2023	Data Collection	Stand delineation, inventory, etc.	HF
1/14/2024	Data Collection	Inventory	HF
1/22/2024	Data Collection	Inventory	HF
1/30/2024	Draft Submission	Submission of FMP Draft	HF

Assessment Methods

Assessment was done by a walk-through observation and inventory of the forested land. A forest inventory was collected of the poletimber and sawtimber size class trees using the following specifications:

Stand #	Inventory Type	Cruise Intensity
1	Variable Radius Plot/ BAF 10 Angle Gauge	1 plot/ 9.9-acres
2	Variable Radius Plot/ BAF 10 Angle Gauge	1 plot/ 6.7-acres
3, 4, 5	N/A (Non-Forested)	

Measurements were as follows:

- DBH (4.5") measurements were taken in 2" increments (0.1" – 3.0" = 2")
- Stems 0.1" – 4.0" DBH were classified as seedling/sapling size.
 - Stems < 4.5' in height were considered seedlings; stems > 4.5' in height were considered saplings.
- Stems 4.1" – 12.0" DBH were classified as poletimber size.
- Stems > 12.0" DBH were classified as sawtimber size.
- Sawlog & Pulp/firewood were recorded in 8' segments.
- An 8' segment that appeared to contain sound wood (exterior features), had a SED of >12", and was of pallet log quality or better was considered sawlog class.
- An 8' segment that had a SED of 4.1" – 12.0" or was a >12.0" SED segment that did not meet the sawlog requirements above was considered Pulp/firewood class.
- Sawlog volumes were measured in International ¼ MBF.
- Pulp/firewood was measured in cords.
- All age estimates were determined using an increment borer at a height of 4.5' (DBH) with a data collection intensity of 1 tree/ ~10-acres.
- All height estimates were determined using a clinometer at a linear distance of 66' (1 chain) with a data collection intensity of 1 tree/ ~10-acres.

Visual observations were recorded of the seedling/sapling layer (recorded species present and overall density of seedling/sapling stems), shrub/midstory tree species observed, herbaceous plant species observed, topography features, resource concerns, trails and access, current management activities, stand health issues present and of concern, noxious/invasive plant species present, and wildlife/fish sign observed.

Special Resources and Considerations

The following natural resource elements are applicable to the entire property. Additional resources will be described in more detail for each unit. See *Appendix V* for Special Resource Concern Checklist for each stand and additional associated documents.

Threatened and Endangered Species.

The Michigan Natural Features Inventory (MNFI) reports the following species that may currently inhabit the area:

- Common loon (*Gavia immer*), Threatened (legally protected). Last observed in 2022

For more information see Appendix V or visit <https://mnfi.anr.msu.edu/>.

Special Sites.

There are no known special sites on the property. The State Historic Preservation Office database does not show the presence of any historical sites in this section of the Township (<https://www.miplace.org/historic-preservation/>). Special sites also include unique natural communities, but there are no unique natural communities on this property (<https://mnfi.anr.msu.edu/communities>).

Forests of Recognized Importance.

This property is located within a “Forest of Recognized Importance” (FORI) due to possible presence of the common loon. FORI’s in Michigan are forests along the Great Lakes coastline, forests along Natural or Wild and Scenic Rivers, rare forest types (old growth), or forests that provide important wildlife habitat (>500 contiguous acres in the southern Lower Peninsula, or **required habitat for threatened or endangered species statewide**). Landowners within a FORI should manage their forest to protect the ecological integrity of that larger important ecosystem.

Carbon Cycle.

Carbon dioxide is removed from the atmosphere through photosynthesis and decomposition of organic matter into the soil. Carbon dioxide is released to the atmosphere through respiration, deforestation, and soil tillage. More than 63% of the terrestrial carbon stocks in Michigan’s forests are in soil organic carbon and only 19% is in the above ground biomass (trunk, branches, leaves). Below ground biomass (roots), dead wood, and litter (dry leaves) make up the remaining 18% of the carbon stocks in Michigan’s forests. Healthy forests clean the air and produce oxygen through photosynthesis. Therefore, forests in Michigan and around the world are very important ecosystems that remove carbon dioxide from the atmosphere and help to reduce the global impacts of climate change. More information about the forest carbon cycle is available at <https://www.fs.usda.gov/ecosystemservices/carbon.shtml>. [Inquire with your forester if Carbon Sequestration markets are of interest to assess potential opportunities.](#)

Forest Health

Almost all forests are affected by insects, diseases, and invasive species. It is important to monitor, and treat, these issues across the entire property and urge neighboring properties to do

the same to significantly lower the impact that can occur from these problems. Forest health and invasive species will be described in more detail in the stand descriptions. Additional information about specific forest health and invasive species on this property can be found in Appendix II.

To learn more about Michigan's Forest Health concerns visit:
<https://www.michigan.gov/dnr/managing-resources/forestry/health>.

Forest pest/disease that may affect forest in this area/ species on this property: Oak wilt disease, overpopulation of white-tailed deer, gypsy moth, oak decline, & white pine weevil.

Invasive plant species that may affect forest in this area: Autumn/Russian olive, bush honeysuckle, buckthorn, multiflora rose, Japanese barberry, garlic mustard, tree of heaven, black locust, giant knotweed, phragmites, oriental bittersweet, reed canary grass, Norway maple, giant hogweed, purple loosestrife, spotted knotweed, & wild parsnip.

Water Features & Sensitive Areas

Water features on this property include Bungo Lake and beaver flooding(s). Sensitive areas on this property include wetland soils, riparian areas, and steep slopes. To protect wetland soils minimal activity should be allowed within the boundaries and surrounding area. Equipment use should be limited within the area during management and limited quantities of vegetation should be removed within the boundaries. Recreation use should be limited in these locations as the soil is sensitive to disturbance. To protect steep slopes from erosion careful planning should be done when implementing trails and traversing this terrain to minimize erosion. These sensitive areas should be avoided during times of heavy precipitation and/or high soil moisture content.

Topography

Topography on this property ranges from some flat locations to mostly minor/moderate slopes. Multiple ridges run through the property and there are locations of steep slopes present.

Wildfire Risk

Wildfire is a moderate risk in this portion of the County or the forest types on the property. More information about minimizing the risk of wildfire in Michigan can be found at <https://www.michigan.gov/michiganprepares/be-informed/wildfire>

Wildlife

Some wildlife on this property will greatly benefit from the implementation of this Forest Management Plan. All wildlife species have specific habitat requirements that range in complexity. Individual habitat requirements vary between specific wildlife species and are dependent on the wildlife species range, local ecotypes, flora composition, ecological successional stage, and a variety of other key factors. By implementing management recommendations within this plan certain wildlife species will greatly benefit while others may not. If there are wildlife species of interest associated with the goals of the plan, then management should reflect the needs of that/those wildlife species. Any endangered, threatened, or specials of concern (both fauna & flora) should also be carefully considered as well.

To learn more about Michigan's wildlife visit: <https://www.michigan.gov/dnr/managing-resources/wildlife>.

Common terrestrial species that may inhabit this area/stand types within the property:

Black bear, white-tailed deer, wild turkey, ruffed grouse, woodcock, porcupine, raccoon, opossum, skunk, cottontail rabbit, snowshoe hare, squirrel/chipmunk species, coyote, fox, bobcat, badger, marten, rodents (mice/moles/shrews), reptiles (turtles/snakes/lizards), & amphibians (salamanders/frogs/toads).

Common aerial species that may inhabit this area/stand types within the property: Various bat species, various songbird species, woodpecker species, & various raptor species (eagles, hawks, owls).

Common aquatic species that may inhabit this area/stand types within the property: Mink, beaver, muskrat, waterfowl species, amphibian species (salamanders/frogs/toads), reptile species (turtles/snakes/lizards), & various fish species.

Fish and Wildlife Habitat Elements: Moderate thermal cover, significant overstory cover, moderate understory cover, minor understory cover, minor soft mast food source, significant hard mast food source, minor herbaceous layer (possible food/cover), woody browse food source, upper canopy nesting structure for small and large bird species, upper canopy roosting structure for small and large bird species, understory nesting structure for small and large bird species, understory roosting structure for small and large bird species, provides roosting structure for wild turkeys, provides snags for cavity nesting species, coarse woody debris structure for a variety of amphibians and reptiles, security cover for a variety of small game species and rodents, security cover for various game species, a seasonal water source, a year-round water source, a year-round water source for waterfowl, a seasonal water source for waterfowl, & a water source for fish species.

Management and Natural Disturbance History (known)

Management on this property has included forest management in the past.

Natural disturbance on this property has included some natural mortality in the overstory and a large straight wind event along the west property line.

Access

Property Access: This property has multiple entry points from the south and east property line. There are two main entrances along the east property line along oak street.

Roads/Trails: There are two open trails running from the east property line to the north just north and south of Stands 4 & 5. There are also other trails throughout the property that are currently impassable.

Landings: Various openings (Stand 3) are present across the stand and some of the main trails are very wide which could all be used for staging equipment/material during forest management.

Stream Crossings: There are no established water crossings currently. However, there are 2-3 locations where new trails are desired that will require crossings.

Prescribed Burning Opportunities

Prescribed burning is a management tool used to reduce hazardous fuels, remove unwanted understory plants, and maintain early successional habitat. Prescribed fire should only be conducted by highly trained and properly insured professionals. All prescribed fires require a Burn Permit available from the DNR at www.Michigan.gov/BurnPermit. Prescribed fire is a viable tool for the current management strategies of some of the stands on the property. More information about prescribed fire is available on the Michigan Prescribed Fire Council website at www.FireCouncil.org

Forest Products

Stand #	Current Forest Products	Future Forest Products
1	Softwood/Hardwood Sawtimber and Pulpwood	Softwood/Hardwood Sawtimber and Pulpwood
2	Softwood Sawtimber and Pulpwood	Softwood Sawtimber and Pulpwood
3	N/A, Non-forested	N/A, Non-forested

Reforestation/Afforestation Options

Reforestation options on this property include natural, assisted natural, and artificial regeneration. Management recommendations are for natural and assisted natural.

There are no afforestation options on this property.

Grazing Practices & Agroforestry

There are no current grazing or agroforestry practices implemented on this property.

Management recommendations do not include any grazing or agroforestry practices on this property.

Management Activity Issues

Stand #	Management Activity Issues
1	Non-commercial management (monetary cost) needed prior to commercial management. Concerns with overbrowsing from white-tailed deer.
2	Minimal volumes will make commercial management difficult.
3, 4, 5	All management recommendations will be non-commercial (monetary cost)

Adjacent Properties/Stands

Limitations: No adjacent stand or property limitations observed. Possible limitations with access to east entrances due to county road access being limited to larger trucks.

Opportunities: No adjacent stand management opportunities observed. Possible coordination with nearby Hunters Land Management Clients on certain management activities to reduce costs.

Recreation Use

This property will be utilized for recreational camping, hiking, education, & lake access for the Clare 4-H membership.

Landscape Overview

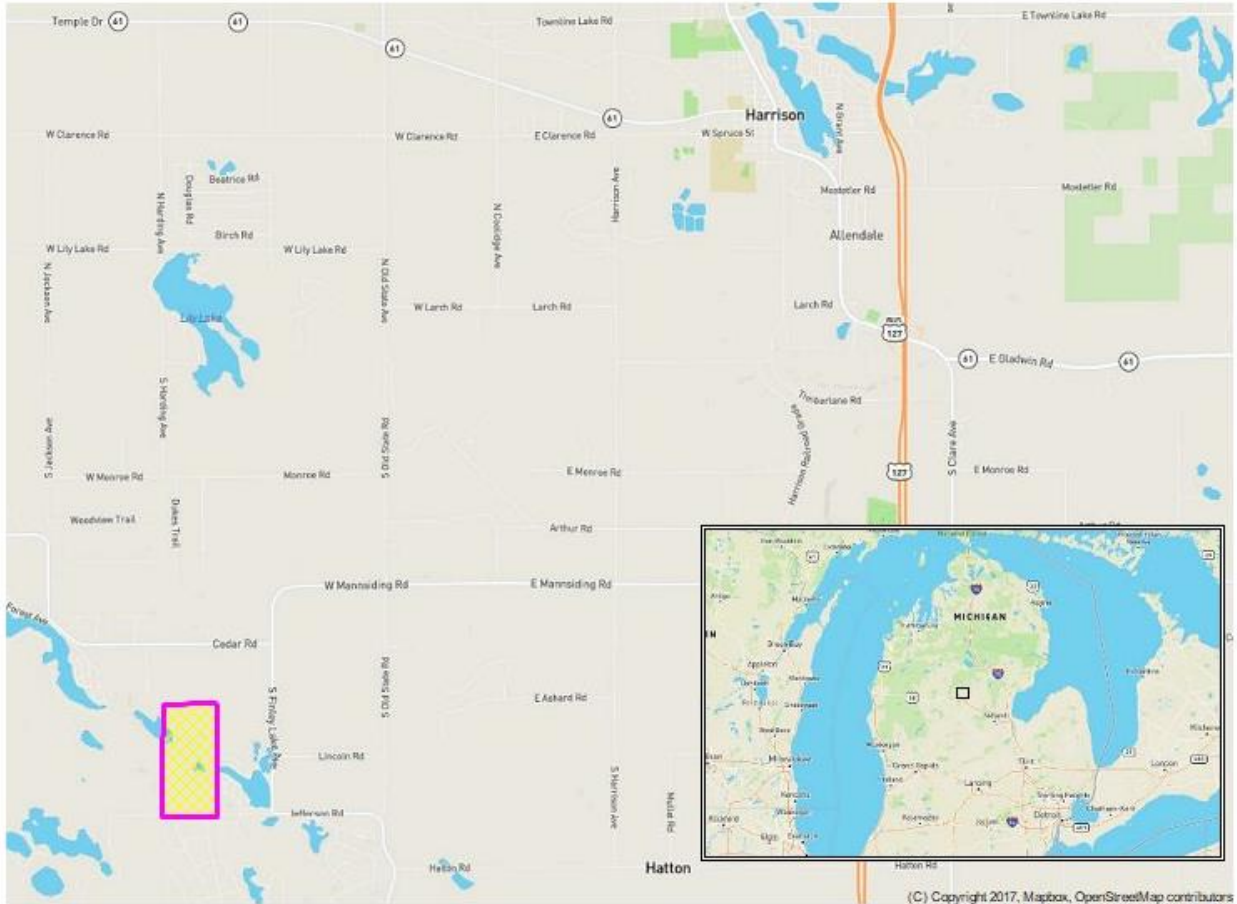
Local Landscape: The local landscape encompasses the immediate surrounding area (1 to 10-mile radius). This property is located within an area that is mostly dominated by a natural surrounding landscape. Various larger lakes in the area have significant rural development surrounding them which could contribute to an inflated white-tailed deer population (winter feeding). Also possibly expect this area to continue to expand in development into the future which will result in continued loss of natural surrounding landscape. Additionally, to the east there are larger tracts of agricultural use which may continue to expand towards this property in the future bringing new forest health issues (increase in white-tailed deer populations and invasive plant species encroachment). Currently, however, the connectivity of natural landscape in the area is providing abundant corridors for natural movement of wildlife and possible migration of plant species/genetics.

State-Regional Landscape: This property is located within the Northern Lower Peninsula of Michigan. This region of Michigan ranges from minimally to moderately fragmented and consist mainly of natural landscapes with some areas of high agricultural use. White-tailed deer densities can range from appropriate to overpopulated depending on local landscape characteristics, continuous or degraded natural landscapes are location dependent, and invasive plant species densities can range from minor to severe. Challenges for forest and habitat management is dependent on the local characteristics described above. This region tends to have a range of timber markets that accommodate a multitude of sizes (both sawlog and pulpwood) of most species making commercial forest management plausible in many scenarios.

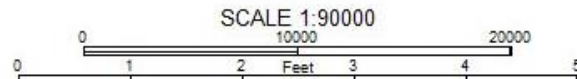
Regional Landscape (Midwest): Michigan is located within the greater regional extent of the Midwest Region of the United States. Depending on the location within the state, Michigan forest types include central hardwoods, northern hardwoods, lowland conifer, upland conifer, upland mixed, lowland mixed, aspen dominated, etc. In most portions of the state (like the Midwest region itself) overpopulation of white-tailed deer, invasive plant species, invasive forest pest/diseases, improper forest management, and loss of natural landscapes are daunting challenges for management.

Refer to the Location Map and Landscape Map for visual details.

Location Map



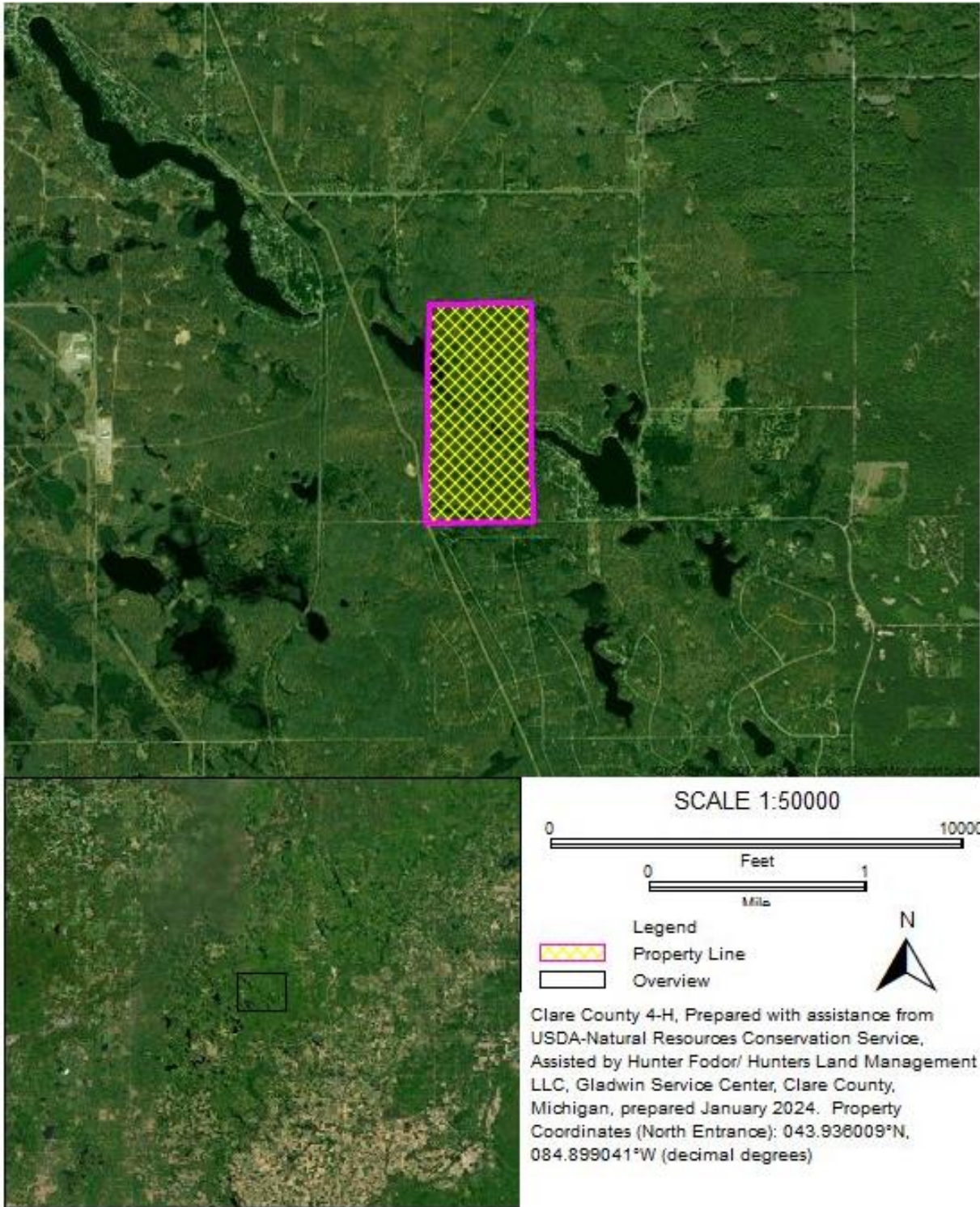
Legend
 Property
 Overview Map



Clare County 4-H, Prepared with assistance from USDA-Natural Resources Conservation Service, Assisted by Hunter Fodor/ Hunters Land Management LLC, Gladwin Service Center, Clare County, Michigan, prepared January 2024. Property Coordinates (North Entrance): 043.936009°N, 084.699041°W (decimal degrees)

Property Information				
Town: T18N	Range: R5W	Section: 22	Township: Lincoln	County: Clare
Property Legal Description (Quarter-Quarter Section, Quarter Section, Section, Township, Range, Township, County): <p style="text-align: center;">320 a. in W 1/2, 22, T18N, R5W, Lincoln Township, Clare County, MI</p>				
How to Find Property from Harrison, MI from the intersection of Main Street (M-61) & 1 st Street (Business 127): Head west on West Main Street (M-61). After 1.4 miles turn left (south) onto Harrison Avenue. After 4.1 miles turn right (west) onto Manssiding Road (turns into Soth Finley Kale Road). After 5.0 miles turn right (west) onto Jefferson Road. After 0.5 miles the southeast corner of the property will be on the right (north) side of the road.				

Landscape Map



Property Boundary Map

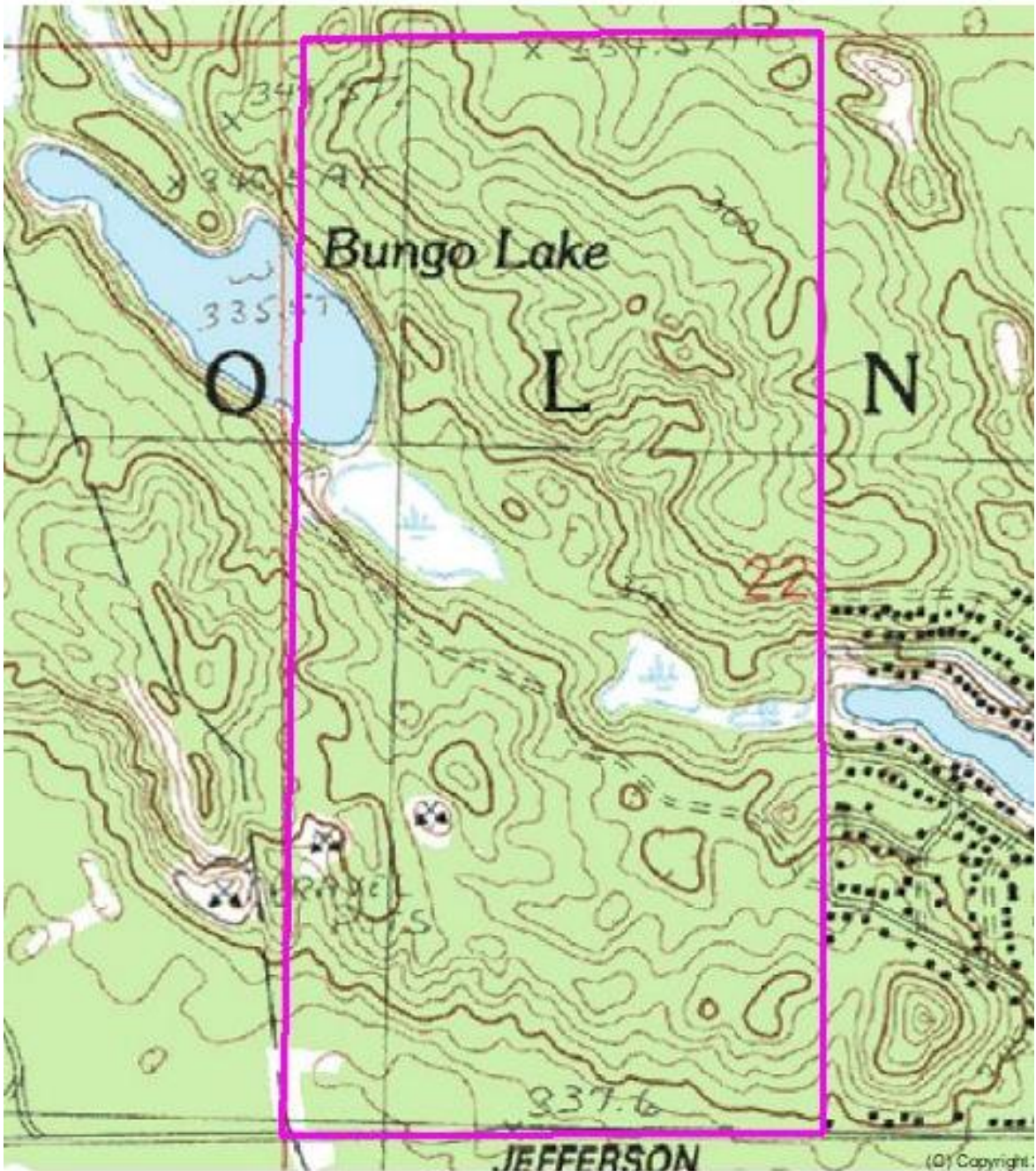


Legend
— Property Line

SCALE 1:12000
0 1000
Feet

Clare County 4-H, Prepared with assistance from USDA-Natural Resources Conservation Service, Assisted by Hunter Fodor/ Hunters Land Management LLC, Gladwin Service Center, Clare County, Michigan, prepared January 2024. Property Coordinates (North Entrance): 043.936009°N, 084.899041°W (decimal degrees)

Topographic Map



Legend
— Property Line

SCALE 1:12000

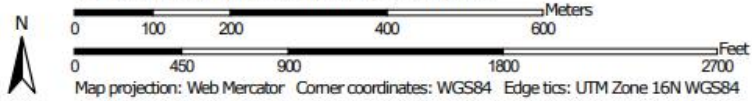


Clare County 4-H, Prepared with assistance from USDA-Natural Resources Conservation Service, Assisted by Hunter Fodor/ Hunters Land Management LLC, Gladwin Service Center, Clare County, Michigan, prepared January 2024. Property Coordinates (North Entrance): 043.936009°N, 084.899041°W (decimal degrees)

Soil Map



Map Scale: 1:9,450 if printed on A portrait (8.5" x 11") sheet.



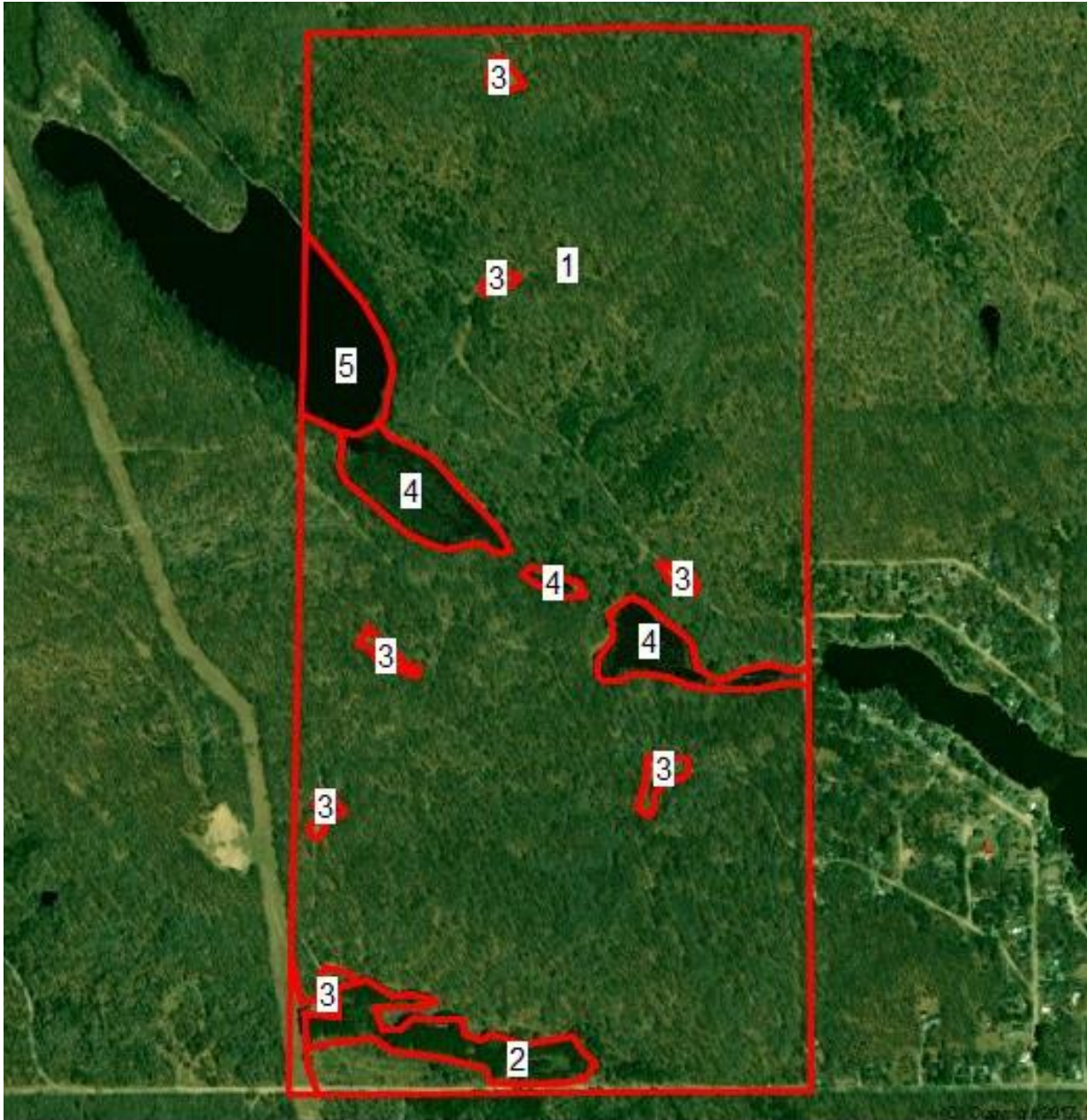
Clare County 4-H, Prepared with assistance from USDA-Natural Resources Conservation Service, Assisted by Hunter Fodor/ Hunters Land Management LLC, Gladwin Service Center, Clare County, Michigan, prepared January 2024. Property Coordinates (North Entrance): 043.936009°N, 084.899041°W (decimal degrees)

Soil Legend/ Classifications

Soil Map Legend and Soil Description Details										
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI	Depth to Restrictive Feature	Natural Drainage Class	Runoff Class	Depth to Water Table	Frequency of Flooding	Frequency of Ponding	Available Water Storage in Profile
GyB	Grayling sand, 0 to 6 percent slopes	3.7	1.2%	More than 80 inches	Excessively drained	Very low	More than 80 inches	None	None	0 to 60 inches: Low (about 3.4 inches)
Gycaab	Graycalm sand, 0 to 6 percent slopes	9.9	3.2%	More than 80 inches	Somewhat excessively drained	Very low	More than 80 inches	None	None	0 to 60 inches: Low (about 4.5 inches)
Gycaad	Graycalm sand, 6 to 18 percent slopes	118.1	38.3%	More than 80 inches	Somewhat excessively drained	Low	More than 80 inches	None	None	0 to 60 inches: Low (about 3.8 inches)
Lupaba	Lupton muck, 0 to 1 percent slopes	5.2	1.7%	More than 80 inches	Very poorly drained	Negligible	About 0 inches	None	Frequent	inches: Very high (about 23.9 inches)
MtD	Montcalm loamy sand, 6 to 18 percent slopes	151.7	49.2%	More than 80 inches	Well drained	Low	More than 80 inches	None	None	0 to 60 inches: Low (about 5.5 inches)
Ro	Roscommon mucky loamy sand	9.9	3.2%	More than 80 inches	Poorly drained	Negligible	About 0 inches	None	Frequent	0 to 60 inches: Low (about 4.7 inches)
W	Water	9.9	3.2%	-	-	-	-	-	-	-
Totals for Area of Interest		308.4	100.0%							

Additional information about forest productivity, equipment limitations, erosion/windthrow concerns, & site preparation/ seedling mortality can be found in Appendix V.

Management Stand Map



Legend
Stand Boundary

SCALE 1:12000
0 1000 2000
Feet

Clare County 4-H, Prepared with assistance from USDA-Natural Resources Conservation Service, Assisted by Hunter Fodor/ Hunters Land Management LLC, Gladwin Service Center, Clare County, Michigan, prepared January 2024. Property Coordinates (North Entrance): 043.936009°N, 084.899041°W (decimal degrees)

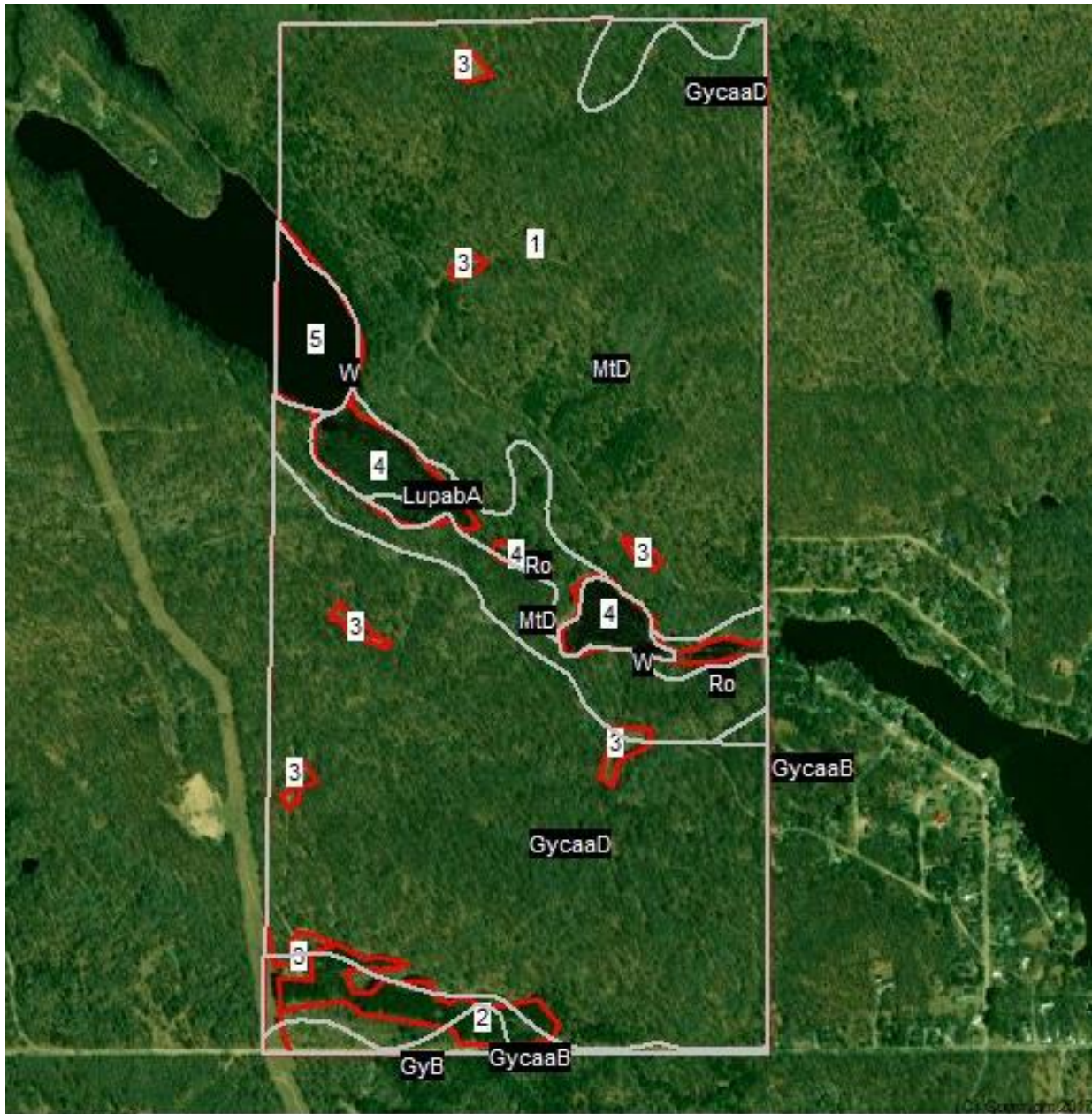
Management Stand Legend/Use Table

<u>Stand</u>	<u>Stand Type</u>	<u>Tree Size</u>	<u>Acres</u>	<u>Cover Type</u>
1	O	9	279.3	Well Stocked Oak Sawtimber
2	R	9	6.7	Well Stocked Red Pine Sawtimber
3	G	0	4.6	Grass
4	N	0	10.9	Marsh
5	Z	0	6.9	Water



Figure 2. Down aspen trees from beaver activity

Soil/Stand Map



Clare County 4-H, Prepared with assistance from USDA-Natural Resources Conservation Service, Assisted by Hunter Fodor/ Hunters Land Management LLC, Gladwin Service Center, Clare County, Michigan, prepared January 2024. Property Coordinates (North Entrance): 043.936009°N, 084.899041°W (decimal degrees)

Management Stands

Stand 1

Acres: 279.3	Stand Type: Well Stocked Oak Sawtimber (O9)	
BA: 117 ft ² (±31 ft ²)	S.I.: 63' tall/ 50 years (N. red oak)	Stand Age Type: Uneven-aged
Desired Future Condition: Even-aged Well Stocked Oak Seedling (O3), Even-aged Well Stocked Red Pine Seedling (R3), Uneven-aged Well Stocked Aspen Poletimber (A6), & Uneven-aged Well Stocked White Pine Poletimber (W6)		

Stand Description: This stand consists of a moderately/well stocked overstory dominated by Northern red oak and white oak. The northern portion of the stand has a slightly higher stem density/basal area. Soft maple and mixed aspen are also strong secondary components across the stand. There are locations in the northern half of the stand that also have a heavy Eastern white pine component. There is a considerable number of sporadic locations across the stand that are mixed aspen dominated (aspen patches).

In the past this stand looks to have had multiple thinning of overstory oak but no midstory or understory management which has resulted in a thick midstory of soft maple and witch hazel. A lack of sunlight to the forest floor in combination with heavy browse pressure from white-tailed deer has significantly reduced any current regeneration of oak and soft maple in the understory. Multiple locations across the stand also have had recent wind throw resulting in areas of down and damaged trees. A salvage harvest occurred shortly after to capture mortality value in these areas.

Stocking Table:

SPECIES COMPOSITION	BA		TPA	AVG DBH	AVG MHT	VOLUME PER ACRE	
						MBF	CORDS
	116.8		1886.8	3.4		5.61	12.97
N. red oak	50.7	43.4%	145.5	8.0	43.8	4.50	6.06
soft maple	33.2	28.4%	1422.0	2.1	13.0	0.33	2.43
mixed aspen	13.6	11.6%	117.4	4.6	26.1	0.09	1.98
white oak	12.1	10.4%	172.2	3.6	29.6	0.46	1.52
E. white pine	3.2	2.8%	11.7	7.1	32.9	0.12	0.50
mixed oak	2.9	2.4%	3.2	12.9	29.0	0.10	0.40
paper birch	0.7	0.6%	7.6	4.2	20.0		0.09
black cherry	0.4	0.3%	7.3	3.0	0.0		

Dominant/Co-dominant Tree Height: Average of 85' (18" DBH, N. red oak/white oak)

Current Stand Age (dominant/Co-dominant Trees): > 50 years old (based on S.I.)

Sawtimber Species Present: Soft maple, mixed oak, Northern red oak, white oak, mixed aspen, Eastern white pine, & red pine

Poletimber Species Present: Soft maple, mixed oak, Northern red oak, white oak, paper birch, mixed aspen, black cherry, & Eastern white pine

Sapling Species Present: Ranging from poorly - well stocked soft maple, Northern red oak, white oak, mixed aspen, black cherry, & Eastern white pine

Seedling Species Present: Poorly stocked soft maple, Northern red oak, & white oak
Observation difficult due to snow depth

Midstory/Understory Trees & Shrubs: Witch hazel (high density) & hawthorn (low density)

Other Vegetation: Ferns (various spp.). *Difficulty due to dormant season/snow depths during observations*

Main Soil Types Present: GycaaD (S.I.), MtD, Ro. See “Soil Map” and/or “Soil/Stand Map” for soil type distribution. See “Soil Classification” and “Forest Productivity” section for soil descriptions.

Fish and Wildlife Observations: Game trails, white-tailed deer sign (browse damage, tracks), observed a porcupine, & woodpecker sign (feeding/tree damage).

Forest Health: Overbrowsing occurring from white-tailed deer (high concern), invasive plant species densities (minor concern), noxious/undesirable native species densities (high concern), oak wilt disease (possible symptoms observed-further testing needed), oak decline (observed), & gypsy/spongy moth (observed).

Non-Native* & Invasive Plant Species Present:** Autumn olive** (low densities)

Noxious Native Plant Species Present: Witch hazel and fern

Herbivory Concerns: Moderate concern due to moderate browse impact on moderately preferred browse species (white-tailed deer)

Resource Concerns: Lack of desirable native regeneration, lack of desirable stems recruitment to the upper size class, lack of native woody stem diversity, increasing densities of invasive plant species, concerns with forest health issues, increasing densities of non-desirable species, & high browse damage occurring on desirable regeneration.

Desired Future Conditions: Desired future conditions are to create an even-aged stand of well stocked advanced oak seedling regeneration [O3] across most of the area where witch hazel is currently dominating the midstory and oak is abundant in the overstory. A 40 to 80-acre portion of the stand should be converted to a red pine plantation (even-aged red pine seedling) [R3]. Locations where mixed aspen is present should be similar in composition by the end of this plan cycle with management occurring on these locations during the next plan cycle [A6]. Areas where Eastern white pine is abundant should result in uneven-aged Eastern white pine poletimber [W6] dominance by the end of this plan cycle. These changes from management should result in four new stand types for the next plan cycle that will provide better diversity and future sustainable commercial value to the property.

Management Outline: Management should begin with property wide activities that include a reduction in the local white-tailed deer population (recommend a hunting lease and/or allowing members to hunt) and constructing multiple observational deer exclosures across this stand to monitor herbivory (white-tailed deer) browse impacts on desirable vegetation and understory species composition.

Individual stand management should begin with a midstory removal (brush management) across most of the stand. Removal should target witch hazel, invasive autumn olive, and saplings (< 4" DBH) anywhere oak is dominant in the overstory and aspen or Eastern white pine is lacking/absent: for removal utilize a combination of mechanical and chemical treatment - herbicide treat all removed stumps EXCEPT oak and aspen [area will be future stand **O3**]. In areas where aspen is abundant/dominant in the overstory (aspen patches) maintain all stems, including shrubs (these areas will be assessed in the next plan cycle for management) [area will be future stand **A6**]. In areas where Eastern white pine is abundant/dominant utilize a thinning (non-commercial FSI) to remove all stems < 12" DBH EXCEPT pine [area will be future stand **W6**].

Next locate a total of 40 to 80-acres across the stand where overstory is at the lowest basal area/ midstory removal has occurred and utilize a clear cut (commercial FSI) to remove all stems [area will be future stand **R3**]. Follow up with a broad herbicide treatment to reduce/remove all competitive vegetation (stump sprouts, seedlings/herbaceous plants) and then utilize mechanical site preparation to create planting furrows. Lastly, utilize artificial row planting of red pine in this area to convert to a red pine plantation.

In the remainder of the stand where midstory removal occurred follow up with ground scarification to promote oak regeneration [**O3**]. Also utilize ground scarification in location(s) where thinning for white pine occurred as well [**W6**].

Also consider using remaining woody stem material (from midstory removal and slash from non-commercial/commercial FSI) to create slash deer exclosures and/or brush piles for small game habitat (CSP activity E666O).

Best Management Practices: avoid any management that could damage oak trees during oak wilt season (April 15 – July 15). Avoid moderate/steep terrain during time of moist soils to reduce erosion. Avoid herbicide use during times of high precipitation.

No-Action and Alternative Outcomes: If no action occurs (non-commercial management activities are not completed and deer population is not reduced), or only commercial logging occurs, this stand will quickly progress away from a forested stand and become only witch hazel dominated moving into the future.

Conservation Practices:

Date	Conservation Activity (EQIP Code - Scenario)	I.D. #	Acres
July 2026	Midstory Removal, Brush Management (314-9)	1a	~180.0
Description: Removal of all witch hazel, invasive shrubs, and saplings (<4" DBH) in areas where oak is dominant in the overstory. Herbicide treat all stems EXCEPT removed oak and aspen. Avoid areas where aspen or Eastern white pine is abundant/dominant in the overstory.			
Objective: Reduce midstory canopy to adjust light conditions to promote oak seed germination & advanced oak regeneration establishment.			
Marking: Mark out boundary of areas with specifications for removal.			
July 2027	Ground Scarification, Tree Site Preparation (490-1)	1b	~100.0
Description: Scarification of the soil under oak overstory dominance/ midstory removal areas.			
Objective: Increase oak seed germination & advanced oak regeneration establishment.			
Feb. 2029	Clear Cut, Commercial Forest Stand Improvement (666-11)	1c	~80.0
Description: Remove all stems >4" DBH			
Objective: Prepare site for artificial regeneration (planting of red pine).			
Marking: Mark out boundary of areas with specifications for removal.			
Feb. 2029	Overstory Removal/Thinning – Non-Commercial FSI (666-9)	1d	~40.0
Description: Removal of all stems < 12" DBH (EXCEPT pine) in area of pine dominance.			
Objective: Release Eastern white pine seedlings, saplings, and poletimber.			
Marking: Mark out boundary of areas with specifications for removal.			
July 2030	Broad Herbicide Treatment (315-4)	1e	~80.0
Description: Broad herbicide treatment of future red pine plantation area.			
Objective: Reduce competitive competition with upcoming red pine seedling planting.			
Aug. 2030	Planting Furrows, Tree Site Preparation (490-1)	1f	~80.0
Description: Create planting furrows for red pine seedlings.			
Objective: Provide minimal competition and ideal growing scenario for red pine seedlings.			
Aug. 2030	Ground Scarification, Tree Site Preparation (490-1)	1g	~40.0
Description: Scarification of the soil under white pine overstory dominance/ thinned areas.			
Objective: Increase white pine seedling densities & advanced pine regeneration establishment.			
May 2031	Red Pine Plantation Planting, Tree Establishment (612-1)	1h	~80.0
Description: Planting of red pine seedlings.			
Objective: Establish red pine plantation.			

Note: Most management recommendations above are non-commercial and will not result in a positive monetary return. Commercial forest stand improvement should result in a positive monetary return. Preparing for commercial forest stand improvement (timber harvest) should begin 1 year prior to the scheduled harvest date. Contact your local NRCS office at least 1-year prior to scheduled activities to apply for EQIP or CSP cost/share opportunities.

To ensure that management activities are being performed correctly it is highly recommended to utilize the services of a certified ecologist, biologist, or forester to ensure objectives are met. For practices involving forest manipulation the services of a consulting forester are highly recommended. See Appendix III for more information on recommended management activities. See Appendix V for additional stand/soil data.



Figure 3. Large oak in the overstory with a dense midstory layer in Stand 1

Stand 2

Acres: 6.7	Stand Type: Well Stocked Red Pine Sawtimber (R9)	
BA: 170 ft ²	S.I.: 60' tall/ 50 years (red pine)	Stand Age Type: Uneven-aged
Desired Future Condition: Uneven-aged Well Stocked Red Pine Sawtimber (R9)		

Stand Description: This stand consists of a red pine plantation in the sawtimber/poletimber size class. Based on current conditions numerous thinning's have occurred in the past. A second cohort of sapling/seedling sized oak, maple, & witch hazel is present beneath the overstory. There are some pockets of mortality across the stand which could possibly be red pine pocket decline/mortality or heterobasidion root disease.

Stocking Table:

SPECIES COMPOSITION						VOLUME PER ACRE	
	BA		TPA	AVG DBH	AVG MHT	MBF	CORDS
	170.0		400.0	8.8		14.47	19.03
red pine	150.0	88.2%	158.9	13.2	45.9	14.47	17.75
soft maple	20.0	11.8%	241.1	3.9	8.0		1.28

Dominant/Co-dominant Tree Height: 71' tall (15" DBH, red pine)

Current Stand Age (dominant/Co-dominant Trees): > 50 years old (based on S.I.)

Sawtimber Species Present: Soft maple, Northern red oak, white oak, & red pine

Poletimber Species Present: Soft maple & red pine

Sapling Species Present: Well stocked soft maple, mixed oak, Northern red oak, white oak, paper birch, mixed aspen, & black cherry

Seedling Species Present: Well stocked, soft maple, Northern red oak, & white oak.
Observation difficult due to snow depth

Midstory/Understory Trees & Shrubs: Witch hazel (high density)

Other Vegetation: Ferns (various spp.). *Difficulty due to dormant season/snow depths during observations*

Main Soil Types Present: GyCaaB (S.I.), GyB. See "Soil Map" and/or "Soil/Stand Map" for soil type distribution. See "Soil Classification" and "Forest Productivity" section for soil descriptions.

Fish and Wildlife Observations: White-tailed deer sign (browse damage, tracks)

Forest Health: Invasive plant species densities (minor concern), noxious/undesirable native species densities (moderate concern), Possible red pine pocket decline/mortality (dead red pine observed), & Possible heterobasidion root disease (dead pine observed).

Non-Native* & Invasive Plant Species Present:** Autumn olive**(low density)

Noxious Native Plant Species Present: Witch hazel (moderate densities)

Herbivory Concerns: Moderate concern due to moderate browse impact on moderately preferred browse species (white-tailed deer) & moderate browse impact on minimally preferred browse species (white-tailed deer).

Resource Concerns: Lack of desirable native regeneration, lack of desirable stems recruitment to the upper size class, concerns with forest health issues, increasing densities of non-desirable species, & high browse damage occurring on desirable regeneration.

Desired Future Conditions: Desired future conditions are to continue to promote advanced regeneration (of desirable species) in the understory that should include soft maple, oak, and some pine. A significant reduction in witch hazel, invasive plant species, and non-desirable species/ poor quality stems should occur with retention stems being of preferred species and higher quality by the end of this plan cycle.

Management Outline: Management should begin with property wide activities that include reduction in the local white-tailed deer population and constructing multiple observational deer exclosures across this stand to monitor herbivory (white-tailed deer) browse impacts on desirable vegetation and understory species composition.

Individual stand management should focus on thinning in the midstory/understory (brush management) to reduce witch hazel and invasive autumn olive competition with more desirable species such as oak and maple. Utilize herbicide treatment on stumps to reduce stump sprouting of removed stems.

Assess the overstory for a commercial thinning during the next plan cycle (in coordination with commercial management of other adjacent stands).

Best Management Practices: Further investigation should occur with mortality occurring to determine cause and mitigate appropriately.

No-Action and Alternative Outcomes: If no management occurs the understory will continue to recruit slowly with less desirable species (as browse to white-tailed deer) like witch hazel will dominate moving into the future.

Conservation Practices:

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>Acres</u>
July 2028	Midstory /Understory Thinning, Brush Management (314-9)	2a	6.7
Description: Removal (chemical or mechanical/chemical) of witch hazel and autumn olive.			
Objective: To reduce competition with desirable species such as oak and maple.			

Note: All management recommendations above are non-commercial and will not result in a positive monetary return. Contact your local NRCS office at least 1-year prior to scheduled activities to apply for EQIP or CSP cost/share opportunities.

To ensure that management activities are being performed correctly it is highly recommended to utilize the services of a certified ecologist, biologist, or forester to ensure objectives are met. For practices involving forest manipulation the services of a consulting forester are highly recommended. See Appendix III for more information on recommended management activities. See Appendix V for additional stand/soil data.



Figure 4. A view of Stand 2 (a pocket of pine mortality is present on the right)

Stand 3

Acres: 4.6	Stand Type: Grass (G)
Desired Future Condition: Grass (G)	

Stand Description: This stand is comprised of a section of the powerline in the southwest corner and various small forest openings already present across the property. Most of these openings have successional progression towards woody stem dominated along the outer edges with established mixed deciduous seedlings/saplings.

Main Soil Types Present: MtD, GyCaaD, GyCaaB. See “Soil Map” and/or “Soil/Stand Map” for soil type distribution. See “Soil Classification” and “Forest Productivity” section for soil descriptions.

Fish and Wildlife Observations: Game trails & white-tailed deer sign (browse damage, tracks)

Stand Health: No concerns observed.

Non-Native* & Invasive Plant Species Present:** Autumn olive (low density)

Noxious Native Plant Species Present: Native woody stem encroachment.

Herbivory Concerns: None observed

Resource Concerns: None observed

Desired Future Conditions: Desired future conditions are to maintain these openings (and others not delineated in Stand 1 and Stand 2) as areas dominated by native herbaceous plants (grasses & forbs/wildflowers). These areas will also be used for equipment/material staging during management activities and parking locations for recreational/educational use. Expect a small portion of Stand 1 and Stand 2 to be “added” to this stand during the next plan cycle.

Management Outline: Management should begin by removing woody stem encroachment around the exterior of these openings with a forestry mulcher. Next utilize a non-selective broad herbicide treatment to remove all established vegetation and then follow-up with planting of native grasses & forbs/wildflowers.

Utilize selective chemical spot treatment/disking or prescribed burning periodically during the next plan cycle as well to maintain herbaceous plant dominated species composition.

Best Management Practices: Avoid herbicide use during times of high precipitation.

No-Action and Alternative Outcomes: If recommended management does not occur succession will continue to close these openings converting to forest dominated moving into the future.

Conservation Practices:

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>Acres</u>
Aug. 2029	Midstory/Understory Removal, Brush Management (314-4)	3a	~10.0
Description: Utilize a forestry mulcher to remove all woody stems.			
Objective: Remove all woody stems within the stand boundaries.			

July 2030	Broad Herbicide Treatment (315-4)	3b	~10.0
Description: Broad herbicide treatment of stump sprouts and current herbaceous vegetation.			
Objective: Reduce competitive with upcoming native herbaceous planting.			
May 2031	Herbaceous Planting, Conservation Cover (327-2, 327-4)	3c	~10.0
Description: Planting of native grasses &/or forbs/wildflowers.			
Objective: Establish beneficial native early successional habitat.			

Note: All management recommendations above are non-commercial and will not result in a positive monetary return. Contact your local NRCS office at least 1-year prior to scheduled activities to apply for EQIP or CSP cost/share opportunities.

To ensure that management activities are being performed correctly it is highly recommended to utilize the services of a certified ecologist, biologist, or forester to ensure objectives are met. See Appendix III for more information on recommended management activities. See Appendix V for additional stand/soil data.



Figure 5. A view of one of the forest openings (Stand 3) on the property

Stand 4

Acres: 10.9	Stand Type: Marsh (N)
Desired Future Condition: Marsh (N)	

Stand Description: This stand consists of lowland soils/wetland corridor moving east from Bungo Lake (Stand 5) towards Bertha Lake. In portions of the stand periodic flooding/ponding looks to have occurred in the past due to beaver activity while other areas are currently flooded from beaver dams. Adjacent to this area in Stand 1 there are high numbers of trees that have been removed by beavers as well. One portion of the stand has an abandoned beaver lodge at higher elevation in adjacent Stand 1 suggesting that a large beaver pond/flooding occurred here prior. Plant dominance is in herbaceous species mainly dominated by sedge and fern. Some standing water is present across the stand.

Main Soil Types Present: LupabA, Ro, W. See “Soil Map” and/or “Soil/Stand Map” for soil type distribution. See “Soil Classification” and “Forest Productivity” section for soil descriptions.

Fish and Wildlife Observations: Game trails & beaver sign (tree girdling/felling, slide, lodge, dam/flooding)

Stand Health: No concerns observed

Non-Native* & Invasive Plant Species Present:** None observed

Noxious Native Plant Species Present: Sedge

Herbivory Concerns: None observed

Resource Concerns: None observed

Desired Future Conditions: Desired future conditions are to allow beaver activity to naturally occur to provide wildlife habitat benefits and a recreational/educational opportunity to observe various wildlife that frequent beaver ponds/floodings (waterfowl, shore birds, etc.).

Management Outline: No management recommendations at this time.

Best Management Practices: Avoid equipment use due to moist soils

No-Action and Alternative Outcomes: Will continue to periodically be flooded by beaver activity moving into the future.

Conservation Practices:

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>Acres</u>
2033	No Practice	-	-



Figure 6. A view of a portion of Stand 4

Stand 5

Acres: 6.9	Stand Type: Water (Z)
Desired Future Condition: Water (Z)	

Stand Description: This stand is made up of Bungo Lake.

Main Soil Types Present: W. See “Soil Map” and/or “Soil/Stand Map” for soil type distribution. See “Soil Classification” and “Forest Productivity” section for soil descriptions.

Fish and Wildlife Observations: None observed

Stand Health: None observed

Non-Native* & Invasive Plant Species Present:** None observed

Noxious Native Plant Species Present: None observed

Resource Concerns: None observed

Desired Future Conditions: Maintain as is.

Management Outline: No recommendations currently. For recreational access create well planned/implemented trails to the waters edge to avoid erosion and degradation of the steep slopes adjacent to the water in Stand 1.

Best Management Practices: Create trails to waters edge where desired with proper planning/implementation to avoid/minimize erosion.

No-Action and Alternative Outcomes: N/A

Conservation Practices:

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>Acres</u>
2033	No Practice	-	-

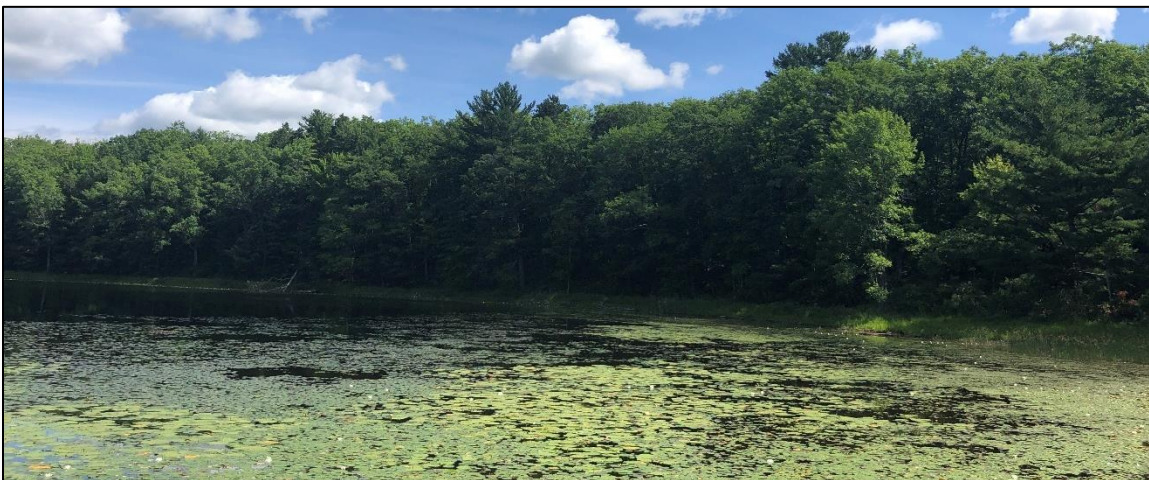


Figure 7. A view of Bungo Lake (Stand 5)

Additional Management Considerations

Forest Openings

Forest openings are canopy gaps located within a forested stand that range from as small as 1/20th of an acre to a few acres in size. These openings can provide a multitude of benefits including habitat for native wildlife species, recreational use opportunities, and staging locations for equipment/wood products during scheduled management activities.



Native Herbaceous/Shrub Plant Communities: These openings naturally consist of native plant communities

dominated by herbaceous plants and/or shrubs. Historically these openings would be temporary until forest succession took hold or maintained long term with periodic natural disturbances (wind or fire). The native plant community within the forest opening provides necessary habitat elements to a range of terrestrial and aerial wildlife species. To maintain forest openings periodic prescribed burning, mowing, and/or ground scarification will need to occur.

Management (and Food Plots): Forest openings should be managed to ensure that plant dominance is maintained as herbaceous plants and/or shrubs. These openings can be entirely utilized for wildlife food plots but do not provide nearly the benefit of a natural native plant community. An ideal compromise is to maintain the center of the opening as a natural native plant community and create a narrow exterior food plot on the forest edge that can double as a firebreak for periodic prescribed burning (that maintains the early successional plant community present in the interior). This scenario will then provide both wildlife and recreational benefits.

Invasive Species Concerns: Often these openings provide “edge” locations that can be ideal environments for invasive plant species. If invasive plant species begin to take hold within these locations, they can outcompete native vegetation and become unproductive sites for wildlife and recreation as well as encroach into the adjacent forest. Frequent monitoring, and management, of these openings is crucial to the opening itself as well as the surrounding forested stand.

Scheduled Forest Practices: Forest openings are excellent locations to utilize while performing scheduled management activities. During management that requires equipment these locations can be used as staging areas to load/unload equipment and store fuel, equipment, and chemicals. During commercial forest stand improvement operations these areas can also be utilized as log landings/decking areas where harvested trees are brought to, processed, sorted, and transferred to log trucks for shipment to the mills.

Flowing Water Resources

Flowing water (rivers, streams, and creeks) across properties can be greatly beneficial to wildlife and great locations for recreational activities.

Flowing water can provide great habitat for waterfowl, fish, and other aquatic species. These flowing bodies of water often provide extensive benefits to the larger landscape in the



area as well. All flowing water provides a water source to a variety of terrestrial wildlife and can allow for certain species to inhabit an area more frequently.

Management: Due to government regulation management of flowing water is often limited. However, management of the riparian zone (adjacent land) can provide a beneficial impact on the water source and goals of the landowner. Maintaining desirable native species along the banks to improve bank stability can be crucial to water quality. Additionally, this can also provide benefits to aquatic species for habitat and water temperature regulation. should be focused on the goals of the water source. Depending on the designation of flowing water these management activities may need approval from government agencies. Also consider and utilize Best Management Practices (BMP's) when managing locations adjacent to lakes/ponds to ensure minimal negative impacts occur on the water resource.

Invasive Species Concerns: Invasive species can greatly degrade water resources. Many invasive aquatic plants can displace native species while also having little to no benefit to wildlife. Certain invasive species can displace water, interrupt natural flow, and even alter water temperatures. Efforts should be made to remove these invasive species when present and frequent monitoring should occur to identify new occurrences as soon as possible.

Crossing Rivers, Streams, and Creeks: Often times flowing water sources may limit the accessibility of portions of the property. If equipment access is required, then a permanent or temporary crossing will be needed. These crossings REQUIRE a permit from the Michigan Department of Environment, Great Lakes & Energy (EGLE) to construct and utilize. Constructing such a crossing should incorporate careful planning, construction, and maintenance to ensure the ecological integrity of the water way is maintained.

Access Trails

Access trails on a property are a crucial element when implementing scheduled management activities. These trails also provide access for recreational use as well. Access trails can be used for a multitude of purposes (depending on their size and structure) including hiking, off-road vehicles, and equipment access. Ideally a property will have an appropriate trail system that can provide adequate access to all management stands while also limiting the negative impacts (ground compaction, fragmentation, reduced aesthetics, etc.)



Access Types: Trails can provide a variety of different access types. Small trails may provide access for foot-traffic and small ORV's. Other locations on the property may require heavy duty trails that can be accessed by large trucks and equipment. Planning and implementation of a trail system should consider the access type required to different locations/stands on the property into the foreseeable future. Ensure that trails across the property provide the appropriate access type where needed. Suitable access allows for higher quality and time efficient management.

Management: Access trails should be maintained on an annual basis. Management includes removal of encroaching vegetation/down woody debris/hazardous trees, erosion prevention, and adding fill material to degraded sections. Erosion can be minimized by carefully planning trail direction/layout, planting certain types of vegetation, and incorporating water bars/drainage slopes where appropriate. Monitoring and managing invasive plant species is also a high priority as these trails provide avenues for these plants to invade native ecosystems on the property. Trails can also provide benefits to wildlife and recreation by planting vegetation that doubles as a food source that wildlife can utilize (clover, annual grains, etc.). When creating new trails ensure that proper planning occurs to ensure that the access trails created will be appropriate for the location, structurally sound for use, and can be maintained for use into the future.

Erosion Concerns: Erosion is often the most degrading factor of access trails. Based on the type of fill material, slope, and annual use trails can become degraded to the point where access is nearly impossible. By planning your trail system in accordance with slopes and soil types, using appropriate fill material, avoiding use during periods of high degradation (after heavy rains, spring thaw, etc.), and maintaining beneficial vegetation trail erosion can become a minimum concern.

Standing Water Resources

Lakes and ponds provide habitat/benefits for wildlife/fish and great locations for recreational activities. Seasonal ponds (vernal pools) and shallow lakes/ponds can provide great habitat for certain waterfowl species, fish, and other aquatic species. Water sources that have significant depths and size



can be great locations for sustained fisheries and other aquatic species. All lakes/ponds provide a water source to a variety of terrestrial wildlife and can allow for certain species to inhabit an area more frequently.

Management: Lake/pond management should be focused on the goals of the water source. Shallow lakes/pond management may need to be managed for desirable species and maintenance of vegetation may need to occur to ensure open water is not reduced and acceptable depths are maintained. Deeper lakes/ponds may need to be managed to ensure appropriate depths are present to avoid freeze-out/fish kill-off during the winter. All water sources should be monitored for invasive species as these plants can greatly degrade water sources. Depending on the size and locations of these water sources management activities may need approval from government agencies. Also consider and utilize Best Management Practices (BMP's) when managing locations adjacent to lakes/ponds to ensure minimal negative impacts occur on the water resource.

Invasive Species Concerns: Invasive species can greatly degrade water resources. Many invasive aquatic plants can displace native species while also having little to no benefit to wildlife. Certain invasive species can displace water, interrupt natural flow, and even alter water temperatures. Efforts should be made to remove these invasive species when present and frequent monitoring should occur to identify new occurrences as soon as possible.

Creating New Lakes/Ponds: Lakes/ponds are a great resource to have on your property. However, always remember that ponds are not feasible in all locations and soil types. Other factors determining where ponds can be dug are based on laws and regulations enforced by the Michigan Department of Environment, Great Lakes & Energy (EGLE). Check with your local natural resources government organizations to ensure that digging a pond is allowed. Ensure that proper planning occurs to ensure that the artificial lake/pond will achieve the goals of the water source.

Conservation Activity Schedule

<u>Date</u>	<u>Conservation Activity (EQIP Code - Scenario)</u>	<u>I.D. #</u>	<u>X</u>
2024	American Tree Farm System Enrollment/Initial Inspection		X
2024	Apply for NRCS EQIP Funding		
2024	Begin White-tailed Deer Population Reduction (possible hunting lease?)		
Aug. 2025	Forest Trail Establishment (655-2)	0a	
Aug. 2025	Construct Observational Deer Enclosures (612-73)	0c	
July 2026	Midstory Removal, Brush Management (314-9)	1a	
July 2027	Ground Scarification, Tree Site Preparation (490-1)	1b	
July 2028	Midstory /Understory Thinning, Brush Management (314-9)	2a	
2029	American Tree Farm System Inspection		
Feb. 2029	Clear Cut, Commercial Forest Stand Improvement (666-11)	1c	
Feb. 2029	Overstory Removal/Thinning – Non-Commercial FSI (666-9)	1d	
Aug. 2029	Midstory/Understory Removal, Brush Management (314-4)	3a	
July 2030	Broad Herbicide Treatment (315-4)	1e	
July 2030	Broad Herbicide Treatment (315-4)	3b	
Aug. 2030	Planting Furrows, Tree Site Preparation (490-1)	1f	
Aug. 2030	Ground Scarification, Tree Site Preparation (490-1)	1g	
May 2031	Red Pine Plantation Planting, Tree Establishment (612-1)	1h	
May 2031	Herbaceous Planting, Conservation Cover (327-2, 327-4)	3c	
2033	Update Forest Management Plan		
2033	No Practice	4 & 5	
<i>Management activity preparation should begin 1-year prior for non-commercial management activities & 2-years prior for commercial management activities to assess/apply for cost/share funding, execute appropriate planning, and arrange contractors if necessary.</i>			

Monitoring

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

Appendix I

Glossary of Common Forestry Terms

The following glossary is adapted from www.dnr.state.md.us/forests/gloss.html.

- Abiotic:** non-living parts of an environment such as sunlight, temperature, wind, water, soil, etc.
- Aerial Wildlife:** Wildlife species that live predominantly or entirely in the air/ above ground level.
- Afforestation:** Convert (land) into forest, especially for commercial use.
- Agroforestry:** A land-use system that combines both agriculture and forestry in one location.
- Alley Cropping:** Widely spaced rows of trees with annual crops growing in between the rows.
- Artificial Food Source:** Plants that are planted and maintained with the requirement of human facilitation. Often planted for human consumption or as a wildlife attractant/ supplemental food source. Example: food plots, orchards, etc.
- Artificial Regeneration/Planting:** Planting of trees, shrubs, or herbaceous plants by humans using hand tools or equipment.
- Assisted Natural Regeneration:** Management methods used to “assist” natural regeneration to establish and recruit. Examples include ground scarification, protection from deer, and competition thinning.
- Aquatic Wildlife:** Wildlife species that live predominantly or entirely in the water.
- Basal Area (BA), Tree:** Cross sectional area of a tree at 4.5 feet off ground in units of square feet (ft²).
- Basal Area (BA), Forest:** Basal area of all trees per acre compiled, in units of ft²/acre; measure of density.
- Basal Area Factor (BAF):** Is the number of units of basal area per acre (or per hectare) represented by each tree. The formula for basal area = $(3.1416 \times \text{DBH}^2) / (4 \times 144)$. This formula simplifies to basal area = $0.005454 \times \text{DBH}^2$
- Basal Area Standard Deviation (BA Std Dev):** Quantity indicating the extent of deviation for the Basal area samples taken. Signifies difference in Basal Area across the stand.
- Biomass:** Harvesting and using whole trees or parts of trees for energy production
- Biotic:** Living organisms
- Board Foot:** A measure of volume 1 foot by 1 foot by 1 inch or 144 cubic inches of wood. Depicted in Doyle, Scribner, or International ¼ scale.
- Bolt:** A 8-foot-long log.
- Bramble:** Any rough, tangled, prickly shrub, usually in the genus *Rubus*, which grows blackberries, raspberries, or dewberries.
- Broad Herbicide Treatment:** Treatment of all vegetation in an area regardless if it is desired or not; non-selective
- Browse:** Parts of woody plants, including twigs, shoots, and leaves, eaten by forest animals.
- Carbon Cycle:** The biogeochemical cycle to exchange carbon between the biosphere and atmosphere by means of photosynthesis, respiration, and combustion.
- Clearcut:** The harvest of all the trees in an area to reproduce trees that require full sunlight.
- Coarse Woody Debris:** Dead pieces of wood that are currently laying upon the ground with a diameter larger than 10 cm. This can include full trees, logs, and branches. Also referred to as Down Dead Wood (DDW)
- Commercial Management:** Management that results in the removal of trees/products that have monetary value that outweighs the cost of removal and therefore results in a positive financial return to the owner.
- Cord:** A unit of wood cut for fuel that is equal to a stack 4 x 4 by 8 feet or 128 cubic feet
- Cordwood:** Small diameter or low-quality wood suitable for firewood, pulp, or chips.
- Crop Tree:** A young tree of a desirable species with certain desired characteristics.
- Crown:** The uppermost branches and foliage of a tree.
- Cruise:** A forest survey used to obtain inventory information and develop a management plan.
- Cull Tree:** A tree designated for removal that has no timber value because of poor shape or damage.
- Cut-to-Length Harvest:** Trees are felled and processed in the forest and removed in small lengths usually not exceeding 16’.
- Decking Area:** A staging area for logs during a “Cut-to-Length Harvest”. Usually along a road/trail or in a small opening. Often less than 1/4 acre.
- Deforestation:** Deforestation, or land clearing, is the removal of a forest or stand of trees from land that is then converted to non-forest use.
- Diameter at Breast Height (DBH):** Diameter of a tree trunk taken at 4 1/2 feet off the ground.
- Diameter Distribution:** The variation of tree diameter sizes in a species cohort, stand, or larger area.

Diameter-Limit Sale/Harvest: 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 poor forestry practice.

Down Dead Wood (DDW): See coarse woody debris (CWD) and fine woody debris (FWD)

Early Successional Habitat: Well developed ground cover or shrub and young tree component, lack a closed, mature tree canopy, and are created or maintained by intense or recurring disturbances.

Endangered Species: A species in danger of extinction.

Even-Aged Stand: Forest Stand with the age difference between the oldest and youngest trees is minimal (<10 years).

Fauna: The animals of a particular region, habitat, or geological period

Fescue: Any of the narrow-leaved grass species.

Fine Woody Debris (FWD): Dead pieces of wood that are currently laying upon the ground with a diameter smaller than 10 cm. This includes branches, twigs, and small down dead trees. Also referred to as Down Dead Wood (DDW)

Flora: The plants of a particular region, habitat, or geological period

Forestland: Land at least one acre in size that is at least 10 percent stocked with trees.

Forest Farming: Cultivating high value specialty crops in the shade of natural forests.

Forest Stand Improvement (FSI): Any practice that increases the health, composition, value, or rate of growth in a stand. Also called Timber Stand Improvement when focused on timber production.

Full-Length Harvest: Trees are felled and pulled out whole. This method is often used when chipping is involved.

Goal: The main reason a landowner owns the property or what they are trying to achieve on the property.

Group Selection: Harvesting groups of trees to open the canopy and encourage uneven aged stands.

Ground Scarification: Disturbing the understory layer by creating ground disturbance to the duff and often exposing bare soil.

Habitat: The ecosystem in which a plant or animal lives and obtains food and water.

Hard maple: Forest Industry term for sugar maple

Hardwoods: A general term encompassing broadleaf, deciduous trees.

High-Grading: To remove all good quality trees from a stand and leave only inferior trees.

Hydric: Characteristic of high amounts of moisture, wet conditions

Hydrophilic Plants: vegetation that grows in water or on a substrate that is at least periodically deficient in oxygen because of excessive water content (i.e., plants typically found in wet habitats).

Intolerance: Characteristic of certain tree species that does not permit them to survive in the shade.

Invasive: Tend to spread prolifically. Have little to no wildlife, human, or ecosystem value: often undesirable and/or harmful.

Landing Area: Cleared area where logs are processed/chipped, piled, and loaded for transport to a sawmill. This is used during “Tree Length Harvest” or “Full Length Harvest”. Area usually exceeds ½ acre in size.

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.

Mesic: Characteristic of moderate amounts of moisture, a medium between xeric and

Micro-Stand: A relatively small area of difference (i.e. species composition, stem size/age, etc.) that is located in a larger management stand that may be identified and possibly management differently than the remaining larger stand it is within.

Microtopography: The surface features of a landscape on a small or microscopic scale.

Midstory Canopy: A secondary canopy that is created under the main canopy usually by codominant stems. Often created by saplings and shrubs.

Mixed ash: Trees include one or more of the following: white ash, green ash, and black ash.

Mixed aspen: Trees include one or more of the following: bigtooth aspen, trembling/quaking aspen, Eastern cottonwood, and balsam poplar.

Mixed Elm: Trees include one or more of the following: Red/slippery elm and American/white elm.

Mixed Hickory: Trees include one or more of the following: shagbark, shellbark, pignut, and bitternut hickory.

Mixed Oak: Trees include one or more of the following: black, northern pin, and scarlet oak.

Mixed Spruce: Trees include one or more of the following: White spruce, black spruce, Norway spruce, and Colorado blue spruce.

Natural Regeneration: Renewal of forests by means of self-sown seeds, root suckers, or coppicing that is independent of human interference (artificial regeneration)

Non-Commercial Management: Management that does not result in the removal of commercially valuable products and therefore is a monetary cost to the landowner to perform.

Objective: A target that needs to be achieved to contribute to the overall “Goal”

Old Growth: The stage is the hypothesized consequence of no disturbances occurring to the forest within the natural life span of the oldest trees that began in the stand initiation stage. It can take on many forms, but the process is one of trees and other plants having all begun during the understory re-initiation stage or later. (stage 4 of 4), *see stand initiation, stem exclusion, and understory re-initiation.*

Overbrowsing: When herbivores consume a portion (or all) of a plant that inhibits its ability to regenerate or continue to grow.

Over-mature: Trees that have declined in growth rate because of old age and loss of vigor.

Overstocked: Trees are so closely spaced that they do not reach full growth potential.

Poletimber: Trees 4.1 to 12.0 inches DBH.

Pre-Commercial Operations: Cutting to remove wood too small to be sold.

Prescribed Fire/Burn: An intentional and controlled fire used as a management tool used to reduce hazardous fuels or unwanted understory plants (invasive, undesirable species, etc.).

Prescription: A detailed plan of action that contributes to the success of objectives and goals

Pruning: The removal of selected branches on the stem of a tree to increase value or seed production.

Pulp/firewood: Wood within a tree suitable for use in paper manufacturing or firewood production.

Range: Cattle grazing in natural landscapes.

Reforestation: The natural or intentional restocking of existing forests and woodlands (forestation) that have been depleted, usually through deforestation, or other means.

Regeneration: The process by which a forest is reseeded and renewed.

Riparian Zone/Forest Buffers: Strips of land along stream banks where trees, shrubs and other vegetation are planted and managed to capture erosion from agricultural fields.

Root/Stump Suckers: Shoots/sprouts that emerge from adventitious buds on the stump or roots that create a clone stem.

Salvage Harvest/Cut: The removal of dead, damaged, or diseased trees to recover value.

Sapling: A tree at least 4 1/2 feet tall and between 0.1 inch and 4.0 inches DBH.

Sawlog: A log large enough to be sawed economically, usually >12-inch diameter and >8 feet long.

Sawtimber: A tree whose DBH is greater than 12 inches.

Scale Sale: A commercial timber sale that is paid on a percentage by product based on the volume that is taken to the mill.

Sealed-Bid Sale: A timber sale in which buyers submit a bid that is kept confidential until the bid opening date to deter unwanted behavior and maximize the likelihood of higher profit.

Seedling: A tree less than 4 1/2 feet tall and between 0.1 inch and 4.0 inches DBH.

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

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

Selective Herbicide Treatment: Treatment of selective plants to remove while avoiding desirable species.

Shelterwood Harvest: Harvesting all mature trees in two or more cuts, leaving trees to protect seedlings.

Silvopasture: Growing trees and improved forages to provide suitable pasture for grazing livestock.

Silviculture: The art and science of growing forest trees.

Site Index (S.I.): Measure of quality of a site based on the height of a dominant tree species at 50 years old.

Site Preparation: Treatment of an area prior to re-establishment of a forest stand.

Skidder: A rubber-tired machine with a cable winch or grapple to drag logs out of the forest.

Slash: Branches and other woody material left on a site after logging.

Snag: A dead tree that is still standing and provides food and cover for a variety of wildlife species.

Soft maple: Forest Industry term for red maple and silver maple.

Softwood: Any gymnosperm tree including pines, hemlocks, larches, spruces, firs, and junipers.

Species Composition: Refer to the different kinds and number of species per area. “Species diversity”

Species of Special Concern: Not threatened or endangered yet but has low or declining populations.

Stand: A group of forest trees of sufficiently uniform species composition, age, and condition to be considered a homogeneous unit for management purposes.

Stand Density: The quantity of trees per unit area, evaluated in basal area, crown cover or stocking.

Stand Initiation: Following a major disturbance (wind, fire, clearcuts) forest regeneration of open space from seed, sprouts & advance regeneration create an even-aged stand (stage 1 of 4), *see stem exclusion, understory re-initiation, and old growth.*

Stem Exclusion: As an even-aged stand develops limited resources matched with increasing needs by individual stems results in mortality of weaker stems. Crown size of stems in this stage are small and therefore quickly expand to fill canopy gaps limiting stand re-initiation. (stage 2 of 4), *see stand initiation, understory re-initiation, & old growth*

Stocking: The number and density of trees in a forest stand. Classified as under-, over-, or well-stocked.

Stumpage Price: The price paid for standing forest trees and paid prior to harvest.

Succession: The replacement of one plant community by another over time in the absence of disturbance.

Sustained Yield: Ideal forest management where growth equals or exceeds removals and mortality.

Terrestrial Wildlife: Wildlife species that live predominantly or entirely on land.

Thinning: Partial cut in an immature, overstocked stand of trees to increase the stand's value and growth.

Threatened Species: A species whose population is so small that it may become endangered.

Timberland: Forest capable of producing 20 ft³ of timber per acre per year.

Timber Stand Improvement: See "Forest Stand Improvement"

Tolerance: The capacity of a tree species to grow in shade

Tree Length Harvest: Trees are felled, treetop (small branches) is cut, and pulled out of the woods in lengths exceeding 50 feet.

Two-aged Stand: Two dominant age classes of trees represented in a single stand.

Under-stocked: Trees so widely spaced that even with full growth, crown closure will not occur.

Understory: The level of forest vegetation beneath the canopy.

Understory Re-initiation: Eventually, the initial cohort is not vigorous enough to occupy all growing space and exclude vegetation from regenerating in the forest floor. This process allows a vegetative understory to develop, creating the understory stage. (Stage 3 of 4), *see stand initiation, stem exclusion, and old growth*.

Uneven-Aged Stand: Two or more age classes of trees represented in a single stand.

Unit Sale: A timber sale in which the buyer makes regular payments based on mill tally and receipts.

Vegetative Reproduction: A new plant grows from a fragment or segment of the parent plant and creates a clone stem.

Veneer Log: A high-quality log of a desirable species suitable for conversion to veneer.

Well-Stocked: Stands where growing space is effectively occupied but there is still room for growth.

Windbreaks: Rows of trees to provide shelter for crops, animals, or farm buildings.

"Wolfy" Trees: An individual tree whose crown branching begins at a low height and extends outward, creating a large outward crown. Often found in fence lines and in open areas.

Xeric: Characteristic of low amounts of moisture, dry conditions

Appendix II

Related Stand/Forest Health Issues

Present in Report: Oak wilt disease, oak decline, gypsy/spongy moth, red pine pocket decline/mortality, & heterobasidion root disease

Additional Resources:

- https://www.michigan.gov/dnr/0,4570,7-350-79136_79237_81077---,00.html
- https://www.canr.msu.edu/news/exotic_forest_diseases

Related Noxious Native, Non-Native*, & Invasive** Plant Species

Present in Report: Autumn olive**, fern, witch hazel

Additional Resources:

- <http://www.michiganinvasives.org/>
- https://www.canr.msu.edu/invasive_species/
- <https://mnfi.anr.msu.edu/invasive-species/InvasivePlantsFieldGuide.pdf>

Related Herbivory (Overbrowsing) Concerns and Regeneration

Present in Report: Yes, significant browse damage is occurring from white-tailed deer and limiting desirable native forest regeneration establishment and recruitment.

Additional Resources:

- <https://extension.psu.edu/regenerating-hardwood-forests-managing-competing-plants-deer-and-light>
- <https://www.miwildlife.org/deer-browsing.html>
- <http://forest-to-faucet.org/pdf/deer-browsing.pdf>



Oak Wilt *Ceratocystis fagecearum*

Why we care: Oak wilt kills healthy red oaks. White oaks can also be affected but are more resistant and less vulnerable to mortality from the disease. Once a red oak becomes infected with the oak wilt fungus, the tree will die, and there is no treatment to save the infected tree. Once an oak wilt infection is confirmed, however, treatments are available to save surrounding oaks and stop the spread of this disease.

What is at risk? All red oaks are susceptible to oak wilt. Red oaks are common urban and suburban landscape trees. The loss of these trees can have a significant negative impact. In the forest, red oaks are also an important producer of acorns for wildlife habitat. Using 2011 Forest Inventory and Analysis data along with the current average stumpage price for red oak sawlogs, it is estimated that the value of red oak timber in Michigan is approximately 1.6 billion dollars.

The threat: Oak wilt moves slowly on its own through root systems and travels short distances overland when new spores are moved by beetles from an infected tree to a freshly pruned or injured tree. Oak wilt can be moved long distances when people move infected firewood from one location to another. Look for red oaks that suddenly drop their leaves in the summer. The disease spreads, killing nearby oaks from one year to the next. Currently, oak wilt is generally distributed throughout the Midwest and Texas.

What could happen in Michigan? Once established, if not treated, oak wilt will continue to spread, killing all red oaks in a neighborhood or a forest.

What can you do? DO NOT prune oak trees during the growing season. If you need to prune oaks, DO NOT prune them between April 15 and July 15. DO NOT move firewood: oak wilt is spread by the movement of infected wood.



Report Suspect Forest Pest Infestations in Michigan

Email: DNR-FRD-Forest-Health@michigan.gov
Midwest Invasive Species Information Network: www.misin.msu.edu

Learn more: <http://michigansaf.org/ForestInfo/Health/E3169-OakWilt.pdf> and
http://na.fs.fed.us/pubs/howtos/ht_oakwilt/identify_prevent_and_control_oak_wilt_print.pdf

Don't Move Firewood!





What is Oak Decline?

For centuries, oak trees (genus *Quercus*) have dominated forests of the Eastern United States. They are vital components of deciduous forest ecosystems and are one of North America's most valuable hardwoods. In recent years however, populations of many oak species have dramatically declined. Symptoms include early browning of leaves, thinning of canopy cover, and loss of branches, which can eventually lead to tree mortality. Understanding and preventing this phenomenon has been challenging, given that no single factor is responsible for what is generally defined as Oak Decline.

A host of stressors including climate, tree age, site conditions, and history of disease interact to weaken trees over time, ultimately leading to sudden* death when the tree's resources are exhausted. This "death by a thousand cuts" makes prevention of oak decline difficult, as stressors can vary both over time and by location.

Invasive pests, drought, fire suppression, and soil compaction from human activities are among the **primary factors** influencing oak decline in our region in recent years. Although most healthy, mature oaks can contend with one or a few of these stressors, in combination, they weaken the tree and make it more susceptible to **secondary factors**, such as fungal and bacterial infections. In the National Capital Area, Armillaria root rot fungus, two-lined chestnut borer beetle (*Agilus bilineatus*), and bacterial leaf scorch (caused by *Xylella fastidiosa*) are commonly blamed for killing oaks, even though they typically only attack trees that are already in a state of decline.

What can you do?

Despite these factors, there are ways to prevent oak decline; by maintaining oak trees in a healthy state you can limit the impact of different stressors. This may include,

- Removing invasive vines from trees
- Avoiding damage to tree limbs, trunk, and roots
- Monitoring trees for insect pests and fungal and bacterial infections
- Pruning damaged/diseased limbs
- Mulching around the base of trees to protect roots
- Watering trees during dry spells and limiting pesticide use
- Consulting with local forestry experts and ISA Certified Arborists for advice and assistance on tree-related issues
-

*Oak decline differs from Sudden Oak Death (SOD), which is caused by *Phytophthora ramorum*, a tree pathogen that is not present in the Mid-Atlantic region.

Article by: By Dorothy Borowy, Ecologist and Integrated Pest Management Coordinator for the National Capital Area



Heterobasidion Root Disease
Previously called annosus root disease
(Heterobasidion occidentale,
Heterobasidion irregulare)

Introduction: Heterobasidion root disease (HRD), formerly known as annosum root rot, is considered one of the most destructive diseases of conifers in the northern parts of the world. Prevention of HRD is key, as it is difficult to treat and control. Many tree species can be hosts, but it is most common in Michigan in red and white pine plantations.

Biology: Infection by the HRD fungus (Heterobasidion irregulare; formerly H. annosum) most often occurs when spores, produced by the fruit body, land and germinate on the surface of a freshly cut stump. This infection process proves a strong relationship between HRD and thinned

stands. Spores are most often produced when the temperature is between 41° - 90° F. Though most spores are deposited within 300 feet, spores can be carried in the wind over many miles.

Identification:

Fruit bodies, or conks, of HRD can be found at the base of fading and dead trees, as well as on stumps. These fruit bodies may be buried in the soil and duff layer. Fruit bodies are most observed in the fall but can be found any time of the year. Young fruit bodies look like popcorn, and under favorable environmental conditions, become bracket-shaped or shelf-like. Fruit bodies vary in color but are usually light to dark brown above and white to tan below.

Prevention:

Once this disease is in a stand, it is very difficult to control. Prevention is the best approach. If you are planning a thinning, consider treating freshly cut stumps of susceptible tree species with fungicides. Stumps should be treated as soon as possible after cutting, and no later than one day after cutting. Many factors, such as tree species, distance from HRD-infected stands and time of year influence the risk of infection and impact by HRD.

Management of HRD: Preventing Heterobasidion root disease is crucial. If you are thinning a plantation within several miles of a confirmed location, consider either (1) thinning when temperatures are forecast to be below 32° F, or (2) applying an appropriate fungicide on freshly cut stumps. These actions are critical if you are within a mile of confirmed Heterobasidion root disease. Spores of Heterobasidion can travel long distances, and the closer a confirmed location is to the thinning site, the greater the risk of infection.

In stands where Heterobasidion Root Disease is present the most feasible management is to convert the stand to species not susceptible to the disease (most often deciduous/hardwood species).



Gypsy Moth (*Lymantria dispar*)

Identification:

- Gypsy moth caterpillars emerge from tan, fuzzy egg masses in April and feed on leaves through late June.
- Caterpillars are hairy, with a yellow and black head and 5 pairs of blue spots, followed by 6 pairs of red spots.
- Mature caterpillars are 1.5 to 2 inches in length.
- Leaf debris and small, round frass found under trees are indications of gypsy moth infestation.
- Male moths' wings have a wavy pattern of brown to dark brown and span 1.5 inches.
- Female moths are larger than males and do not fly. Wings are white to cream with wavy black markings.

Habitat: Most often feeds on the leaves of oak and aspen but can also be found on hundreds of other plant species.

Native Range: Europe and Asia

U.S. Distribution: Northeastern U.S. west to Minnesota

Local Concern: Gypsy moth caterpillars defoliate trees, leaving trees vulnerable to diseases and other pests, which may lead to tree mortality. During large outbreaks, debris and frass from feeding caterpillars can be disruptive to outdoor activities.

Pathways of Spread: Though female moths do not fly, small caterpillars can be blown by the wind to other trees. Gypsy moth egg masses and pupae can be unknowingly transported on firewood, vehicles and recreational gear.





Armillaria Root Rot/Disease (genus *Armillaria*)

Introduction: Armillaria root rot occurs naturally in most of the United States and the Great Lakes region and is caused by several fungi in the genus *Armillaria*. These include *A. ostoyae*, *A. mellea*, *A. gallica*, *A. calvescens* and *A. sinapina*, all of which have been documented in the Great Lakes region. The host range of the fungi is vast with hundreds of vines, shrubs, trees, & horticultural crops affected. Susceptible tree species include maple, oak, white pine, red pine, aspen, peach, and cherry. Armillaria root rot eventually girdles and kills host plants. The Armillaria fungus can remain latent in the soil for many years.

Biology: Armillaria root rot overwinters in the same fungal form present during the growing season (rhizomorphs or mycelium) on diseased or decaying plant materials and roots. Armillaria root rot may also overwinter as basidiospores – the sexual spores of the fungi – produced by honey-colored mushrooms that form at the base on infected plants in the fall. The principal method of spread of the fungus is root-to-root through rhizomorphs, or root-like structures, or direct root contact during which mycelium invades healthy roots directly.

Rhizomorphs grow from infected plants or decaying material to healthy trees in the surrounding area. Basidiospores typically colonize decaying materials or compromised host tissue with the subsequent rhizomorphs infecting healthy hosts. Armillaria root rot is capable of attacking healthy hosts, but the greatest mortality occurs in stressed trees. In cultivated settings, infected debris and basidiospores can be spread through cultivation.

Symptoms: Affected plants may exhibit reduced growth, small chlorotic leaves, branch dieback and the slow or abrupt death of the plant. Symptomatic plants may appear random spatially, but over time a pattern of circular expansion often becomes evident. Symptomatic trees have decaying bark at the soil line and on the roots. The key diagnostic sign of Armillaria root rot is a white mycelial mat, or spongy fungal sheet, between the bark and wood in the cambial layer. The mycelial fans appear veined and may extend up the trunk of the tree several feet. Rhizomorphs are another distinct sign of Armillaria root rot. Rhizomorphs are brown-black “shoestring” structures, 0.01 inch in diameter with an outer black mycelium and a white core. Rhizomorphs have the same growth pattern as roots and may form under the bark or spread into the soil surrounding the root zone of host plants.

Management: According to Michigan State University Extension, there is no known control for Armillaria root rot. Control has been attempted via root excavation, trenching and fumigation with little to no effect. Current areas of treatment research include biological control and innate resistance screening of host plants.



Red Pine Pocket Decline & Mortality

Introduction: Red pine pocket decline and mortality is a disease of plantation-grown red pine. The most likely trees to show symptoms of this syndrome are 30- to 45-year-old red pines in thinned plantations. Studies to identify the reasons why certain plantation sites have red pine pocket decline and mortality are ongoing.

Biology: Insects including root collar weevil (*Hylobius radialis*), pales weevil (*H. pales*), red turpentine beetle (*Dendroctonus valens*), pitch-eating weevil

(*Pachylobius picivorus*) and *Hylastes porculus* feed on freshly cut stumps, the lower stem and roots of red pine and carry the fungi *Leptographium terebrantis* and *L. procerum* into the lower stem and root system.

Once settled in the shared root system of a red pine plantation, *Leptographium* spreads to healthy trees through root connections. Trees infected with *Leptographium* are stressed because they cannot take up and move water or make defensive compounds as well as usual. These stressed trees continue to attract lower stem feeding beetles, particularly the red turpentine beetle. Bark beetles (*Ips pini* and *I. grandicollis*) are ultimately responsible for the trees' death.

Symptoms and Signs:

Pockets typically start small, with one to a few dead trees surrounded by trees that have reduced shoot growth, yellowing leaves and thin crowns (fader trees). Each year, a few trees on the pocket edge may die and the edge of the pocket expands. Over time, pockets can become quite large (four-acre pockets have been seen).

Management:

There are several options for managing red pine pocket decline and mortality -

- Leave the pocket as a natural opening.
- Cut dead trees and trees that are showing dieback and/or yellowing of the foliage (fader trees) within and just outside the pocket.
- Cut dead trees and trees that are showing dieback and/or yellowing of the foliage (fader trees), and also cut a buffer area around the pocket.

Autumn Olive

Elaeagnus umbellata

Habit: Deciduous shrub or small tree growing up to 6 m (20 ft) in height and 9 m (30 ft) wide.

Leaves: Simple, alternate, oval, 5-10 cm (2-4 in) long; margins entire, wavy; gray green above, silvery scaly below; early leaf out (mid-March).

Stems/bark: Often thorny; silvery or golden brown, with brownish scales giving stems a speckled appearance.

Flowers: Fragrant; tubular; 4 petals and stamens; cream to light yellow; in clusters of 1-8; bloom from April to June.

Fruits/seeds: Drupe, 0.6 cm (0.25 in) in diameter; silvery with brown scales when immature, speckled red or yellow when mature; ripen September to October; begin to bear fruit at 3 to 5 years; each tree can produce 2-8 lbs. of seed per year; fruit eaten, and seed dispersed by birds.

Habitat: Moderately shade tolerant; occurs in a variety of soil types (pH range of 4.8-6.5), thrives on infertile soils because of nitrogen-fixing root nodules; found in open woods, forest edges, roadsides, fence rows, meadows, sand dunes, and other disturbed areas.

Reproduction: By seed; also, by root sprouting. Similar species: Related invasive Russian olive (*E. angustifolia*) has longer, narrower, leaves, silver above and below.

Comments: Native to Asia. Invades disturbed areas, can out-compete native species; increases soil nitrogen levels which facilitates expansion of weedy and/or invasive species; had been widely recommended for conservation planting until invasive traits became apparent.

Monitoring & rapid response: Monitor sunny open sites; autumn olive leaves out early in spring, retains leaves in fall, can be recognized year-round. Hand pull seedlings; focus on newest infestations and highest quality areas first; cutting, girdling, and burning are ineffective unless used in conjunction with herbicide as they stimulate sprouting; basal bark/stem sprays effective in late spring; basal stem injection of herbicide on dormant plants provides excellent control with low concentrations of herbicide. This species is difficult to control—research control options thoroughly.



Noxious Native Plant - Ferns *class Polypodiopsida*

Description: Nonflowering, herbaceous vascular plants that possess true roots, stems, and complex leaves and that reproduce by spores. The number of known extant fern species is about 10,500.

Habitat: Moderately shade tolerant; occurs in a variety of soil types (pH range of 4.8-6.5), thrives on infertile soils because of nitrogen-fixing root nodules; found in open woods, forest edges, roadsides, fence rows, meadows, sand dunes, and other disturbed areas.

Reproduction: Because of their ability to disperse by spores and their capacity to produce both sex organs on the same gametophyte and thus to self-fertilize, it would seem logical to assume that ferns possess higher powers of long-distance dispersal and establishment than do seed plants.

Habit: Ferns often create colonies that may spread, and dominate, across an entire understory. The most notorious is bracken (*Pteridium*), which spreads quickly by its underground ropelike rhizome, rapidly invading abandoned fields/pastures.

Noxious Characteristics: The typical fern, a sporophyte, consists of stem, leaf, and root; it produces spores; and its cells each have two sets of chromosomes, one set from the egg and one from the sperm. The sporophyte of most ferns is perennial (it lives for several years) and reproduces vegetatively by branching of the rootlike underground stem, or rhizome, often forming large, genetically uniform colonies, or clones. Often in the understory of Michigan forest ferns become a monoculture due to the absence of herbivory (lack of feeding on these plants by local wildlife). When paired with high herbivory populations (white-tailed deer and rabbit) that avoid feeding on ferns this species can quickly take over an understory. In locations where ferns have created a monocultural understory canopy other desirable native species may no longer have the ability to establish/regenerate.

Management & Monitoring: Management of monocultural stands of ferns can be successful. Due to the reproductive nature of ferns the most successful method of removal/reduction is chemical treatment (herbicide). By treating the leaves/stems of the plant with herbicide removal of the living root structure will also occur. Mechanical treatment of certain species may have success, however, for most fern species this will often worsen the issue. Continued monitoring of a treated area is crucial to ensure that herbivory impacts on reestablishing plant diversity does not recreate the previous issue.



Herbivory: Overbrowsing from White-tailed Deer

White-tailed Deer (*Odocoileus virginianus*): A native species of Cervidae family in Michigan, the white-tailed deer is a herbivore that inhabits a variety of terrestrial landscapes including forest, grasslands, swamps, farmlands and brushy areas. White-tailed deer feed on a variety of vegetation, depending on what is available in their habitat. In eastern forests, buds and twigs of oak, maple, sassafras, aspen, birch, pine, and cedar (to name a few) are consumed, as well as many shrubs. (http://animaldiversity.org/accounts/Odocoileus_virginianus/)



21st Century Forest and Regeneration: Due to the removal of Michigan forest, for agriculture and rural development, much of Michigan's forested landscape has been drastically reduced. Much of the remaining forest has been severely fragmented, poorly managed, and/or negatively impacted by invasive species, pest, and diseases. Additionally, the eradication of apex predators (wolves, cougar, etc.) across the majority of the state has created issues within these delicate ecosystems as well. However, the reproduction and growth habits of Michigan forest and tree species are still adapted to conditions prior to these issues.

The Deer/Forest Relationship: White-tailed deer utilize natural habitat, such as forest, for shelter and food. Prior to European settlement all native wildlife relied strictly on natural forage to survive. When an appropriate white-tailed population is present (due to a balance between vegetation/ herbivores/ carnivores) forest succession can occur while also providing an adequate food source for wildlife through hard/soft mast, woody browse, and forage without degrading native plant communities and forest regeneration.

The Issue with Over-Browsing: Many factors affect the regeneration efforts of Michigan forest and overbrowsing (from white-tailed deer) is included within that list. Overbrowsing occurs from either an over-population of white-tailed deer in relation to the carry capacity of the *natural habitat* in a certain area OR habitat degradation/reduction within a white-tailed deer population region. In both scenarios forest growth below the browse line (what vegetation deer can reach) is reduced below a threshold of sustainability. However, not only can overbrowsing directly impact forest regeneration but it also can indirectly affect other issues such as the impacts of invasive plant species, which are not often browsed on by white-tailed deer and can thrive with the absence of native competition. Agriculture, supplemental feeding, and food plots can often worsen these issues because they increase the carry capacity of the deer herd in an artificial manner that does not coincide with the *natural habitat* carrying capacity. Additionally, the loss of apex predators impacts these issues by decreasing mortality and can increase browsing intensity in individual locations.

Management: Often the best solution to these issues is to reduce the population of deer to meet the carrying capacity of the *natural habitat* within that area. To impact a population female individuals (doe) must be harvested to achieve future population reduction. Continued monitoring of browse impacts and seedling development can help determine if current population reduction is working or a higher annual harvest of the population is needed. Additionally, sustainable management practices that increase desirable vegetation densities within the *natural habitat* can also offset overbrowsing impacts allowing for a higher deer population to occur.



The photos above show the difference between where deer could freely browse (left of the fence) and where no deer browse occurred (right of the fence). All other factors were the same between both sides of the fence. These "deer exclosures" provide an observation tool that allows forest managers/owners to identify herbivory (white-tailed deer) impacts on the natural plant community to assess for appropriate management.

Appendix III

Federal and State Laws Related to Forest Management

- USA - Federal Insecticide, Fungicide, and Rodenticide Act, 1947
- USA - National Historic Preservation Act, 1966
- USA - Clean Water Act, 1948 and 1972
- USA - Endangered Species Act, 1973
- MI - Michigan Pesticide Control Act, Public Act 171 of 1976
- MI - Natural Resources and Environmental Protection Act, Public Act 451 of 1994
- MI - Right to Forest Act, Public Act 676 of 2002

Best Management Practices

Best Management Practices (BMPs) are guidelines published by the State of Michigan to protect Michigan's water resources from non-point source pollution and erosion while working on forest land. BMPs are now called "Sustainable Soil and Water Quality Practices on Forest Land" and the document is online at www.Michigan.gov/PrivateForestLand. BMPs include proper location and construction of logging roads, the use of riparian management zones, installation of culverts and other stream crossings, proper use of pesticides and other chemicals, and site preparation for planting. BMPs also include the proper seasonal timing of activities to minimize the spread of insects or disease. Any forest management activities should minimize soil erosion near wetlands and surface water. Tree Farm certification requires compliance with best management practices.

Forest Health

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

DNR Forest Health - www.Michigan.gov/ForestHealth

DNR Invasive Species Info - www.Michigan.gov/InvasiveSpecies

MDARD Exotic Forest Pests – www.Michigan.gov/ExoticPests

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

Wildlife Habitat

The DNR Wildlife Division has an excellent publication on managing wildlife habitat at www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/index.htm.

DNR Wildlife Division – www.Michigan.gov/Wildlife

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

Quality Deer Management Association – www.qdma.com

Audubon Society - www.MichiganAudubon.org

Foresters for the Birds – <http://vt.audubon.org/foresters-birds>
Ruffed Grouse Society - www.RuffedGrouseSociety.org
National Wild Turkey Federation - www.nwtf.org
Michigan Trout Unlimited – www.MichiganTU.org
US Fish and Wildlife Service - www.fws.gov/partners

Forest Economics

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

American Tree Farm System

I recommend that you join the American Tree Farm System to certify your exemplary and sustainable forest management. A free inspection from one of the 145 Tree Farm Inspecting Foresters is required to enroll. This Forest Stewardship Plan complies with the Farm System’s eight Standards of Sustainability listed below. See www.TreeFarmSystem.org for information about the Tree Farm program, forest certification, and the full Standards of Sustainability.

1. **Commitment to Practicing Sustainable Forestry.** Forest owner demonstrates commitment to forest vitality by developing and implementing a sustainable forest management plan.
2. **Compliance with Laws.** Forest management activities comply with all relevant federal, state and local laws, regulations and ordinances.
3. **Reforestation and Afforestation.** Forest owner completes timely restocking of desired species of trees on harvested sites and non-stocked areas where tree growing is consistent with land use practices and the forest owner’s management objectives.
4. **Air, Water, and Soil Protection.** Forest management practices maintain or enhance the environment and ecosystems, including air, water, soil and site quality.
5. **Fish, Wildlife and Biodiversity.** Forest management activities contribute to the conservation of biodiversity.
6. **Forest Aesthetics.** Forest management plans and management activities recognize the value of forest aesthetics.
7. **Protect Special Sites.** Special sites are managed in ways that recognize their unique historical, archeological, cultural, geological, biological or ecological characteristics.
8. **Forest Product Harvests and Other Activities.** Forest product harvests and other management activities are conducted in accordance with the management plan and consider other forest values.

Qualified Forest Program

The Qualified Forest Program (Public Acts 42 and 45 of 2013, as amended) exempts forest owners from paying local millage taxes up to 18 mills in each tax jurisdiction (township). Landowners must have 20 acres or more, a forest management plan, and agree to comply with their forest

management plan. Landowners must report harvests to the Michigan Department of Agriculture and Rural Development after they occur. A Forest Stewardship Plan is accepted by the Qualified Forest program. See www.Michigan.gov/QFP for information and enrollment forms. The application deadline is September 1 for tax benefits in the following year.

Commercial Forest Program

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

Financial Assistance Programs

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

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

Herbaceous Plant Establishment

Creating Early Successional Plant Communities/Habitat

Species Selection: A herbaceous plant community/early successional habitat will be dominated by non-woody stem species including grasses, forbs, & wildflowers. There is a multitude of species to choose from. When selecting species to plant it is important to address the site characteristics and ensure that the species selected are adapted to the soil type, sun/shade availability, soil moisture, etc. Also, it is highly recommended to incorporate a diverse variety of types/species as well as select plants that are native specifically to the region/area you are located. See below for a list of common native herbaceous plants found in Michigan:

Native Grasses/Forbs/Wildflowers	
big bluestem (<i>Andropogon gerardii</i>) little bluestem (<i>Schizachyrium scoparium</i>) Indian grass (<i>Sorghastrum nutans</i>) hog peanut (<i>Amphicarpaea bracteata</i>), thimbleweed (<i>Anemone cylindrica</i>) butterfly-weed (<i>A. tuberosa</i>) showy tick-trefoil (<i>Desmodium canadense</i>) flowering spurge (<i>Euphorbia corollata</i>),	veiny pea (<i>Lathyrus venosus</i>) black-eyed Susan (<i>Rudbeckia hirta</i>) early goldenrod (<i>Solidago juncea</i>) smooth aster (<i>Symphotrichum laeve</i>) frost aster (<i>S. pilosum</i>) Culver’s root (<i>Veronicastrum virginicum</i>) golden alexanders (<i>Zizia aurea</i>) swamp milkweed (<i>Asclepias incarnata</i>)
For a more extensive list of native grasses, forbs, and wildflowers native to different portions of Michigan visit: https://www.canr.msu.edu/nativeplants/plant_facts/local_info/index	

Site Preparation: Areas where herbaceous plant establishment will occur should be prepared properly to ensure successful planting. Non-desirable vegetation should be removed through mechanical and/or chemical means.

Planting: Planting can occur through soil preparation (tilling) and broadcasting or with a no-till drill. Ensure that planting is occurring during the correct time of year.

Maintenance: To maintain the early successional plant community frequent “disturbance” will need to occur to avoid succession. Prescribed burning, mowing, and/or disking can provide the appropriate disturbance to knock back woody stem encroachment and maintain herbaceous plant dominance moving into the future.

Funding Opportunities: Contact your local NRCS office to inquire about funding opportunities for site preparation (brush management – code 314, herbaceous weed treatment – code 315) and planting of native herbaceous plants (conservation cover –code 327).

Ground Scarification

What: Ground scarification is the disruption of the forest floor to expose bare mineral soil.

Why: By exposing bare mineral soil species that require direct seed-to-soil contact will likely have a much higher germination rate. This can also open the seed bank up for desired dormant herbaceous seeds to germinate as well.

How: Ground scarification can be done with a wide variety of tools and equipment. Disruption of the duff layer and soil can be done with rakes, pull behind disk, and large equipment with specifically constructed attachments for ground scarification (see photo).



- **Hand Tools**
 - Hand Rake
 - Pro: Inexpensive and can be done in hard to access areas
 - Con: Time consuming and low productivity
- **ORV or Lawn Mower**
 - ATV, Side-by-Side, or Lawnmower with a heavy drag/pull behind disk.
 - Pros: Relatively inexpensive and can do a larger area in a shorter time than hand tools. Still can get into hard to access areas.
 - Cons: Still time consuming and lower production when implanting in large areas. Down dead wood and saplings can make maneuvering difficult.
- **Large Equipment**
 - Tractor with disk/drag, track skidsters, dozers with scarification implements.
 - Pros: can handle large areas efficiently
 - Cons: Expensive, harder to maneuver in standing forest, access issues
- **Logging Operations**
 - Skidders, Harvesters, etc.
 - Pros: This type of ground scarification comes with the appropriate timber harvesting equipment and is expense free during a timber harvesting operation
 - Cons: Only scarifies areas of harvest and is not thorough through the entirety of the area

When & Where: Implementation can occur at any stage of forest management. However, the greatest effect will occur pre-harvest to promote advanced regeneration or post-harvest to provide conditions favorable to promote germination after seed release. Ground scarification is best implemented in forested stands that have significant layers of down dead debris and duff. It is an excellent alternative when prescribed burning is not an appropriate or available tool.

Other Considerations: Consider factors such as invasive plant species, large coarse woody debris, sapling densities, and plants already established at the site to determine if ground scarification is appropriate an/or if other steps need to be taken prior to implementation. Additionally, consider other factors such as soil type, forest type, species composition, topography, slope, and access to determine if ground scarification is plausible and what method is appropriate.

Contact your forester for further assistance in planning and implementing ground scarification.

Forest Health (Disease/Pest) Management

What: Forest health concerns can negatively affect your forest and significantly degrade the wildlife, financial, and sustainability potential. Such forest health concerns may include oak wilt disease, beech bark disease, hemlock woolly adelgid, spruce budworm, etc.

Why: Managing forest health concerns can greatly increase the overall value (aesthetic, wildlife, & financial) of your forest and property. Forest health issues, especially invasive disease & pest, can be detrimental to the forest and even result in deforestation.

How: Forest health management is a multi-step process with every step being crucial. Planning, implementation, and monitoring are all important factors in successfully achieving objectives:

- **Planning:**
 - Planning usually involves creating a descriptive management plan specific to the forest health issue and its management. A plan should include the forest health of focus, objectives, management options, and a monitoring schedule.
- **Implementation**
 - Implementation will depend on the type of forest health issue being managed. Some forest health management may have minimal labor requirements where others may cost 10's of thousands of dollars to implement.
- **Monitoring**
 - Monitoring of the site is crucial to determine if objectives were met and if additional planning and /or implementation needs to occur.

When & Where: This process can take extended periods of time depending on the specific forest health issue being managed. Planning should be the first step. Focus efforts on the most manageable locations first.

Other Considerations: Consider factors such as realistic objectives, access, resource requirements, current forest factors, reforestation efforts, and site conditions when planning. Forest health issues such as beech bark disease may not have a management alternative and salvage harvest may be the only option. Other issues such as oak wilt disease may need high levels of planning and require an *Oak Wilt Specialist*.

Contact your forester for further assistance in planning and implementing Forest Health Management. Contact your local USDA-NRCS office for financial assistance opportunities.



Deer Exlosures for Observation

What: A deer enclosure is a constructed barrier that impedes access to white-tailed deer (and elk if applicable) so no browsing of vegetation occurs. An “Observation Deer Enclosure” encompasses a small area and allows the landowner/ land managers to observe the effects of deer browse on the vegetation by creating a “control” that shows the absence of deer and their browse impacts.

Why: These small “windows” allow landowners/ land managers to observe and compare the vegetation species composition, size, and browse impacts inside and outside of the enclosure. This can then give the landowner/ land manager a comparison to understand the impacts that deer are having on their habitat and the vegetation present. This information can then be utilized to help make management decisions in relation to herd management and vegetation manipulation.

How: Constructing these enclosures can be rather simple. Sizes can range from small 6” diameter cages to enclosures that encompass a larger area. To construct these “Observation Deer Enclosures” you will need to gather the proper tools and material in accordance with the type of enclosure you are creating:



Individual Tree Cage

- Size: Range from 6” – 10’ diameter at heights of 4’ -6’
- Material: Welded wire or tree tube, small post (t-post, wood stakes, or metal/plastic stakes)
- Equipment: T-post post pounder/hammer
- In areas where there are multiple seedlings heavily browsed on place one of these over just 1 or a few and observe the difference between the protected and unprotected seedlings overtime.

Fence Enclosure (top photo)

- Size: Recommend 12’x12’ (this is 48 linear feet/ a 50’ roll) that is 5’-6’ tall
- Material: Fence (welded wire, polyester, or woven wire), post (t-post &/or wood post), fence clips/staples
- Equipment: Post hole digger, post pounder, pliers
- This type of enclosure is easy to construct. Size can vary from the recommended dimensions. Anything that is larger than 15’x15’ will need to be 7’ or taller. (15’x15’ or smaller is to confined of an area for deer to comfortably enter)

Slash or “Lincoln Log” Enclosure (bottom photo)

- Size: Recommend 10’x10’ or 15’x15’ with 6’-8’ tall walls. *Larger dimensions should have 8’-12’ tall walls.*
- Material: Woody debris (often remaining from forest stand improvement work: i.e., logging slash)
- Equipment: Chainsaw. Mini- excavator w/ thumb and/or track skidsters w/ grapple (larger material)
- Slash enclosures consist of piled up woody material. Pile heavier material on bottom with lighter material on top. “Lincoln Log” enclosures consist of sapling, poletimber, or sawtimber size trunks/ logs stacked in a “Lincoln Log” method to create the walls of the enclosure.

Other Considerations: Enclosures can be constructed at any time of the year but significant results of vegetation growth within the enclosure should not be expected immediately. These “Observational Deer Enclosures” should be placed in various locations on the property under different management types/steps. They can also be placed on food plots and early successional fields/openings to observe browse effects in these areas as well. When choosing locations look for areas that will reflect factors you are trying to observe. Consider other factors such as forest floor debris, coarse woody debris, invasive plant species, plants already established at the site, small mammals (i.e., rabbits, mice), etc. Additionally, consider removing the duff layer to simulate prescribed burning/ ground scarification to reflect vegetation that would exist after that type of specific management. Also remember that conditions inside the enclosure represent “0” deer which is not a realistic scenario. Outside of the enclosure does not need to exactly mimic the inside to meet your goals and objectives. NRCS Funding Available (Code 612-73)

Contact your forester for further assistance in planning and implementing “Observation Deer Enclosures.”

Commercial Forest Stand Improvement

What: Commercial forest stand improvement is the active management of trees in a forest, based on a prescription, that have a significant enough monetary value to result in a positive financial return during management.

Why: These trees are selected for a harvest, based on a stand prescription, to achieve specific goals. These stems have monetary value resulting in a positive financial return, so this type of harvest is considered a

“Commercial Harvest”. The selection of the removed stems is still based on forest ecology and silviculture. These stems are often sawtimber or poletimber size. The volume and quality are also large contributors to the extent at which the harvested trees commercial value is.



How: Commercial forest stand improvement involves the manipulation of sawtimber/poletimber to release its use of occupational space and resources allowing for the recruitment of seedlings and saplings. Such commercial harvest prescription techniques include the following:

- **Thinning**
 - partial cut in an immature, overstocked stand of trees to increase the stand's value and growth
- **Selection Harvest**
 - harvesting single trees or groups at regular intervals to maintain uneven-aged forest.
- **Shelterwood Harvest**
 - harvesting all mature trees in two or more cuts, leaving trees to protect seedlings.
- **Seed Tree Harvest**
 - felling all trees except for a few desirable trees that provide seed for the next forest.
- **Clear-cut Harvest**
 - the harvest of all the trees in an area to reproduce trees that require full sunlight.
- **Salvage Harvest**
 - the removal of dead, damaged, or diseased trees to recover value.

When: The timing of commercial harvest can be crucial in determining the success of the goals and prescription. Forest goals, shade tolerance, regeneration type, and disease/pest characteristics are important factors to consider for the selected stems to harvest and retain.

Other Considerations: Ensure that you are taking a planned out managed approach to commercial timber harvest. The most common mistake in such management is allowing individuals with inadequate forest ecology credentials, such as loggers & timber buyers, to implement this management. Often prescriptions are not followed, goals are not met, and “high grading” can occur without the supervision of an experienced forester. Oversight by a consulting forester can ensure the timber harvest follow designated harvest prescriptions and timber buyers comply with the restrictions and regulations of the timber sale. Additionally, the timber sale administration services of a consulting forester can ensure a thorough timber sale contract, payment schedules occur, and the timber sale is held to the specifications outlined by the contract.

Commercial forest stand improvement (timber sales) can be a difficult process to plan and all parts of the process are crucial to ensure success in management. Contact your forester for further assistance in the process of timber sale administration or timber sale preparation.

Whitetail Deer Population Control

What: Whitetail deer population control is the monitoring and management of local whitetail deer populations. Management is done through lethal means of harvesting female deer (does) to reduce future population densities.

Why: Controlling whitetail deer populations is an important management tool for habitat management. When deer populations exceed the native ecosystems carrying capacity it can have negative effects on the native vegetation. If populations numbers are not kept below this threshold forest recruitment is often not achieved and invasive plant species densities increase.

How: Population control is achieved through lethal means of harvesting whitetail deer does 1.5 years or older. By targeting does that are 1.5 years or older the local future deer population will be reduced.

When: Harvest most often takes place during legal hunting seasons, however, under extreme agricultural damage scenarios does may be targeted outside of hunting season with the proper state issued permits. For most private landowner's doe harvest must occur during state approved hunting seasons (see your state agency). The fall hunting seasons also occur right before/during the time period when whitetail deer target woody browse (seedling buds) so it is the most crucial time of the year to reduce local deer populations.



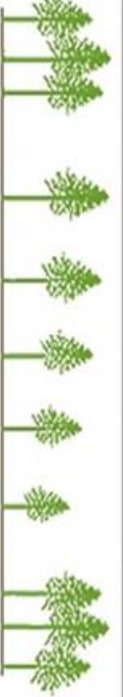

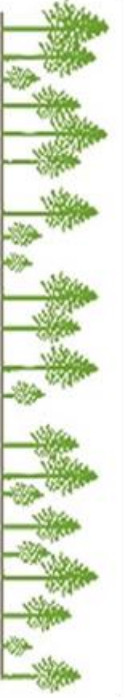
Where: Whitetail deer home ranges often average a 1 square mile area. However, this can vary based on gender, age, time of year, and habitat quality. Targeting does that live within the area where the browse damage is occurring is especially important. Whitetail deer that reside in these areas most likely are contributing to a high percentage of the damage. Also keep in mind that an individual deer's core area may change throughout the year.

Additional Notes: For landowners who do not hunt whitetail deer management can seem like a much more daunting task. Keep in mind that whitetail deer hunting is an immensely popular hobby for many residents. Seek out family members, friends, and/or neighbors who may be interested in helping you with harvesting does. Leasing your land's whitetail deer hunting rights out to interested parties can also help achieve population management while bring an additional monetary value to your land.

In most regions of the Midwest whitetail deer population is arguably the most important management tool in habitat and forest management. It is also important to realize that population control is only achieved by reducing female deer (DOE) populations!



Silvicultural Harvest Techniques and Forest Species Shade Tolerance

Regenerative Harvest Type	Light Availability/ Appropriate Shade Tolerance	Common Regenerative Species
 <p>CLEARCUTTING</p>	<p>High Very Shade Intolerant -Shade Intolerant Species</p>	<p>Eastern cottonwood, aspen, willow, paper birch, tamarack, jack pine, red pine, silver maple, black walnut, butternut, black oak</p> <p><i>Note: Other reproduction characteristics determine which harvest type is appropriate.</i></p>
 <p>SEED TREE</p>	<p>Moderate Intermediate Shade Tolerance Species</p>	<p>American elm, bitternut hickory, Eastern white pine, green and white ash, Northern red and white oak, red maple, shagbark hickory, pignut hickory</p>
 <p>SHELTERWOOD</p>		<p><i>Note: Overall landowner goals/objectives and forest factors determine which harvest type is appropriate.</i></p>
 <p>GROUP SELECTION</p>	<p>Low Shade Tolerant – Very Shade Tolerant Species</p>	<p>American basswood, black spruce, N. white cedar, white spruce, American beech, serviceberry, balsam fir, Eastern hemlock, ironwood, sugar maple</p>
 <p>SINGLE TREE SELECTION</p>		

Additional Notes: Thinning and Forest Stand Improvement (FSI) are also a silvicultural harvest techniques. Thinning focuses on promoting stems that are already present. Forest Stand Improvement (FSI) is the removal of undesirable trees, shrubs, vines, or other vegetation to achieve the desired stocking of the desired species.

“Selective Harvest” is **NOT** a silvicultural harvest technique. It is considered “High Grading” to trained professionals. It will most often resemble a selection harvest, in appearance, to the untrained eye.

Prescribed Burning

What: Prescribed burning is the use of fire to reduce undesirable vegetation, manipulate species composition, reduce/remove down dead vegetation & duff, and promote growth of desirable plant species.

Why: Prescribed burning is a management tool that is natural to many ecosystems (pre-European establishment). Appropriate prescribed burning can alter ecosystems in a positive way by manipulating vegetation composition through removal of undesirable species and promotion of fire adapted plant species.

Where: Prescribed burning can be utilized in early successional fields, forest, and wetlands. Location should be appropriate to surrounding factors (such as homes, livestock, adjacent properties) as well as size of prescribed burning area to accommodate objectives, experience, and resources.



How: Prescribed burning can be a high-risk management activity when not performed correctly. The following items must be considered and implemented to utilize prescribed burning in a safe and effective manner:

- **Education and Experience**
 - Without the proper knowledge and experience a prescribed burning can quickly turn into a wildland fire resulting in the destruction of property, legality issues, legal fines, and risking innocent lives.
 - It is important to educate yourself and others helping in the prescribed burning to maximize efficiency and safety.
 - Stay within your limits and do not take on a larger burn than you can manage.
 - Seek professional guidance and services to ensure the prescribed burn goes as planned.
- **A Burn Plan & the Proper Permits:**
 - A burn plan is a must have item when implementing prescribed burning.
 - A burn plan will include the prescribed burning prescription, prescription activities, dates of implementation, conditions limits required for the burn, the most current forecast, emergency contact information, and planning for different scenarios.
- **Appropriate Goals & Objectives:**
 - Ensure that you are burning for the right reasons and that it accomplishes goals and helps reach objectives.
 - *This should be included in the burn plan.*
- **Appropriate Conditions:**
 - Ensure that the conditions are appropriate for the prescribed burn.
 - *This should be included in the burn plan.*
- **The Correct Gear & Tools:**
 - Prescribed burning approved PPE
 - Appropriate hand tools
 - Access to portable water (i.e. water tanks, etc.)
 - *This should be included in the burn plan.*
- **Thorough Implementation:**
 - Ensure that fire breaks are adequately constructed, surrounding properties have been notified, and mop up is thorough and complete.

Prescribed burning can be an efficient tool to reach objectives when managing vegetation. Ensure that the utmost respect, planning, and responsibility is taken when performing this management activity. For more information visit: https://www2.dnr.state.mi.us/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/Habitat_Mgmt/Grassland/Prescribed_Burning.htm

Non-Commercial Forest Stand Improvement (FSI)

What: Non-commercial forest stand improvement is the active management of trees in a forest, based on a prescription, that do not have a significant enough monetary value to result in a positive financial return during management.

Why: If this management does not occur than individual stems that progress to the canopy may not be the desired species and/or highest quality trees. Through artificial selection (FSI) desired stems within the stand can be promoted through reduction of competition to ensure a higher likelihood of those individuals surviving.

How: Non-commercial forest stand improvement involves the manipulation of unvaluable stems to release its use of occupational space and resources allowing for the recruitment of other stems.

Such activities may include thinning or midstory/understory canopy removals using the following techniques:

- **Hack & Squirt:** “Hacking” into the cambium layer of the stem and introducing herbicides that result in mortality to the stem and root system.
 - **Pros:** This strategy limits residual vegetation disturbance and completely kills the stem and roots which kills off the entire plant.
 - **Cons:** Involvement of herbicides. Time consuming, stems is retained and often most expensive, form of treatment. Soil disturbance can also provide optimal conditions for invasive species seed present at the site.
 - **Tools/Equipment:** hatchet/ saw & herbicide applicator.
- **Girdle Cut:** The cutting of the cambium layer (sapwood) of the tree to cut off the “circulation” which results in the death of the trunk of the tree. Add herbicide to also kill the root structure if desired.
 - **Pros:** The stem is killed freeing up growing space (sunlight, water, nutrients, etc.). The process is relatively easy and results in minimal immediate danger.
 - **Cons:** a dead, standing stem is now present which can be a hazard. Stump sprouting can occur if herbicide is not applied.
 - **Tools/Equipment:** Handsaw or Chainsaw (and herbicide applicator if using herbicide)
- **Felling:** Cutting down of the stem completely
 - **Pros:** The stem is completely removed.
 - **Cons:** Experience is needed to perform this activity. The roots can resprout depending on the species and scenario (if not adding herbicide to the cut stump)
 - **Tools/Equipment:** Handsaw or Chainsaw
- **Foliage Treatment:** Herbicide treatment of foliage resulting in death to entire plant.
 - **Pros:** Can eliminate large quantities of stems relatively quick with minimal effort
 - **Cons:** Can result in non-target stem mortality. Only reasonable on small size stems (seedlings/saplings)
 - **Tools/Equipment:** Herbicide applicator.
- **Warning:** Use of herbicides should be well planned. Non-target mortality can occur with species that root graft or reproduce vegetatively.

When/Where: The timing of forest stand improvement can be crucial in determining the success of the residual trees. Shade tolerance, vegetative regeneration, and disease/pest characteristics are important factors to consider for the selected stems to harvest and retain. Ensure that you are taking a planned out managed approach to forest stand improvement. The most common mistake in such management is taking on too much of a workload as well as selection of the incorrect stems and amount to remove based on your management goals and objectives.

Non-commercial forest stand improvement can be a difficult process to plan and all parts of the process are crucial to ensure success in management. Contact your forester for assistance in the determination of any of the above factors or assistance in performing management. Contact your local NRCS office to apply for cost/share to implement these activities



Native Shrub and/or Herbaceous Plant Management

What: Native shrubs and/or herbaceous plant species can become overabundant due to many different factors including overbrowsing from whitetail deer, local conditions, and successional processes. This can limit regeneration efforts of desirable species/stems and forest regeneration.

Why: If these native shrubs and/or herbaceous plant species are not kept in-check they can create monocultures reducing forest regeneration efforts and degrading species composition and wildlife habitat. This must also be accommodated with other management that addresses the concerns that this issue resulted from.



How: The removal/reduction of these selected native shrubs and/or herbaceous plant species results in freed up resources (growing space, sunlight, water, nutrients, etc.) allowing for desirable species to have the chance to occupy that space. Management activities to achieve native shrub and/or herbaceous plant species management:

- **Root-pull Removal:** The removal of the entire plant, root system and all.
 - **Pros:** This strategy limits residual vegetation disturbance and completely removes the stem and root which kills off that plant. Herbicide is also not needed.
 - **Cons:** It is the most physically demanding, and often most expensive, form of treatment. Soil disturbance can also provide optimal conditions for invasive species seed present at the site.
 - **Tools/Equipment:** Mini-Excavator/ Skid steer OR chain/UTV OR hand pulling.
- **Foliage Herbicide Treatment:** Direct application of herbicide to the foliage of the plant.
 - **Pros:** No soil disturbance.
 - **Cons:** May result in mortality of non-target stems/plants. Use of herbicides.
 - **Tools/Equipment:** Backpack sprayer OR vehicle mounted sprayer.
- **Cut (and Spray):** The removal and/or killing of the above ground mass of the plant with cutting (and follow-up treatment of the stump with herbicide). Best used on shrubs. Utilize herbicide if stump sprouting is not desired.
 - **Pros:** Can be highly effective in select scenarios. Will kill the stem and
 - **Cons:** Often very physically demanding and time consuming.
 - **Tools/Equipment:** Chainsaw (& sprayer) OR forestry mulcher (& sprayer)
 - **Additional Modified Method:** “Hack-and-Squirt” method which utilizes herbicide treatment to the cambium layer through small incisions in the bark while the stem remains standing.

When/Where: The timing of native shrub and/or herbaceous plant treatment can be crucial in determining the success of removal. This determination is made based on the type of vegetation being treated, the location, and the surrounding desirable vegetation. The right timing in control can be crucial for management objectives. Ensure that you are planning out a manageable approach to this management activity. The most common mistake in such management is taking on too much of a workload and/or managing unrealistic locations. The best approach is to devise a plan that will segment out problematic locations across the area you intend to treat. Start with the least impacted locations to gain the upper hand and make sure to not take on to large of a location at once. Also remember to continue to monitor treated areas and revisit if native shrubs and/or herbaceous plants return at unacceptable densities.

Native shrub and/or herbaceous plant species control can be a difficult process to plan and all parts of the process are crucial to ensure success in management. Contact your forester for assistance in the determination of any of the above factors or assistance in performing management.

Management Tools – Prescribed Burning

Management Activity Types (NRCS Code):	Prescribed Burn (338)
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Prescribed burning is an excellent management tool for certain forest types, early successional habitat, and certain wetland habitats. Prescribed burning is a high-risk activity and should only be implemented by professionals or highly trained landowners. *Always have a well written, and approved, burn plan in place before using prescribed burning.* Cost/share is available for both Prescribed Burn Planning and Implementation through the NRCS EQIP Program. Personal Protection Equipment (PPE): Always wear/use appropriate clothing and gear that is approved for use in prescribed burning. Ensure that you are well trained/educated if you intend to implement prescribed burning on your own.

Tools for Management

Small Scale: Very small-scale burns (an acre in size or smaller).

- **Burn Preparation (fire breaks):** Leaf Blower (Fig. 2), metal tined rake, chainsaw
- **Ignition Source:** Drip Torch (Fig. 1) or basic lighter
- **Water Source:** Small ATV or lawn mower/trailer with small water tank
- **Mop-up:** Leaf blower (Fig. 2), metal tined rake, shovel, chainsaw

Large Scale: Prescribed burning on large scale areas

- **Burn Preparation (fire breaks):** Small bulldozer (Fig. 3), tractor with disk/plow
- **Ignition Source:** Drip Torch (Fig. 1)
- **Water Source:** Large Water tank associated with Truck/Tractor/Bulldozer
- **Mop-up:** Leaf blower (Fig. 2), metal tined rake, shovel, chainsaw

Commercial Scale Tools:

- Contracting with a certified/Insured company that specializes in the implementation of prescribed burning is highly recommended. These companies can be located through the “Michigan Prescribed Fire Council” or request a list of contractors from your Forester (Hunters Land Management LLC)

Other Considerations: Scale of burn area and tool types should be determined by the Prescribed Burn Plan.



Figure 1



Figure 2



Figure 3

Management Tools/Methods – Non-Commercial Stem Removal*

Management Activity Types (NRCS Code):	Forest Stand Improvement (666) or Brush Management (314)
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Non-commercial stem removal* can be used for Forest Stand Improvement (666) or Brush Management (314). There are various ways to remove* woody stems. It should also be noted that the standing or downed stems do not need to be “cleaned up” (though you may want to for aesthetic reasons or for firewood/lumber use). This removed* material left on site can be beneficial for various wildlife species (nesting for birds, cover for rodents, reptiles, and amphibians) and can also serve as “protection” to new forest regeneration from over-browsing occurring from herbivores (white-tailed deer). The following techniques/tools can also be used in combination with each other in an area on non-commercial stem removal* management.

Removal: Management used to **KILL** the stem of the tree (above the ground). This does not mean the tree must be felled or removed. A standing dead tree qualifies as removed. Recommendations may also include killing the stump (underground portion) by using herbicide.*

Techniques for Management

Felling: The cutting off, and dropping, of stems designated for removal* from the stump completely. By cutting the stem the upper portion of the stem is now removed from the canopy freeing up light for growth in the understory.

- Tools needed: Chainsaw and felling PPE/tools (helmet, chainsaw chaps, wedges, hatchet, etc.)
- Forestry mulching/ Equipment-Assisted-Felling are included in this management technique type.
- **STUMP TREATMENT** - Additionally, if management recommendations specify, treatment of stump with herbicide immediately after cutting will completely kill the stem’s stump (underground portion of stem).
- **For safety reasons proper training and/or experience should be obtained before felling trees.**

Girdling: Cutting of the cambium layer (sapwood) of the stem to kill the upper portion of the stem but leave the standing stem upright. Removes risk of felling & down dead woody material while removing leaf growth from the canopy - freeing up light for growth in the understory.

- Tools needed: Chainsaw, or handsaw, and PPE (helmet, chainsaw chaps, etc.)
- **STUMP TREATMENT** - Additionally, if management recommendations specify, treatment of stump (by spraying the cut with herbicide immediately after cutting) will completely kill the stem’s stump (underground portion of stem).

Hack & Squirt: “Hacking” of the bark with a hatchet to expose the cambium layer (sapwood) of the stem and immediate follow-up of herbicide spray onto the exposed cambium layer (sapwood). Herbicide is then taken in by the stem and kills the upper stem and the stump (underground portion of the stem)

- Tools needed: Sharp hatchet, spray bottle/herbicide, and PPE (gloves, mask, etc.)
- Note: this method is best used on smaller diameter stems. Refer to herbicide guidelines for proper herbicide types and application rates.

Other Considerations: Hinge cutting is a popular activity that is often identified as forest stand improvement. The NRCS EQIP funding program DOES NOT consider hinge cutting an approved method of stem removal*. Based on silvicultural practices and long-term research data, hinge cutting is not a recommended management tool by Hunters Land Management.

Management Tools/Methods – Herbicide Use

Management Activity Types (NRCS Code):	Tree/Shrub Site Preparation (490), Herbaceous Plant Treatment (315), Forest Stand Improvement (666), Brush Management (314)
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Herbicide can be a very useful tool when eliminating a specific species (usually invasive plant species, non-native species, or undesirable native species)

Treatment Types

Broad Treatment: Kills all plants in treatment area.

- Use of broad herbicides that are indiscriminate towards species.
- Large coverage tools such as solid cone or flat fan nozzles to cover a large area.

Selective treatment: Target/kill specific plant species in treatment area.

- Use of selective herbicides that are specific to certain species.
- Small coverage tools such as wicks or single stream nozzles to limit spray area.

Treatment Methods

Foliar Method: Spraying of foliage (must be done in growing season)

- Good for herbaceous plants and smaller size woody stem plants

Basal Bark Method: Spraying onto bark of woody stems with addition of diesel fuel to penetrate bark.

- Good method for treating small to medium size woody stems.

Stump/Wound Spray Method:

Hack & squirt: small incisions (hacks) into bark with hatchet followed by herbicide (squirt) – Usually 1 “hack” for each inch of diameter.

- Good method for treating small to medium size woody stems.

Girdle & Spray: Cut a girdle ring in the stem followed by herbicide into cut (spray)

- Good method for treating medium to large size woody stems.

Stump Cut & Treat: Cut off trunk of woody stem followed by herbicide treatment of stump.

- Good method for treating medium to large size woody stems. (Dabber bar, Figure 1)



Figure 1.



Figure 2

Herbicide & Tool Types

Common tools used for the methods above: Dabber bar (fig. 1), spray bottle, backpack sprayer (fig. 2), ORV mounted sprayer.

Common herbicides used for woody stems (active ingredients): 2,4-D (several trade names) - foliar spray; Glyphosate (Roundup) - foliar spray; Imazapyr (Arsenal) - foliar, frill, stump treatment; Triclopyr (Garlon) - spray.

Other Considerations: Ensure that you are following all instructions and regulations of the herbicide used (it's the law!). Always wear proper PPE (personal protection equipment) when using herbicides. Ensure that herbicide is applied properly (season, time of the day, temperature, etc.) to maximize effectiveness.

Invasive Species (Vegetation) Management

What: Invasive species are non-native species that significantly impact/manipulate the environment around them that causes harm/damage to humans, native flora & fauna, and natural resources.

Why: If invasive species are not kept in-check they can greatly degrade wildlife habitat, water resources, forest diversity, and the next generation of natural vegetation. The displacement of native species in forested systems is an especially high concern as native species are struggling due to this competition in combination with other factors.

How: The removal of an invasive species will free-up resources (growing space, sunlight, water, nutrients, etc.) allowing for native species to have the chance to occupy that space. There are 3 main types of invasive species removal:



- **Root-pull Removal:** The removal of the entire plant, root system and all.
 - **Pros:** This strategy limits native vegetation disturbance and completely removes the stem and root which kills off that plant. Herbicide is also not needed.
 - **Cons:** It is the most physically demanding, and often most expensive, form of treatment. Soil disturbance can also provide optimal conditions for invasive species seed present at the site.
 - **Management Scenario:** Best utilized on small vegetation such as seedlings, saplings, and shrubs.
 - **Best Tools/Equipment:** Mini-Excavator/ Skid steer OR chain/UTV
- **Foliage Herbicide Treatment:** Direct application of herbicide to the foliage of the plant.
 - **Pros:** No impact to native vegetation or soil disturbance.
 - **Cons:** Results can vary as some species can rebound from treatment. Use of herbicides.
 - **Management Scenario:** best in situations with smaller dispersed vegetation to manage or areas where equipment is not accessible.
 - **Best Tools/Equipment:** Backpack sprayer OR UTV mounted sprayer
- **Cut and Spray:** The removal or killing of the above ground mass of the plant and follow-up treatment of the stump with herbicide.
 - **Pros:** Can be highly effective in select scenarios.
 - **Cons:** Often very physically demanding and time consuming.
 - **Management Scenario:** Areas where equipment may not be accessible, areas where soil disturbance may not be advised, and/or areas where invasive species vegetation exceeds ability to perform previous two methods.
 - **Best Tools/Equipment:** Chainsaw & sprayer OR forestry mulcher & sprayer
 - **Additional Modified Method:** “Hack-and-Squirt” method which utilizes herbicide treatment to the cambium layer through small incisions in the bark while the stem remains standing.

When/Where: The timing of invasive species treatment can be crucial in determining the success of removal. This determination is made based on the type of vegetation being treated, the location, and the surrounding native vegetation. The right timing in control can be crucial for management objectives. Ensure that you are planning out a managed approach to this invasive species management. The most common mistake in such management is taking on too much of a workload and/or managing unrealistic locations. The best approach is to devise a plan that will segment out problematic locations across the area you intend to treat. Start with the least impacted locations to gain the upper hand and make sure to not take on to large of a location at once. Also remember to continue to monitor treated areas and revisit if invasive species begin to return at unacceptable densities.

Invasive species control can be a difficult process to plan and all parts of the process are crucial to ensure success in management. Contact your forester for assistance in the determination of any of the above factors or assistance in performing management.

Herbicide Type Selection Chart

For details of delivery, mix rates, and safety requirements refer to the label on the bottle.

<u>Active Ingredient</u>	<u>Time of Year</u>	<u>Target</u>	<u>Resistant</u>
Imazapyr	Summer, in advance of regeneration	Most hardwoods, annual and perennial grasses and forbs, Bermuda, fescue, crabgrass, dog fennel, pigweed, greenbriar, morning glory	Elms, woody legumes, wax myrtle, croton spp., rubus, buckeye, baccharis, pine
Imazapyr	Growing season following full leaf expansion	Most hardwoods, annual and perennial grasses and forbs, Bermuda, fescue, crabgrass, dog fennel, pigweed, greenbriar, morning glory	Elms, woody legumes, wax myrtle, croton spp., rubus, buckeye, baccharis, hickory, pine
Glyphosate	Prior to planting, active growth following full leaf expansion	Most hardwoods (black locust, persimmon, sassafras, sumac, sweetgum, yellow-poplar) most annual and perennial grasses and forbs	Red maple*, oaks*, ash*, hickory*, dogwood*, rubus, greenbriar, Virginia creeper, trumpet vine
Glyphosate and Imazapyr	During periods of active growth	Control most annual and perennial grasses, broadleaf weeds, vines, and woody vegetation	
Metsulfuron Methyl	During periods of active growth following full leaf expansion	Wide range of annual and perennial broadleaf weeds and woody plants, kudzu, multiflora rose	Grasses, yellow poplar, loblolly pine
Sulfometuron Methyl	Early spring, before herbaceous weeds emerge or shortly thereafter	Annual grasses and forbs and certain perennial herbs	Bermuda, broomsedge, croton spp., trumper vine, panicums, pines, most hardwoods
Sulfometuron Methyl and Metsulfuron Methyl	After full leaf expansion in spring and before normal defoliation in fall. Herbaceous weeds: apply pre-emergence or shortly thereafter	Various woody plants, vines and herbaceous weeds	Loblolly pine
Triclopyr	During periods of active growth	Most hardwoods, southern pine, waxy species such as bay, gallberry, wax myrtle, and yaupon, forbs, dog fennel, pigweed, greenbriar, and morning glory, rubus	Grasses
Aminopyralid	Anytime during the growing season. Preferred when weeds are small and actively growing	Rubus, morning glory; horseweed, pigweed, sicklepod, ragweed, wilding pines	Grasses
Clopyralid	Anytime during the growing season. Preferred when weeds are small and actively growing	certain broadleaf weeds including thistle, kudzu, sicklepod, morning glory, ragweed, coffee weed most legume species	Most established grasses and woody plants

<u>Active Ingredient</u>	<u>Time of Year</u>	<u>Target</u>	<u>Resistant</u>
Dicamba	During periods of active growth	Many annual and perennial broadleaf weeds, woody brush (including hardwoods and pines), multiflora rose (when dormant)	
Fosamine	Apply during the growing season	Postharvest control of pine and hardwood species for southern pine planting site preparation	Non-woody plants (usually) and waxy leafed species
Hexazinone	Early spring - early summer after bud break and before hardening off	Most hardwoods, rubus, crabgrass, fescue, lespadeza, horseweed, dog fennel, annual and perennial rye grass	Yellow-poplar, eastern redcedar, sassafras, blackgum, hollies, American beautyberry, Bermudagrass, white snakeroot, broomsedge, Johnsongrass, sicklepod, trumpet vine, morning glory
Picloram	During periods of active growth	Annual and perennial broadleaf weeds, woody plants especially legumes and southern pine species and vines	Most grasses are resistant
Picloram and 2, 4-D	During periods of active growth	Most annual and perennial broadleaf weeds, woody plants, and vines	Most grasses are resistant
Sulfometuron Methyl and Metsulfuron Methyl	After full leaf expansion in spring and before normal defoliation in fall. Herbaceous weeds: apply pre-emergence or shortly thereafter	Various woody plants, vines and herbaceous weeds	Loblolly pine
Triclopyr	During periods of active growth	Most hardwoods, southern pine, waxy species such as bay, gallberry, wax myrtle, and yaupon, forbs, dog fennel, pigweed, greenbriar, and morning glory, rubus	Grasses
Aminopyralid	Anytime during the growing season. Preferred when weeds are small and actively growing	Rubus, morning glory; horseweed, pigweed, sicklepod, ragweed, wilding pines	Grasses
Clopyralid	Anytime during the growing season. Preferred when weeds are small and actively growing	certain broadleaf weeds including thistle, kudzu, sicklepod, morning glory, ragweed, coffee weed most legume species	Most established grasses and woody plants
Dicamba	During periods of active growth	Many annual and perennial broadleaf weeds, woody brush (including hardwoods and pines), multiflora rose (when dormant)	

Artificial Regeneration

(Tree/Shrub Planting)

In most forest settings forest managers rely on natural regeneration to provide the next generation of trees/shrubs in the forest. However, in certain situations this may not be possible.

Artificial regeneration (tree/shrub planting) can assist in afforestation/ reforestation efforts where nature does not have the ability to do so. Such situations that artificial regeneration is necessary include afforestation of open areas (where trees are not

currently present), supplemental planting of desirable species (where individuals of those species are not present), or scenarios where local wildlife and/or vegetation discourages natural regeneration.



Reasons to Plant: There are many reasons that an individual landowner will choose artificial regeneration: including reclaiming agricultural fields, increasing stem densities in standing forest, introducing new species to standing forest, increasing density/value of stems in a specific location, erosion control, and reforestation after vegetation removal. These reasons can also be linked to your goals: increasing wildlife habitat, increasing species diversity, timber production, etc.

Planning: The planning process can be the most crucial step in a successful artificial regeneration project. There are many factors that are important to consider before planting. Individual tree/shrub species all have different shade, moisture, and soil tolerance/requirements among many other factors that need to be identified to ensure a successful effort. Desirable species requirements should be compared with planting location characteristics to identify the probability of success. Once the proper species have been identified other factors such as stocking size (seed, seedling, sapling), stocking source (local, regional, hybrid, etc.), site preparation, planting time frame, spacing between stems, and if herbivory protection is needed. Taking all these factors into consideration can greatly increase the success, and lower the cost/time, of artificial regeneration projects.

Planting Techniques: Artificial regeneration can be broken down into the layout and mechanism of planting. The layout of planting describes where trees will be planted in comparison to one another: dispersed or row planted. Disperse planting is where stems are randomly planted within the planting area without uniformity. This usually takes place in forested settings where trees are being planted among an already established canopy. Row planting is the planting of stems in uniform rows with equal spacing between rows and stems. This method is often utilized in open areas and can aid in the ease of continued maintenance. The mechanism of planting describes the technique to how the tree enters the ground: Hand planting, mechanical row, and mechanical spade. Hand planting is the most common mechanism of planting trees/shrubs and utilizes the assistance of a spade (or shovel) to plant a seedling or potted tree/shrub into the ground. Mechanical row planting utilizes a planter attached behind a piece of equipment (tractor, skidder, etc.) that allows for a high volume of stems to be planted in a short time.

However, this method requires intensive ground preparation and must be done in rows. Mechanical spade planting involves large equipment that can transplant larger stem trees. This method is the least utilized and the most expensive/time consuming.

Protecting Seedlings: Once seedlings are established and thriving, failure can still occur due to biotic factors. Many species of wildlife utilize tree/shrub seedlings as a food source. Of those wildlife species white-tailed deer and rabbits can often have negative effects on seedling growth where growth reduction or mortality can result. To protect these vulnerable seedlings from damage it is advised to use protective guards such as wired enclosures or growing tubes to eliminate these issues. These protective guards should be kept in place until the tree reaches sapling status (> 1" DBH and/or above the browse height of deer). However, maintaining the protective guard through the sapling stage is advised as rutting bucks can still damage the stem of a sapling (by rubbing their antlers on them during the fall) and rabbits can still girdle the trunk. Once the stem has reached the desired size, where protection is no longer needed, ensure you remove the protective guard, so it does not restrict further growth.

Reducing Competition: In the early stages of development seedlings can be very vulnerable to surrounding competitive vegetation. Herbaceous plants, shrubs, and other vegetation can outcompete seedlings/saplings for resources (light, water, nutrients, growing space, etc.) if not kept in check. Removal can be done mechanically (disking, mowing, burning, etc.) or chemically (herbicide). Reducing competitive vegetation often starts with site preparation. Removal of this competition prior to planting can be a crucial step towards success. Once the seedlings/saplings are planted the competitive vegetation will continue to reestablish. For tree species, continued monitoring and management until the stem reaches poletimber size will greatly increase the productivity of your planting. As the stem progresses into the poletimber size class herbaceous vegetation and shrubs become less of a concern.

Forest Stand Improvement: At the initial planting, more stems are often planted than can eventually turn into full size mature trees (sawtimber). To ensure that the best stems make it to full size, periodic thinning over time is necessary to ensure that the most desirable, healthiest, and best growing form stems survive. Thinning begins within the first few years after planting and will continue until the stand has matured. As the stems progress, they will begin to outcompete one another and grow slower due to the increased competition for the limited resources (light, water, nutrients, growing space, etc.). During this time additional thinning will be required to ensure the best stems continue to thrive.

Additional Considerations: Monitoring, seedling replacement, pruning, irrigating, and fertilizing. Monitoring is another crucial element to long term success of artificial regeneration: annual observations should look for signs of pests, disease, decline in stem health, and other factors described above. Seedling replacement is the practice of replacing seedlings that did not survive the initial planting. This can be done for several years post-initial planting until the original stems reach a size where seedlings will no longer be able to coincide. Pruning is often performed on trees in plantations where high quality stem production is the main goal of the planting. However, any tree planting will benefit financially long term by periodically pruning for stem quality. Irrigating can be a useful tool during the early stages of a planting to assist seedling/saplings during dry periods. Once saplings begin to enter the poletimber size class irrigation is often not necessary. Fertilizing recommendations are based on the goals of the species planted size, time, and location. In most afforestation/reforestation efforts fertilizing is not a cost effective/beneficially feasible strategy.

Appendix IV

Financial Assistance Opportunities

NRCS Environmental Quality Incentive Program (EQIP) & Conservation Stewardship Program (CSP)

Federal funding for completing approved management activities.

<https://www.nrcs.usda.gov/wps/portal/nrcs/mi/home/>



The Environmental Quality Incentives Program (EQIP) provides technical and financial assistance to producers to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion, and improved or created wildlife habitat.

Apply at your local USDA Service Center, which you can find in the “Important Resource Contacts” within this management plan or @ <https://offices.sc.egov.usda.gov/locator/app> . Applications for EQIP financial assistance are accepted throughout the year. Specific state deadlines are set for ranking and funding. If your application is ranked and selected, you will enter into a contract with NRCS to receive financial assistance for the cost of implementing conservation practices. Payment rates for conservation practices are reviewed and set each fiscal year. For more information, visit <https://www.nrcs.usda.gov/>

Avenza Map App For Your Management Plan Map(s)

Avenza Maps is a mobile map app that allows you to download maps for offline use on your iOS, Android, and Windows smartphone or tablet. Use your device's built-in GPS to track your location on any map. Plot and record information about locations, import and export placemarks, measure distance and area, and even plot photos.

By downloading the *General Use Map* (or various other management maps included) you can see in realtime where you are located on the property within the management plan map along with the details associated with the map itself.

The avenza map free subscription can maintain up to 3 georeferenced maps. If you would like to have access to more than 3 maps, then there are affordable subscription options available.

How to Download Avenza Maps

1. Go to your device's application store on the device and search "Avenza Maps"
2. Download the application.

How to upload your Georeferenced Map from Hunters Land Management

1. A georeferenced map in PDF form should have been included in your Final Management Plan Package via email. If this map was not included contact Hunters Land Management (HLMforestry@gmail.com) to have the georeferenced PDF map sent to you.
2. Download the PDF map from your email app on your phone to your phone's files.
3. Open the Azenza Map APP
4. Click the "download" icon in the upper right-hand corner.
5. Click "From Storage Locations"
6. Navigate to the location in your phone's files where the Georeferenced PDF Map File was downloaded too
7. Click on the Georeferenced PDF Map File
8. The map should download automatically and now will be ready to use!

You will see your location as a "blue dot" on the screen. You can now use the app to navigate your property and see your location on your forest management plan map(s). Note: you can also record your movement (record GPS track), create points/lines/polygons, and drop "photo points".

Natural Resource Education

Online Resources

Michigan Project Learning Tree

Education Program

<https://www.michiganplt.org/>

Project Learning Tree is an award-winning environmental education program designed for teachers and other educators, parents and community leaders working with youth from preschool through grade 12. There are many options to choose from: Elementary and Middle School Guide, Environmental Experiences for Early Childhood, High School Supplements, All aligned with state and national educational standards.

Learn about Michigan’s Species – Michigan DNR

Education

<https://www.michigan.gov/dnr/education/michigan-species>

Social Media

“Native Habitat Managers” – Facebook

#hailtheforestrydog – Facebook, Instagram

@nativeplanttok – TikTok

Videos

BeLeaf It or Not

Michigan based Educational YouTube Series

<https://www.beleafitornot.org/> or ***“BeLeaf It or Not” on YouTube***

BeLEAF It or Not! is a YouTube channel hosted by Bill Cook and Georgia Peterson - just 2 run-of-the-mill, slightly addled yet well-intended foresters who love sharing their love of the forest with you! Join Bill and Georgia as they uncover the hidden mysteries of Michigan Forests!

Our team, including director/videographer James Ford, is working to build a collection of professionally-produced episodes for Michigan and the upper Great Lakes States. The series is intended for students in grades four through seven, but we welcome all audiences. For teachers, each episode will be supported with additional information appearing on a website. Our goal is to produce about 30 episodes that address various aspects of Lake States forests and forestry. For teachers, each episode will be supported with additional information appearing on a website - visit <https://www.beleafitornot.org/>

Plant Identification APPs

Technological advances have made smart phones very useful when it comes to plant identification. Numerous phone applications are currently available to assist in proper plant identification and education.

I Naturalist

One of the world's most popular nature apps, iNaturalist helps you identify the plants and animals around you. Get connected with a community of over a million scientists and naturalists who can help you learn more about nature! What's more, by recording and sharing your observations, you'll create research quality data for scientists working to better understand and protect nature. iNaturalist is a joint initiative by the California Academy of Sciences and the National Geographic Society.

<https://www.inaturalist.org/>

Picture This*

PictureThis offers a powerful plant identifier to identify flowers, leaves, trees, herbs, and more in seconds! You'll also develop your green thumb, get personalized gardening tips, and become a gardening expert!

<https://www.picturethisai.com/>

Plantnet

Pl@ntNet is a tool to help identify plants with pictures. It is organized in different thematic and geographical floras. Choose the one that corresponds to your region or area of interest from the list below. If you don't know what to choose, select "World flora" which has the widest coverage but will give less accurate results than a more focused flora.

<https://identify.plantnet.org/>

PlantSnap

With over 650,000 plants and 475 million+ images in our database, PlantSnap is currently using Machine Learning technology and artificial intelligence to help anyone, anywhere, identify any plant or tree on planet Earth!

<https://www.plantsnap.com/>

**: This is the app currently used by your forester*

Mapping Software APPs

Technological advances have made smart phones very useful for natural resource management. When performing management on your property it can often be helpful to have mapping software to assist in planning, recording, and implementing management activities. Additionally, these programs can be beneficial for recreational use such as hunting, hiking, and other outdoor activities. Below you will find various programs that can accommodate your needs.

Avenza Maps*

Avenza Maps is a mobile map app that allows you to download maps for offline use on your iOS, Android, and Windows smartphone or tablet. Use your device's built-in GPS to track your location on any map. Plot and record information about locations, import and export placemarks, measure distance and area, and even plot photos.

<https://www.avenza.com/avenza-maps/>

OnXHunt**

The onX Hunt App turns your phone into an outdoor handheld GPS navigator using the built-in GPS to display your location on the sat / topo map. Cellular coverage is NOT needed as tile-saving technology allows you to save basemaps and layers for offline navigation.

<https://www.onxmaps.com/>

HuntStand

HuntStand has spent the last 10 years developing an indispensable toolset for hunting, habitat management and land ownership. We've combined advanced mapping, premium satellite layers and dozens of useful features to create something that has revolutionized the way millions of Americans hunt.

<https://www.huntstand.com/>

Terrain Navigator Pro***

Terrain Navigator Pro is a robust mapping platform combining built-in topographic maps and aerial photos with easy-to-use mapping tools. Create map projects, annotate, edit, collect, import and export GIS data and maps and synchronize across desktop, web, and mobile devices. Output professional map products quickly and easily.

<https://www.terrainnavigator.com/>

*: An avenza map comes with your forest management plan package. **: This application is used by your forester for personal use. ***: This program is used by Hunters Land Management for mapping projects.

Recommended Organizations to Join

American Tree Farm System

The American Tree Farm System® is a network of 74,000 family forest owners sustainably managing 19 million acres of forestland. ATFS is the largest and oldest sustainable woodland system in the United States. American Tree Farm System helps you do what's best for your woods by giving you the tools and information you need. We're here to help.

<https://www.treefarmssystem.org/>

Michigan Forest Association

MFA's mission is to inspire and empower people to sustainably manage, conserve and enjoy forests through education, advocacy and fellowship. Benefits of Membership. If you care about Michigan forests, there are many reasons to join the Michigan Forest Association. Learn more about the benefits of joining our group!

<https://michiganforests.org/>

Michigan Prescribed Fire Council

The Michigan Prescribed Fire Council was formed to bring together practitioners, guides, and students of prescribed fire to provide a network through which information could be disseminated, partnerships could form and the use of prescribed fire would be protected.

<https://www.firecouncil.org/>

Black Walnut Council

This international association represents nearly 800 woodland owners, foresters, forest scientists, and wood-producing industry representatives. We promote sustainable forest management, conservation, reforestation, and utilization of American black walnut (*Juglans nigra*) and other fine hardwoods.

<https://walnutcouncil.org/>

Arborday Foundation

Since 1972, the Arbor Day Foundation has been hard at work helping as many people as possible not just plant trees, but truly understand their value. As we've grown to become the largest member nonprofit organization, so has our passion for getting our hands in the dirt and determination to teach everyone about the role trees play in the health of our planet.

<https://www.arborday.org/>

The Wildlife Society

The Wildlife Society (TWS) is an international non-profit association involved in wildlife stewardship through science and education. The Wildlife Society works to improve wildlife conservation in North America by advancing the science of wildlife management, promoting continuing education of wildlife professionals, and advocating for sound, science-based wildlife policy.

<https://wildlife.org/>

Ruffed Grouse Society

Established in 1961, the Ruffed Grouse Society is North America's foremost conservation organization dedicated to preserving our sporting traditions by creating healthy forest habitat for ruffed grouse, American woodcock and other wildlife.

<https://ruffedgrousesociety.org/>

National Wild Turkey Federation

The National Wild Turkey Federation is an international non-profit organization whose mission is 'the conservation of the wild turkey and the preservation of our hunting heritage.'

<https://www.nwtf.org/>

National Deer Association

The National Deer Association is the leading conservation organization dedicated to conserving North America's favorite game animal. We are hunters from all walks of life who share a passion for wild deer. We believe it is our responsibility to ensure the future of wild deer, wildlife habitat and hunting.

<https://deerassociation.com/>

Michigan United Conservation Clubs

Michigan United Conservation Clubs is the largest statewide conservation organization in the nation. Founded in 1937, our mission is to unite citizens to conserve, protect and enhance Michigan's natural resources and outdoor heritage.

<https://mucc.org/>

Podcasts

Podcasts are an excellent source of information for natural resource management. These digital audio files are a free resource that can be found on *Apple, Spotify, Google, Audible*, etc. However, beware! There are many podcasts that are hosted by “self-proclaimed” professionals that provide poor, unsustainable management advice. Below you will find a list of podcasts that are hosted by certified professionals with a higher education in natural resource management and credentials to back their knowledge.

The Native Habitat Project*

Welcome to the Native Habitat Podcast. If you’ve even got the slightest interest in the outdoors, you’re in the right place! Join hosts Kyle Lybarger and Jake Brown as they hit the field with special guests who have a passion for wildlife, plants, and native habitats.

<https://www.nativehabitatproject.com/podcast>

Leadership Nature Podcast

The Leadership Nature Podcast was founded in 2016 to share the lessons of leadership, communications, teamwork and careers of professionals throughout the forestry and natural resources community. Since then, the podcast has featured over 100 diverse guests in a number of Seasons, Series, and Topics as you will see in the navigation bars. Please enjoy, learn and share with others.

<http://leadershipnature.com/category/podcasts/>

Fire University

Fire University is a science-based podcast covering the latest research in fire ecology and how it relates to management of wildlife and plant communities. This podcast is part of the larger podcast network Natural Resources University. Funding for this project comes from the Renewable Resources Extension Act.

<https://podcasts.apple.com/us/podcast/fire-university/id1542816170>

Land & Legacy

The Land & Legacy podcast brings expert advice each week on everything from habitat management, hunting, and recreational land investments. We unpack real world scenarios that we experience through consulting across the country to help you become a more productive landowner and hunter. If you own land, this is the podcast for you!

<https://landandlegacy.tv/category/podcast/>

SilviCast*

Join Wisconsin Department of Natural Resources silviculturists Greg Edge and Brad Hutnik as they explore topics related to silviculture in the Great Lakes. Each month they interview experts from across the U.S. and Canada on a variety of topics including forest regeneration, deer browse, and prescribed fire.

<https://www3.uwsp.edu/cnr-ap/WFC/Pages/Research-Development/SilviCast.aspx>

YourForest

This podcast exists to challenge our ideas of sustainability. Why do we do the things that we do? And how can we make sure that what we are doing is right? This show is an exercise in developing new perspective and context around land management in order to help us make the best decisions possible.

<https://yourforestpodcast.com/>

*: These are podcasts frequently listened to by your Forester and are highly recommended. If you have other natural resource-based podcast you think are beneficial please email them to your forester @ HLMforestry@gmail.com

White-tailed Deer Population Management

Antlerless License

<https://www.michigan.gov/dnr/things-to-do/hunting/deer>

The Michigan Department of Natural Resources allows individuals to purchase up to 10 antlerless licenses to assist in removing an overabundance of white-tailed deer. This license can be purchased at any licensing dealer or online through the Michigan DNR E-license website (<https://www.mdnr-elicense.com/>). These licenses can be used during any valid fall deer hunting season within the regulations of the Michigan DNR. Also, in many cases the combo license (two antlered deer tags) can also be used to harvest antlerless deer as well. If you are a deer hunter than this can be a valuable tool. If you are a landowner who does not hunt then seek out this option through a hunting lease (service offered by *Hunters Land Management LLC*) or allow permission to family/friends on your property to harvest antlerless deer.

DMAP (Deer Management Assistance Permits)

Additionally, if antlerless permit quotas are not sufficient for current deer harvest objectives landowners can apply for **DMAP** (Deer Management Assistance Program). Under approved circumstances this program can provide additional antlerless permits for the property that can be used by any hunter. If this scenario pertains to you reach out to your local DNR wildlife biologist to discuss this option.

MSAH

(Michigan Sportsman Against Hunger)

<https://www.sportsmenagainsthunger.org/>

Established in 1991, the Michigan Sportsmen Against Hunger is an all volunteer, 501c3 nonprofit organization, that coordinates participating licensed game processors throughout the state as drop off locations for whitetail deer harvested by hunters during the hunting season and deer harvested through deer management practices.

These processors (a list can be found at their website above) accept legally tagged deer, at no cost to the donating hunter, to then be processed and distributed to the hungry of local communities. A great program for hunters, managing deer populations, with full freezers.

Invasive Species Information

MISIN

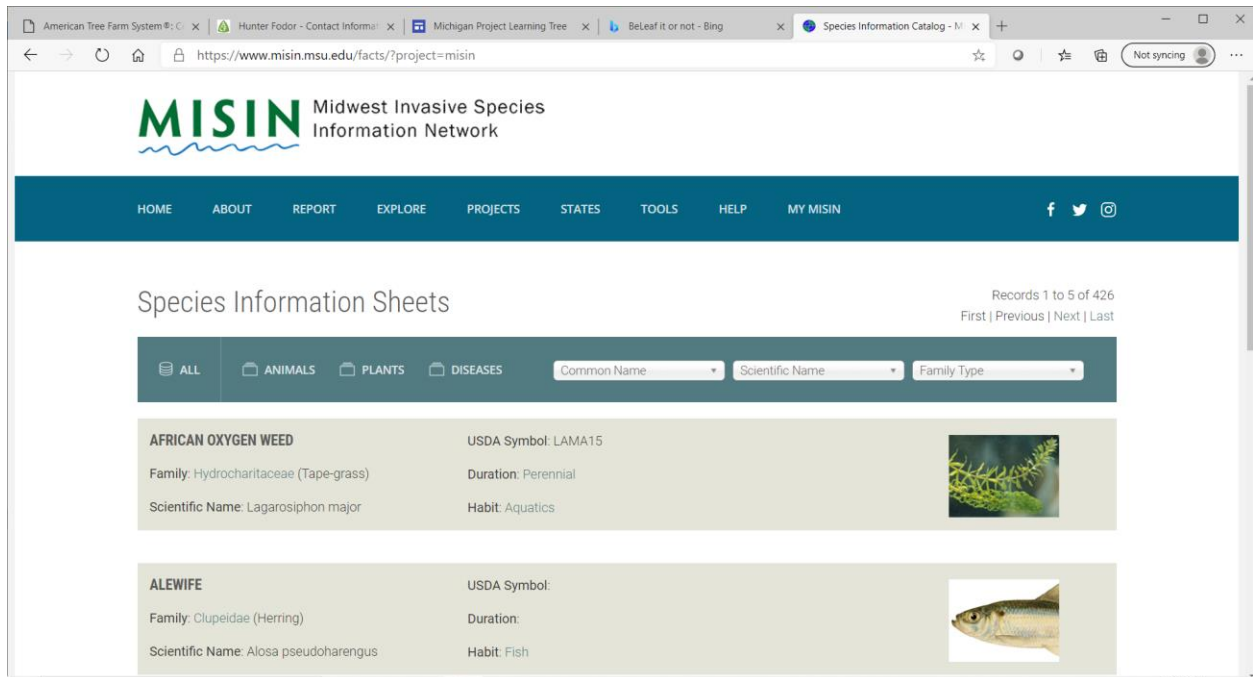
(Midwest Invasive Species Information Network)

<https://www.misin.msu.edu/>



The Midwest Invasive Species Information Network (MISIN) is a regional effort to develop and provide early detection and response resources for invasive species.

Our goal is to assist both experts and citizen scientists in the detection and identification of invasive species in support of successful management.

This effort is being led by researchers with the Michigan State University Department of Entomology laboratory for [Applied Spatial Ecology and Technical Services](#) in conjunction with a growing consortium of supporting partners.



The screenshot shows a web browser window displaying the MISIN website. The URL is <https://www.misin.msu.edu/facts/?project=misin>. The page features a dark blue navigation bar with the MISIN logo and the text "Midwest Invasive Species Information Network". Below the navigation bar, there is a section titled "Species Information Sheets" with a sub-header "Records 1 to 5 of 426" and navigation links "First | Previous | Next | Last". A filter bar includes tabs for "ALL", "ANIMALS", "PLANTS", and "DISEASES", along with dropdown menus for "Common Name", "Scientific Name", and "Family Type". Two species are listed:

Species Name	USDA Symbol	Family	Duration	Habit	Image
AFRICAN OXYGEN WEED	LAMA15	Hydrocharitaceae (Tape-grass)	Perennial	Aquatics	
ALEWIFE		Clupeidae (Herring)		Fish	

Conservation Programs & Easements

Partners for Fish & Wildlife Program

The Partners for Fish and Wildlife Program provides free technical and financial assistance to landowners, managers, tribes, corporations, schools and nonprofits interested in improving wildlife habitat on their land. Since 1987, we have helped more than 60,000 landowners restore more than 7 million acres of forest, prairie, wetland and stream habitat for wildlife.

The Partners for Fish and Wildlife Program of the U.S. Fish and Wildlife Service employs 220 biologists, located in all 50 states and territories, who consult with landowners to help them conserve and improve wildlife habitat.

Projects are voluntary and customized to meet landowners' needs. Participating landowners continue to own and manage their land while they improve conditions for wildlife.

Our staff provide free technical and financial assistance to plan, design, supervise and monitor customized habitat restoration projects. These projects range in size from a wetland of a few acres to a grassland restoration covering several hundred thousand acres.

<https://www.fws.gov/program/partners-fish-and-wildlife>

Conservation Easements

A conservation easement is a voluntary legal agreement between a landowner and a land trust or government agency that permanently limits uses of land to protect its conservation values. It is an interest in real property that runs with the land and is recorded in local land records. The landowner retains ownership and can sell or pass on the land but agrees to restrict the type and amount of development or certain uses that may harm the natural, productive, or cultural features of the land. The land trust or government agency monitors the land to ensure compliance with the agreement.

Benefits include:

- Selling a conservation easement can be a good way to get some cash out of the property.
- Landowners who donate conservation easements may receive tax benefits.
- Conservation easements can reduce the property's overall value, making the land more affordable for future farmers.
- Conservation easements can give peace of mind that a beloved property will not be commercially developed.

More information about conservation easements can be found at the following MSU document:

<https://www.canr.msu.edu/uploads/resources/pdfs/conservationeasement.pdf>

Appendix V

Endangered, Threatened, or Species of Concern

Gavia immer Common loon



Key Characteristics

The Common loon is a large, heavy-bodied bird, averaging 32 inches (81.3 cm) in length, with a wingspan of about 5 feet (1.5 m). In breeding plumage, its head and dagger-like bill are dark, its breast white, and its back is a distinctive black and white checkerboard pattern.

Habitat

Typically, Common loons nest in sheltered islands on large, undeveloped inland lakes, although they may nest in lakes as small as 11 acres (4.5 hectares). Preferred nest sites are on small islands or bog mats, at the water's edge. Nursery areas - quiet, shallow, sheltered coves - are important for rearing chicks.

Management Recommendations

Loons are sensitive to human disturbance during the breeding season. Minimize maintenance activities within 1/4 mile of active nests during the breeding season. Nursery areas may be vulnerable also. Schedule construction, maintenance, or habitat management activities during the non-breeding season, from September through February. Application of herbicide to control aquatic vegetation should only be conducted outside the nesting season on lakes where loons nest, particularly on small lakes.

Active Period

Migration from second week of March to third week of May
Migration from third week of October to third week of December
Nesting from first week of May to fourth week of July

Additional Forest Inventory Data

Stand 1

TREES PER ACRE															1/14/24
STAND 1	Stand 1	Sampling Method: Variable Radius Plots													
ACRES 279.3		Basal Area Factor: 10.00 28 PTS													
Q-Factor 2.1	TOTAL	6	8	10	12	14	16	18	20	22	24	26	28	30	32+
N. red oak	145.5	13.1	2.7	2.4	9.7	9.3	13.7	5.0	1.1	0.4	0.2	0.2	0.3	0.1	
soft maple	1,422.0	49.8	14.7	4.9	2.7	3.1	0.9								
mixed aspen	117.4	28.8	9.4	4.9	0.5	0.8	0.3								
white oak	172.2	7.9	1.3	2.4	1.6	3.9	1.5	0.7			0.1				
E. white pine	11.7		1.3	1.6	0.5	0.4	0.3			0.1		0.1			
mixed oak	3.2			0.8	0.5	0.8	0.6	0.5							
paper birch	7.6						0.3								
black cherry	7.3														
TOTAL	1,886.	99.5	29.4	17.0	15.7	18.2	17.5	6.1	1.1	0.6	0.4	0.3	0.3	0.1	

STAND BASAL AREA															1/14/24
STAND 1	Stand 1	Sampling Method: Variable Radius Plots													
ACRES 279.3		Basal Area Factor: 10.00 28 PTS													
Q-Factor 2.1	TOTAL	6	8	10	12	14	16	18	20	22	24	26	28	30	32+
N. red oak	50.7	1.8	0.7	1.1	6.4	8.6	16.8	7.9	2.1	1.1	0.7	0.7	1.1	0.4	
soft maple	33.2	6.8	3.9	2.1	1.8	2.9	1.1								
mixed aspen	13.6	3.9	2.5	2.1	0.4	0.7	0.4								
white oak	12.1	1.1	0.4	1.1	1.1	3.6	1.8	1.1			0.4				
E. white pine	3.2		0.4	0.7	0.4	0.4	0.4			0.4		0.4			
mixed oak	2.9			0.4	0.4	0.7	0.7	0.7							
paper birch	0.7						0.4								
black cherry	0.4														
TOTAL	116.8	13.6	7.9	7.5	10.4	16.8	21.4	9.6	2.1	1.4	1.1	1.1	1.1	0.4	

Stand 2

TREES PER ACRE															1/14/24	
STAND 2	Stand 2														Sampling Method: Variable Radius Plots	
ACRES 6.7															Basal Area Factor: 10.00	1 PTS
Q-Factor 1.1	TOTAL	6	8	10	12	14	16	18	20	22	24	26	28	30	32+	
red pine	158.9			45.3	30.3	10.8	40.7	31.7								
soft maple	241.1		37.4													
TOTAL	400.0		37.4	45.3	30.3	10.8	40.7	31.7								

STAND BASAL AREA															1/14/24	
STAND 2	Stand 2														Sampling Method: Variable Radius Plots	
ACRES 6.7															Basal Area Factor: 10.00	1 PTS
	TOTAL	6	8	10	12	14	16	18	20	22	24	26	28	30	32+	
red pine	150.0			20.0	20.0	10.0	50.0	50.0								
soft maple	20.0		10.0													
TOTAL	170.0		10.0	20.0	20.0	10.0	50.0	50.0								

Special Resource Concerns Checklist (NRCS)

RESOURCE CONCERN CHECKLIST Field Inventory Guide Sheet (Optional)		Client/Plan Information: Clare County 4-H, Property Coordinates (North Entrance): 043.936009°N, 084.899041°W (decimal degrees)
Identify the resource concern(s) that need to be addressed and the assessment tool(s) used for the evaluation.		
SOIL	<input type="checkbox"/> Sheet & Rill <input type="checkbox"/> Ephemeral gully erosion <input type="checkbox"/> Bank erosion from streams, shorelines or water conveyance channels <input type="checkbox"/> Subsidence <input type="checkbox"/> Compaction <input type="checkbox"/> Soil organism habitat loss or degradation	<input type="checkbox"/> Wind Erosion <input type="checkbox"/> Classic gully erosion <input type="checkbox"/> Organic matter depletion <input type="checkbox"/> Concentration of salts or other chemicals <input type="checkbox"/> Aggregate instability <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____
Assessment tools, Problems & Notes:		No concerns observed. Planner Observation
WATER	<input type="checkbox"/> Ponding and flooding <input type="checkbox"/> Seasonal High water table <input type="checkbox"/> Seeps <input type="checkbox"/> Drifted snow <input type="checkbox"/> Surface water depletion <input type="checkbox"/> Ground water depletion <input type="checkbox"/> Naturally available moisture use <input type="checkbox"/> Inefficient irrigation water use <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____	<input type="checkbox"/> Nutrients transported to surface water <input type="checkbox"/> Nutrients transported to groundwater <input type="checkbox"/> Pesticides transported to surface water <input type="checkbox"/> Pesticides transported to groundwater <input type="checkbox"/> Pathogens and chemicals from manure, bio-solids or compost applications transported to surface water <input type="checkbox"/> Pathogens and chemicals from manure, bio-solids or compost applications transported to groundwater <input type="checkbox"/> Salts transported to surface water <input type="checkbox"/> Salts transported to groundwater <input type="checkbox"/> Petroleum, heavy metals, and other pollutants transported to surface water <input type="checkbox"/> Petroleum, heavy metals, and other pollutants transported to groundwater <input type="checkbox"/> Sediment transported to surface water <input type="checkbox"/> Elevated water temperature <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____
Assessment tools, Problems & Notes:		No concerns observed. Planner Observation
AIR	<input type="checkbox"/> Emissions of particulate matter (PM) and PM precursors <input type="checkbox"/> Emissions of greenhouse gases (GHGs) <input type="checkbox"/> Emissions of ozone precursors <input type="checkbox"/> Objectionable odors <input type="checkbox"/> Emissions of airborne reactive nitrogen	<input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____
Assessment tools, Problems & Notes:		No concerns observed. Planner Observation
PLANTS	<input checked="" type="checkbox"/> Plant productivity and health <input type="checkbox"/> Plant structure and composition <input checked="" type="checkbox"/> Plant pest pressure	<input type="checkbox"/> Wildfire hazard from biomass accumulation <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____
Assessment tools, Problems & Notes:		Overbrowsing from white-tailed deer, undesirable plant structure projection (without management), and increasing invasive plant species densities. Planner Observation
ANIMALS	<input type="checkbox"/> Terrestrial habitat for wildlife and invertebrates <input type="checkbox"/> Aquatic habitat for fish and other organisms <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____	<input type="checkbox"/> Feed and forage imbalance <input type="checkbox"/> Inadequate livestock shelter <input type="checkbox"/> Inadequate livestock water quantity, quality and distribution <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____
Assessment tools, Problems & Notes:		No concerns observed. Planner Observation
ENERGY	<input type="checkbox"/> Energy efficiency of equipment and facilities <input type="checkbox"/> Energy efficiency of farming/ranching practices and field operations	<input type="checkbox"/> Other: _____
Assessment tools, Problems & Notes:		No concerns observed. Planner Observation

Forest Productivity

This table is designed to assist forestland owners or managers in planning the use of soil for wood crops. It provides the potential productivity of the soils for wood crops.

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

The *Base Age* is the age of trees in years on which the site index is based. "TA" indicates total age. "BH" indicates breast height age. "N/A" indicates that base age is not applicable.

The *Site Index Curve Number* is listed in the National Register of Site Index Curves. It identifies the site index curve used to determine the site index.

The *Volume Growth Rate* is the maximum wood volume annual growth rate likely to be produced by the tree species. This number, expressed as cubic feet per acre per year, is calculated at the age of culmination of the mean annual increment (CMAI). It indicates the maximum volume of wood fiber produced per year in a fully stocked, even-aged, unmanaged stand.

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

Report — Forestland Productivity

Clare County, Michigan				
Map unit symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site Index	Volume of wood fiber	
			<i>Cu ft/ac/yr</i>	
GyB—Grayling sand, 0 to 6 percent slopes				
Grayling	Jack pine	49	71	—
	Northern red oak	45	57	
GycaaB—Graycalm sand, 0 to 6 percent slopes				
Graycalm	Bigtooth aspen	70	81	—
	Jack pine	54	80	
	Northern red oak	63	57	

	Quaking aspen	60	64	
	Red pine	60	92	
GycaaD—Graycalm sand, 6 to 18 percent slopes				
Graycalm	Bigtooth aspen	70	81	—
	Jack pine	54	80	
	Northern red oak	63	57	
	Quaking aspen	60	64	
	Red pine	60	92	
LupabA—Lupton muck, 0 to 1 percent slopes				
Lupton	—	—	—	—
MtD—Montcalm loamy sand, 6 to 18 percent slopes				
Montcalm	Bigtooth aspen	70	—	—
	Jack pine	52	—	
	Northern red oak	61	—	
	Paper birch	—	—	
	Quaking aspen	—	—	
	Red maple	—	—	
	Red pine	62	—	
	Sugar maple	58	—	
Ro—Roscommon mucky loamy sand				
Roscommon	Balsam fir	—	0	Black spruce, Northern white- cedar, Tamarack
	Black spruce	—	0	
	Jack pine	—	0	

	Northern white-cedar	—	0	
	Quaking aspen	74	86	
	Red maple	—	0	
	Yellow birch	—	0	
W—Water				
Water	—	—	—	—

Equipment Limitations

This table provides interpretive ratings for the use of harvesting equipment and for log landings and haul roads. The ratings are both verbal and numerical.

The rating class terms are expressed as Well suited, moderately suited, and Poorly suited. Well suited indicates that the soil has features that are favorable for the specified practice and has no limitations. Good performance can be expected, and little or no maintenance is needed. Moderately suited indicates that the soil has features that are moderately favorable for the specified practice. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance is needed. Poorly suited indicates that the soil has one or more properties that are unfavorable for the specified practice. Overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified forest management practice (1.00) and the point at which the soil feature is not a limitation (0.00).

Limitations in this table are given for the most limited season of the year, generally spring or late fall. In some areas, however, the most limiting season is during dry periods in summer, when loose sand can limit trafficability on deep, well drained, sandy soils.

The paragraphs that follow indicate the soil properties considered in rating the soils for the forest management practices in this table. More detailed information about the criteria used in the ratings is available in the "National Forestry Manual," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

Suitability for use of harvesting equipment refers to the use of equipment in logging areas and on skid roads. These are areas where some or all of the trees are being cut. Generally, equipment use is least intensive in these areas. The ratings in this column are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, and ponding.

Log landings are areas where logs are assembled for transportation. Wheeled equipment may be used more frequently in these areas than in any other areas affected by logging. The ratings in this column are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, ponding, flooding, and the hazard of soil slippage.

Haul roads are access roads leading from primary or surfaced roads to the logging areas. The logging roads serve as transportation routes for wheeled logging equipment and logging trucks. Generally, they are unpaved roads. Some are graveled. The ratings in this column are based on slope, flooding, permafrost, plasticity index, the hazard of soil slippage, content of sand, the Unified classification, rock fragments on or below the surface, depth to a restrictive layer that is indurated, depth to a water table, and ponding.

Report – Equipment Limitations on Woodland (MI)

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

Clare County, Michigan							
Map symbol and soil name	Pct. of map unit	Suitability for use of harvesting equipment (MI)		Suitability for haul roads (MI)		Suitability for log landings (MI)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
GyB— Grayling sand, 0 to 6 percent slopes							
Grayling	89	Moderately suited		Well suited		Moderately suited	
		Too sandy	0.5			Too sandy	0.5
GycaaB— Graycalm sand, 0 to 6 percent slopes							
Graycalm	94	Moderately suited		Moderately suited		Moderately suited	
		Too sandy	0.5	Sandiness	0.5	Too sandy	0.5

Gycaad— Graycalm sand, 6 to 18 percent slopes							
Graycalm	90	Moderate ly suited		Moderate ly suited		Moderate ly suited	
		Too sandy	0.5	Sandines s	0.5	Slope	0.5
						Too sandy	0.5
LupabA— Lupton muck, 0 to 1 percent slopes							
Lupton	92	Not Rated		Poorly suited		Not Rated	
				Low strength	1		
				Wetness	1		
MtD— Montcalm loamy sand, 6 to 18 percent slopes							
Montcalm	90	Well suited		Well suited		Moderate ly suited	
						Slope	0.5
Ro— Roscommon mucky loamy sand							

Roscomm on	85	Poorly suited		Poorly suited		Poorly suited	
		Wetness	1	Wetness	1	Ponding	1
						Wetness	1
W—Water							
Water	100	Not Rated		Not Rated		Not Rated	

Erosion & Windthrow

Forestland Erosion and Windthrow Hazard

This table provides interpretive ratings for off-road or off-trail erosion and for the windthrow hazard. The ratings are both verbal and numerical.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest impact on the specified forest management practice (1.00) and the point at which the soil feature is not a limitation (0.00).

Ratings in the column **hazard of off-road or off-trail erosion** are based on slope and on soil erodibility factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe. A rating of *slight* indicates that erosion is unlikely under ordinary climatic conditions; *moderate* indicates that some erosion is likely and that erosion-control measures may be needed; *severe* indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and *very severe* indicates that significant erosion is expected, loss of soil productivity and offsite damage are likely, and erosion-control measures are costly and generally impractical.

Ratings in the column **windthrow hazard** indicate the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high-water table and the depth to bedrock, a fragipan, or other limiting layers. The windthrow hazard is described as slight, moderate, or severe. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet, and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Report — Forestland Erosion and Windthrow Hazard (MI)

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

Clare County, Michigan					
Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion (MI)		Windthrow hazard (MI)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
GyB—Grayling sand, 0 to 6 percent slopes					
Grayling	89	Slight		Slight	
		Slope/erodibility	0.04		
GycaaB—Graycalm sand, 0 to 6 percent slopes					
Graycalm	94	Slight		Slight	
		Slope/erodibility	0.04		
GycaaD—Graycalm sand,					

6 to 18 percent slopes					
Graycalm	90	Slight		Slight	
		Slope/erodibility	0.2		
LupabA—Lupton muck, 0 to 1 percent slopes					
Lupton	92	Slight		Severe	
				Wetness	1
MtD—Montcalm loamy sand, 6 to 18 percent slopes					
Montcalm	90	Slight		Slight	
		Slope/erodibility	0.2		
Ro—Roscommon mucky loamy sand					
Roscommon	85	Slight		Severe	

		Slope/erodibility	0.02	Wetness	1
W—Water					
Water	100	Not Rated		Not rated	

Site Preparation and Seed Mortality

Forestland Site Preparation and Potential Seedling Mortality

This table provides interpretive ratings for mechanical site preparation (surface) and seedling mortality. The ratings are both verbal and numerical.

In the column "suitability for mechanical site preparation (surface)," the rating class terms are expressed as *well suited*, *poorly suited*, and *unsuited*. *Well suited* indicates that the soil has features that are favorable for the specified practice and has no limitations. Good performance can be expected, and little or no maintenance is needed. *Poorly suited* indicates that the soil has one or more properties that are unfavorable for the specified practice. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration. *Unsuited* indicates that the expected performance of the soil is unacceptable for the specified practice or that extreme measures are needed to overcome the undesirable soil properties. The ratings are based on slope, depth to a restrictive layer, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The part of the soil from the surface to a depth of about 1 foot is considered in the ratings.

The numerical ratings in this column indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified forest management practice (1.00) and the point at which the soil feature is not a limitation (0.00).

In the column *potential for seedling mortality*, the rating class terms are expressed as *low*, *medium*, and *high*. The ratings are based on flooding, ponding, depth to a water table, content of lime, reaction, salinity, available water capacity, soil moisture regime, soil temperature regime, aspect, and slope.

The numerical ratings in this column indicate gradations between the point at which the potential for seedling mortality is highest (1.00) and the point at which the potential is lowest (0.00).

Report — Forestland Site Preparation and Potential Seedling Mortality (MI)

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

Clare County, Michigan					
Map symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (surface) (MI)		Potential for seedling mortality (MI)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
GyB—Grayling sand, 0 to 6 percent slopes					
Grayling	89	Well suited		Medium	
				Droughty	0.5
GycaaB—Graycalm sand, 0 to 6 percent slopes					
Graycalm	94	Well suited		Medium	
				Droughty	0.5
GycaaD—Graycalm sand, 6 to 18 percent slopes					
Graycalm	90	Well suited		Medium	
				Droughty	0.5

LupabA—Lupton muck, 0 to 1 percent slopes					
Lupton	92	Unsuited		High	
		Wetness	1	Wetness	1
MtD—Montcalm loamy sand, 6 to 18 percent slopes					
Montcalm	90	Well suited		Low	
Ro—Roscommon mucky loamy sand					
Roscommon	85	Unsuited		High	
		Wetness	1	Wetness	1
W—Water					
Water	100	Not rated		Not Rated	

Management Service Provider

Certified Professionals

When performing management on your property, especially on forested land, it is a good strategy to request assistance from a professional with the proper education and credentials. Consulting Foresters can provide a wide range of services that can benefit your property, and the goals you are trying to achieve upon them. When conducting forest management/timber harvest, hiring a consulting forester to administer (or prepare) a timber harvest can ensure the appropriate trees are being harvested/retained, greatly increase the income provided by the sale, and provide peace of mind knowing that a forest steward is overseeing the project to ensure compliance and right doing by the timber purchaser. For any of the services provided below that you would like to perform on your property, please contact Hunters Land Management LLC to help reach your goals and objectives!

Forest Management/ Harvest

- Ensuring that the forest management/timber harvest is in the best interest of the landowner's goals.
- Timber sale administration or timber sale preparation.
- Forest stand improvement marking/implementation.

Forest Management Plans

- A detailed overview of the characteristics of your forest, as well as the management and projection of your goals and objectives into the future.
- Basic (Forest Stewardship Plan) or Premium (NRCS EQIP) Forest Management Plans.
- Required for property tax incentive programs such as QFP & CFP

Land Management

- General/educational consultation, forest inventory/assessment, expert witness
- Tree/shrub planting, invasive plant species control, and disease/pest management.
- Hunting lease administration



Hunters Land Management LLC

Hunter Fodor, Owner & Forester

Michigan Registered Forester #47000

3012 Grant Street, Coleman, MI 48618

(517) 425-2192

HLMforestry@gmail.com

www.HLMforestry.com