Forest Management Plan
Michigan Forest Association
Emmet County #1 on Valley Road
2016 to 2036

Prepared by Dean Reid
D&S Forestry Services
N1078 Gros Cap Road
St. Ignace, MI 49781
18 February 2016

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Forest Management Plan

EMMET # 1

Landowner and Site Information

Landowner Name: MFA – Debra Huff, Executive Director Landowner Phone: 517-651-5401

Landowner Address: Suite 16, 15851 S. US-27, Lansing, MI 48906

Landowner Email: huff.debra@gmail.com Alternate Phone: 517-243-7102 c

Property Location: NE ¼ SE ¼, Sec. 10, T 37N, R 5W, (Center Township, Emmet Co., MI)

Plan Date: 2-18-16 Acres in Plan: 40

Plan Length: 20 years to 2036

Plan Writer Information

Plan Writer: Dean I. Reid Plan Writer Phone: 906-430-0490 ©

Company Name: D & S Forestry Services Co.

Plan Writer Address: N 1078 Gros Cap Road, St. Ignace, MI 49781

Plan Writer Email: reiddi46@sault.com Alternative Phone: 906-643-7515

Plan Acceptance

Landowner's Signature: _____ Date: _____

Plan Writer's Signature: Dean I Reid Date: 2-18-16

Introduction

Forestry is similar to other professions and fields of science in that they have their own terminology. Understanding this terminology is vital to understanding the stand description and management recommendations that follow. The following definitions and concepts are given to assist you in understanding the language that foresters use.

Unit (stand): A group of similar trees, normally the same species or species that commonly associate with each other such as aspen and birch. A forest of pure aspen could have stands identifying the different age classes that make up the forest. Units are located on cover type maps for easier references.

Cover type map: Hand drawn or computer generated map showing location of units(stands), fields, streams, and other features that identify specified areas.

Age class: Groups of trees of similar age. Normally trees within a ten year period of time are treated as being the same age.

Basal Area (BA): Measurement of the cross-section of the individual trees in a stand. The measurement is expressed in square feet per acre. Basal area is used to determine if the unit has too many or too few trees per acre.

Site index (S.I.): Site index gives the expected height of individual tree species for different soils. It is used to determine which tree species is best suited for the soil. A site index of 65 for sugar maple means that sugar maple will be 65 feet high at 50 years of age. The same soil could have a site index of 75 for red pine.

Timber cruise: A timber cruise is the actual measurement of standing trees to determine timber volume and quality. Using statistical analysis, a sample number of trees from each unit are measured. Both the diameter and merchantable height of the trees are measured or estimated.

DBH: DBH (diameter at breast height), all diameter measurements in forestry are taken 4 ½ feet above the ground. This makes for easy and accurate measuring as it gets away from the butt swell of the tree. Unless specified as being measure elsewhere, contracts using tree diameters as a selection tool (cut all trees 12 inches in diameter) refers to the diameter at DBH.

Pulpwood: Refers to small diameter trees under 10 inches or large diameter trees with lots of rot or defect. Measured by the cord (4’ x 4’ x 8’ or 128 cubic feet).

Logs or Sawlogs: A log is normally 10 inches in diameter measured at the small end, inside the bark. Logs 8 feet or longer are normally measured in MBF (1000 board feet).

Wildlife habitat: Good habitat is defined by four components. They are food, cover (protective and thermal), water, and space. All four components are needed somewhere in the surrounding landscape.

Landowner Objectives

MFA organization wants to manage the wooded property sustainably with a financial return; have a written forest management plan that meets compliance with TF,NRCS, FSP; establish a baseline timber value; look at options for various management(timber, wildlife, aesthetics, etc); look to work with MSU research project on canopy gaps; look at educational field day opportunities, annual forest walks with an 'expert', possibly with self-directed maps for walking tours, look at for possible MFA video project; look for parking area for walking tours of property; to show small scale landowner practice installations and examples; show road locations and ideal road locations along with possible walking access; work around canopy gaps with exclosure research being done by Mike Walters of MSU; follow BMP's in harvesting and any road work; and finally deal with invasives presently and as they occur in the future.

Property Overview

Access

Access is directly off Valley Road, which is 5 ½ miles on Levering Road west of Levering at M-31, then south 1 ½ miles south on Valley Road to northeastern corner of property.

Roads

Valley Road lies on the east edge of the property and is a paved, county road. Two track roads loop through the property with some dead-ending.

Property Description

Legal property description: T 37N R 5W, Section 10, NE ¼ SE¼, - 40 acres

Total forested acreage: 39.0 Elevation: 846 '

Tax parcel numbers:

GPS coordinates: 45 degrees 36' 49.39" N, 84 degrees 53' 38.43" W (north two-track road junction with Valley Road)

Number of unique stands of trees: 3 Non-resident of property

Road conditions: Excellent (80% accessible)

Estimated improved road length (bulldozed with gravel surface or paved): .25 of Valley Road

Estimated unimproved road length (bulldozed but with original soil/bedrock): less .75 mile

Watershed located in: Maple River

GPS Locations

NE survey corner (buried in center of Valley Road): 45 degrees 36' 49.19" N & 84 degrees 53' 38.43" W

HISTORY

Land was donated to MFA in 2015 from the Forest of the Future, originally owned by Fred Prince. He acquired

the land through tax sale. The property is under the Commercial Forest Act and gets a tax break for managing the timberlands and allowing public access. FMP was written in 1994 by Gayne "Gus" Erdmann, N. Central Forest Service researcher. Fred's goals and objectives were to provide a demonstration and research area to show small nonindustrial, private landowners how to manage their lands for high-quality hardwood veneer and sawtimber without harming scenic beauty or other forest values. In early 1990's a selection cut was done to remove residual culls, high-risk trees, and almost all high quality hardwood trees 16" inches and larger in DBH. A firewood cut was done during the winters of 1992-1993 and 1993-1994 to start bringing this even-aged stand under uneven-age management. With an over-population of deer throughout the years, their selective browsing has removed the more desirable hardwood species and left an established understory of beech and ironwood seedlings/saplings. Canopy gap opening were establish for research by Mike Walters of MSU starting in 2007. These gaps were fenced with plastic fencing to keep deer out (deer exclosures) and to see what tree and herbaceous species would survive without the over-browsing by deer. Numerous trees have metal tags on their bases, part of MSU's research. The hardwoods were selectively marked with yellow paint prior to MFA acquiring the property, but it is fading enough to require re-marking to set up a timber sale.

THREATENED & ENDANGERED SPECIES

NRCS staff checked MI Natural Features data base and no species were found.

SPECIAL SITES

None

NATURAL & CULTURAL FEATURES

There is no evidence of any cultural features or natural features on site. According to the State Archaeologist, Dean Anderson, they have no record of any archaeological sites on this property.

FOREST OF RECOGNIZED IMPORTANCE

Not part of or located near any Forest of Recognized Importance.

SOCIAL CONSIDERATIONS

The Forest of the Futures intent was to provide a demonstration and research area to show small nonindustrial, private landowners how to manage their lands. Many people especially foresters have visited to see the canopy gap research by MSU. Because of MFA's intent to provide education, management options and tours to private forest landowners; the land was donate to them.

ADJACENT STAND CONCERNS

Property is surrounded by other private lands on all sides, but there is no apparent concern from adjacent property owners. Blue paint lines face into the property from recent selection marking.

Suggest that the blue paint be painted on the opposite of the boundary line to indicate to adjoining owners that their boundary ends at the blue line to avoid future timber trespass or road intrusion on the property.

RECREATION

The property is used for walking, hunting, by off-road vehicles, and firewood cutting. A neighbor, Bill Smith, across the road has cut trees that fell across the two-track roads and in assistance to Mike Walters in his research and deer hunting as well as keeping an eye on the property. He has been given an honorary MFA membership. Presently, there is no evidence of trash dumping by the public on this property. Signing should be considered to inform the public of the purpose of this property and that respectful use of the property by the public is expected.

SOIL PROTECTION

Best Management Practices (BMP) should be used to minimize any rutting to roads and forest stands during wet periods of the year. Re-location two-track roads to better spots to prevent soil erosion may be difficult to do without doing more damage to residual trees and exposing soil. Leaf cover is preventing most erosion possibilities. Portions of the existing two-track may need to be graveled as a requirement of a timber sale to prevent rutting by the public during wet periods.

TIMBER STAND PROTECTION

Logging activities in the future should be restricted from operations during the bark peeling season of May 1st to July 1st during the summer month. This period may needed to be extended further into the summer to protect ground nesting birds.

Invasive Species

Although there are few beech tress on this property, most will need to be removed because of the Beech Bark Disease (BBD). Any relatively clean beech trees without much evidence of BBD should be saved when the next marking is done. There is a concern for the ash trees because of the widespread Emerald Ash Borer (EAB) problem in the Lower Peninsula. At least all sawlog-sized ash trees should be marked for removal in the next timber sale. No other invasive species were noted in the inventory of the property, but that was done near mid-December when all herbaceous vegetation was dead.

Fish, Stream & Wetland Protection

No stream or wetland areas on this property.

WILDLIFE

Turkey and deer are the main game species that use the property. There could be some grouse use in and around the aspen stand and the grassy powerline right-of-way alongside Valley Road. Other non-game species use the property and other experts could provide a list for future use. Sugar maple is the predominate species at about 80%, but the other species should be retained which should help most wildlife species, when not facing loss to Beech Bark Disease or Emerald Ash Borer. The hardwood stand lack vertical diversity. Habitat could be improved for deer grouse with aspen clear-cutting to create diversity of herbaceous species and forest regeneration.

BIODIVERSITY

For biodiversity, a mixture of species of trees should be retained in stands. Selection cutting every 12 to 15 years will provide for herbaceous plants and new trees seedling if canopy gaps are large enough (check best results of MSU's research work). Cutting the mature aspen stand will open the ground for more herbaceous plants and biodiversity than presently occurring.

WOOD & FIBER PRODUCTION

MFA plans to sustainably manage the hardwood stand for quality products along with removal of the topwood that makes hardwood pulpwood. Aspen stand will be harvested every 40-45 years for pulpwood products during hardwood selection cuttings as its size is non-commercial on its own.

General Site Description

Site is rolling to steep. Soils are well to moderately well drained moraine, loamy soils. Timbered stands are very good to excellent quality. Property is well roaded.

Forest Management Plan Development

To collect data for development of this plan, a variable radius plot (point sampling) inventory was conducted. Tree data (species and diameter) along with stand density (basal area) was collected at 21 points distributed throughout the property. Additionally, an ocular assessment of understory vegetation, wildlife habitat elements, invasive species, endangered species, terrain, etc. was conducted throughout the site. Soils information included in this plan was generated by http://websoilsurvey.nrcs.usda.gov/.

Summary of Possible Projects

In spring and summer look for NW and SW survey corners following blue paint lines; paint boundary lines on both sides to indicate to adjoining owners that their boundary ends; to look for possible invasive species and herbaceous plants as the forest inventory was done in December after all plants were all dead, which might include a botanist or wildlife professional; discuss management options for each stand; incorporate MSU research work in next harvest treatment for regeneration canopy gaps and treatment near existing gaps; discuss MFA video, site signing, walking tour possibilities; to look for parking areas probably under the powerline part of open area with the possibility of the narrow strips of hardwood trees being removed for firewood; to consider pollinator species/shrub plantings especially in openings and their edges; to consider planting red oak seedlings with wire fencing in future canopy gaps to provide hard mast; and look at existing two-track roads for armoring to prevent rutting during wet periods as well as where roads should have been built originally to limit erosion as best locations.

Summary Table of Scheduled Conservation Practices

Date	Land	Practice	Extent
Oct. 2019	Unit 1	Parking areas – in cleared power line right-of-way	.2
Aug. 2018	Unit 2	Practice 666 – Timber Stand Improvement - Clearcut	1.3 ac.
Aug. 2018 Aug. 2033	Unit 3	Practice 666 – Timber Stand Improvement - Selection	37.7 ac. 37.7 ac.

Provisions for keeping continuous records of silvicultural practices accomplished: is for MFA to fill out 'Tree Farm Records' form and is a separate sheet in FMP.

Provisions for amendments to reflect disasters or other unexpected events: as events occur, MFA will consult with a forester to modify FMP as needed.

Additional Management Details

Forest Stand Improvement (Acres) 666

This improvement is the manipulation of species composition, stand structure, and stocking by cutting or killing selected trees and understory vegetation. The purpose is to increase the quantity and quality of forest products, to harvest forest products, to initiate forest stand regeneration, to improve growth on residual stems, and to improve wildlife habitat. This practice is called for when growth rates have slowed because the stand density is too high for optimum growth (128 BA in Unit # 3) or a stand is mature (Unit # 2).

Commercial improvement can be done through a commercial timber sale. Equipment that is typically used include feller/bunchers, chainsaws for over-sized trees, and forwarders to move the wood to the landings. No cutting or other operations between May 1st and July 1st should be allowed to prevent excessive barking that occurs during this time of the year, possibly later for ground nesting birds. Harvesting operations must follow BMPs (Best Management Practices). No skidding shall take place if ruts greater than 6 inches are created. Skidding and cutting shall cease until conditions improve so that ruts are not developed. Maximum stump heights to average 12" on sawlog sized trees and 6" on pole sized trees, measured on the high side. No decking against residual trees should be allowed. Extreme care should be taken to not damage residual trees.

COVER TYPE MAP

Landowner	County	Mapped By	Date
MFA - Emmet #1	Emmet	Dean I. Reid	2-16-16

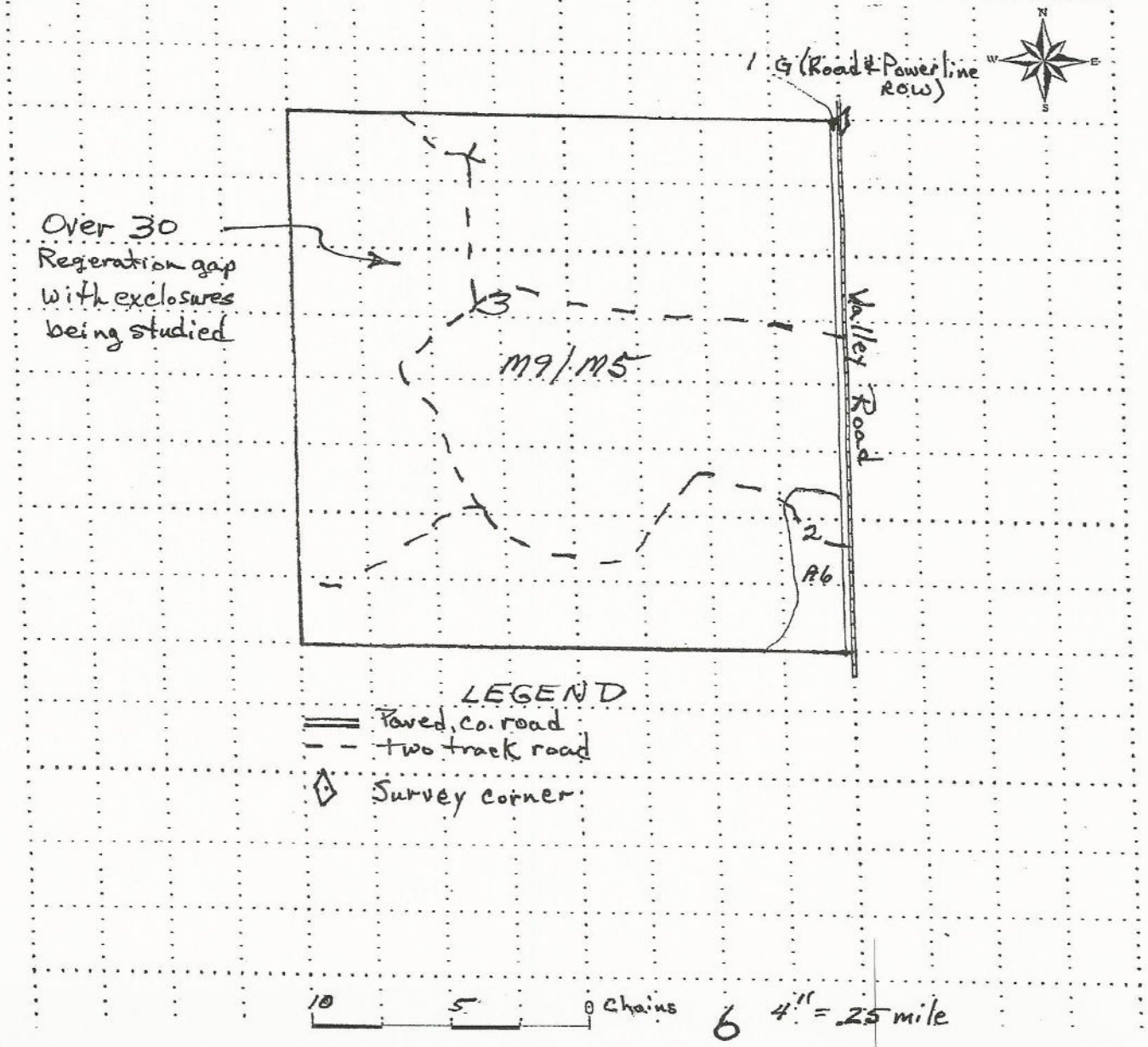
Township	Range	Section(s) and Subdivision(s)
37N	5W	10 NE¼ SE¼ 40 ac.

Cover Type

A = Aspen	J = Jack Pine	O = Oak	U = Upland Brush
B = Paper Birch	K = Rock	P = Lowland Poplar	UM = Upland Mix Forest
C = Cedar	L = Lowland Brush	Q = Mixed Swamp Conifer	V = Bog or Marsh
D = Treed Bog	LM = Lowland Mix Forest	R = Red Pine	W = White Pine
E = Swamp Hardwoods	M = Maple, Beech, Birch	S = Black Spruce	X = Non Stocked
F = Spruce/Fir	MC = Mixed Conifer	T = Tamarack	Y = Sand
G = Grass	MD = Mixed Deciduous		Z = Water
H = Hemlock	N = Marsh		

Density

0 = Non Stocked	5 = Pole Timber Medium
1 = Seedling Sapling Poor	6 = Pole Timber Well
2 = Seedling Sapling Medium	7 = Saw Timber Poor
3 = Seedling Sapling Well	8 = Saw Timber Medium
4 = Pole Timber Poor	9 = Saw Timber Well



========== MANAGEMENT UNIT # 1 ==========
[G]

CURRENT CONDITIONS

Land Unit Acres:	1.0	Average Tree Diameter:	0
Basal Area:	0	Stocking Level (trees per acre):	0
Soil Type:	Blue Lake loamy sand	Site Index:	61 (Ms)

Species Composition
Opening is the right-of-way (ROW) of Valley Road, half of Valley Road, electrical distribution line ROW to tree line 33' (1/2 chain)wide. There is a very narrow strip of trees between the road ROW and electric line ROW that could be cut for firewood by the neighbor across the road that keeps an eye on the property for MFA. Opening has bracken, light grass, browsed sumac.

Soil types and Condition
Blue Lake loamy sand is a loamy sand, very deep, well drained, 0 to 6% slopes, nearly level to undulating soils, found on moraines and till plains. A more detailed explanation of soil types are found in the Appendix.

Wood Products Potential
Site is very good for site productivity.

Topography
The land is level to undulating.

Roads and Trails
2 two-track roads cross this opening and loop together to stands to the west. Parking locations should be looked at here as the best site as the site has only slight construction limitations especially tied to the 2 two-track roads. These roads are part of the haul road system. No erosion was present.

Wildfire and Pest Risk
Fire risk is high only in the spring with the dead grass.

Known Fish and Wildlife Species
No fish species in this upland site. Deer, grouse, and turkey use this stand for browsing and food source for insects. Other non-game bird species use this stand.

Noxious and Invasive Species
During the field inventory, no major invasive species were found in this open area.

Water Quality and Other Important Features
None

Existing Conservation Practices
None

Desired Future Condition
MFA would like to maintain grassy opening; haul roads through if located in the best spots to tie to the remaining stands; may want to remove very narrow strip of hardwood trees between Valley Road ROW and powerline ROW for firewood use by neighbor to the east looking after the property; information signing for property, and consider pollinator species/shrub plantings at this location. Some shrub plantings should be fenced to limit deer damage.

========== MANAGEMENT UNIT # 2 ==========
[A6]

CURRENT CONDITIONS

Land Unit Acres:	1.3	Average Tree Diameter:	10.7
Basal Area:	93	Stocking Level (trees per acre):	
Soil Type:	Blue Lake loamy sand	Site Index:	70 (A)

Species Composition
The stand is a mixture of aspen, white birch, sugar maple, and black cherry. Understory is light with white birch, sugar maple, black cherry, and w. ash saplings.

Stand Density
This stand is fully stocked with the basal area (BA) for aspen of 67 BA, sugar maple and black cherry of 16, and white birch of 10 BA.

Wood Products Potential
This stand is a very productive site for aspen. Stand age is 54 years in 2015. Aspen averages 18.2 cd/ac, misc. hardwood averages 2.8 cd/ac, and white birch averages 2.2 cd/ac.

Soil type and Condition
Blue Lake loamy sand is a loamy sand, very deep, well drained, 0 to 6% slopes, nearly level to undulating soils, found on moraines and till plains. A more detailed explanation of soil types are found in the Appendix.

Topography
The land is level to undulating.

Roads and Trails
A two-track road cross through this stand and has been used as a haul road. No erosion was present.

Wildfire and Pest Risk
Wildfire risk is slight only in the spring with dead vegetation. Although aspen is mature, there is no health problem yet. Old age is the biggest risk to the aspen and white birch.

Known Fish and Wildlife Species
No fish species in this upland site. Deer, grouse, and turkey use this stand for browsing and food source for insects. Other non-game bird species use this stand.

Noxious and Invasive Species
During the field inventory, no major invasive species were found in this stand.

Water Quality and Other Important Features
None.

Existing Conservation Practices
None presently.

Harvest History
None in last 50 years
Desired Future Condition
MFA plans to manage this productive stand as an aspen stand. Need to discuss whether to shrink or expand this stand with Unit # 3.

PLANNED CONSERVATION PRACTICES

Forest Stand Improvement (666) – Commercial clearcut in 2017-18 and combine with the selection cut in stand # 3.

ADDITIONAL MANAGEMENT CONSIDERATIONS

MFA staff asked about planting trees and shrubs, but with the dense nature of aspen regeneration and the deer browsing problem, this might not be feasible.

========== MANAGEMENT UNIT # 3 ==========
[M9/M5]

CURRENT CONDITIONS

Land Unit Acres:	37.7	Average Tree Diameter:	14.4
Basal Area:	128	Stocking Level (trees per acre):	
Soil Type:	Blue Lake loamy sand & Kalkaska sand	Site Index:	61 (Ms)

Species Composition
This northern hardwood stand is heavier to sugar maple at 80% with basswood, white ash and very minor amount of red maple and beech. The seedlings and saplings are beech, ironwood and few w. ash. Herbaceous plants include lady fern, shield fern, maidenhair fern, leeks, and Herb-Robert.

Stand Density
This is a fully stocked stand of sawtimber basal area (BA) that totals 88 of which sugar maple is 71 BA, basswood is 11 BA, white ash is 4 BA, red maple is 1 BA, and beech is 1 BA. Poletimber is 40 BA with mainly sugar maple poles.

Wood Products Potential
This can be a very productive sugar maple site. Volume of sugar maple average 4.57 MBF/ac, basswood average 1.05 MBF/ac, white ash average .55 MBF/ac, red maple average .04 MBF/ac, and beech average .02 MBF/ac.

Soil type(s) and Condition
Blue Lake loamy sand is a loamy sand, very deep, well drained, 0 to 25% slopes, nearly level to hilly soils, found on moraines and till plains and Kalkaska sand is very deep, somewhat excessively drained, 18-45% slopes, very hilly to steep soils, found on outwash plain, moraines, and till plains. A more detailed explanation of soil types are found in the Appendix.

Topography
The land is level to steep.

Roads and Trails
Several two-track roads are through-out the stand, which have been used as haul roads. Most were located in valleys with slight grades, but should have been located on contours and not at the bottom of valleys. There is slight rutting during wet weather, which will need to be armored with gravel to prevent rutting and erosion. Years of leaf fall has helped to prevent more erosion.

Wildfire and Pest Risk
Wildfire risk is very low as this is a northern hardwood stand. Beech bark disease is present in this stand and most should be removed before they are killed. Emerald Ash Borer is a real threat to the white ash as it is very wide spread in the Lower Peninsula. At least the ash sawlog-sized trees should be removed in the next selection cut.

Known Fish and Wildlife Species
No fish species in this upland site. Deer and turkey use this stand for browsing and food source for insects. Other non-game bird species use this stand. Stand has had deer over-browsing as there is no sugar maple seedlings or
saplings over 1 feet.

Noxious and Invasive Species
During the field inventory, no noxious species were found in this stand, but Beech Bark Disease is present and Emerald Ash Borer is imminent.

Water Quality and Other Important Features
None

Existing Conservation Practices

Canopy gap research is being done by Mike Walters of MSU with plastic fenced exclosures to keep deer out of.

Harvest History

In early 1990's a selection cut was done to remove residual culls, high-risk trees, and almost all high quality hardwood trees 16" inches and larger in DBH. A firewood cut was done during the winters of 1992-1993 and 1993-1994 to start bringing this even-aged stand under uneven-age management. Following this cutting the average stand diameter was 10.9" and basal area total of 71.5 sq. ft. and 5.46 MBF/ac average. Stand was marked with yellow paint for a selection cut prior to transfer of property to MFA last year. The stump marks are especially fading so stand will have to be remarked for a future timber sale.

Desired Future Condition

MFA desires to follow northern hardwood management recommendations made by Gus Erdmann, MTU professor of forestry. He recommended tree size of 20" DBH as a goal of basswood and sugar maple with residual basal area of 80 after a selection cut for trees 4.6" or larger. He suggested cutting canopy gaps to 30'. In light of BBD and EAB problems, his suggestions for w. ash and beech trees no longer make sense. I would recommend a tree size of 18" for the red maple in the stand. MFA staff would like to see a few trees at least 24" left in the stand after the next selection cut. I would suggest that the stumps of large basswood and sugar maple trees be checked for enlarging heartwood and slowing of diameter growth after the selection cut, if that is happening, to inform other forest landowners that have similar northern hardwood stands in the Lower Peninsula.

PLANNED CONSERVATION PRACTICES

Forest Stand Improvement (666) – Commercial harvest through a selection cutting in 2017-18 along with stand # 2. May need to look at larger than 30' canopy gaps to give regeneration a change to get established along with lower deer density in the general area.

ADDITIONAL MANAGEMENT CONSIDERATIONS

Because the stand will lose most of its hard mast trees, beech to diseases, MFA might consider planting red oak seedling with 5' wire fences to prevent deer browsing in future canopy gaps. To encourage the soft mast black cherry trees in regeneration spots, canopy gaps need to be larger than normal regeneration canopy gaps.

TREATMENT MAP

Landowner	County	Mapped By	Date
MFA - Emmet #1	Emmet	Dean I. Reid	2-16-16

Township	Range	Section(s) and Subdivision(s)	
37N	5W	10, NE¼ SE¼	40 ac.

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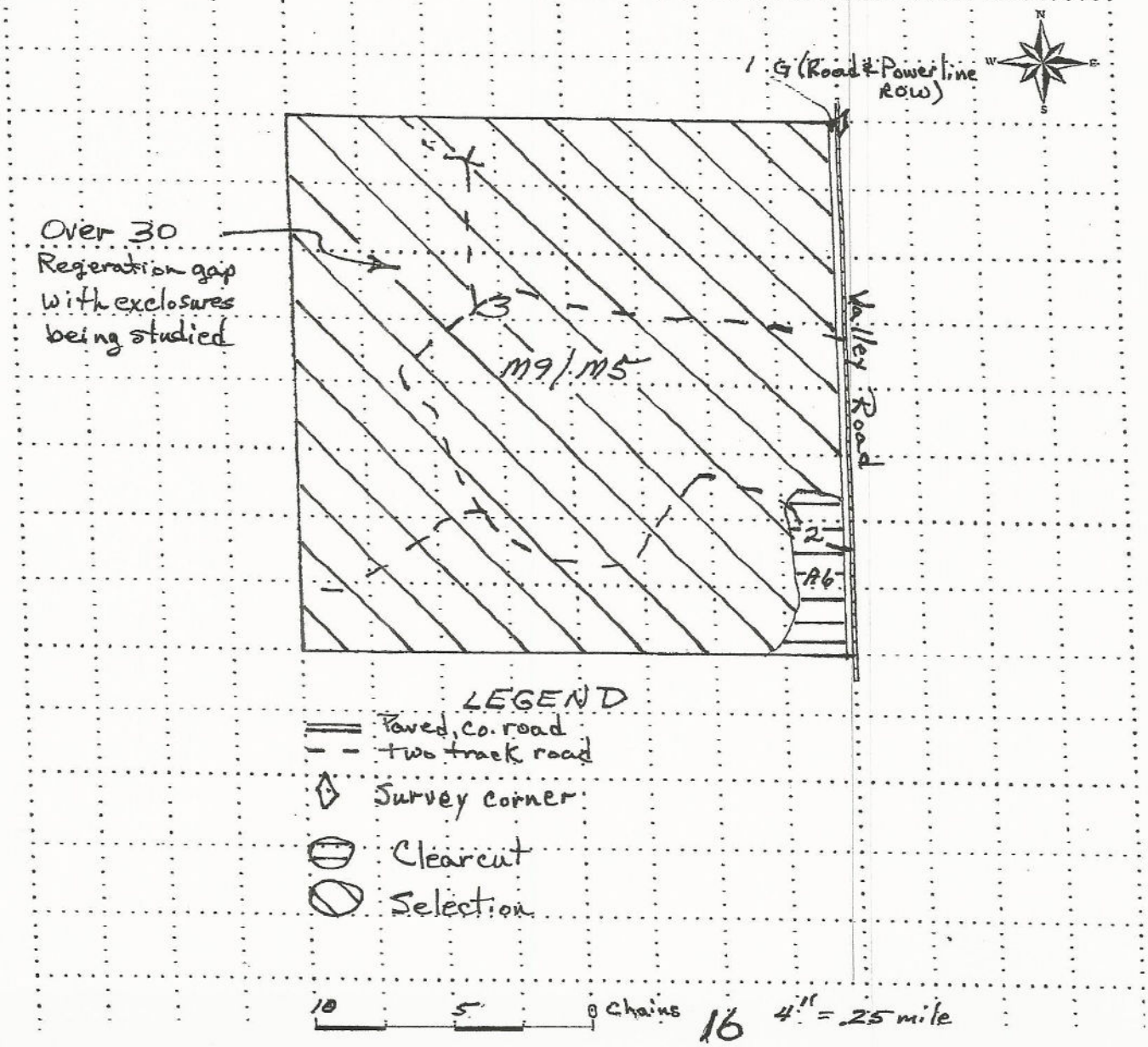
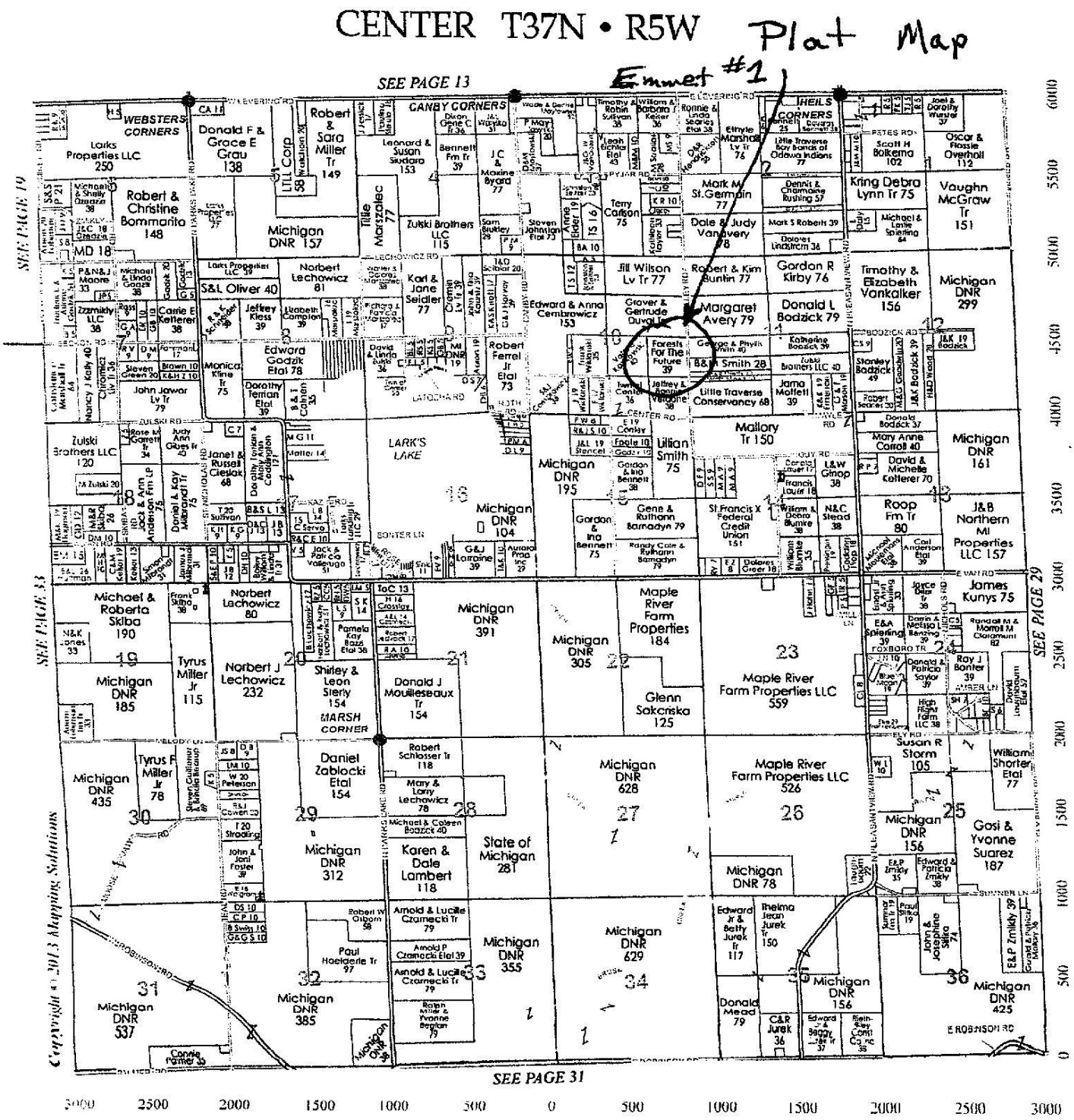


PLAT MAP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CANBY CORNERS
HEILS CORNERS
LARK'S LAKE
MARSH CORNER
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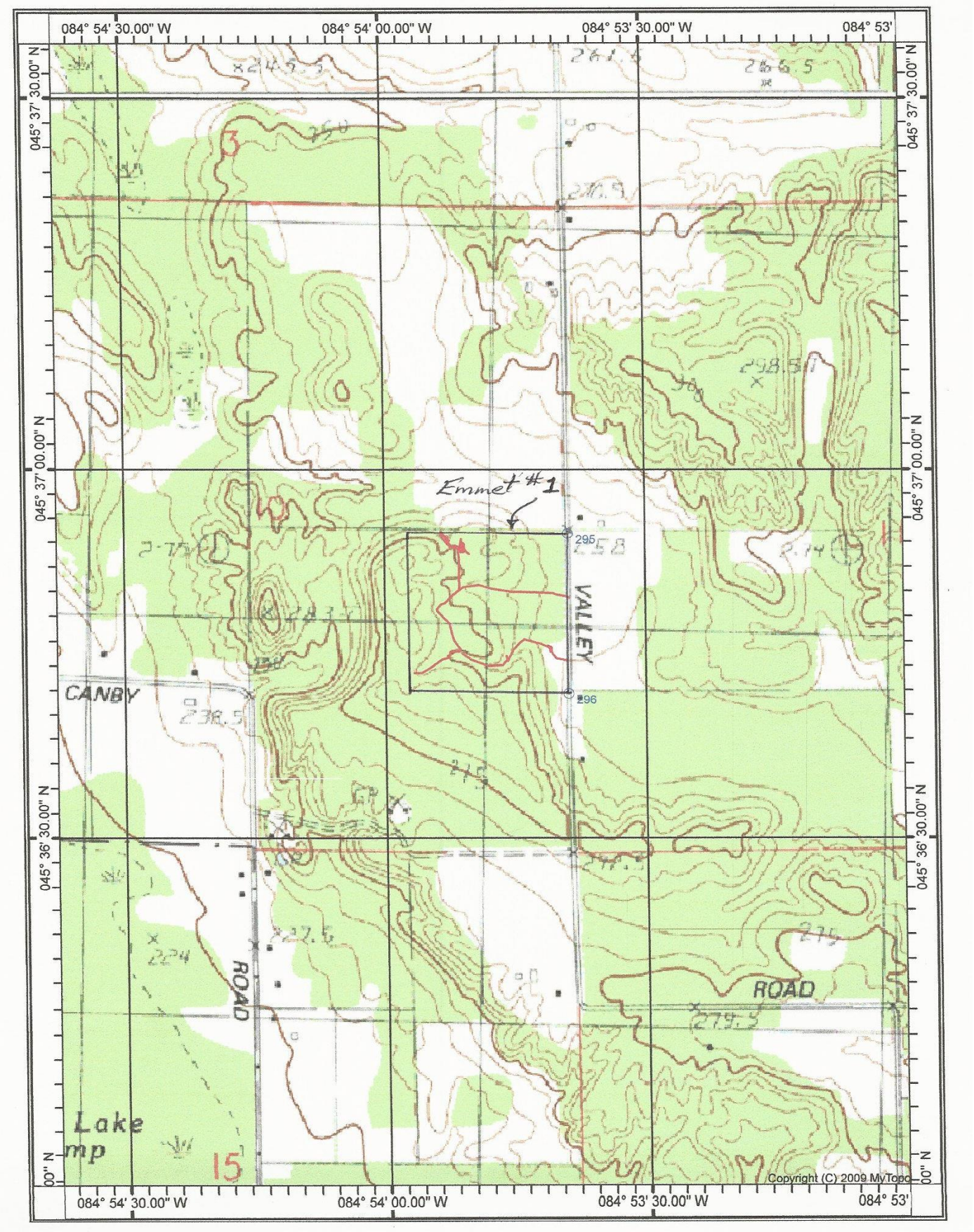
TOPO MAP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Emmet #1
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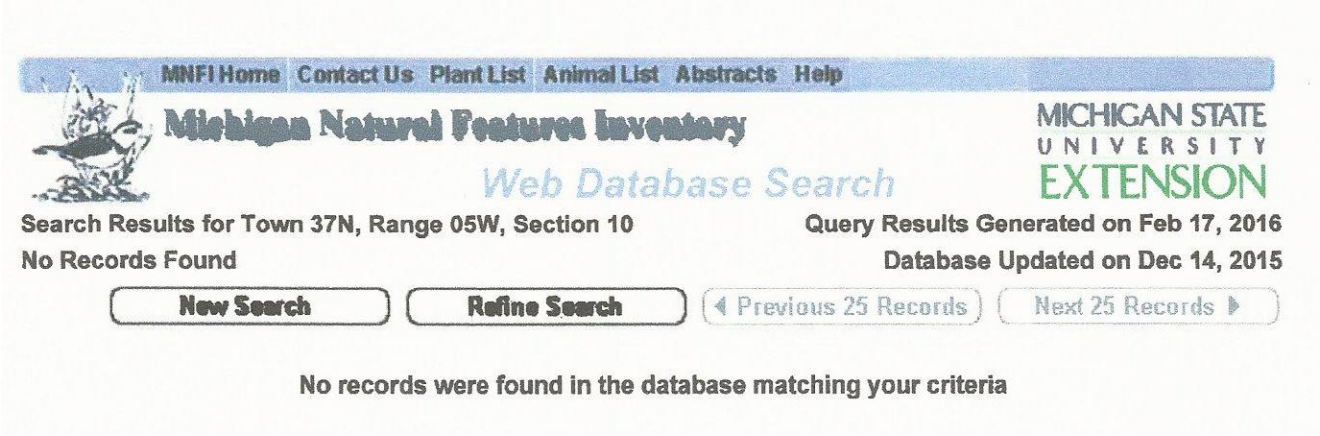
MICHIGAN NATURAL FEATURES INVENTORY REPORT



STATE HISTORIC PRESERVATION OFFICE REPORT

Dean

From: "Anderson, Dean (MSHDA)" <AndersonD15@michigan.gov>
Date: Friday, February 12, 2016 1:31 PM
To: "Dean" <reiddi46@lighthouse.net>
Subject: RE: Cultural Check for Properties for Forest Management Plans

Dean,

I checked our archaeological site file records for both of the Emmet County parcels you described. We have no record of any archaeological sites on either parcel.

If you have other questions, let me know.

Dean

Dean L. Anderson, Ph.D.
State Archaeologist
State Historic Preservation Office
Michigan Library and Historical Center
Box 30740
702 West Kalamazoo
Lansing, MI 48909-8240

Andersond15@michigan.gov

(517) 373-1618

From: Dean [mailto:reiddi46@lighthouse.net]
Sent: Friday, February 12, 2016 9:06 AM
To: Anderson, Dean (MSHDA) <AndersonD15@michigan.gov>
Subject: Cultural Check for Properties for Forest Management Plans

Dean,

I am doing FMPs for the Michigan Forest Association for two of their properties in Emmet Co.: NESE, Sec. 10, T 37N R 5W & E 1/2 W 1/2, Sec. 5, T 36N R 4W. Both properties are forested with the second property having been planted to red pine in early 1950 on about the north 1/3 of the property which probably was originally cleared and farmed. I've inventoried both properties and did not see any evidence of cultural sites. Would you please check your records to see if there are any recorded cultural sites on these two forties? Thank you.

Dean I. Reid, CF
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St. Ignace, MI 49781
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906-430-0490 c

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Emmet County, Michigan

MFA - Emmet 1

December 8, 2015

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

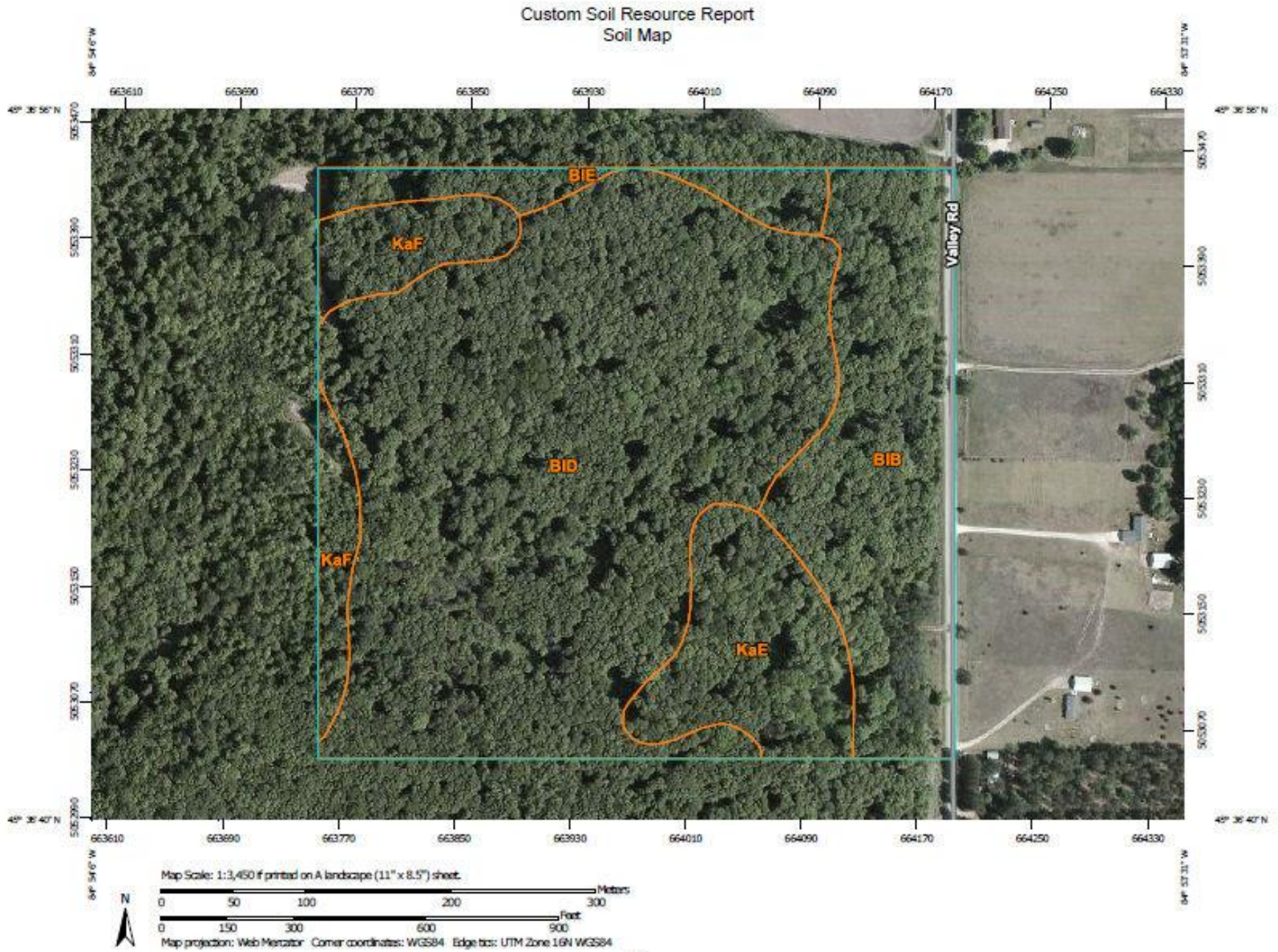
The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


Custom Soil Resource Report
Soil Map
BIE
KaF
BID
BIB
KaF
KaE
Valley Rd
663610
663690
663770
663850
663930
664010
664090
664170
664250
664330
Map Scale: 1:3,450 if printed on A landscape (11" x 8.5") sheet.
Meters
0
50
100
200
300
Feet
0
150
300
600
900
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Emmet County, Michigan
Survey Area Data: Version 11, Sep 18, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 23, 2010—May 16, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Emmet County, Michigan (MI047)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BlB	Blue Lake loamy sand, 0 to 6 percent slopes	9.1	20.5%
BlD	Blue Lake loamy sand, 12 to 18 percent slopes	26.0	58.3%
BlE	Blue Lake loamy sand, 18 to 25 percent slopes	2.0	4.5%
KaE	Kalkaska sand, 18 to 25 percent slopes	4.4	9.9%
KaF	Kalkaska sand, 25 to 45 percent slopes	3.0	6.8%
Totals for Area of Interest		44.6	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Emmet County, Michigan

BlB—Blue Lake loamy sand, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 6bzr
Elevation: 600 to 1,900 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 150 days
Farmland classification: Farmland of local importance

Map Unit Composition

Blue lake and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blue Lake

Setting

Landform: Moraines, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: loamy sand
H2 - 9 to 24 inches: loamy sand
H3 - 24 to 58 inches: stratified loamy sand to sandy loam
H4 - 58 to 60 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A

Minor Components

Kalkaska

Percent of map unit: 4 percent
Landform: Outwash plains, moraines, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear

Rubicon

Percent of map unit: 3 percent
Landform: Outwash plains, glacial drainage channels, moraines, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear

Otisco

Percent of map unit: 3 percent
Landform: Outwash plains, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear

BID—Blue Lake loamy sand, 12 to 18 percent slopes

Map Unit Setting

National map unit symbol: 6bzt
Elevation: 600 to 1,900 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Blue lake and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blue Lake

Setting

Landform: Moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Parent material: Sandy glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: loamy sand
H2 - 9 to 24 inches: loamy sand
H3 - 24 to 58 inches: stratified loamy sand to sandy loam
H4 - 58 to 60 inches: sand

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A

Minor Components

Kalkaska

Percent of map unit: 5 percent
Landform: Outwash plains, moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

Leelanau

Percent of map unit: 5 percent
Landform: Till plains, moraines
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

BIE—Blue Lake loamy sand, 18 to 25 percent slopes

Map Unit Setting

National map unit symbol: 6bzv
Elevation: 600 to 1,900 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Blue lake and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blue Lake

Setting

Landform: Moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Parent material: Sandy glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: loamy sand
H2 - 9 to 24 inches: loamy sand
H3 - 24 to 58 inches: stratified loamy sand to sandy loam
H4 - 58 to 60 inches: sand

Properties and qualities

Slope: 18 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A

Minor Components

Leelanau

Percent of map unit: 5 percent
Landform: Moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

Kalkaska

Percent of map unit: 5 percent
Landform: Moraines, till plains, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

KaE—Kalkaska sand, 18 to 25 percent slopes

Map Unit Setting

National map unit symbol: 6c0y
Elevation: 600 to 1,900 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Kalkaska and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kalkaska

Setting

Landform: Outwash plains, moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Parent material: Sandy glaciofluvial deposits

Typical profile

H1 - 0 to 4 inches: sand
H2 - 4 to 9 inches: sand
H3 - 9 to 48 inches: sand
H4 - 48 to 60 inches: sand

Properties and qualities

Slope: 18 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Minor Components

Blue lake

Percent of map unit: 5 percent
Landform: Moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

Leelanau

Percent of map unit: 5 percent
Landform: Till plains, moraines
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

KaF—Kalkaska sand, 25 to 45 percent slopes

Map Unit Setting

National map unit symbol: 6c0z
Elevation: 600 to 1,900 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Kalkaska and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kalkaska

Setting

Landform: Outwash plains, moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Parent material: Sandy glaciofluvial deposits

Typical profile

H1 - 0 to 4 inches: sand
H2 - 4 to 9 inches: sand
H3 - 9 to 48 inches: sand
H4 - 48 to 60 inches: sand

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Minor Components

Blue lake

Percent of map unit: 5 percent
Landform: Moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

Leelanau

Percent of map unit: 5 percent
Landform: Moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Management

Land management interpretations are tools designed to guide the user in evaluating existing conditions in planning and predicting the soil response to various land management practices, for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture, and rangeland. Example interpretations include suitability for a variety of irrigation practices, log landings, haul roads and major skid trails, equipment operability, site preparation, suitability for hand and mechanical planting, potential erosion hazard associated with various practices, and ratings for fencing and waterline installation.

Construction Limitations for Haul Roads and Log Landings (Emmet 1)

For limitations affecting the construction of haul roads and log landings, the ratings are based on slope, flooding, permafrost, plasticity index, the hazard of soil slippage, content of sand, the Unified classification of the soil, rock fragments on or below the surface, depth to a restrictive layer that is indurated, depth to a water table, and ponding.

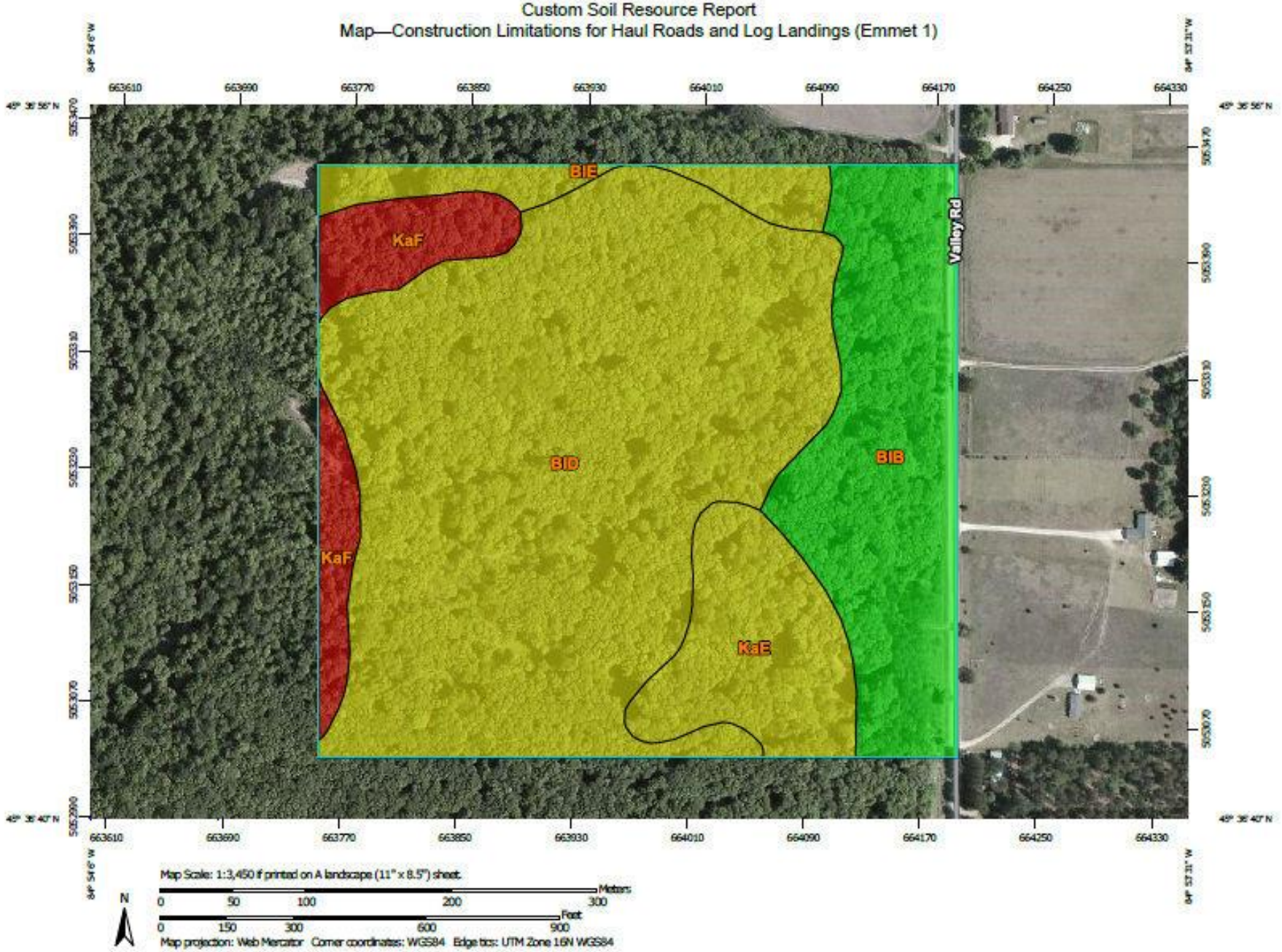
The ratings are both verbal and numerical. Rating class terms indicate the degree to which the soils are suited to this aspect of forestland management. The limitations are described as slight, moderate, or severe. A rating of "slight" indicates that no significant limitations affect construction activities. "Moderate" indicates that one or more limitations can cause some difficulty in construction. "Severe" indicates that one or more limitations can make construction very difficult or very costly.

Numerical ratings 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 aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—Construction Limitations for Haul Roads and Log Landings (Emmet 1)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Background

- Aerial Photography

Soils

Soil Rating Polygons

- Severe
- Moderate
- Slight
- Not rated or not available

Soil Rating Lines

- Severe
- Moderate
- Slight
- Not rated or not available

Soil Rating Points

- Severe
- Moderate
- Slight
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 11, Sep 18, 2015

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Date(s) aerial images were photographed: May 23, 2010—May 16, 2011

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Tables—Construction Limitations for Haul Roads and Log Landings (Emmet 1)

Construction Limitations for Haul Roads and Log Landings— Summary by Map Unit — Emmet County, Michigan (MI047)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
BlB	Blue Lake loamy sand, 0 to 6 percent slopes	Slight	Blue Lake (90%)		9.1	20.5%
			Otisco (3%)			
BlD	Blue Lake loamy sand, 12 to 18 percent slopes	Moderate	Blue Lake (90%)	Slope (0.50)	26.0	58.3%
			Leelanau (5%)	Slope (0.50)		
			Kalkaska (5%)	Slope (0.50)		
				Sandiness (0.50)		
BlE	Blue Lake loamy sand, 18 to 25 percent slopes	Moderate	Blue Lake (90%)	Slope (0.50)	2.0	4.5%
			Kalkaska (5%)	Slope (0.50)		
				Sandiness (0.50)		
			Leelanau (5%)	Slope (0.50)		
KaE	Kalkaska sand, 18 to 25 percent slopes	Moderate	Kalkaska (90%)	Slope (0.50)	4.4	9.9%
				Sandiness (0.50)		
			Leelanau (5%)	Slope (0.50)		
			Blue Lake (5%)	Slope (0.50)		
KaF	Kalkaska sand, 25 to 45 percent slopes	Severe	Kalkaska (90%)	Slope (1.00)	3.0	6.8%
			Blue Lake (5%)	Slope (1.00)		
			Leelanau (5%)	Slope (1.00)		
Totals for Area of Interest					44.6	100.0%

Construction Limitations for Haul Roads and Log Landings— Summary by Rating Value		
Rating	Acres in AOI	Percent of AOI
Moderate	32.4	72.7%
Slight	9.1	20.5%
Severe	3.0	6.8%
Totals for Area of Interest	44.6	100.0%

Rating Options—Construction Limitations for Haul Roads and Log Landings (Emmet 1)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Land Management

This folder contains a collection of tabular reports that present soil interpretations related to land management. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Land management interpretations are tools designed to guide the user in evaluating existing conditions in planning and predicting the soil response to various land management practices, for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture, and rangeland. Example interpretations include suitability for a variety of irrigation practices, log landings, haul roads and major skid trails, equipment operability, site preparation, suitability for hand and mechanical planting, potential erosion hazard associated with various practices, and ratings for fencing and waterline installation.

Equipment Limitations on Woodland (MI) (Emmet 1)

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 limiting 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) (Emmet 1)

[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]

Equipment Limitations on Woodland (MI)–Emmet County, Michigan							
Map symbol and soil name	Pct. of map unit	Suitability for use of harvesting equipment (MI)		Suitability for log landings (MI)		Suitability for haul roads (MI)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
BlB—Blue Lake loamy sand, 0 to 6 percent slopes							
Blue lake	90	Well suited		Well suited		Well suited	
BlD—Blue Lake loamy sand, 12 to 18 percent slopes							
Blue lake	90	Well suited		Moderately suited		Moderately suited	
				Slope	0.50	Slope	0.50
BlE—Blue Lake loamy sand, 18 to 25 percent slopes							
Blue lake	90	Moderately suited		Poorly suited		Moderately suited	
		Slope	0.50	Slope	1.00	Slope	0.50
KaE—Kalkaska sand, 18 to 25 percent slopes							
Kalkaska	90	Moderately suited		Poorly suited		Moderately suited	
		Slope	0.50	Slope	1.00	Slope	0.50
KaF—Kalkaska sand, 25 to 45 percent slopes							
Kalkaska	90	Moderately suited		Poorly suited		Moderately suited	
		Slope	0.50	Slope	1.00	Slope	0.50

Vegetative Productivity

This folder contains a collection of tabular reports that present vegetative productivity data. The reports (tables) include all selected map units and components for each map unit. Vegetative productivity includes estimates of potential vegetative production for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture and rangeland. In the underlying database, some states maintain crop yield data by individual map unit component. Other states maintain the data at the map unit level. Attributes are included for both, although only one or the other is likely to contain data for any given geographic area. For other land uses, productivity data is shown only at the map unit component level. Examples include potential crop yields under irrigated and nonirrigated conditions, forest productivity, forest site index, and total rangeland production under of normal, favorable and unfavorable conditions.

Forestland Productivity (Emmet 1)

This table can help forestland owners or managers plan the use of soils for wood crops. It shows 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 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. Commonly grown 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 *volume of wood fiber*, a number, is the yield likely to be produced by the most important tree species. This number, expressed as cubic feet per acre per year and calculated at the age of culmination of the mean annual increment (CMAI), indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Trees to manage are those that are preferred for planting, seeding, or natural regeneration and those that remain in the stand after thinning or partial harvest.

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

Forestland Productivity–Emmet County, Michigan				
Map unit symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site Index	Volume of wood fiber	
			Cu ft/ac	
BlB—Blue Lake loamy sand, 0 to 6 percent slopes				
Blue lake	American basswood	—	0.00	Eastern white pine, Jack pine, Red pine
	American beech	—	0.00	
	Bigtooth aspen	—	0.00	
	Eastern hemlock	—	0.00	
	Eastern white pine	—	0.00	
	Quaking aspen	—	0.00	
	Red maple	—	0.00	
	Sugar maple	64	43.00	
	Yellow birch	—	0.00	
BlD—Blue Lake loamy sand, 12 to 18 percent slopes				
Blue lake	American basswood	—	0.00	Eastern white pine, Jack pine, Red pine
	American beech	—	0.00	
	Bigtooth aspen	—	0.00	
	Eastern hemlock	—	0.00	
	Eastern white pine	—	0.00	
	Quaking aspen	—	0.00	
	Red maple	—	0.00	
	Sugar maple	64	43.00	
	Yellow birch	—	0.00	
BlE—Blue Lake loamy sand, 18 to 25 percent slopes				
Blue lake	American basswood	—	0.00	Eastern white pine, Jack pine, Red pine
	American beech	—	0.00	
	Bigtooth aspen	—	0.00	
	Eastern hemlock	—	0.00	
	Eastern white pine	—	0.00	
	Quaking aspen	—	0.00	
	Red maple	—	0.00	
	Sugar maple	64	43.00	
	Yellow birch	—	0.00	

Forestland Productivity–Emmet County, Michigan				
Map unit symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site Index	Volume of wood fiber	
			Cu ft/ac	
KaE—Kalkaska sand, 18 to 25 percent slopes				
Kalkaska	American beech	—	0.00	Eastern white pine, Red pine
	Bigtooth aspen	80	100.00	
	Eastern white pine	—	0.00	
	Northern red oak	—	0.00	
	Paper birch	—	0.00	
	Quaking aspen	—	0.00	
	Red maple	63	43.00	
	Red pine	—	0.00	
	Sugar maple	64	43.00	
KaF—Kalkaska sand, 25 to 45 percent slopes				
Kalkaska	American beech	—	0.00	Eastern white pine, Red pine
	Bigtooth aspen	80	100.00	
	Eastern white pine	—	0.00	
	Northern red oak	—	0.00	
	Paper birch	—	0.00	
	Quaking aspen	—	0.00	
	Red maple	63	43.00	
	Red pine	—	0.00	
	Sugar maple	64	43.00	