4 - MANAGEMENT AREA DIRECTION

4.1 – Introduction

This section builds upon the discussions in the previous sections on forest history and current conditions and trends and provides specific management direction for each of the 33 state forest management areas in the northern Lower Peninsula ecoregion (Figure 4.1). Management areas are groupings of forest compartments that range in size from approximately 19,000 to 185,000 acres. The boundaries of management areas are based upon common attributes.

Each management area section contains:

- A summary of use and management;
- An introduction, which includes a projection of harvest acres in this 10-year planning period;
- Management direction for each of the major (covering at least 4-5% of a management area) and some of the minor (covering less than 4-5% of a management area) forest cover types in the management area, including a description of the current condition, desired future condition, 10-year management objectives and long-term management issues;
- Featured wildlife species and habitat specifications; and
- Discussions of rare fish, wildlife and plant management, forest health management, aquatic resources, fire management, recreation, access and other regional-specific issues, such as oil and gas development.

The sustained yield of Michigan state forest timber management is largely predicated upon a sophisticated and continually updated forest inventory that enables the use of a modified area control method and the associated balancing of age classes rather than volume control. Area regulation is an indirect method of controlling the amount of timber to be annually harvested on the basis of an equal (balanced) number of acres in each of several age classes (up to a set rotation age) of stocked trees, in order to meet management objectives and as a means of ensuring sustained yields over time (see Leak, 2011 for a more in-depth description of area regulation). Most public forestry agencies employ an area regulation approach to achieve sustainable, even flows of timber. For the Michigan state forest system, area control is used for management of even-aged stands in the aspen, jack pine and some oak forest types. Management of uneven-aged stands such as northern hardwoods is based upon a basal area/stocking approach, and a combination of basal area and age class is used in management of red and white pine stands. Most lowland cover types are also managed as even-aged stands using the area control method. However, for many lowland forest types (particularly for lowland conifer types) the balancing of age classes may not be achievable or prudent due to the unavailability of many acres and the management objective in these types is to promote regeneration for future habitat and other values.

It is important to understand that balancing age classes for a forest type is a long-term management objective that can only be achieved over the course of time (typically 50 to 80 years or more). During this period, harvest levels in any given year-of-entry can be higher or lower than the desired long-term area-regulated harvest level as unbalanced age classes (resulting from past over- or under-harvesting) are rectified through additional harvest prescriptions. Application of the modified area control method to the effective base of timberland in the state forest ensures that harvest levels are sustainable and comply with forest certification standard requirements.

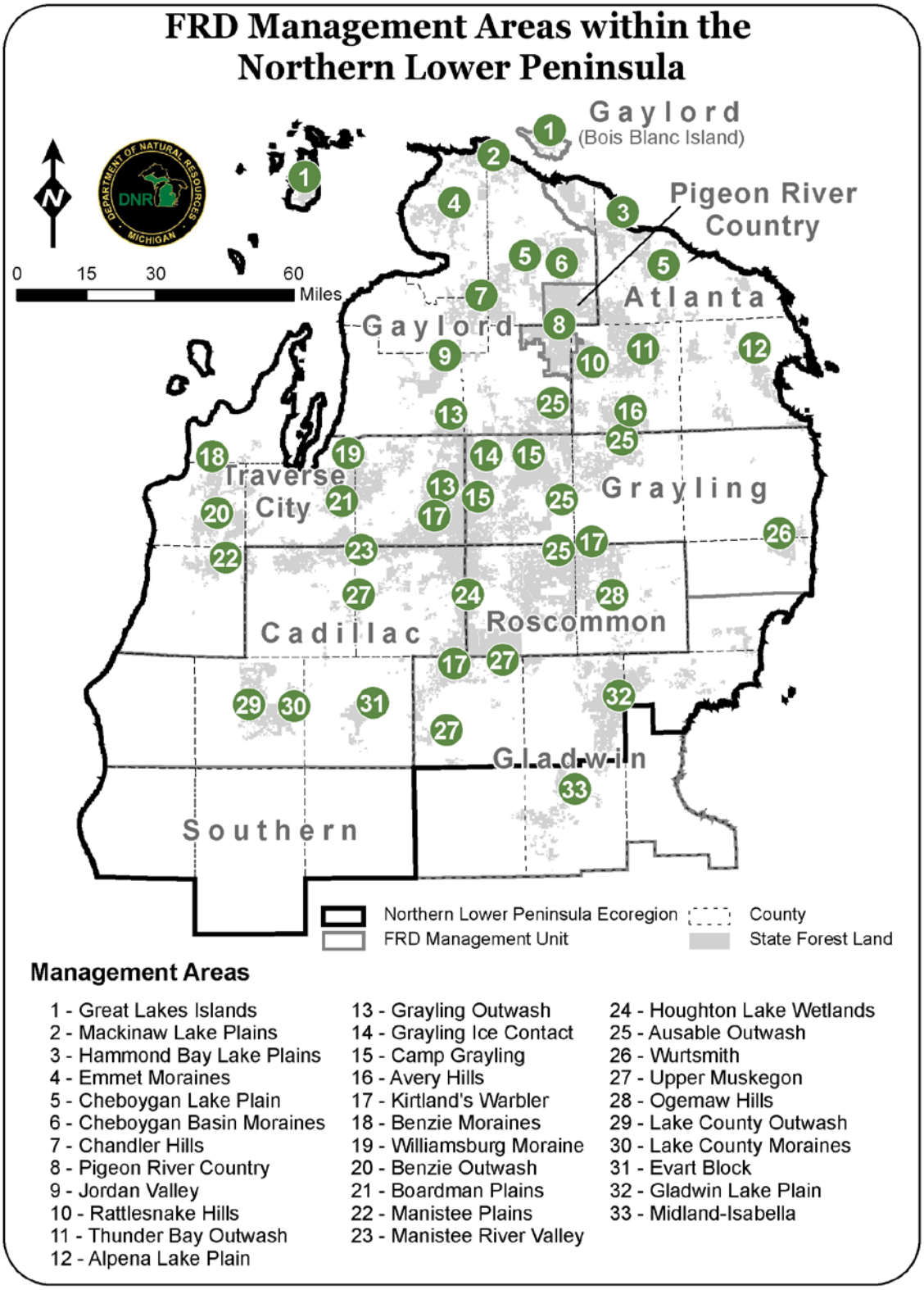

Figure 4.1. A map of the northern Lower Peninsula ecoregion showing the management areas.

The calculation of projected harvest levels is a key component of each management area section in the regional state forest management plan and are framed in terms of projected harvests (in acres) for the major and minor cover types for the following decade. These projections are based upon several factors:

- The desired future condition for the forest type, which include area regulated (balanced) age-class distributions and the perpetuation or transition of dominant forest types based upon Kotar habitat classification (Burger and Kotar, 2003);
- The present acreage and age class and/or stocking condition of forest types, based upon inventory data;
- Areas that are reserved from harvest due to treatment limiting factors or other management goals (including special conservation areas, high conservation value areas and ecological reference areas); and
- The type of silvicultural practices that are typically employed for different cover types, age classes and means of forest regeneration.

Other variable factors such as disease, insect, wind or fire mortality may also impact harvest levels. Where disease, insect or fire mortality problems are known in advance to apply to a management area (e.g., beech mortality due to beech bark disease), they are taken into consideration when establishing harvest levels for that management area. These factors cannot always be predicted with sufficient accuracy or certainty to allow them to be integrated into operational landscape-level planning. So when they do occur, harvest schedules are often adjusted in the compartment review process to address them. Where there are occurrences of disease or insect outbreaks or large wind throws or wildfires, they are usually quite localized and may lead to unanticipated temporary increases in salvage harvests to avoid major losses in timber value. These unanticipated harvests are taken into account in subsequent annual planning analyses and processes.

All the above factors are integrated into DNR planning processes at the strategic-level (2008 Michigan State Forest Management Plan), operational landscape-level (regional state forest management plans) and the tactical-level (through the compartment review process). In particular, they are considered in formulating the management direction for each management area in the regional state forest management plan, which provide specific estimates of harvest levels for the next 10-year compartment review cycle.

The management direction contained within each management area section of the plan is used with appropriate standards and guidelines and professional judgment in the compartment review process to plan tactical prescriptions for timber harvest. Whereas standards originate from higher authority, they retain higher precedence than the contents of this plan. Standards and guidelines that are used for the operational management of the state forest include:

Standards:

1. Natural Resource Commission Policy 2204, Reforestation, issued January 1, 1977
2. Natural Resource Commission Policy 2207, Management of State Forests, issued May 11, 1979
3. DNR Policy and Procedure 32.22-06, Forest Type Mapping Instructions and Type Symbols, issued July 11, 2005
4. DNR Policy and Procedure 32.22-07, Forest Management, issued July 11, 2005
5. DNR Policy and Procedure 39.21-20, Beaver Management, issued July 11, 2005
6. DNR Forest Management, Fire and Mineral Division Policy and Procedure 241, Reforestation, issued October 26, 1999
7. DNR Forest Management, Fire and Mineral Division Policy and Procedure 251, Sale and Removals of Timber, issued March 1, 2000
8. DNR Forest Management, Fire and Mineral Division Policy and Procedure 251a, Sale and Removals of Timber, Visual Management, issued February 28, 2002
9. DNR Forest Management, Fire and Mineral Division Policy and Procedure 441, Operations Inventory and Compartment Review Procedures, issued January 19, 2000
10. Fisheries Division Policy and Procedures 02.01.002, Dams and Barriers.
11. Fisheries Division Policy and Procedures 02.01.007, Stream Crossings (Bridges, Culverts and Pipelines).
12. Fisheries Division Policy and Procedures 02.02.005, Fish Passage.
13. Fisheries Division Policy and Procedures 02.02.011, Riparian Vegetation Protection.
14. Director's Fisheries Order 210.10, Designated Trout Streams for Michigan.
15. Requirements for the Sustainable Forestry Initiative 2010-2014 Program, January 2010.
16. Forest Stewardship Council-U.S. Forest Management Standard (v1.0), July 8, 2010.
17. DNR Forest Certification Work Instruction 1.4 – Biodiversity Management on State Forest Lands
18. DNR Forest Certification Work Instruction 1.5 – Social Impact Considerations and Public Involvement Processes
19. DNR Forest Certification Work Instruction 1.6 – Forest Management Unit Analysis

20. DNR Forest Certification Work Instruction 2.1 – Reforestation
21. DNR Forest Certification Work Instruction 2.3 – Integrated Pest Management and Forest Health
22. DNR Forest Certification Work Instruction 7.1 – Timber Sale Preparation and Administration Procedures

Guidelines:

1. DNR Silvicultural Guidelines
2. Within-Stand Retention Guidance (Michigan Department of Natural Resources, 2011)
3. Michigan Woody Biomass Harvesting Guidance (Michigan Department of Natural Resources, 2010)
4. Sustainable Soil and Water Quality Practices on Forest Land (Michigan Department of Natural Resources and Michigan Department of Environmental Quality, 2009)
5. Evaluating Riparian Management Zones on State Lands (Michigan Department of Natural Resources, 2004)
6. Forest Certification Green-Up Guidelines (Michigan Department of Natural Resources, 2006)
7. Guidelines for Red Pine Management (Michigan Department of Natural Resources, 2006)
8. American Beech Management: Beech Bark Disease (Michigan Department of Natural Resources, 2012)
9. Ash Management: Emerald Ash Borer (Michigan Department of Natural Resources, 2012)
10. Rare Species Protection Approach and Assessment Guidelines (Michigan Department of Natural Resources, 2008)
11. Interim Management Guidance for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands (Michigan Department of Natural Resources, 2012)
12. Strategy for Kirtland's Warbler Habitat Management (Michigan Department of Natural Resources et al., 2001)
13. Conservation Guidelines for Michigan Lakes (Special Report 38).
14. Guide to Stream Protection and Restoration (Special Report 15).
15. Deer Winter Range Guidelines (Michigan Department of Natural Resources et al., 2013).

This forest plan is based upon 2012 DNR state forest inventory data. A model was used to analyze the inventory data and to generate the tables and figures presented in this plan section. Metadata describing the design elements and functions of this model is provided in Appendix D.

The state forest inventory in the northern Lower Peninsula ecoregion totals 2,050,183 acres, of which 1,780,752 acres (87%) are forested (Table 3.1). The dominant cover types are aspen (24%), northern hardwoods (10%), jack pine (10%), oak (10%) and red pine (8%) (Table 4.1). There are 227,440 acres (17%) with hard limiting factors (Table 4.1), resulting in 1,822,734 acres (88%) of manageable forested and non-forested land. There are very little anticipated shifts in cover type acreages over the 10-year planning period, aside from some minor decreases in the jack and red pine types and increases in the northern hardwood and upland mixed cover types. The plan maintains a conservative path for the present, until such time that a scientifically-based, deliberate and quantifiable analysis can be conducted that will help to inform decisions about the cover type composition of the future state forest (next 30 years). As identified in Section 5 of this plan, such an analysis will need to incorporate more complete inventory data from the Integrated Forest Monitoring Assessment and Prescription forest type classification system and also account for probable social, economic and ecological trends and impacts related to climate change over the next century.

Some broad trends on forest acreages merit a brief discussion here, and are discussed in further detail in the management area sections that follow. In some management areas red pine was planted on northern hardwood sites (habitat classes (Burger and Kotar, 2003): AFOCa and AFO) and contains a well-developed hardwood understory. After treatments of these older red pine stands, the decision may be made to allow the red pine to convert back to northern hardwoods. Red pine is also being converted to jack pine on dry sites more suitable for jack pine (habitat class (Burger and Kotar, 2003): PVCd), or red pine may be converted to oak where oak is already present in the understory. These trends may result in a slight reduction in future red pine acres. The oak age-class distribution in the northern Lower Peninsula ecoregion is largely skewed towards the older age-classes and in some management areas older-less-vigorous oak is difficult to regenerate. In addition, forest health issues such as oak wilt and oak decline continue to impact oak. While management will continue to stress maintaining oak as the dominant species in stands, in mixed stands with pine or as a component in other cover types on the landscape, it is expected that the future trend will be toward fewer acres of oak. Northern hardwoods are also being impacted by forest health issues, with increasing mortality from the emerald ash borer and beech bark disease.

Opportunities to increase harvest prescriptions in lowland cover types including lowland deciduous, cedar and lowland conifer will be assessed. This is due to a number of factors, including an abundance of mature acres in these lowland forest types; emerging forest health issues associated with some mature forest types; and a current DNR project to digitize, review and update old hard copy maps of deer wintering complexes (comprised predominantly of lowland conifer cover types) into a unified Geographic Information System shape file.

The modeled DNR inventory data projects a prescribed harvest level of 392,601acres over this 10-year planning period for the state forest in the northern Lower Peninsula ecoregion, which is the summation of the projected 10-year final harvest area and the projected 10-year partial harvest area levels for both major and minor cover types in each management area (Table 4.1).

These higher harvest levels reflect a concerted effort to accelerate the balancing of age classes for upland cover types in the northern Lower Peninsula ecoregion. Harvest projections should be considered to be prescribed inventory acres. Proposed timber sale acres are consistently 10% less than prescribed inventory acres, due to site-specific conditions (such as access issues or survey needs). Considering this, the acreage of proposed timber sales the state forest in the northern Lower Peninsula ecoregion is projected to be about 353,000 acres over this 10-year planning period (an average of about 35,300 acres per year). This does not mean that 35,300 acres of timber will be harvested during every year in the planning period. Harvest levels in any given year may actually be lower or higher than 35,300 acres due to several reasons, including variability in the proportion of different forest types and their age/size classes in any given year-of-entry, variability in the timing of actual harvests during the 3-4 year timber sale preparation and contract process and variability in the number of unanticipated salvage harvests (due to forest health or fire occurrences).

Likewise and for the same reasons, there is variability in the annual harvest levels in any given forest management unit. Harvest levels in each cover type will also be variable due to reclassification of cover types as the transition from the operations inventory to Integrated Forest Monitoring Assessment and Prescription forest inventory systems progresses during the planning period. Harvest levels in lowland cover types may be higher or lower, as available acres are quantified by collection of site condition (limited factor) data for all forest stands during the planning period. However, over the full 10-year planning period it is anticipated that about 353,000 acres of timber will be harvested from the northern Lower Peninsula ecoregion. It is anticipated that this level of harvest activity will decrease in the next planning period (11-20 years from the present), as less aggressive measures will be necessary to continue progression toward the balancing of age classes in the northern Lower Peninsula ecoregion.

Table 4.1. Projected harvest level by cover type and management areas aggregated over this 10-year planning period for the state forest in the northern Lower Peninsula ecoregion (Department of Natural Resources 2012 inventory data).

Species	Percentage	Current Acreage	Hard Factor Limited Acres	Manageable Acres	Project 10 year Final harvest	Project 10 Year Partial Harvest	Projected Acreage at end of planning horizon
Aspen	24%	496,754	32,491	464263	102,132	0	496,754
Cedar	4%	77,881	77,936	-55	0	0	77,881
Hemlock	0%	1,456	72	1384	0	249	1,456
Jack Pine	10%	207,084	16,528	190669	24,356	0	206,971
Lowland Aspen/Balsam Poplar	2%	41,957	21,195	20762	3,384	0	41,957
Lowland Conifers	4%	89,842	72,048	17794	1,880	0	89,842
Lowland Deciduous	5%	99,201	69,790	29411	2,412	800	99,201
Lowland Mixed Forest	1%	11,791	9,454	2337	121	0	11,791
Lowland Spruce/Fir	0%	8,978	7,301	1677	106	0	8,978
Mixed Upland Deciduous	2%	46,626	4,511	42115	7,116	8,113	46,626
Natural Mixed Pines	1%	26,209	1,923	24286	2,309	7,359	26,209
Northern Hardwood	10%	215,204	17,053	197551	2,018	62,091	215,804
Oak	10%	201,067	65,755	135312	11,522	28,377	201,067
Paper Birch	0%	3,431	2,001	1430	291	0	3,431
Planted Mixed Pines	0%	6,536	40	6496	1,038	1,712	6,536
Red Pine	8%	167,896	14,621	154362	37,095	55,583	166,809
Tamarack	0%	7,882	6,322	1560	117	0	7,882
Upland Conifers	0%	2,791	182	2609	1,064	768	2,791
Upland Mixed Forest	1%	21,014	2,236	18178	3,190	4,770	21,614
Upland Spruce/Fir	0%	7,064	2,200	4864	1,856	0	7,064
White Pine	2%	40,088	3,057	37031	8,146	12,626	40,088
Lowland Open/Semi-Open Lands	7%	138,187	1,165	137022	0	0	138,187
Upland Open/Semi-Open Lands	5%	104,070	12,200	91870	0	0	104,070
Misc Other (Water, Local, Urban)	1%	27,174	3,056	24118	0	0	27,174
Totals	1	2,050,183			210,153	182,448	

Climate Change Considerations

As the climate continues to change, the effects of these changes may present forest managers with challenges to achieving the desired future conditions outlined in this plan and exploration of additional strategies for adapting to these changes may be warranted. Within the scope of this plan, forest managers may consider management actions that help to put forests in a better position to respond to a range of future conditions. Millar et al. (2007) described an adaptation framework with actions that fit into three broad categories:

- Resistance Actions – These help a forest ecosystem build its defenses, both against the direct impacts of a changing climate and the indirect impacts of other threats that are aggravated by climatic changes. These are for situations where there is a goal of keeping the ecosystem in a relatively unchanged condition. Examples of actions include creating a complete fire-break around a unique, vulnerable area or intensive removal of all invasive species from an area. For many areas, these actions may only make sense in the short-term, as ultimately, the climatic changes may simply go beyond the physical limits of the species or system and will likely get more expensive with greater climate changes.
- Resilience Actions – These help a forest ecosystem rebound and return to a prior condition following a disturbance and are for situations where a small-degree of change is acceptable. Resilience actions are similar to resistance actions, but are applied more broadly and focus on helping a system cope with disturbance. An example would be actions that help to increase the diversity of species in an ecosystem. Again, these actions may not be long-term solutions, if the climate becomes completely unsuitable for that ecosystem.
- Response Actions – These help a forest ecosystem change and move to a different condition that is suitable for a changing and new climate. These actions include assisted migration (intentionally moving a species to a location outside of its current range) and promoting connected landscapes.

Decisions about what types of adaptation actions are most appropriate for an area will need to consider the implications of climate changes to that area and recognize that they will be influenced by differences in ecosystem, ownership and management objectives. Section 3 includes an overview of some regional differences that may affect which kinds of actions are most appropriate.

Many of the special resource areas described by management area in this section have characteristics that may make them more vulnerable to climate change, as well as characteristics that may make them good candidates as refugia for species threatened by climate changes. Refugia are “locations and habitats that support populations of organisms that are limited to small fragments of their previous range” (Handler et al., In Press). In addition to their potential for providing some protection for vulnerable species and ecosystems, refugia may also be valuable for their potential to protect water supplies and functions as they fluctuate across the landscape (Handler et al., In Press).

Some special resource areas are examples of natural communities that are already rare – either have very specific hydrologic/climatic/disturbance requirements or are already threatened in other ways; regardless, this will make them more vulnerable to additional threats/stresses. However, those special resource areas that are already in good condition and include diverse species and few invasives will have a higher adaptive capacity than other lower quality places, making them good potential refugia. High-quality natural communities are more likely to support rare species – this is an additional characteristic that will make some special resource areas valuable as refugia. Additionally, management objectives already in place in many special resource areas focus on promoting high-quality natural communities, thus are already in line with the best adaptation strategies.

Special Resource Area Management Direction

The Department of Natural Resources has used many mechanisms to identify areas that may have particular or special biological/ecological, social or economic conservation objectives or values. For example, some state natural areas have been dedicated by Natural Resource Commission resolutions and the Simmons Woods Area was established using a land use order under the authority of the director. Some areas are managed through memorandums of understanding and statute and there are also areas that have been noted for their biodiversity potential through less formal mechanisms.

Over time it has become challenging to sift through naming conventions and designations to understand the broad range of conservation values within the state forest system. The special resource area management direction section of this plan begins the process of collating and organizing these areas and their associated designations.

This section provides a description of areas of the state forest that have been identified as having specific or special resource attributes that are considered in management planning and activities. The majority of these areas are noted for renewable resource conservation values; however, some social and non-renewable categories (e.g., concentrated recreation areas and mineral resource areas) have also been included in order to document and track their purposes.

Areas with specific conservation values have been sorted into three primary categories: special conservation areas, high conservation value areas and ecological reference areas. Each category has a conservation value trait and a 'level of recognition' trait. Combined, the two traits determine whether an area is identified as a special conservation area, a high conservation value area or an ecological reference area. It is anticipated that over time, areas will be moved between, added and/or removed from these categories based on conservation values and level of recognition.

Special Conservation Areas: Special conservation areas are areas of state forest land that have one or more identified special conservation objectives, interests or natural community (Kost et al, 2007) element occurrences. They are a broad assemblage of areas that possess some inherent ecological, social or economic value. Conservation objectives listed in the special conservation area category have been identified through a variety of methods and mechanisms. The type and strength of recognition (and possible management options) will vary depending on the process used to identify the conservation value. For example, some objectives are detailed in the land use orders of the director (force of law) while other may be identified through cooperative agreements (administrative recognition). Areas formerly identified through administrative recognition that have not had that recognition superseded by another formal designation will have administrative recognition re-affirmed by this plan. There are also objectives developed through department process or agreement (e.g., deer wintering areas, potential old growth or riparian buffers). The special conservation area category may also be used to document areas identified by an external group or organization, such as National Audubon Society's Important Bird Areas Program.

High Conservation Value Areas: High conservation value areas are areas of state forest lands that have been recognized for their contribution to specific conservation objectives or ecological attributes through a public process. Examples of these formal processes include: legislation, administrative rule or director's or Natural Resource Commission orders. High conservation value areas include dedicated natural, wilderness and wild areas; natural rivers; species recovery plan areas such as piping plover habitat areas; and critical dune areas.

Designated high conservation value areas are located only upon state forest land, but within a landscape context, conservation efforts of equivalent high conservation value area resources should be coordinated with other private and agency landowners. The high conservation value area category is intended to address the Forest Stewardship Council U.S. Forest Management Standard (v1.0) Principle 9, which requires the maintenance of high conservation value forests.

Ecological Reference Areas: Ecological reference areas are areas that serve as models of ecological reference within the state. They are high-quality examples of ecosystems that are primarily influenced by natural ecological processes and they can be located upon any land ownership. High-quality natural communities recognized by NatureServe (an internet based international network of biological inventories) and the Michigan Natural Features Inventory as global (G) or state (S) endangered (1), threatened (2) or rare (3) and with an element of occurrence (EO) rank of A or B in the Michigan Natural Features Inventory database serve as an initial set of ecological reference areas. This ecological classification system was selected as a baseline because it is nationally and internationally acknowledged and is based on a sound scientific system. The ecological reference area category is intended to address the Forest Stewardship Council U.S. Forest Management Standard (v1.0) Criterion 6.4, which requires the establishment of a system of protected representative ecosystems across the landscape of all ownerships.

Identified ecological reference areas, high conservation value areas and special conservation areas will be managed to conserve, protect and/or enhance the defined conservation objective or value. The methods used will vary depending upon the objective and type of designation. Methods can include active management or just the provision of access. Either method must be compatible with the defined conservation objective or value. Land managers, field staff and stand examiners use technical materials, program staff and/or other references when assessing management options that are suitable for the specific conservation objective. All areas will be managed to protect the immediate natural resource values with consideration of human health and safety.

Areas that are designated as ecological reference areas, high conservation value areas and special conservation areas may overlap one another and are not mutually exclusive. The Department of Natural Resources has developed maps that show the spatial extent of these areas across the landscape of the northern Lower Peninsula ecoregion.

The starting point for reviewing special conservation areas is the operations inventory and compartment review process. The starting point for reviewing high conservation value areas and ecological reference areas is the Biodiversity Conservation Planning Process. Both processes include public participation and consider nominations for inclusion, removal or other changes to designations. Additional information regarding these areas can be found in the Conservation Area Management Guidelines and the standards and guidelines applicable to the management directions for each type of special resource area can be found in Section 5 of the Michigan State Forest Management Plan, 2008.

Cultural and Customary Use Areas

Cultural use areas in the northern Lower Peninsula ecoregion are those areas which are important due to the beliefs, practices, history and culture of certain ethnic and religious groups. Native American tribes and other groups may also use forest areas for customary uses which are normally seasonal. Customary uses may include placement of traditional hunting camps or the gathering of non-timber forest products such as wild fruit or mushroom hunting.

Maintenance and preservation of cultural and customary use areas is economically and socially important to our society. The National Historic Preservation Act requires consultation with Tribes and others to identify and manage traditional cultural properties. Sales of gathered non-forest products may be an important source of income during times of economic need such as seasonal unemployment (Jones and Lynch, 2002).

Social ties may be developed through family outings for gathering or harvesting non-forest products (Stynes and Kakoyannis, 1999 and Emery, 1998). These outings may also serve as a form of recreation or exercise. The primary socioeconomic management objective for cultural and customary use areas is to maintain these resources for their intrinsic social and economic value. Though cultural and customary use areas are perceived as economic or consumption value for humans, they may also represent forms of biodiversity that must be maintained on the landscape from an ecosystem management perspective.

Land use permits for non-tribal customary and cultural uses are coordinated by each forest management unit. Permits for cultural and customary uses of state forest resources by tribal members who are exercising their gathering rights in areas that are under the 2007 Inland Consent Decree for the 1836 Treaty of Washington (Figure 4.2) are issued by their respective tribal government.

Archaeological Sites

Archaeological sites have intrinsic social value and require protection in the northern Lower Peninsula ecoregion. There are two types of archaeological sites. First, three are the pre-historic sites that existed before the arrival of Europeans. Examples of pre-historic sites are camp sites, village sites, quarries, mortuary mounds and other areas used by early natives. The second type of archeological site is the historic site. These are sites that may be part of the written record, including cemeteries, town sites, logging camps and homesteads. In the ecoregion, most historic sites are from the early 1800s to the mid-20th century.

Sites may be identified by natural heritage data from the State Historical Preservation Office and Office of the State Archaeologist. Sites or possible sites may be discovered in the course of normal field work. These sites should be reported to the Office of the State Archaeologist if they are not already in the database. To protect archaeological sites it is necessary to safeguard location information. This information is sensitive and will be protected from public disclosure and as such, is exempted from the Freedom of Information Act.

Tribal governments should be contacted when working in areas where Native American use may have occurred. Tribal governments should receive notification of open house meetings to enable review of treatment proposals for any possible disruption to archeological sites.

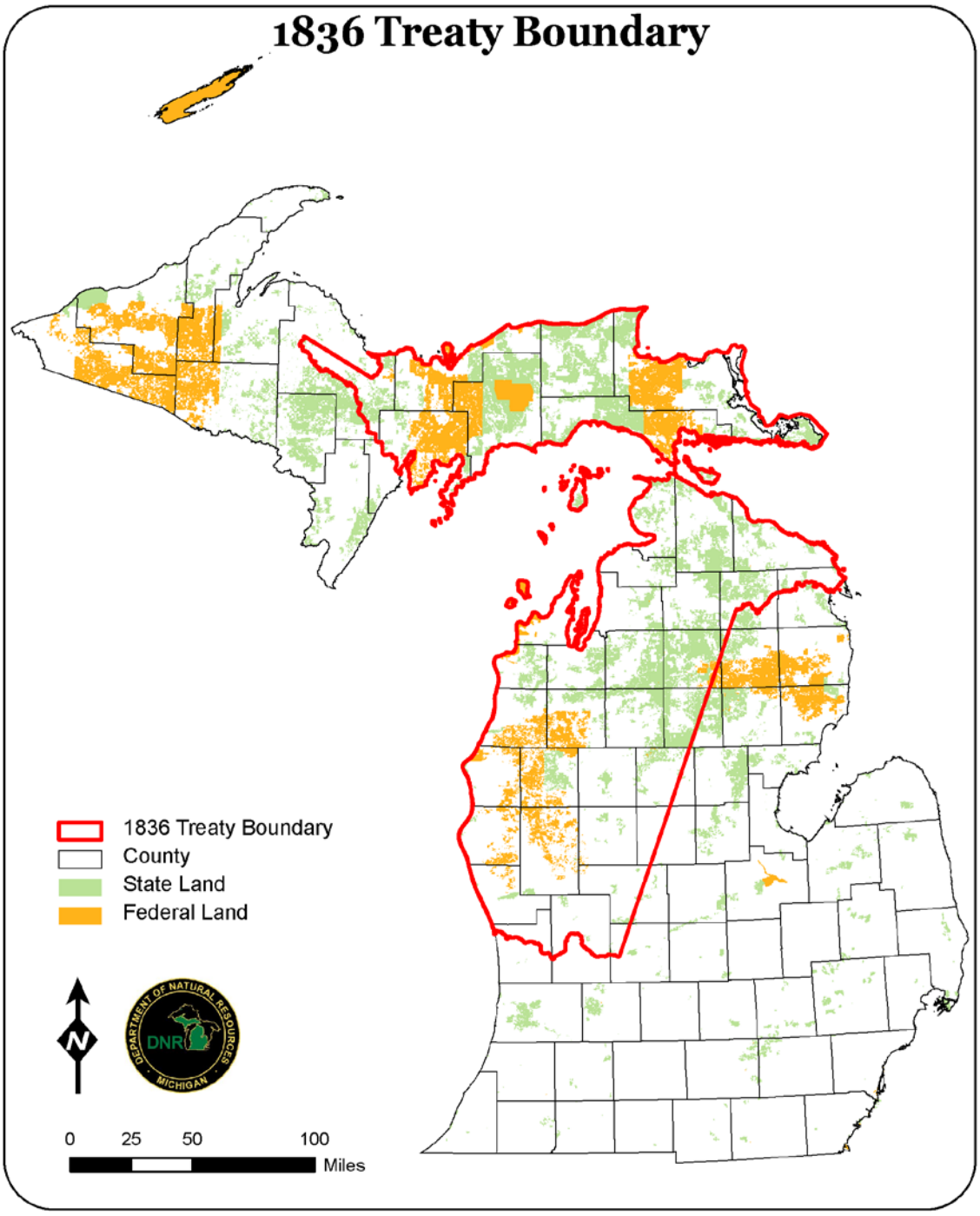

Figure 4.2. Boundary for the 1836 Treaty of Washington (Department of Natural Resources, 2007).

4.2 MA 1 – Great Lakes Islands Management Area

Summary of Use and Management

The Great Lakes Islands management area (MA) consists of the Fox Island group and the Beaver Island group in northern Lake Michigan and Bois Blanc Island in northern Lake Huron (Figure 4.1.1). All of the islands, except Bois Blanc, are wildlife research areas administered by Wildlife Division. Timber on Beaver Island is managed for wildlife habitat maintenance. The Forest Resources Division administers 10,300 acres of state forest land on Bois Blanc Island, including three designated natural areas. Timber management opportunities on Bois Blanc Island are limited due to economics and logistics of travel. Expected trends within this 10-year planning period are increased recreational pressure, especially protecting key habitat for threatened and endangered species such as piping plover; introduced pests and diseases; and respecting traditional tribal use of the islands.

- Ecological classification – North and South Fox islands and High Island fall within the Manistee sub-region, Beaver Island falls within the Cheboygan sub-region and Bois Blanc Island falls within the St. Ignace sub-region as classified by Albert (1995).
- Landform – The Fox Islands and High Island consist of sand dunes or other lacustrine features. Beaver Island is generally similar to other lake plains in the state, much of it a series of beach ridges and adjacent wet depressions. Bois Blanc Island has flat sand or clay deposits where only a few inches of elevation change can alter drainage conditions.

Ownership and size:

Bois Blanc acres total 23,700 acres in size. The state of Michigan administers 10,300 acres (43%) of this land. The state land includes three designated natural areas: 1) Mixed Forest - 968 acres, 2) Northshore - 817 acres and 3) Snake Island/Mud Lake - 244 acres. Approximately 5,400 acres of state forest land on Bois Blanc Island are designated as managed lands as part of Candidate Conservation Agreement with Assurances for the eastern massasauga rattlesnake in Michigan. Timber management opportunities on the island are limited due to economics and logistics/operability, thus the best management type must be matched to the circumstances and site conditions.

- Beaver Island Group
  - Beaver Island is approximately 36,800 acres in size. The state of Michigan administers about 12,300 acres (33%) of this land. State lands have a history of timber management and opening maintenance. There are no current plans to prepare any new sale contracts until the planning process is completed with the Island Committee. The results of past sales could dictate future management opportunity. The island has an active deer management group that is conducting some habitat management activities. The island has a year-round population of 551. The island group has piping plover critical habitat.
  - High Island is approximately 3,600 acres in size and completely owned by the state of Michigan. It is considered one of the most beautiful islands in the state and contains unique geology and biology. The island is an outcrop of limestone bedrock covered with a relatively thick layer of glacial drift. The central part of the island (a high plain) is separated from the rest by an escarpment ranging in height from a few feet to upward of 200 feet or more. Parts of the west side of the escarpment are covered with high perched sand dunes (in excellent condition) with mostly open dune vegetation. Farther west is an area of sandy beach ridges of former lake levels, which has some interesting and beautiful cedar and upland forests. The island has an array of Michigan shoreline features and associated ecosystems that support a number of rare, threatened and endangered plant and bird species.
  - Garden Island is approximately 4,600 acres in size and all but 107 acres is owned by the state of Michigan. The island has specific significance to Native Americans.
  - Hog Island is approximately 2,300 acres in size and completely owned by the state of Michigan. It is one of the least disturbed islands in the Beaver Island group and is a natural, scenic, recreational and scientific gem. The island is largely forested (including pockets of old-growth northern hardwood), but includes extensive great lakes marshes that are important spawning grounds for perch and smallmouth bass, interdunal wetlands and uncut coniferous swamps and bogs. The island provides habitat for the state-threatened common tern, and three state-threatened plant species that are found only on the shores of the Great Lakes: Lake Huron tansy, Pitcher's thistle and Houghton's goldenrod.
- Fox Island Group
  - North Fox Island is 820 acres in size. It was purchased by the state of Michigan in 2000.
  - South Fox is 3,433 acres in size. The island includes a cemetery where members of the Grand Traverse Band of Native Americans are buried. Deer were introduced onto the island in 1915. Hunting is permitted on state land by permit only. There is a lighthouse on South Fox that was built in 1867 and operated until 1959. Portions of the island's shoreline are classified as piping plover critical habitat.

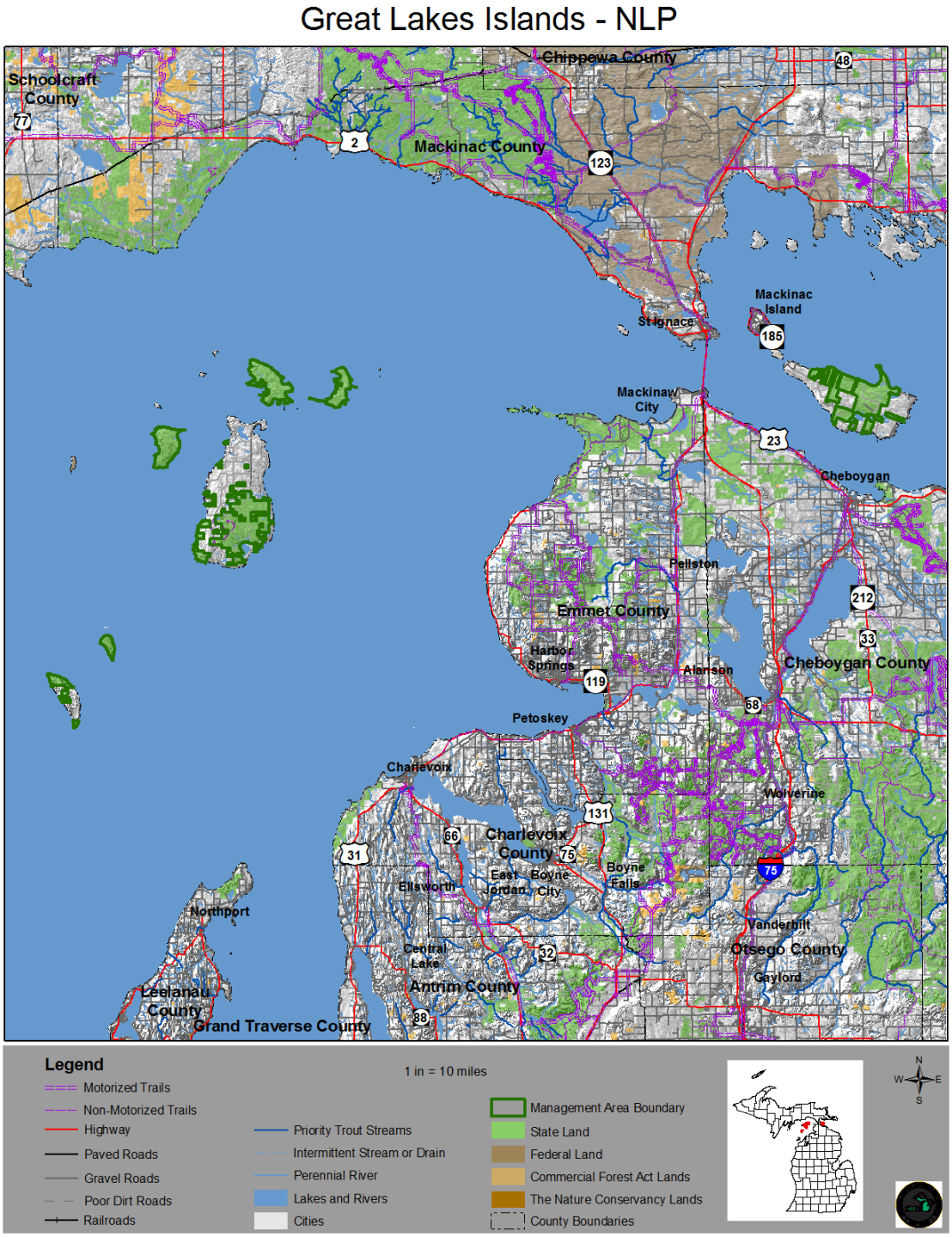

Figure 4.1.1. A map of the Great Lakes Islands management area (dark green boundary) in northern Lake Huron and northern Lake Michigan.

4.1.1 Forest Cover Type Management Direction

All of the Islands, with the exception of Bois Blanc, are administered by DNR Wildlife Division. The state forest land on Beaver Island will continue to be inventoried and be subject to forest management for wildlife habitat objectives as economics and logistics allow. The other Great Lakes islands in the management area are wildlife research areas administered by the Wildlife Division.

The state forest land on Bois Blanc Island will continue to be inventoried and with the exception of the natural areas, be subject to forest management as economics and logistics allow.

4.1.2 Featured Species

Each of the featured species outlined below includes recommended practices with regard to forest management.

The following have been identified as featured species for this management area during this 10-year planning period:

- Eastern massasauga rattlesnake
- Pileated woodpecker
- Piping plover
- Ruffed grouse
- White-tailed deer.

The primary focus of wildlife habitat management in the Great Lakes Islands management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are large blocks of early successional forest, maintenance of open-land complexes, habitat corridors and fragmentation, retention of large over-mature trees and buffers and the provision of snags.

A more detailed overview of featured species is included in Section 3.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the northern Lower Peninsula is to maintain available habitat. Eastern massasauga rattlesnakes inhabit open wetland as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat in priority areas in accordance with the Candidate Conservation Agreement with Assurances. Approximately 5,400 acres of state forest land on Bois Blanc Island are designated as eastern massasauga rattlesnake managed lands per the Candidate Conservation Agreement with Assurances.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
    - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement with Assurances in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees >12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
    - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Piping Plover

The goal for the Great Lakes piping plover is to maintain a breeding population of a minimum 100 nesting pairs. Piping plover select open, sparsely vegetated sandy coastal habitats for nesting, rearing young and foraging. The recovery plan

for the Great Lakes piping plover (2003) defines potential breeding habitat as areas with beach width >7metres (23 feet), shoreline length >0.4 kilometers (0.25 miles), dune area >1.95 hectares (4.82 acres), patches of >0% cobble or debris and areas of beach with up to 50% vegetation cover. State forest habitat management should focus on protecting critical habitat on other occupied shoreline.

Wildlife Habitat Specifications:

- At known breeding sites work with partners to limit human activity near nests, construct predator exclosures around nests and control avian and mammalian predators as needed.
  - Implementation of Great Lake Piping Plover Recovery Plan at occupied sites will be sufficient to meet the habitat specifications for this species.
- In other critical habitat, support land acquisitions and conservation easements.
- At active sites, support public education and increased awareness to help avoid disturbance to nesting birds.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15-year-old) even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
- Balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Successful implementation of these wildlife habitat specifications will require partnerships with conservation partners and may be difficult given the challenging economic and logistic conditions for commercial timber harvest on the islands.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annually manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.
  - Successful implementation of these wildlife habitat specifications will require partnerships with conservation partners and may be difficult given the challenging economic and logistic conditions for commercial timber harvest on the islands.

4.1.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in "*DNR's Approach to the Protection of Rare Species on State Forest Lands*" (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed twelve listed species as well as six natural communities of note occurring in the management area as listed in Table 4.1.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

Table 4.1.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Great Lakes Islands management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Bog		S4/G3G5	Confirmed				Lowland open/semi-open	N/A
Boreal forest		S3/GU	Confirmed				Upland & Lowland Sp/F	Mid
Dry-mesic northern forest		S3/G4	Confirmed				White Pine	Late
Limestone cobble shore		S3/G2G3	Confirmed				Upland open/semi-open	N/A
Mesic northern forest		S3/G4	Confirmed				Northern Hardwood	Late
Poor fen		S3/G3	Confirmed				Lowland open/semi-open	N/A
Birds								
Piping plover	*Charadrius melodus*	LE/E/G3/S1	Confirmed	MV	Moderate	Open dunes	Upland open/semi-open	N/A
Common moorhen	*Gallinula chloropus*	T/G5/S3-4	Confirmed	PS	Very High	Great Lakes marsh	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Emergent Marsh	Lowland open/semi-open	N/A
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Osprey	*Pandion haliaetus*	SC/G5/S2-3	Confirmed	PS	Low	Coastal fen	Lowland open/semi-open	N/A
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland Mixed	Mid
						Hardwood-conifer swamp	Lowland Mixed	Mid
Snail								
Deepwater pondsnail	*Stagnicola contracta*	E/G1/S1	Confirmed	HV	Very High	Inland lake	Aquatic	N/A
						Submergent marsh	Lowland open/semi-open	N/A
Plants								
Calypso or fairy-slipper	*Calypso bulbosa*	T/G5/S2	Confirmed			Rich conifer swamp	Tamarack	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
						Limestone bedrock glade	Upland open/semi-open	N/A
						Volcanic bedrock lakeshore	Upland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Great Lakes barrens	Upland open/semi-open	N/A
						Volcanic bedrock glade	Upland open/semi-open	N/A
Pitcher's thistle	*Cirsium pitcheri*	LT/T/G3/S3	Confirmed			Open dunes	Upland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Great Lakes barrens	Upland open/semi-open	N/A
						Sand and gravel beach	Upland open/semi-open	N/A
Ram's head lady's-slipper	*Cypripedium arietinum*	SC/G3/S3	Confirmed			Rich conifer swamp	Tamarack	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
						Volcanic bedrock lakeshore	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Poor fen	Lowland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Great Lakes barrens	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Volcanic bedrock glade	Upland open/semi-open	N/A
						Granite bedrock glade	Upland open/semi-open	N/A
Dwarf lake iris	*Iris lacustris*	LT/T/G3/S3	Confirmed			Open dunes	Upland open/semi-open	N/A
						Alvar	Upland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Boreal forest	Upland & Lowland Sp/F	Mid
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone cobble shore	Upland open/semi-open	N/A
						Limestone bedrock lakeshore	Upland open/semi-open	N/A
American shore-grass	*Littorella uniflora*	SC/G5/S2S3	Confirmed			Submergent marsh	Lowland open/semi-open	N/A
Lake Huron pansy	*Tanacetum huronense*	T/G5T4T5/S3	Confirmed			Open dunes	Upland open/semi-open	N/A
						Limestone cobble shore	Upland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

As shown in Figure 4.1.2, there are seven islands in this management area that consist of a Great Lakes islands special conservation area as well as nine other special conservation areas. There are four non-dedicated natural areas: McFadden Point (Beaver Island – 65 acres), French Bay (Beaver Island – 138 acres), High Island wilderness area (3584 acres) and Hog Island wilderness area (2264 acres). There are also four potential Type 2 old growth areas: Lime Kiln Island (136 acres of boreal forest), Point La Par (242 acres of dry-mesic northern forest), Bois Blanc Island (231 acres of mesic northern forest) and Central Cedar Swamp (21 acres of rich conifer swamp). The Beaver Island Archipelago and all other islands in this management area (with the exception of Bois Blanc Island) are a state wildlife research area and a special conservation area (Figure 4.1.2).

Also shown in Figure 4.1.2, there are three high conservation value areas on Bois Blanc Island. These high conservation value areas are the Bois Blanc Island Mixed Forest (993 acres), Snake Island/Mud Lake (272 acres) and Northshore (833 acres). There are also five critical dunes that are also high conservation value areas. They are on Beaver Island (parabolic dune), High Island (transverse dune), Garden Island (dune-swale complex and transverse dune), Hog Island (dune-swale complex and transverse dune) and at Point Catosh on Bois Blanc Island (dune-swale complex)(Figure 4.1.2).

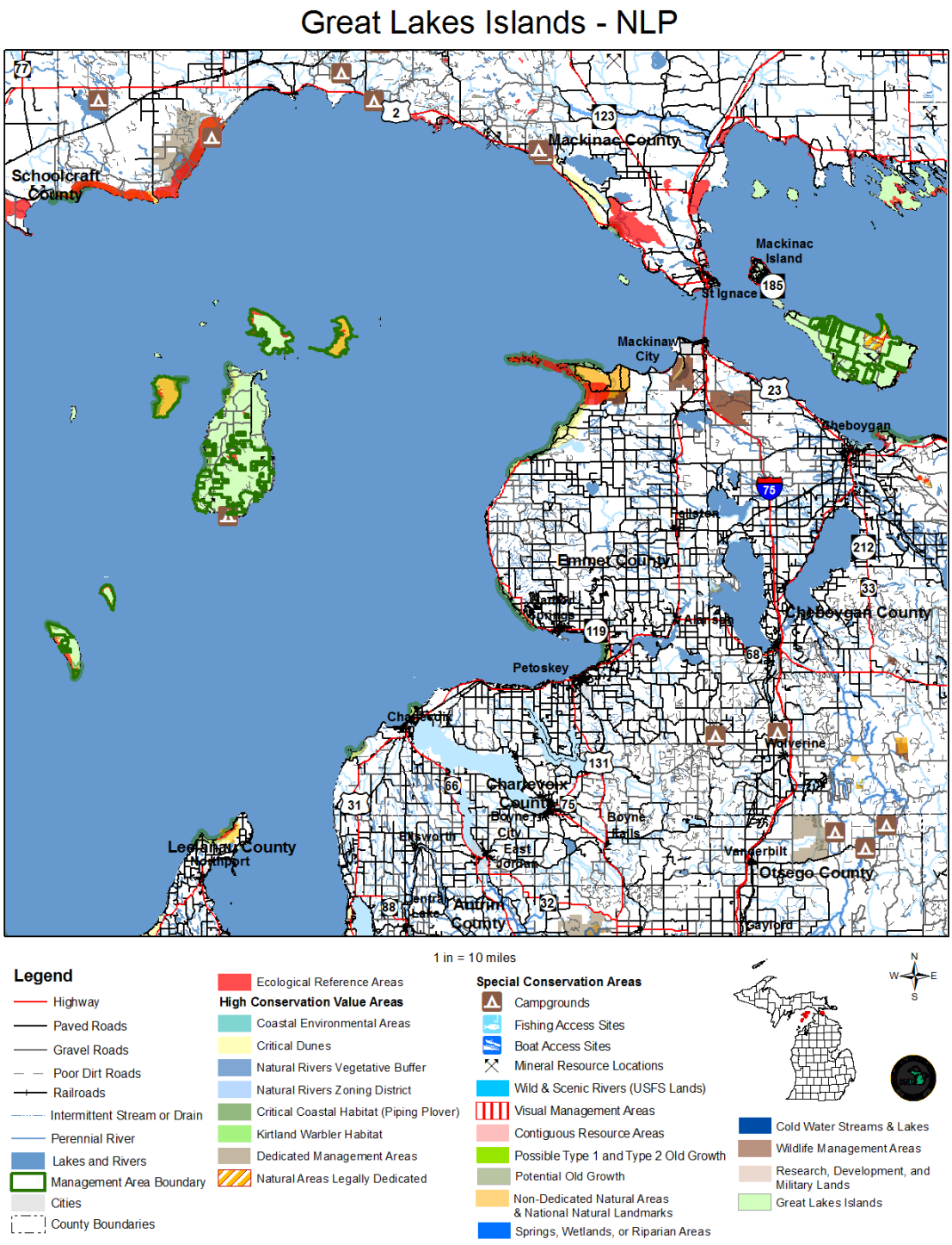

Figure 4.1.2. A map of the Great Lakes Islands management area showing the special resource areas.

There are also four ecological reference areas (Figure 4.1.2) that are partially or mostly on state land. The ecological reference areas represent the following natural communities: poor fen (10.02 acres), limestone cobble beach (6.91 acres), boreal forest (350.35 acres) and bog (148.24 acres). These ecological reference areas will be managed to enhance and protect their natural vegetative and associated wildlife communities as directed by an ecological reference areas-specific management plan. These individual management plans will be developed over the life of this planning period.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

4.1.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include exotic and invasive species, primarily reed grass (*Phragmites)* that floats in from the mainland, as well as incidental transmission by human activities of other species such as spotted knapweed, garlic mustard and purple loosestrife.

Beech bark disease is prevalent throughout the northern hardwood cover type on Beaver Island.

To minimize biological, social and economic impacts due to forest health pests:

- Continue to carry out surveillance activities for exotic plants and animals;
- Develop an action plan for controlling or eliminating invasives; and
- If feasible, follow the Beech Bark Disease Guidelines.

4.1.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. There are no designated high priority trout streams in this management area.

4.1.6 Fire Management

Swamp types, which are a major component of this management area, are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types.

4.1.7 Public Access and Recreation

Access is limited to plane or boat due to the remote character of these islands. Where access is limited on state forest land, the DNR will continue to seek access across adjacent private property.

Due to the remote and isolated nature of the parcels on the Great Lake Islands there are few facilities or trails on the islands. However, there are opportunities for dispersed recreation throughout the state forest lands.

4.1.8 Oil, Gas and Mineral Development

Future management of oil, gas and mineral resources on the Great Lakes Islands will depend on logistics, economics and environmental considerations. The funding source for each island and the associated management emphasis may also impact the potential development of oil, gas and minerals.

4.2 MA 2 – Mackinaw Lake Plain Management Area

Summary of Use and Management

Management in the Mackinaw Lake Plain management area (MA) will emphasize balancing age classes of aspen and lowland poplar, and regenerating the aging cedar resource. Management will strive to sustainably produce various timber products, enhance game and non-game wildlife habitat, such as Dingman Marsh, French Lake and O'Neal Lake managed floodings, protect areas of unique character and provide for forest-based recreational uses. Management activities may be constrained by poor access in this swampy (62% lowland) area. Expected trends within this 10-year planning period are increased recreational pressure, especially near Wilderness State Park and Historic Mill Creek Discovery Park, introduced pests and diseases and the challenge of regenerating lowland cover types which provide habitat for snowshoe hare, woodcock, white-tailed deer and black bear.

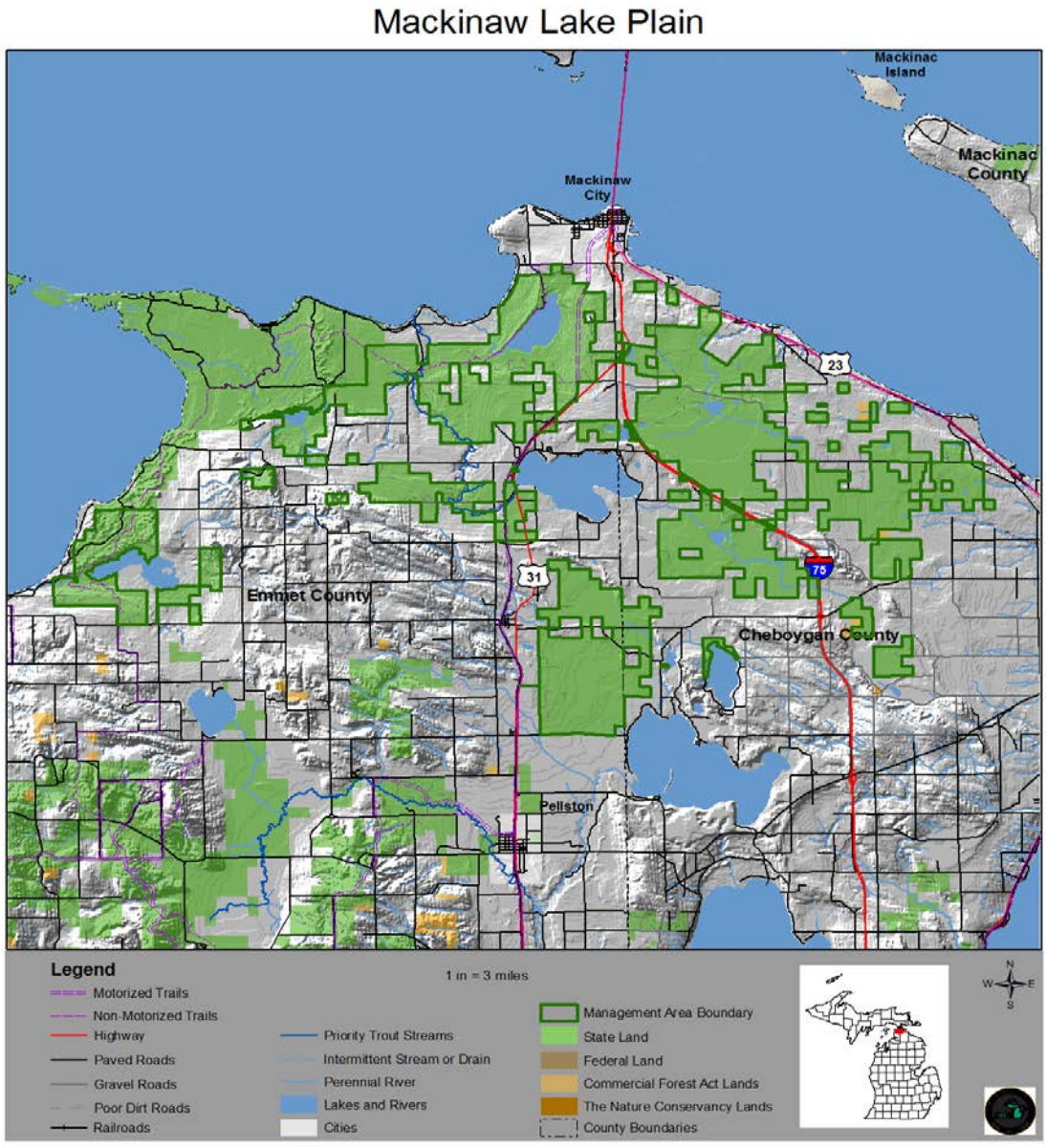

Figure 4.2.1. A map of the Mackinaw Lake Plain management area (dark green boundary) in relation to surrounding state forest and other lands in Emmet and Cheboygan counties, Michigan.

Introduction

The Mackinaw Lake Plain management area is located in the extreme north end of the northern Lower Peninsula in Emmet and Cheboygan counties and contains 38,033 acres of state forest (Figure 4.2.1). The primary attributes which identify the Mackinaw Lake Plains management area include:

- The management area falls entirely within Albert's Cheboygan sub-region.
- The historic and current predominant aspen, cedar, swamp hardwoods and poplar, swamp conifers and natural and planted red pine forest communities.
- The dominant landforms of sandy lake plain over limestone bedrock.
- Due to the proximity of this management area to the population centers of Cheboygan and Mackinaw City, the forest resources contribute significant social and economic values to the area.
- There are three managed floodings in this management area: Dingman Marsh, French Farm and O'Neal Lake.
- Wilderness State Park, Colonial Fort Michilimackinac and Historic Mill Creek Discovery Park are located adjacent to the management area.
- Snowmobile trails and portions of the North Country Trail, North Central State Trail and North West State Rail Trail cross the area.
- Surveys have located several threatened, endangered or special concern species including rams-head lady slipper, dwarf lake iris, pitcher's thistle, Houghton's goldenrod, common loon, Lake Huron tansy, piping plover, osprey and lake sturgeon. Communities of special concern include Great Lakes marsh and wooded dune and swale complex.
- Much of the topography of this management area is dominated by a series of beaches and swales extending inland several miles. Further inland, the wet areas between beaches become better drained, and in some cases are excessively drained.
- Early logging greatly changed the composition of the upland forests of this management area, particularly those originally dominated by white pine, red pine and hemlock. While most of the wetlands have also been logged, wetland types have remained as they were circa-1800.

Table 4.2.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Mackinaw Lake Plains management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	15%	5,564	382	5,182	1,777		5,564	864	
Lowland Conifers	13%	4,937	3,950	987	110		4,937	110	
Lowland Aspen/Balsam Poplar	12%	4,603	2,302	2302	384		4,603	384	
Cedar	12%	4,426	4,426				4,426		
Lowland Deciduous	7%	2,647	1,853	794	102		2,647	102	
Tamarack	5%	2,038	1,630	408	58		2,038	58	
Red Pine	4%	1,647	227	1420	537	526	1,647	158	933
Northern Hardwood	3%	1,083	26	1057		433	1,083		433
Mixed Upland Deciduous	2%	703	108	595	210	45	703	85	257
Upland Open/Semi-Open Lands	2%	792		792			792		
Lowland Open/Semi-Open Lands	14%	5,336		5336			5,336		
Misc Other (Water, Local, Urban)	4%	1,376		1376			1,376		
Others	8%	2,881	1,795	1086	252	205	2,881	123	280
Total		38,033	16,699	21,334	3,430	1,209	38,033	1,884	1,903

4.2.1 Forest Cover Type Management

The following sections contain information on the management direction in the form of **Current Forest Condition, Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of tree species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.2.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 5,564 or 15% of the management area (Table 4.2.1) (Figure 4.2.2). Aspen is distributed throughout the management area on various habitat classes: PArVVb/AFO (see Appendix E), AFO and unclassified lowland. Forest cover types dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer (featured species in this management area) and various song birds.

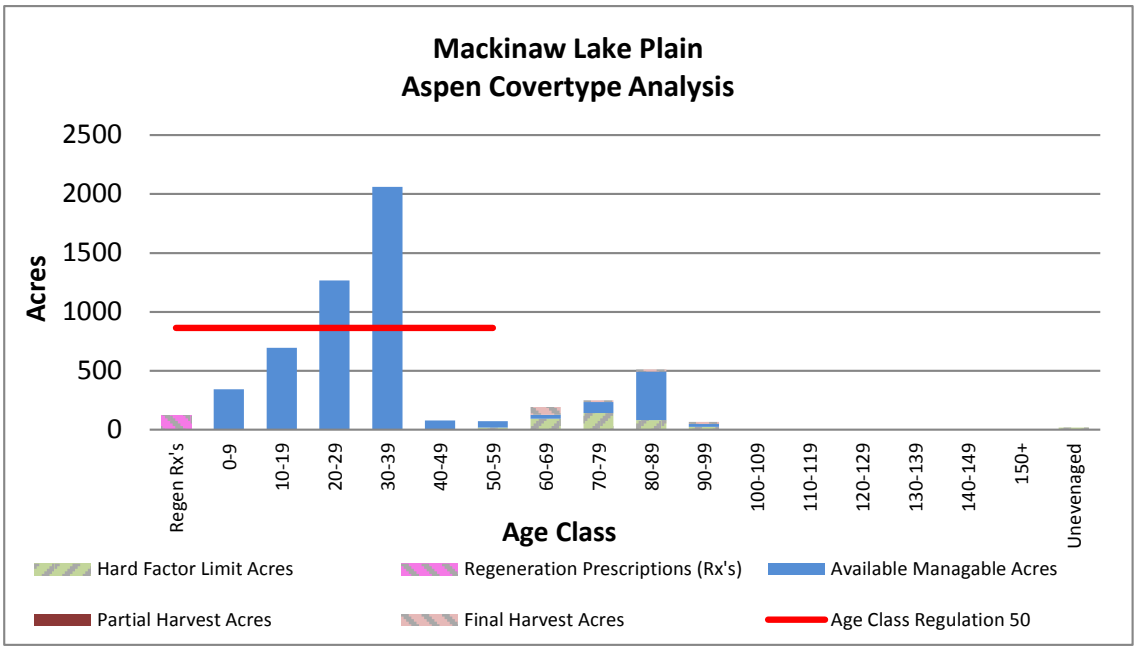

Figure 4.2.2. Age-class distribution for aspen in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

Though aspen occurs throughout the area, including some wet areas, it is primarily concentrated on beach ridges between swale areas and on the sandy lake plain further inland. Accessible aspen has been consistently harvested over the last 40 years with the greatest harvest activity occurring 10-40 years ago. Most of the aspen in this management area is younger than the 60-year rotation. Aspen older than age 70 may be inaccessible. Data show that 382 acres of aspen have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). Currently, 465 acres of stands have a final harvest pending and these acres are included in the regeneration prescription class.

Aspen is generally managed on a 50-year rotation in this management area to produce pulpwood and occasional saw logs. The exceptions to this management are priority areas for ruffed grouse and American woodcock habitat (featured species for this management area) where the emphasis may be placed on shorter rotations to provide more acres in the younger age classes. In some areas, aspen may be of merchantable size at less than 50 years and this may provide an opportunity to harvest stands “early” to restart additional acres which may help to balance the age-class distributions. There is a large spike of acres in the 30-39 year age-class and a lack of aspen acres in the 40+ age classes. This may result in fewer acres being available above the rotation age and considerations should be given to entering stands before the rotation age to expedite balancing the age-class distribution. American woodcock, ruffed grouse, gold-winged warbler, white-tailed deer and beaver, all featured species for this management area, will benefit from continued management of aspen.

Desired Future Condition

- Aspen-dominated forest cover types will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for a sustainable harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 1,777 acres in this 10-year planning period; and
- In stands less than 40 acres being treated before rotation age, consider harvesting only portions of the stand while maintaining an uncut portion to improve juxtaposition of summer and winter habitat for grouse.

Long-Term Management Objectives

- Desired future harvest levels for final harvest are projected at 864 acres per 10-year period. This is a projected decrease over the current 10-year period and will continue the management to balance age-class distributions.

4.2.1.2 Forest Cover Type Management – Cedar and Lowland Conifer

Cedar (Figure 4.2.3) acres total 4,426 or 12% of the management area (Table 4.2.1) and lowland conifers (Figure 4.2.4) acres total 4,937 or 13% of the management area (Table 4.2.1), constituting a significant portion of the management area. However, all 4,426 acres of cedar and 3,950 acres of lowland conifers are factor limited due to access and operability issues. These lowland species may offer only limited opportunities for management.

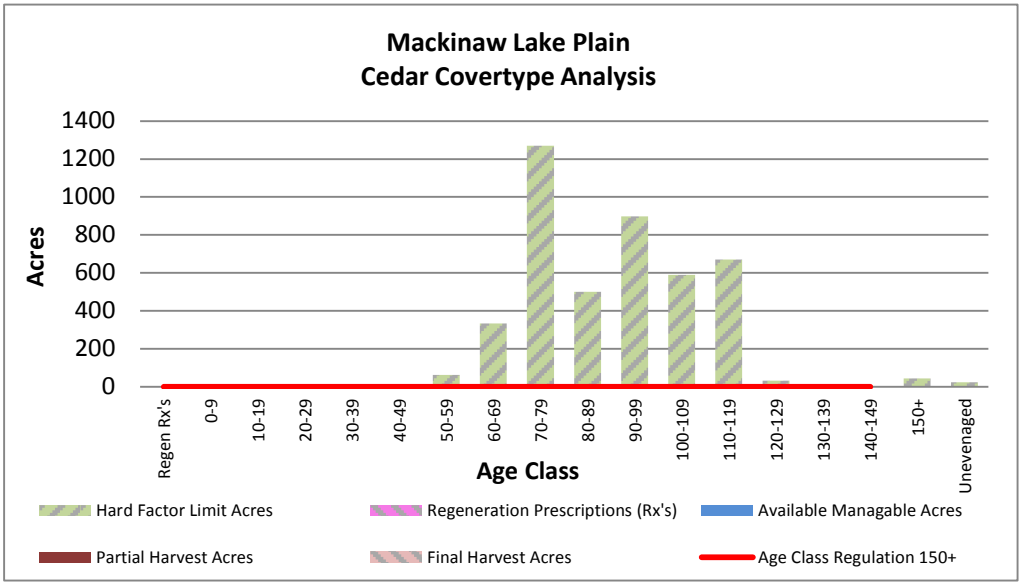

Figure 4.2.3. Age-class distribution for cedar in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

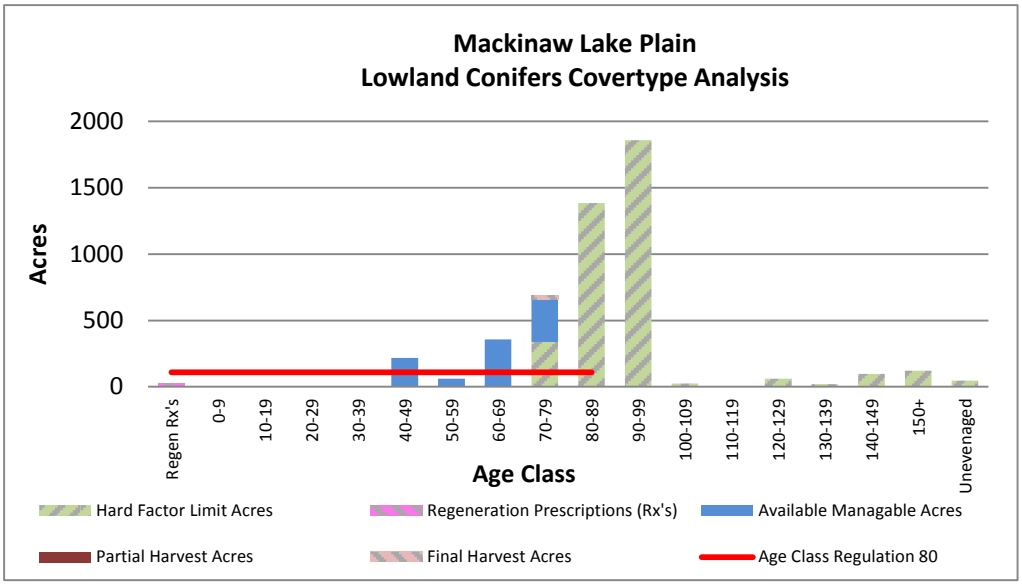

Figure 4.2.4. Age-class distribution for lowland conifers in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape and wildlife habitat while providing forest products.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 110 acres of lowland conifers;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) normal years-of-entry; and
- Consider methods to ensure adequate regeneration of cedar and lowland conifer.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- The desired future harvest level of 110 acres for final harvest of lowland conifer is projected per 10-year period.

4.2.1.3 Forest Cover Type Management – Lowland Aspen/Balsam Poplar

Current Condition

Lowland aspen/balsam poplar acres (Figure 4.2.5) (primarily a mix of balsam poplar, swamp aspen and swamp white birch) total 4,603 acres or 12% of the management area (Table 4.2.1).

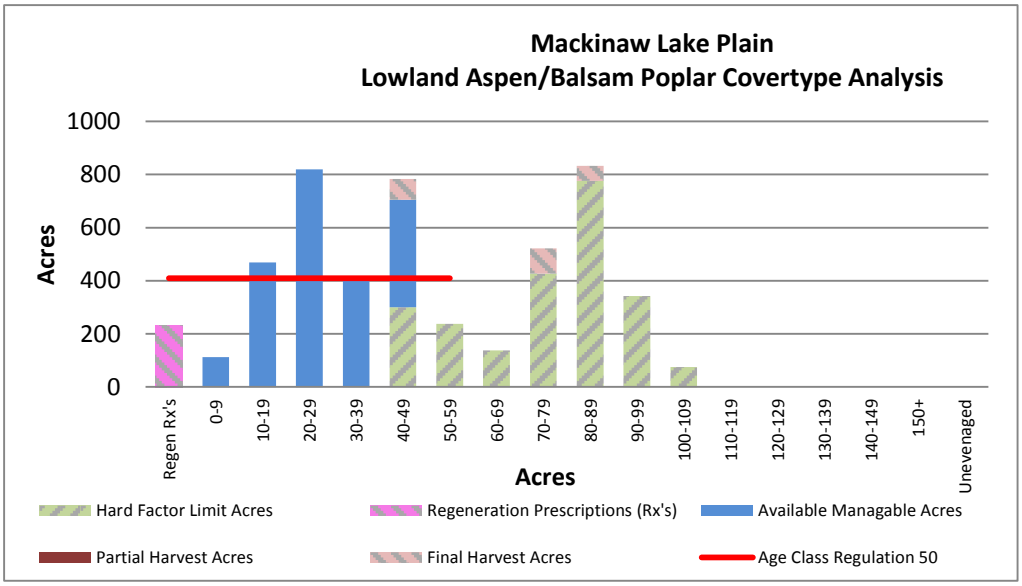

Figure 4.2.5. Age-class distribution for lowland aspen/balsam poplar in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

Lowland aspen/balsam poplar is distributed throughout the management area on areas with a perched water table or seasonally flooded and unclassified lowlands (habitat class: PArVCo). Forest cover types dominated primarily by lowland aspen/balsam poplar in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds as well as commercially for pulp. There are 2,302 acres of lowland poplar that have met harvest criteria, but have site conditions that limit harvest. Currently, 231 acres of stands have a final harvest pending and these acres are included in the regeneration prescriptions (RXs) class.

Management may be severely constrained by access issues due to the wet nature of the management area and/or stands that may be too wet for operations. However, young-dense stands of lowland aspen/balsam poplar are an important habitat for species such as ruffed grouse and snowshoe hare.

Desired Future Condition

- Lowland aspen/balsam poplar-dominated forest cover types will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for a sustainable harvest, wildlife habitat and to contribute to the conservation of regional biodiversity.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 384 acres of lowland aspen/balsam poplar that is age 50 and greater, if it can be done in a manner that will not adversely impact wetland soils; and
- If necessary and feasible, consider habitat cuts in inaccessible or inoperable sites to improve early successional habitat.

Long-Term Management Objectives

- It is acceptable that the older factor-limited lowland poplar, much of it inaccessible for management, will continue to experience natural processes (windthrow, flooding and senescence) resulting in other species encroaching into the understory;
- Consider adaptations to management as a result of emerald ash borer impacts on black ash;
- Continue management on operable sites to provide forest products, wildlife habitat and biodiversity values; and
- Desired future harvest levels for final harvest are projected at 384 acres per 10-year period. This is a decrease in the projections for the current 10-year period and will continue management to balance the age-class distribution.

4.2.1.4 Lowland Deciduous

Current Condition

Lowland deciduous forests are characterized by areas that show evidence of flooding in the past five years or support lowland indicator plants. The lowland type is typically a mixture of ash, red maple, birch, lowland aspen/balsam poplar, oak and other minor species. Lowland deciduous acres total 2,647 acres or 7% of the management area (Table 4.2.1). A large portion of the lowland deciduous cover type is in predominantly older age classes above 70 years (Figure 4.2.6). There has also been very little regeneration in the last 20 years.

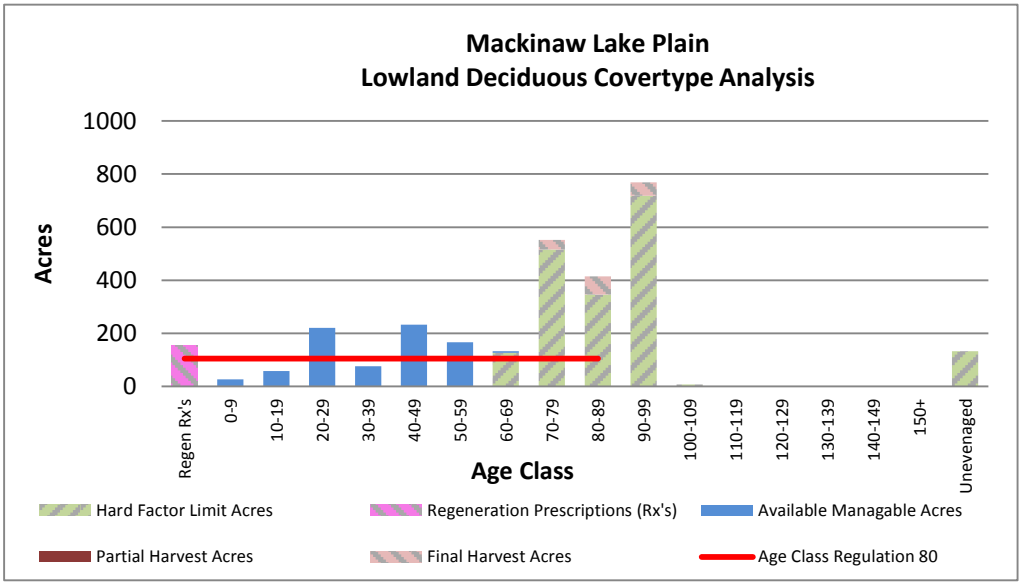

Figure 4.2.6. Age-class distribution for lowland deciduous in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

There are 1,853 acres that have a site condition that precludes harvest, most frequently due to a lack of accessibility in wet areas. Currently, 155 acres of stands have a final harvest pending and these acres are included in the regeneration prescriptions (Rx's) class. The ash component has been heavily impacted by the emerald ash borer.

Desired Future Condition

- Lowland deciduous types will be sustainably managed with acres balanced between 0 and 89 years for a continuous supply of forest products and as a source of mast and habitat for wildlife.

10-Year Management Objectives

- Seek opportunities to harvest where it can be done in a manner that will not adversely impact wetland soils;
- Conduct regeneration harvests on a projected 102 acres to begin the process of producing multiple age classes;
- Follow the Emerald Ash Borer Guidelines for managing ash in lowland deciduous stands; and
- Consider opportunities to conduct non-commercial harvests to manage for habitat and a balanced age-class distribution.

Long-Term Management Objectives

- Where feasible, continue to seek opportunities to conduct regeneration harvests;
- It is acceptable that due to the emerald ash borer the amount of ash in lowland deciduous forests will decrease significantly and will be replaced by other lowland species; and
- Desired future harvest levels for final harvest are projected at 102 acres per 10-year period.

4.2.1.5 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 1,647 acres or 4% of the management area (Table 4.2.1). Red pine timber is a high-value forest commodity which drives continued management of the red pine resource. The red pine in this management area has a skewed age-class structure (Figure 4.2.7) that reflects planting 50-70 years ago. Most of the red pine stands are well stocked. Red pine is scattered throughout the management area primarily on habitat classes AFO, PArVVb/AFO. Data show that 227 acres of red pine have met harvest criteria, but have site conditions that may limit the ability to harvest. Data show that 516 acres have a partial harvest pending in the 50-59 year-old age class.

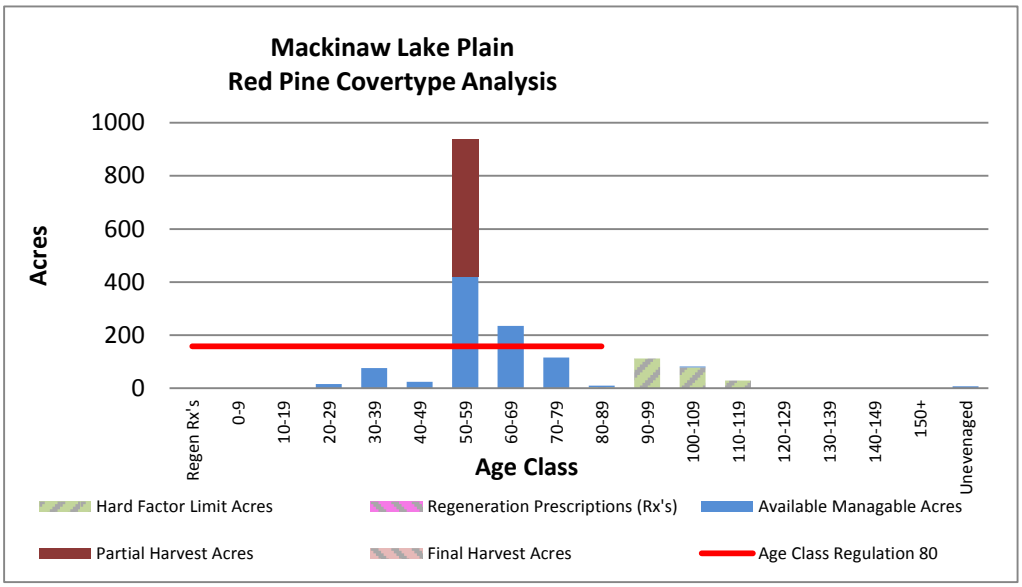

Figure 4.2.7. Age-class distribution for red pine in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

Due to the active era of red pine planting during the 1940s and 1950s there are spikes of acres above the rotation regulation in the 50-59 and 60-69 year age classes. These acres are being thinned to increase growth on the remaining trees to achieve a more valuable product. There is a pronounced lack of red pine acres in the 0-49 year age classes which will severely affect future supplies of red pine for harvest.

Desired Future Condition

- Red pine on dry-mesic sites will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity, with acres balanced between 0 and 89 years of age to provide for a sustainable harvest, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distribution;
- Conduct partial harvests on a projected 526 acres on the younger age classes to improve quality and size class; and
- Conduct final harvests on a projected 537 acres in the older age classes to help balance the age-class distribution.

Long-Term Management Objectives

- Continue work towards balancing the age-class distribution between the ages of 0 and 89 years through final harvests and replanting;
- Seek opportunities to move red pine to suitable sites which may include managing red pine in mixed stands with oak or other species;

- Due to the lack of red pine acres in the 0-49 year-old age class, long-term planning will need to consider whether to immediately begin to final harvest the older age-classes or to harvest some of the older red pine later to continue the supply of red pine; and
- Projected harvests in this 10-year planning period are 158 acres for final harvests and 933 acres for partial harvests. This is a decrease in final harvest acres and an increase in partial harvest acres over the current period. This reflects a continued management for balanced age class distribution and management to improve the value of stands currently in the older age classes.

4.2.1.6 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: tamarack, 2,038 acres (5%), northern hardwood, 1,083 acres (3%), mixed upland deciduous, 703 acres (2%) and lowland mixed forest, 694 acres (2%) (see Table 4.1). Also included, but not shown in Table 4.2.1 are even smaller acreages of other cover types including oak, 461 acres (1%), natural mixed pines, 448 acres (1%), lowland spruce/fir, 370 acres (1%), paper birch, 247 acres (1%), upland mixed forest (1%) and other scattered acres of jack pine, white pine, upland spruce/fir, hemlock, planted mixed pines and upland conifers. All of these timbered and non-timbered cover types have important ecological values and are important habitat for numerous species. Some of these types are managed through partial or final harvests to provide forest products.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape while providing forest products and habitat for wildlife.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct final harvests on a projected 58 acres of tamarack, 210 acres of mixed upland deciduous, 15 acres of lowland mixed forest, 24 acres of oak, 92 acres of natural mixed pines, 50 acres of paper birch, 27 acres of upland mixed forest and 44 acres of white pine; and
- Conduct partial harvests on a projected 433 acres of northern hardwood, 45 acres of mixed upland deciduous, 145 acres of natural mixed pines, 28 acres of upland mixed forest and 70 acres of white pine.

Long-Term Management Objectives

- Continue management to regenerate lowland types; and
- Continue management of upland types to provide a sustainable yield of forest products and wildlife habitat.

4.2.1.7 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open lands acres total 5,336 or 14% of the management area (Table 4.2.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-openlands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.2.1.8 Forest Cover Type Management – Upland Open/Semi-Openlands

Current Condition

Upland open/semi-open acres total 792 or 2% of the management area (Table 4.2.1). This category is a combination of the following non-forested land cover types: herbaceous openland, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife including wild turkey (a featured species in this management area).

Desired Future Condition

- Maintain upland open/semi-openlands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Where feasible and necessary, conduct management to maintain upland open/semi-open lands; and
- Conduct management activities that favor mast-producing shrubs (such as blueberry, juneberry, cherry and hawthorn) for black bear, turkey and ruffed grouse.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-openlands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.2.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management are during this cycle of state forest planning:

- American woodcock
- Beaver
- Black bear
- Golden-winged warbler
- Mallard (Dingman Marsh Flooding, French Farm Flooding, and O'Neal Flooding state wildlife management areas)
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer
- Wood duck (Dingman Marsh Flooding, French Farm Flooding and O'Neal Flooding state wildlife management areas)

The primary focus of wildlife habitat management in the Mackinaw Lake Plain management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are maintenance of young forest, extensive mature forest, large open grassland complexes and marsh/grassland complexes, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast, understory shrub and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams (See appendix F for list of trout streams).

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less than 15% and other inland bodies of water.
  - Implementation of the Dingman Marsh and French Farm Flooding master plans and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of best management practices riparian guidance will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within the management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting and brood rearing. Mallard pair-bonding wetlands are typically 0.25 to 20 acres in size and brood rearing wetlands are typically 1.2 to 30 acres in size. Optimal hemi-marsh sites are >2.5 acres with open water portions having extensive portions less than three feet deep and 4:1 area of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within about 200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plans for Dingman Marsh, French Farm Flooding, and O'Neal Lake state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees >12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast-height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than five acres in size with a savannah-like dispersion of large trees (<50% canopy cover) with open understory and include tall trees or snags larger than12 inches in diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags >12-inches in diameter at breast height.
    - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age-classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two 1-to-3-acre un-harvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
    - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
    - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
    - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
    - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland openland will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland openland will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annually manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland openland and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood duck are most limited by available nesting and brood rearing habitat. Wood duck nest in tree cavities near rivers, streams, swamps, beaver ponds and marshes. Nests require mature hardwood trees with 10 inches or larger in diameter at breast height. Brood-rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority state wildlife management areas with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plans for Dingman Marsh, French Farm Flooding, and O'Neil Lake state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification.
- Maintain stable water levels at managed floodings from April through August.

4.2.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations, following the guidance in "*DNR's Approach to the Protection of Rare Species on State Forest Lands*" (IC4172). This is especially important when listed species are present, past surveys have indicated a possibility of their presence, or when appropriate habitat is available and the species is known to occur in the general region.

Past surveys have noted and confirmed five listed species as well as two natural communities of note occurring in the management area as listed in Table 4.2.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

Table 4.2.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Mackinaw Lake Plains management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Hardwood-conifer swamp		S3/G4	Confirmed				Lowland open/semi-open	N/A
Wooded dune and swale complex		S3/G3	Confirmed				Upland open/semi-open	N/A
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Black tern	*Chlidonias niger*	SC/G4/S3	Confirmed	MV	Very High	Great Lakes marsh	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Emergent Marsh	Lowland open/semi-open	N/A
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Butterfly								
Grizzled skipper	*Pyrgus Wyandot*	SC/G1G2Q/S1S2	Confirmed	?	?	Oak-pine barrens	Oak	Mid
						Alvar	Upland open/semi-open	N/A
						Pine barrens	Jack Pine	Early

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

As shown in Figure 4.2.8, there are three state wildlife management areas that are in or adjacent to this management area and they are special conservation areas. The three state wildlife management areas (managed floodings) are Dingman Marsh, French Lake and O'Neal Lake.

Although there is one ecological reference areas for the wooded dune and swale complex natural community type (10.8 acres) within the management area there are two high conservation value areas represented by critical coastal habitat for piping plover and critical dunes as shown in Figure 4.2.8.

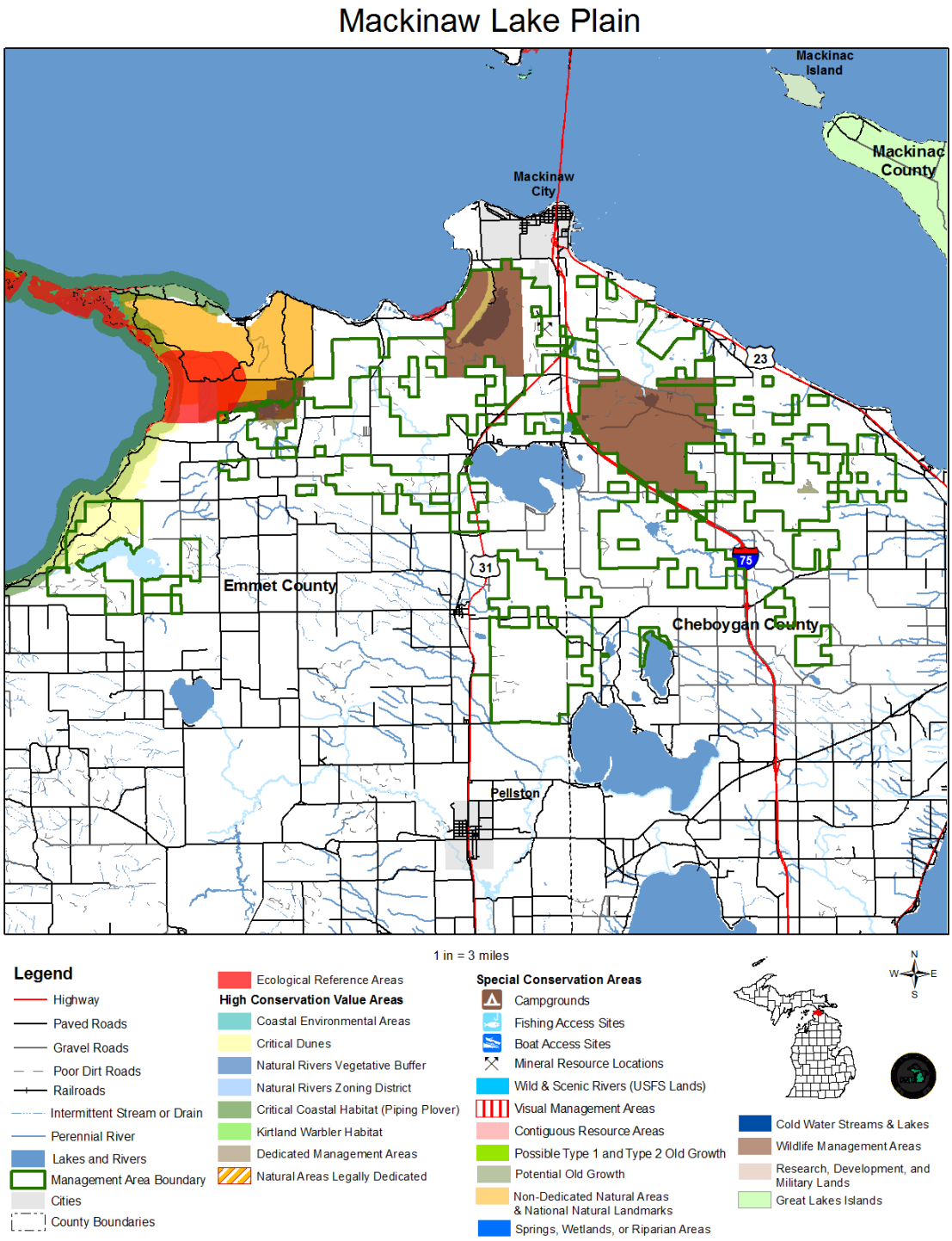

Figure 4.2.8. A map of the Mackinaw Lake Plains management area showing the special resource areas.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

4.2.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include oak decline and management should be adapted as follows:

Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.2.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.2.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Mackinaw Lake Plain - FMD MAs	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	3	28	31	8

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
Reed Canary Grass *Phalaris arundinacea*	1	Glossy Buckthorn *Rhamnus frangula*	4
Spotted Knapweed *Centaurea stoebe*	1	Japanese Knotweed *Fallopia japonica*	2
Wild Parsnip *Pastinaca sativa*	1	Phragmites (Common Reed) *Phragmites australis*	18
-	-	Purple Loosestrife *Lythrum salicaria*	2
-	-	Reed Canary Grass *Phalaris arundinacea*	1
-	-	Tatarian Honeysuckle *Lonicera tatarica*	1

4.2.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.2.1 and listed in Appendix F.

4.2.6 – Fire Management

Swamp types which are a major component of this management area are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife

game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- When feasible, seek opportunities to use fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition.
- When feasible, seek opportunities to incorporate fire as a tool to restore or maintain managed openings.
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.2.7 Public Access and Recreation

Access for management and/or recreation is generally limited throughout much of this management area due to wet sites and limited access from adjacent landowners. In accordance with the DNR's Sustainable Soil and Water Quality Practices on Forest Land, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

The North Country Trail and an off-road vehicle trail cross the management area as shown in Figure 4.2.1 and recreation in the form of hunting and other types of dispersed recreation are popular throughout the management area. Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division through the compartment review process. Public input received through meetings, including the Compartment Review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as retaining trees along single-track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetation management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42, and the Department of Natural Resources Within Stand Retention Guidance.

4.2.8 Oil, Gas and Mineral Development

Surface sediments consist of lacustrine (lake) sand and gravel, dune sand, coarse-textured till and peat and muck. The glacial drift thickness varies between zero and 600 feet. Gravel pits are located in this management area and there is good gravel potential for additional pits on the uplands.

The Devonian Detroit River Group and Bois Blanc Formation subcrop below the glacial drift. The bedrock formations have some limestone/dolomite potential.

The nearest oil and gas production, the Antrim Shale gas play, is located over 20 miles to the south. The Collingwood Formation may have oil and gas potential in this area and the southern portion of this management area is currently leased for development. If production is established, leasing and drilling could expand in the management area.

Metallic mineral production is not supported by the geology given the depth to known metallic-bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as

amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.3 MA 3 – Hammond Bay Lake Plain Management Area

Summary of Use and Management

Management in the Hammond Bay Lake Plain management area (MA) will emphasize balanced age classes of aspen, red pine, oak and lowland poplar. Management will strive to produce sustainable forest products, enhance game and non-game wildlife habitat, protect areas of unique character and provide for forest-based recreational uses in areas such as the Black Mountain Forest Recreation Area. Management activities may be constrained by poor access in this swampy (35% lowland) area. Expected trends within this 10-year planning period are increased recreational pressure, especially near the recreation area and Cheboygan, Hoeft and Onaway state parks; introduced pests and diseases; and the difficulty in regenerating swamp types. The proximity of uplands interspersed with considerable area of swamp types in this management area is conducive to featuring hare, woodcock, grouse, white-tailed deer and bear.

Introduction

The Hammond Bay Lake Plain management area is located near the northern shore of Lake Huron in the northeast Lower Peninsula in Cheboygan and Presque Isle counties and contains 40,016 acres of state forest (Figure 4.1). The primary attributes which identify the Hammond Bay Lake Plains management area include:

- The management area falls within Albert's Onaway and Cheboygan sub-regions (Albert, 1995).
- The historic cover types of hemlock, northern hardwoods, mixed pines and wetlands.
- The current predominant cover types include aspen, red pine, lowland poplar, oak and swamp types.
- The dominant landforms of sandy lake plain over limestone bedrock near the surface.
- Due to the proximity of this management area to the population centers of Cheboygan and Rogers City, the forest resources contribute social and economic values to the area.
- There are two proposed natural areas in this management area:
    - Duck Lake – Mud Lake (253 acres), features dry-mesic northern forest, bog and northern coast plain marsh communities.
    - Lake Sixteen (133 acres), features Lake Sixteen and northern coast plain marsh communities.
- Department of Natural Resources recreation facilities in this management area include Cheboygan, Hoeft and Onaway state parks, Black Mountain Recreation Area and numerous state forest campgrounds and boat launches. Snowmobile, off-road vehicle and hiking trails cross the area.
- Surveys have located the several threatened, endangered or special concern species including red shouldered hawk, eastern massasauga rattlesnake, Blanding's turtle, wood turtle, bayonet rush, Hill's thistle and Hill's pondweed.
- Communities of special concern include intermittent wetland, inter-dune wetland, wooded dune and swale complex and open dunes.

Much of the topography of this management area is dominated by rolling ground-moraines where glaciers sculpted drumlin fields separated by poorly drained outwash. Beach and swale complexes are well developed near the shoreline portions of the management area.

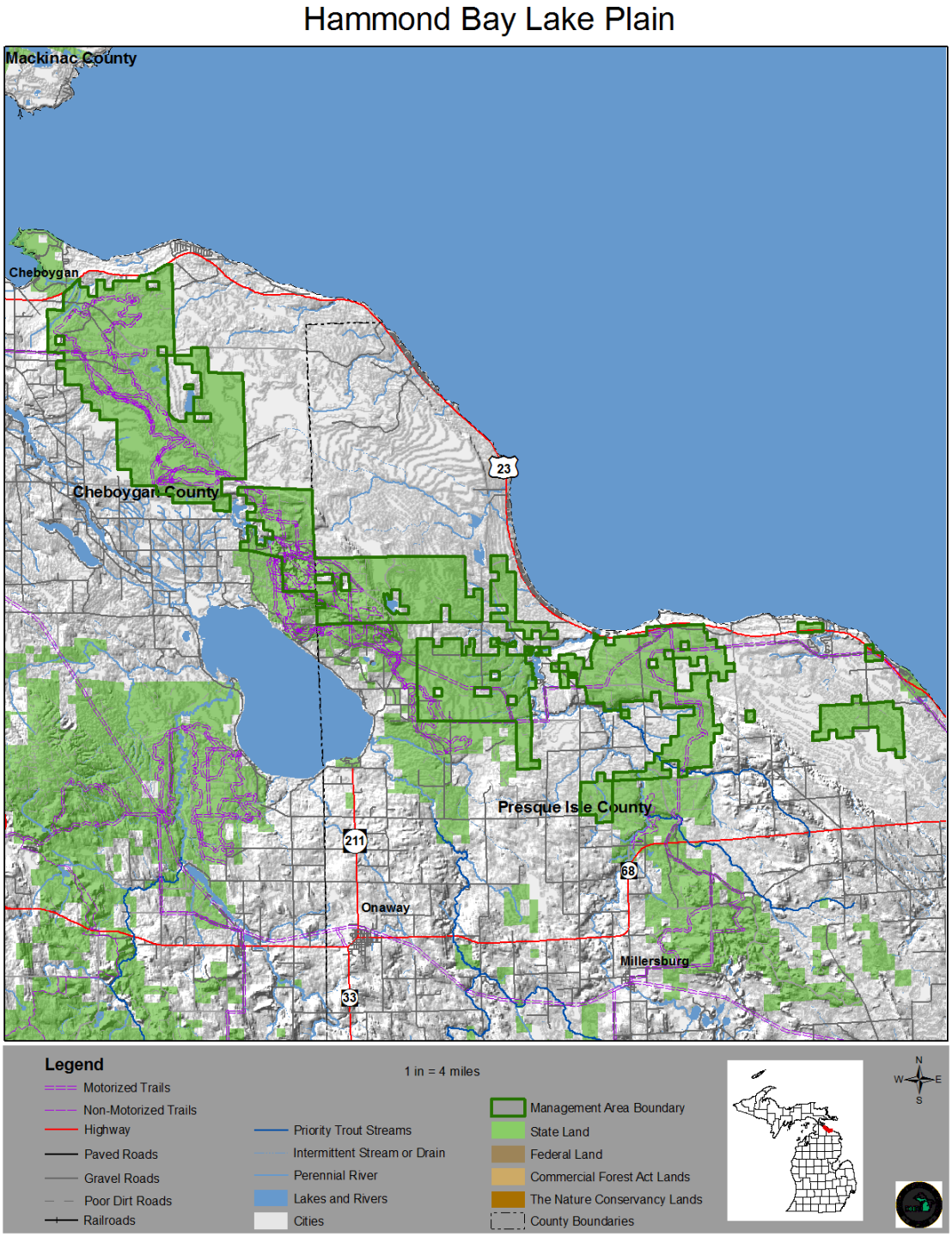

Figure 4.3.1. A map of the Hammond Bay Lake Plain Management Area (dark green boundary) in relation to surrounding state forest and other lands in Cheboygan and Presque Isle counties, Michigan.

Table 4.3.1. Current cover types, acreages, projected harvests and projected acreages at the end of the ten-year planning period for the Hammond Bay Lake Plain management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	22%	8,998	784	8,214	1,846		8,998	1,369	
Red Pine	18%	7,236	707	6529	2,321	2,916	7,236	725	3,684
Lowland Aspen/Balsam Poplar	13%	5,135	2,568	2568	448		5,135	448	
Lowland Conifers	8%	3,074	2,459	615	69		3,074	69	
Oak	5%	2,043	689	1354		320	2,043	150	320
Cedar	4%	1,745	1,745				1,745	2	
Northern Hardwood	4%	1,410	120	1290		418	1,410		568
Lowland Deciduous	3%	1,379	950	429	53		1,379	53	
Jack Pine	3%	1,224	88	1136	0		1,224	162	
Upland Open/Semi-Open Lands	1%	581		581			581		
Lowland Open/Semi-Open Lands	7%	2,892		2892			2,892		
Misc Other (Water, Local, Urban)	1%	246		246			246		
Others	10%	4,053	846	3207	381	700	4,053	355	912
Total		40,016	10,957	29,059	5,117	4,354	40,016	3,333	5,484

4.3.1 Forest Cover Type Management Direction

The following sections contain information on the management direction in the form of **Current Forest Condition, Desired Future Conditions, 10-year Management Objectives, and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of tree species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.3.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen (Figure 4.3.2) acres total 8,998 or 22% of the management area (Table 4.3.1). Aspen is distributed throughout the management area including some wet areas, beach ridges along Lake Huron and glacial outwash plains, sandy beach ridges and coarse textured moraines (habitat classes: PArVVb and PArVHa (see Appendix E)). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation.

Most of the aspen in this management area is younger than the 60-year rotation as accessible aspen has been consistently harvested over the last 40 years. The data show that 784 acres of aspen have met harvest criteria, but are hard-factor limited for a site condition that limits the ability to harvest (hard factor limited acres). The data shows that 612 acres that have a regeneration harvest pending and these acres are included in the regeneration prescription class.

The aspen age class distribution is fairly well balanced and a regulated distribution will be achieved without adjustments to the regulated level of 1,369 acres for each 10-year planning period.

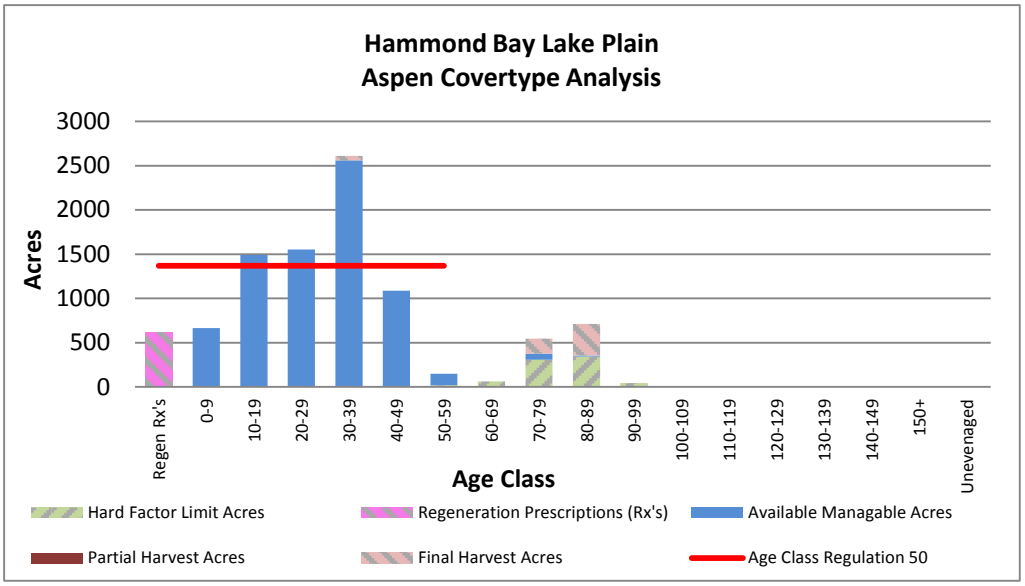

Figure 4.3.2. Age-class distribution for aspen in the Hammond Bay Lake Plain management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0-59 years of age to provide for regulated and sustainable harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 1,846 acres concentrating on the older age classes where site conditions allow;
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions; and
- Non-commercial harvests to manage habitat may be needed where access is limited.

Long-Term Management Objectives

- Desired future harvest levels for final harvest are projected at 1,369 acres per 10-year period to balance the aspen age-class distribution. This is a decrease over the current 10-year period and reflects a continuation of management to balance the age-class distribution.

4.3.1.2 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 7,236 or 18% of the management area (Table 4.3.1). Red pine is distributed throughout the management area including habitat classes PArVVb, PArVVb/AFO, PArVHa and PArVCo. When the red pine stands in this management area were planted, a significant amount of jack pine regenerated from seed. These volunteers were often removed during the first thinning, leaving in many cases, red pine stands with less than full stocking.

Forest communities dominated primarily by red pine in this management area are valued commercially for pulp, utility poles and saw timber. There are 707 acres of red pine that have met harvest criteria, but have site conditions that limit harvest (Figure 4.3.3).

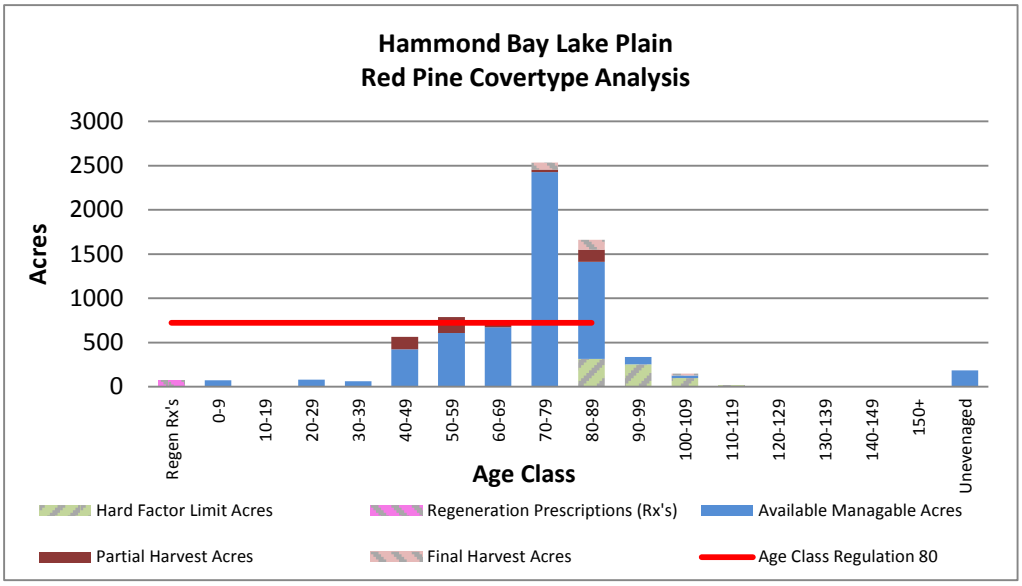

Figure 4.3.3. Age-class distribution for red pine in the Hammond Bay Lake Plain management area (2012 Department of Natural Resources inventory data).

There are 492 acres with a partial harvest prescribed method of cut. These acres remain in the same age class as before the harvest. There are also 70 acres with a final harvest currently prescribed and these acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine on dry-mesic sites will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0 and 89 years of age to provide for continual harvest, wildlife habitat and recreational opportunity.
- Due to the active era of red pine planting during the 1920s and 1930s there are spikes of acres above the rotation regulation in the 70-79 and 80-89 year age classes. These acres are being thinned to increase growth on the remaining trees to achieve a more valuable product; and
- There has been almost no regeneration of red pine in the last 40 years and continued efforts, as presented in the Red Pine Management Guidelines, are needed to regenerate the red pine resource.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommend growing red pine on suitable sites and balancing age-class distribution between the ages of 0 and 89;
- Conduct thinning harvests on a projected 2,916 acres, concentrating on stands of better quality red pine that have the potential for a higher product value in larger size classes; and
- Conduct final harvests on a projected 2,321 acres of red pine beginning with the oldest age classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- Over the next several decades, continue thinning red pine that are currently in the 40-69 year age classes;
- Desired future harvests for partial harvests are projected at 3,684 acres per 10-year period. This is an increase in projected acres for partial harvests and reflects continuing management to increase the value of the older age classes;
- For most stands at age 80, conduct stand replacement harvests for either natural or planted regeneration; and
- Desired future harvests for final harvest are projected at 725 acres per 10-year period. This is a decrease over the current projected 10-year projected harvests. This represents a continued management to balance the age-class distribution.

4.3.1.3 Forest Cover Type Management – Cedar and Lowland Conifer

Cedar acres total 1,745 acres or 4% of the management area and lowland conifer acres total 3,074 or 8% of the management area. These acres constitute a significant portion of the management area. However, all 1,745 acres of cedar and 2,459 acres of lowland conifers are factor limited due to access and operability issues. These lowland species may offer only limited opportunities for management.

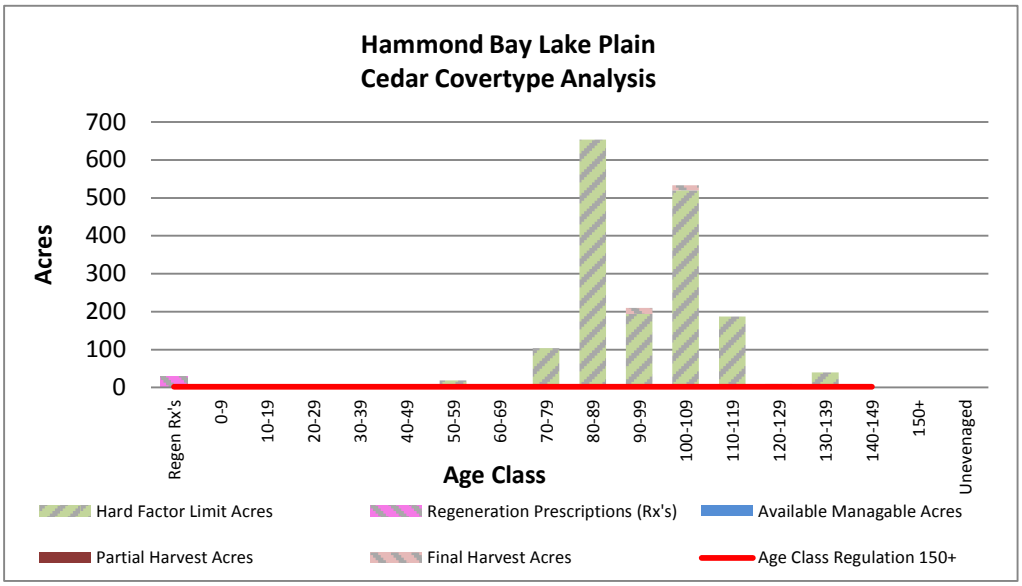

Figure 4.3.4. Age-class distribution for cedar in the Hammond Bay Lake Plain management area (2012 Department of Natural Resources inventory data).

There are 66 acres of final harvests scheduled in lowland conifer and these acres are included in the regeneration prescriptions (Rx's) class (Figure 4.3.5).

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape and wildlife habitat while providing forest products.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 69 acres of lowland conifers where feasible;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years of entry; and
- Consider methods to ensure adequate regeneration or cedar and lowland conifer.

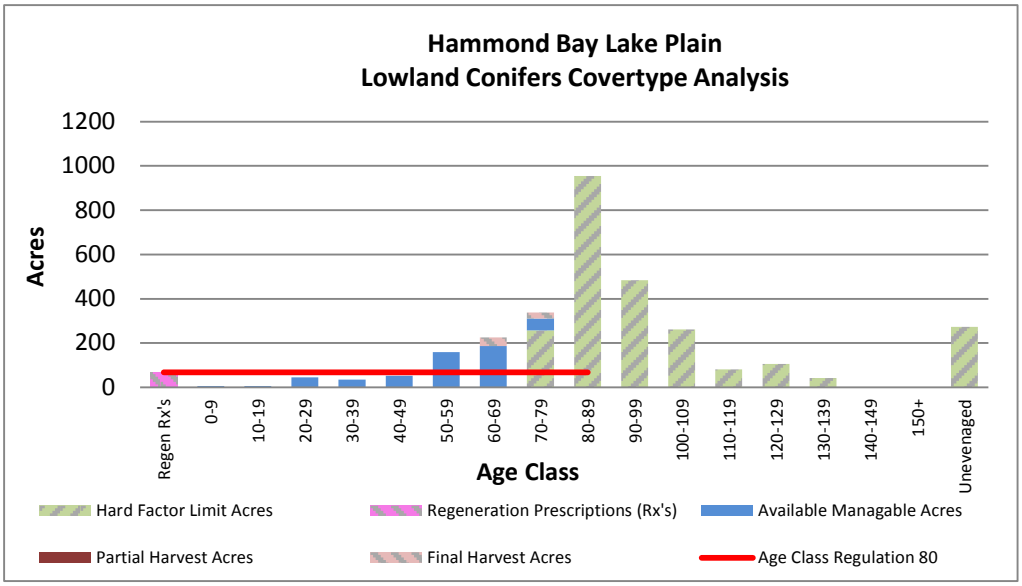

Figure 4.3.5. Age-class distribution for lowland conifers in the Hammond Bay Lake Plain management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- Desired future harvests are projected to remain steady at 69 acres for final harvest of lowland conifer per 10-year period.

4.3.1.4 Forest Cover Type Management – Lowland Aspen/Balsam Poplar

Current Condition

Lowland aspen/balsam poplar (Figure 4.3.6) (primarily balsam poplar, swamp aspen and swamp white birch) acres total 5,135 or 13% of the management area.

Forest communities dominated primarily by lowland poplar in this management area are valued ecologically as sources of habitat for numerous species of wildlife including woodcock, ruffed grouse, bear, white-tailed deer (a featured species in this management area) and various song birds; and commercially for pulp. Lowland poplar is distributed throughout the management area including easement limited sites, outwash plains and till plains (habitat classes: PVCd and unclassified lowlands) and this may limit treatment options. Data show that 2,568 acres of lowland poplar have met harvest criteria, but have site conditions that limit harvest. There are 383 acres with a final harvest prescribed and these acres are included in the regeneration prescription class.

There are spikes of acres above the regulation level of 665 acres in the 20-29 and 0-9 year age classes. Final harvests may need to be adjusted down in this 10-year planning period to offset the surplus in the 0-9 year age class to help balance the age-class distribution. There are few acres available above the 50-year age class regulation target and consideration should be given to harvesting from younger age classes to expedite balancing the age-class distribution.

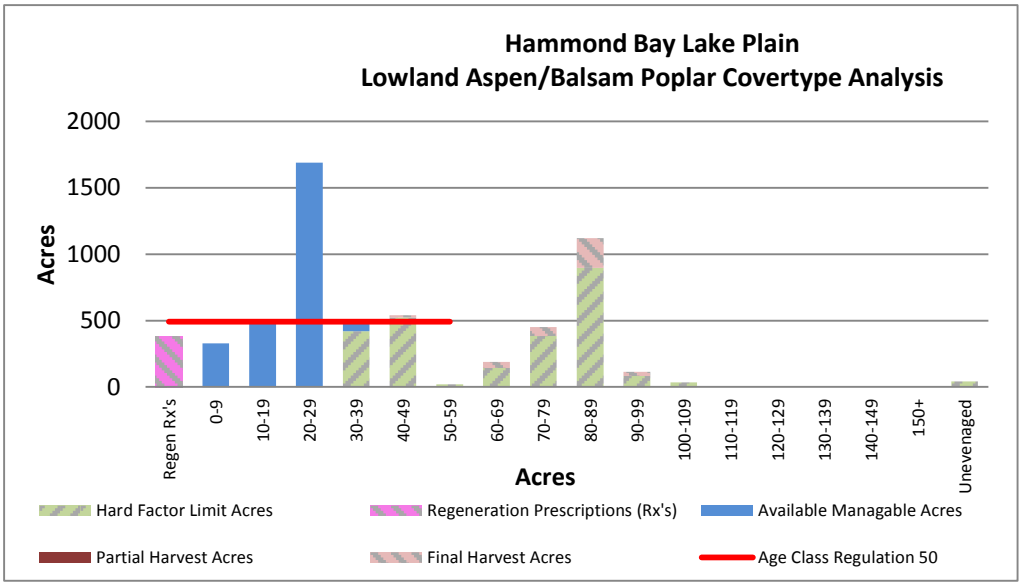

Figure 4.3.6. Age-class distribution for lowland aspen/balsam poplar in the Hammond Bay Lake Plain management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland poplar-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 69 years of age to provide for a regulated and sustainable harvest, wildlife habitat and to contribute to the conservation of regional biodiversity.

10-Year Management Objectives

- Conduct final harvests on a projected 448 acres of lowland aspen/balsam poplar, if it can be done in a manner that will not adversely impact wetland soils; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite balancing of age-class distributions.

Long-Term Management Objectives

- It is acceptable that the older lowland poplar, much of it inaccessible for commercial harvest, will continue to experience natural processes (windthrow, flooding and senescence);
- Consider alternatives to managing ash in lowland areas due to impacts from the emerald ash borer; and
- Desired future harvest levels for final harvest are projected at 448 acres per 10-year period. This reflects a continued management to balance age class distributions.

4.3.1.4 Forest Cover Type Management – Oak

Current Condition

Oak acres total 2,043 acres or 5% of the management area (Table 4.3.1). Oak is sparsely distributed throughout the management area including sandy outwash plains on very dry/very poor nutrient sites (habitat class: PVCd). Moderate to well-stocked forest communities dominated primarily low quality red oak, in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, white-tailed deer (a featured species in this management area), squirrels and various birds and commercially for firewood and industrial lumber. There are 689 acres of oak that have met harvest criteria (Figure 4.3.7) but have site conditions that limit harvest. There are 309 acres that have a final harvest pending and these acres are included in the regeneration prescriptions class.

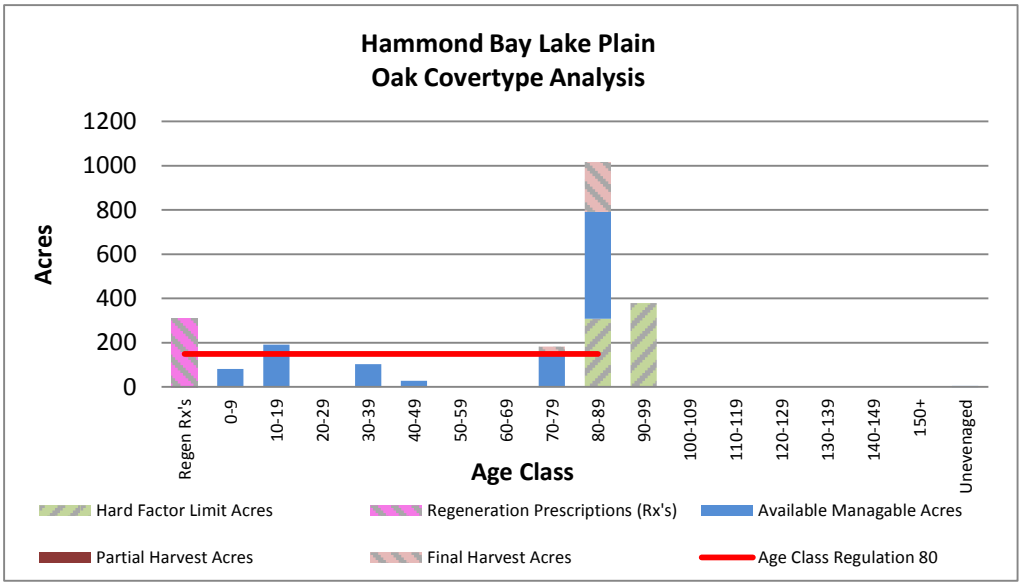

Figure 4.3.7. Age-class distribution for oak in the Hammond Bay Lake Plain management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management between 0 and 89 years of age to provide for timber products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Conduct partial harvests on a projected 320 acres of oak;
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types; and
- Consider final harvests on lower quality oak sites in 80+ year-old stands to expedite the regeneration of oak.

Long-Term Management Objectives

- It is acceptable that some oak stands may become mixed stands through partial removal of an oak overstory, planting pine in oak stands or through natural regeneration of other species;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area;
- Continue work towards maintaining oak as the predominant species in selected stands through final harvests;
- Desired future harvests for final harvest are projected at 150 acres per 10-year period;
- This reflects the need to begin the process of regenerating oak through final harvests and a continuation of management to balance age class distributions;
- Desired future harvests for partial harvest are projected at 320 acres per 10-year period; and
- This reflects continued management to maintain oak on the landscape for wildlife values and timber production.

4.3.1.5 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 581 acres or 1% of the management area (Table 4.3.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural fire, frost or other disturbances which created openings in the forest canopy and intentional opening maintenance through prescribed fire or removal of trees that have encroached in openings. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife including wild turkey, a featured species for this management area.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Where feasible and necessary, conduct management to maintain upland open/semi-open lands; and
- Conduct management activities that favor mast-producing shrubs (such as blueberry, juneberry, cherry and hawthorn) for black bear, turkey and ruffed grouse.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.3.1.6 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 2,892 acres or 7% of the management area (Table 4.3.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to ensure an adequate level of wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.3.1.7 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: northern hardwood, 1,410 acres (4%), lowland deciduous, 1,379 acres (3%), and jack pine, 1,224 acres (3%) (Table 4.1). Also included but not shown in Table 4.1 are even smaller acreages of other cover types including mixed upland deciduous, 813 acres (2%), upland mixed forest, 697 acres (2%), natural mixed pines, 584 acres (1%), white pine, 552 acres (1%), lowland mixed forest, 249 acres (1%) and planted mixed pines, 249 acres (1%). Other scattered acres include paper birch, upland conifers, lowland spruce/fir, tamarack, upland spruce/fir and hemlock. All of these timbered and non-timbered cover types have important ecological values and are important habitat for numerous species. Some of these types are managed through partial or final harvests to provide forest products.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape while providing forest products and habitat for wildlife.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Consider methods to ensure adequate regeneration of lowland types;
- Conduct final harvests on a projected 53 acres of lowland deciduous, 45 acres of mixed upland deciduous and 58 acres of upland mixed forest; and
- Conduct partial harvests on a projected 418 acres of northern hardwood, 148 acres of mixed upland deciduous, 229 acres of natural mixed pines, 104 acres of planted mixed pines and 45 acres of upland conifers.

Long-Term Management Objectives

- Continue management to regenerate lowland types;
- Continue management of upland types to provide a sustainable yield of forest products and wildlife habitat; and
- Consider whether to delay further selection harvesting in northern hardwood due to resultant lower than normal residual basal area in post-salvage harvest stands.

4.3.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management are during this 10-year planning period:

- American woodcock
- Beaver
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- White-tailed deer.

A more detailed overview of featured species is included in Section 3.

The primary focus of wildlife habitat management in the Hammond Bay Lake Plain management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard-mast and mesic conifer components.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones (see Appendix F) or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams (see Appendix F).

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less than 15% and other inland bodies of water.
    - Implementation of the Dingman Marsh and French Farm Flooding master plans and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees >12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
    - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than five acres in size with a savannah-like dispersion of large trees (<50% canopy cover) with open understory and include tall trees or snags larger than12 inches in diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags larger than 12 inches in diameter at breast height.
    - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.

- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.3.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in "*DNR's Approach to the Protection of Rare Species on State Forest Lands*" (IC4172). This is especially important when listed species are present, past surveys have indicated a possibility of their presence, or when appropriate habitat is available and the species is known to occur in the general region.

Past surveys have noted and confirmed six listed species as well as two natural communities of note occurring in the management area as listed in Table 4.3.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.3.8, there are two non-dedicated natural areas that are special conservation areas: Duck Lake-Mud Lake Chain (237 acres) and Lake Sixteen (181 acres).

Although there are no high conservation value areas, there are four ecological reference areas for the intermittent wetland natural community (one each of 33.87 acres, 47.58 acres, 73.75 acres and 28.7 acres on state land) in the Hammond Bay Lake Plains management area as shown in Figure 4.3.8.These ecological reference areas will be managed to enhance and protect their natural vegetative and associated wildlife communities as directed by an ecological reference area-specific management plan. These individual management plans will be developed over the life of this planning period.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.3.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Hammond Bay Lake Plains management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Dry northern forest		S3/G3?	Confirmed				Jack Pine, Red Pine	Late
Intermittent wetland		S3/G2	Confirmed				Lowland open/semi-open	N/A
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Dry-mesic southern forest		
						Mesic northern Forest	Northern Hardwood	Late
Prairie warbler	*Dendroica discolor*	E/G5/S1	Confirmed	IL	Very High	Open dunes	Upland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Oak-pine barrens	Oak	Mid
						Great Lakes barrens	Upland open/semi-open	N/A
Moth								
Three striped oncocnemis	*Oncocnemis piffardi*	*SC/G4/S1S2*	Confirmed	HV	Moderate	Northern fen	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Interdunal wetland	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
Reptile								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic southern forest		
						Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Plants								
Bayonet rush	*Juncus militaris*	T/G4/S1	Confirmed			Emergent marsh	Lowland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

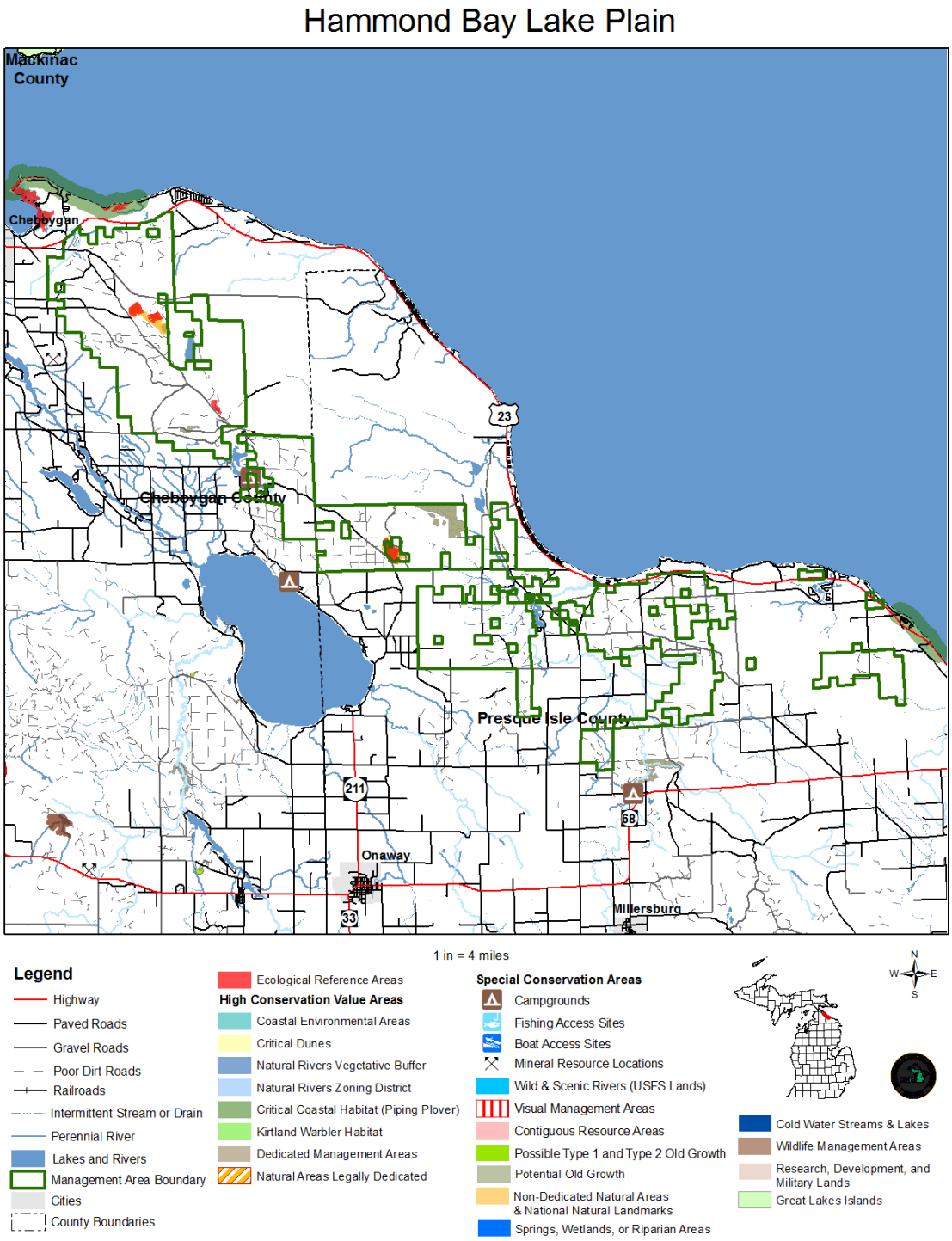

Figure 4.3.8. A map of the Hammond Bay Lake Plains management area showing the special resource areas.

4.3.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce the risk of decline.
- Emerald ash borer in black ash on lowland sites will be difficult to control due to access issues. It is expected that other species will replace ash on lowland sites.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.3.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information, and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.3.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Hammond Bay Lake Plain - FMD Management Areas	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	17	17	2

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Japanese Knotweed *Fallopia japonica*	3
-	-	Phragmites (Common Reed) *Phragmites australis*	14

4.3.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.3.1 and listed in Appendix F.

4.3.6 Fire Management

Swamp types which are a major component of this management area are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- When feasible, seek opportunities to use fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition.
- When feasible, seek opportunities to incorporate fire as a tool to restore or maintain managed openings.
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.3.7 Public Access and Recreation

Access for management and/or recreation is generally limited throughout much of this management area due to wet sites and limited access from adjacent landowners. The Department will continue to seek access across adjacent private property. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Recreation in the this management area centers around the Black Mountain Recreation Area and includes the Black Lake Trail Camp, Twin Lake State Forest Campground (Figure 4.3.8), Black Lake State Forest Campground (Figure 4.3.8) and the Black Mountain – Silver Creek Snowmobile Trail (Figure 4.3.1). Also included in the management area is the Ocqueoc River Mouth Access Site.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.3.8 Oil, Gas and Mineral Development

Surface sediments consist of lacustrine (lake) sand and gravel, dune sand and coarse-textured till. The glacial drift thickness varies between 0 and 600 feet. Sand and gravel pits are located in this management area and there is gravel potential for additional pits.

The Devonian Traverse Group, Bell Shale, Dundee Limestone, Detroit River Group and Bois Blanc Formation subcrop below the glacial drift. Most of the bedrock formations have limestone/dolomite potential, especially in areas of thin glacial till.

The nearest oil and gas production, the Guelph (former Niagaran) reef play, is located six miles south of the management area in Presque Isle County. The Collingwood Formation may have oil and gas potential in this area and most of the management area is currently leased. If drilling is sucessful for the Collingwood, additional leasing and drilling in the management area could occur.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established

by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire, and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.4 MA 4 – Emmet Moraines Management Area

Summary of Use and Management

Management in the Emmet Moraines management area (MA) will emphasize the selective management of the northern hardwood resource, balancing the age classes of aspen, continued thinning of red pine to increase value and maintaining species distribution as it currently occurs. Management will strive to sustainably produce various forest products, enhance game and non-game wildlife habitat, protect areas of unique character, provide for forest-based recreational uses and respect the Native American use of non-commercial forest products. Management activities may be moderately constrained by poor access on the steep slopes and areas of seeps and springs, especially in the northern hardwoods. Expected trends within this 10-year planning period are increased recreational pressure and introduced pests and diseases, especially beech bark disease and emerald ash borer (beech and ash are significant species in northern hardwood stands). The extensive area of multi-generational northern hardwood forest in this management area provides habitat to red-shouldered hawk, northern goshawk, pine marten and neotropical migrant birds.

Introduction

This management area is located near the northwest end of the northern Lower Peninsula in Emmet County and contains 35,957 acres of state forest (Figure 4.4.1). The primary attributes which identify the Emmet Moraines management area include:

- The management area falls mostly within Albert's Stutsmanville sub-region (Albert, 1995).
- The historic and current cover types are dominated by northern hardwoods species including beech, sugar maple, hemlock, basswood, ironwood and yellow birch. Red pine was a minor component circa-1800. Aspen occurs on 15% of the management area.
- The dominant landforms include steep glacial moraines or sand ridges (some nearly 500 feet high) with poorly drained outwash plain and high dunes near Lake Michigan.
- Due to the proximity of this management area to the population centers of Mackinaw City, Pellston and Harbor Springs, the forest resources contribute social and economic values to the area.
- Department of Natural Resources recreation facilities in this management area include Wilderness State Park. Snowmobile and hiking trails cross the area, including a portion of the North Country Trail and the North Western State Trail.
- The University of Michigan Biological Station is located near this management area.
- Certain areas of this management area are sources of non-commercial forest products sought by Native Americans.
- Surveys have located the several threatened, endangered or special concern species including red-shouldered hawk, osprey and ram's head lady slipper. Communities of special concern include mesic northern forest and open dunes.
- Much of the topography of this management area is dominated by large, broad ridges of moderate to steep sloped ground moraines of well-drained sands and sandy loams.

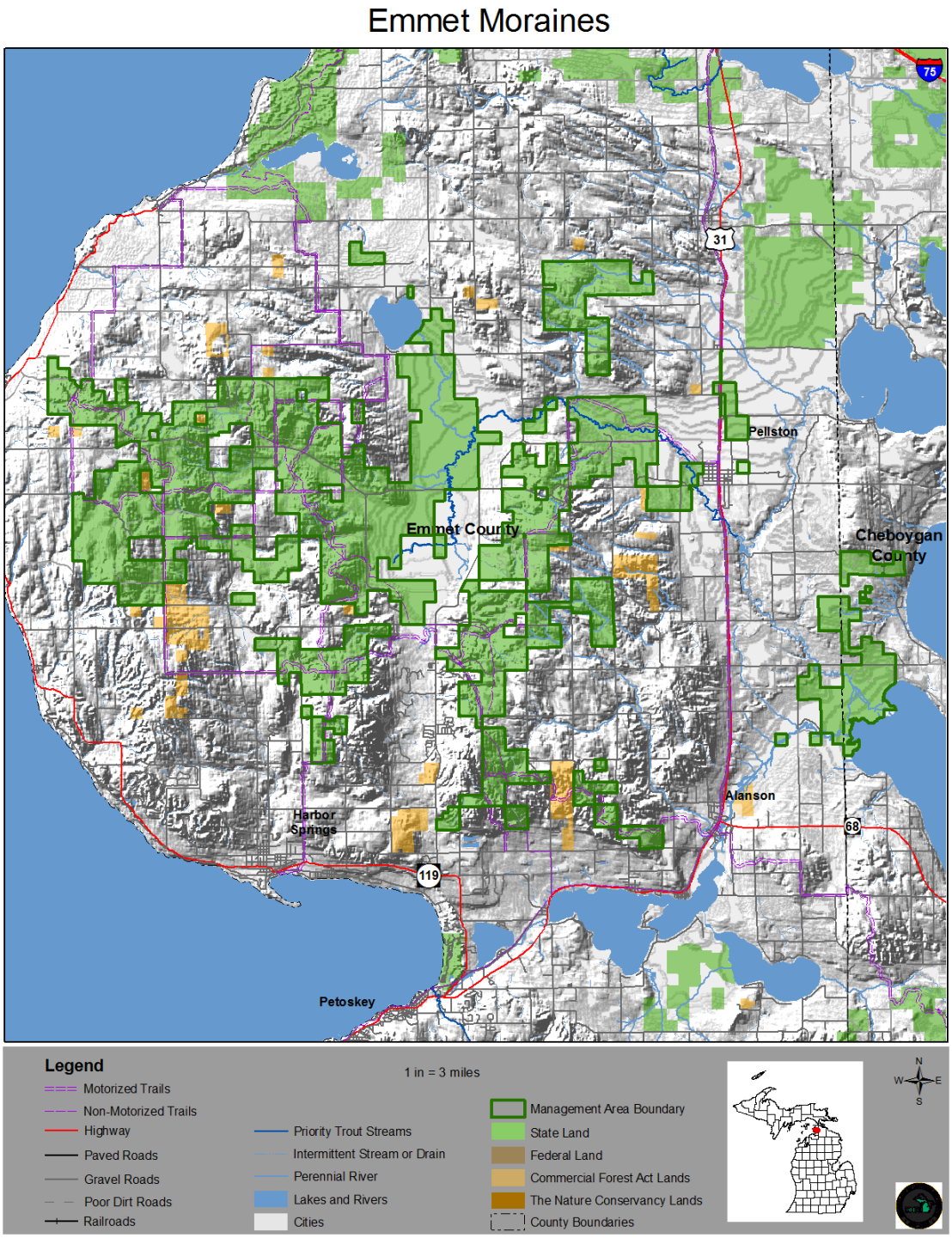

Figure 4.4.1. A map of the Emmet Moraines management area (dark green boundary) in relation to surrounding state forest and other lands in Emmet and Cheboygan counties, Michigan.

Table 4.4.1. Current cover types, acreages, projected harvests and projected acreages at the end of the ten-year planning period for the Emmet Moraines management area, northern Lower Peninsula ecoregion. (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Northern Hardwood	54%	19,294	1,274	18,020		1,162	19,294		8,586
Aspen	15%	5,560	266	5294	758		5,560	756	
Red Pine	8%	2,748		2748	1,023	838	2,748	305	1,723
Lowland Deciduous	4%	1,481	1,037	444	49		1,481	49	
Lowland Conifers	3%	1,151	921	230	26		1,151	26	
Cedar	2%	840	840				840		
Upland Open/Semi-Open Lands	3%	1,236		1236			1,236		
Lowland Open/Semi-Open Lands	6%	2,307		2307			2,307		
Misc Other (Water, Local, Urban)	0%	130	0	130			130		
Others	3%	1,210	428	782	147	172	1,210	98	172
Total		35,957	4,765	31,192	2,003	2,172	35,957	1,234	10,481

4.4.1 Forest Cover Type Management Direction

The following sections contain information on the management direction in the form of **Current Forest Condition, Desired Future Conditions, 10-Year Management Objectives, and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of tree species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.4.1.1 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwoods acres (Figure 4.4.2) total 19,294 or 54% of the management area (Table 4.4.1). Northern hardwoods are distributed throughout the management area, including coarse textured end moraines, ground moraines, drumlins and outwash plains, till plains and undifferentiated end moraine-ground moraine complexes (habitat classes: AFOCa and AFO (see Appendix E)).

Forest communities dominated by northern hardwoods in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, marten and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. Many of the stands have portions that are located on steep slopes or have seeps that may limit treatment options. There are 1,274 acres of northern hardwoods have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). Extensive salvage harvests are currently being conducted in stands with a high basal area of ash and American beech species due to the presence of the emerald ash borer and beech bark disease in the management area. There are 3,417 acres with a partial harvest pending and these acres are included in their current basal area range.

Desired Future Condition

- Northern hardwoods-dominated forest communities will be maintained on operable sites through selective harvesting to achieve an uneven-aged stand structure, to provide for a continuous supply of timber products, wildlife habitat and recreational opportunity.

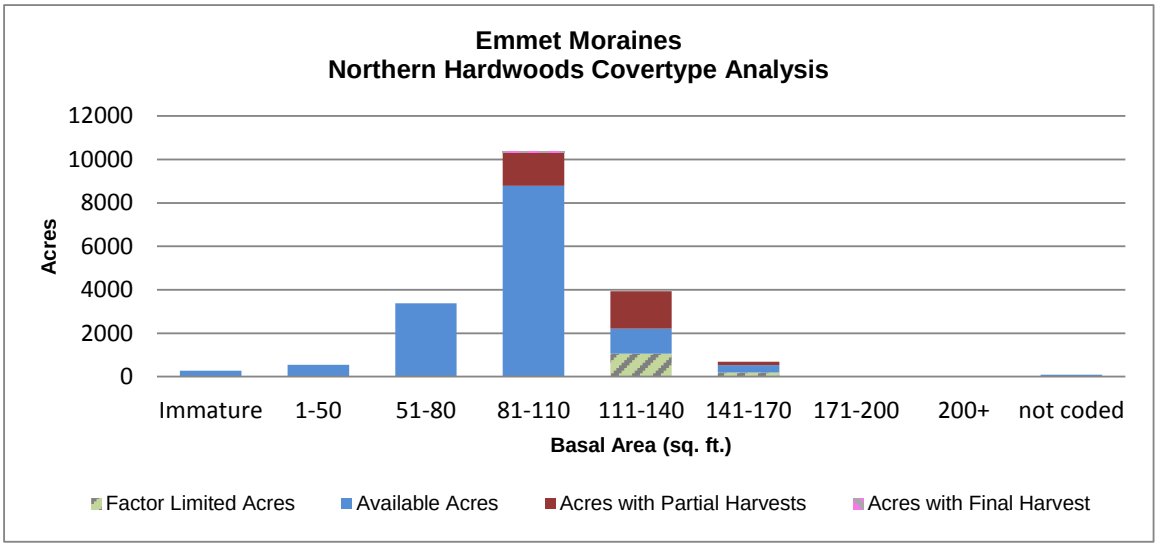

Figure 4.4.2. Basal area distribution for northern hardwoods in the Emmet Moraines management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct partial harvests on a projected 1,162 acres of northern hardwood from the higher basal area ranges; and
- Consider harvesting stands in lower basal area ranges to expedite the balancing of basal area distributions.

Long-Term Management Objectives

- Seek opportunities to collect more detailed quantitative data to assess impacts of loss of ash and beech due to insect and disease;
- Management may need to take into consideration the impacts of emerald ash borer and beech bark disease on northern hardwood stand compositions in this management area;
- Consider delaying treatments where ash and beech have been salvaged resulting in reduced basal area; and
- As these species lessen in the northern hardwood stands, consider managing for other mast producing species where available.

4.4.1.2 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 5,560 or 15% of the management area (Table 4.4.1). Aspen is distributed throughout the management area including coarse textured moraines, ground moraines, outwash plains, till plains and undifferentiated end moraine-ground moraine complexes (habitat class: AFO).

Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer (a featured species in this management area) and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. Most of the aspen in this management area is younger than the 60-year rotation age (Figure 4.4.3). Accessible aspen has been consistently harvested over the last 40 years. Data show that 266 acres of aspen have met harvest criteria, but have site conditions that limit harvest. There are 172 acres of stands that have a final harvest pending and these acres are included in the regeneration prescription class.

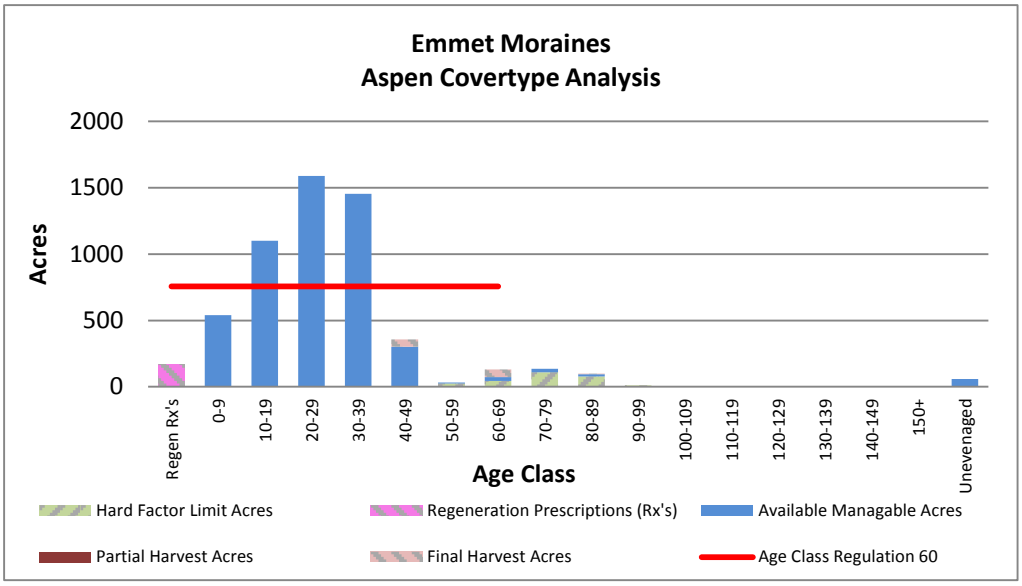

Figure 4.4.3. Age-class distribution for aspen in the Emmet Moraines management area (2012 Department of Natural Resources inventory data).

Aspen is generally managed on a 60-year rotation in this management area to produce pulpwood and sawlogs. The exceptions to this management are priority areas for ruffed grouse habitat (a featured species for this management area) where the emphasis may be placed on shorter rotations which provides more acres in the younger age classes. In some areas, aspen may be of merchantable size at less than 60 years and this may provide an opportunity to harvest stands "early" to restart additional acres which may help to balance the age-class distributions.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 69 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 758 acres; and
- Consider harvesting stands below the rotation age (60 years) to expedite balancing the age-class distribution.

Long-Term Management Objectives

- Continue management to balance age-class distributions; and
- A desired future harvest level is projected at 756 acres per 10-year period. This is an increase over the projected harvests for the current 10-year planning period and reflects continued management to balance age-class distributions.

Section 4.4.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 2,748 acres or 8% of the management area (Table 4.4.1), with most being 50-59 years old.

Red pine is distributed throughout the management area including coarse textured moraines, ground moraines, outwash plains, till plains and undifferentiated end moraine-ground moraine complexes on mesic/medium- to rich-nutrient sites (habitat class: AFO).

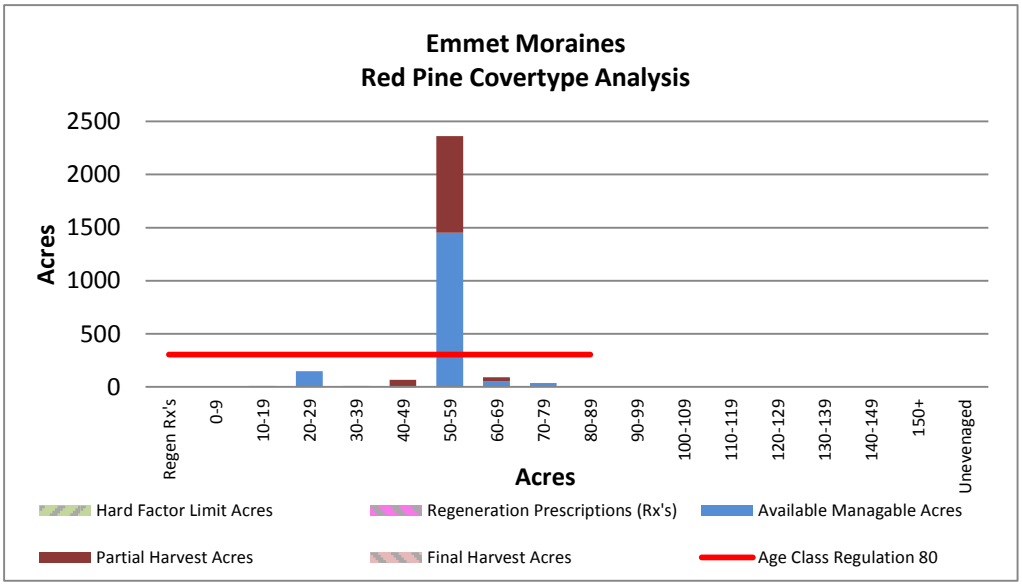

Figure 4.4.4. Age-class distribution for red pine in the Emmet Moraines management area (2012 Department of Natural Resources inventory data).

Red pine in this management area is commercially valued for pulp, saw logs and utility poles, which drives continued management of the red pine resource. Nearly all of the pine is of planted origin occurring on mesic (hardwood) sites with hardwood saplings in the under-story.

There are 1,010 acres with a partial harvest pending and these acres are included in their current age class (Figure 4.4.4).

Almost all of the red pine acres in the Emmet Moraines management area are in the 50-59 year age class which reflects the era of planting in the 1950s. These acres will continue to be managed through partial harvests to increase the value. There is very little red pine near the rotation age of 80 years and few acres will be final harvested in the next 10-year period.

Desired Future Condition

- Red pine, virtually all of which is on mesic sites (hardwood soils) will be primarily managed with a thinning regime until 80 years of age;
- Planted red pine on mesic sites will be managed to economic maturity, while allowing natural hardwood conversion on sites more suitable for hardwoods;
- Red pine will be regenerated on sites lacking high-quality natural hardwood regeneration; and
- On sites being converted to hardwoods, a scattering of a few pine trees per acre will retained providing a super-canopy of red pine and providing vertical structure for various wildlife species.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age-class distribution;
- Conduct partial harvests on a projected 838 acres, concentrating on stands of better quality red pine that has the potential for a higher product value in larger size classes; and
- Conduct final harvests on a projected 1,023 acres, concentrating on poorer quality red pine sites lacking a hardwood understory.

Long-Term Management Objectives

- A desired future harvest level is projected at 1,723 acres for partial harvest per 10-year period. This is an increase over the projected partial harvest in the current 10-year planning period and reflects management to improve the value of the older age classes in preparation for future final harvests; and
- Desired future harvest levels for final harvest are projected at 305 acres per 10-year period. This reflects continued management to balance the age-class distribution.

4.4.1.4 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open lands occur on approximately 1,236 acres (3%) of the management area. This category is a combination of herbaceous open land, upland shrub low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands;
- Conduct management activities that favor mast-producing shrubs (such as blueberry, juneberry, cherry, and hawthorn) for black bear, turkey and ruffed grouse; and
- Manage for warm season bunch grasses, row crops and drill planted forages were possible for wild turkey brood rearing habitat.

Long-Term Management Objectives

- If feasible, continue management to keep the amount of upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.4.1.5 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open lands acres total 2,307 acres (6%) of the management area (Table 4.4.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels.

4.4.1.6 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: lowland deciduous, 1,481 acres (4% of the management area), lowland conifers, 1,151 acres (3%) and cedar, 840 acres (2%) (see Table 4.4.1). Also included but not shown in Table 4.4.1 are even smaller acreages of other cover types including white pine, 392 acres (1%) and lowland aspen/balsam poplar, 346 acres (1%). Other scattered acres include tamarack, mixed upland deciduous, jack

pine, hemlock, upland spruce/fir, paper birch, oak, lowland spruce/fir, natural mixed pines, lowland mixed forest, planted mixed pines, upland conifers and upland mixed forest. All of these timbered and non-timbered cover types have important ecological values and are important habitat for numerous species. Some of these types are managed through partial or restarting harvests to provide forest products.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape while providing forest products and habitat for wildlife.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct restarting harvests on a projected 26 acres of lowland conifer and 49 acres of lowland deciduous stands;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years-of-entry;
- Consider methods to ensure adequate regeneration of lowland types;
- Conduct final harvests on a projected 83 acres of white pine, 33 acres of lowland aspen/balsam poplar and 31 acres of jack pine; and
- Conduct partial harvests on a projected 150 acres of white pine.

Long-Term Management Objectives

- Continue management to regenerate lowland types;
- Continue management of upland types to provide a sustainable yield of forest products and wildlife habitat; and
- Desired future harvest levels are projected to remain steady for lowland conifer (26 acres) and lowland deciduous at (49 acres) per 10-year period.

4.4.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management during this cycle of state forest planning:

- American woodcock
- Beaver
- Black bear
- Black-throated blue warbler
- Golden-winged warbler
- Pileated woodpecker
- Red-headed woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer
- Wood thrush.

The primary focus of wildlife habitat management in the Emmet Moraines management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest, extensive mature forest, large open grassland complexes and marsh/grassland complexes, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast, understory shrub and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream (see Appendix F) riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams (see Appendix F).

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less than 15% and other inland bodies of water.
  - Implementation of the Dingman Marsh and French Farm Flooding master plans and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Black-throated Blue Warbler

The goal for black-throated blue warbler in the northern Lower Peninsula is to maintain available habitat. Black-throated blue warbler is an area-sensitive species (e.g., densities increase exponentially with increasing patch size) mainly occurring in mesic deciduous forest tracts >50 years in age and >250 acres in size, with a dense understory layer for nesting and foraging. State forest management for the species should focus on maintaining mature, large (>50 years old and >250 acres) mesic deciduous forest tracts with a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size.
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices.
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-Year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees >12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than five acres in size with a savannah-like dispersion of large trees (<50% canopy cover) with open understory and include tall trees or snags larger than12 inches in diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags larger than 12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Red-shouldered Hawk

The goal for red-shouldered hawk in the northern Lower Peninsula is to maintain available habitat. Red-shouldered hawks nest in contiguous, mature, closed canopy, hardwood forests. Nesting habitat consists primarily of well-stocked pole or sawtimber stands (stocking densities 6 and 9) with a closed canopy (80-100%) and basal area of at least 98 square feet per acre. Nests are usually found in deciduous trees with a mean 23 inches in diameter at breast height. State forest management activities should focus on the maintenance of large blocks (>385 acres) of mesic northern forest with the appropriate level of large diameter trees in priority landscapes.

Wildlife Habitat Specifications:

- All suspected red-shouldered hawk nests are to be reported to local wildlife staff and confirmed nests documented in accordance with the DNR Approach to the Protection of Rare Species on State Forest Lands (CI 4172) and included in Integrated Forest Monitoring, Assessment and Prescriptions when there is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan DNR's *Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands* (August 2012) will be followed.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.

- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.)
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Thrush

The goal for wood thrush in the northern Lower Peninsula is to maintain available habitat. Wood thrush occur primarily in upland, mesic deciduous and mixed forests with large trees, diverse tree communities, moderate undergrowth and a well-developed litter layer.

Wood thrush is highly susceptible to nest predation and brood parasitism, which increases with forest fragmentation. State forest management for the species should focus on maintaining large (>250 acres) forest tracts, minimizing edge and promoting a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size.
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices.
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

4.3.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in "*DNR's Approach to the Protection of Rare Species on State Forest Lands*" (IC4172). This is especially important when listed species are present, past surveys have indicated a possibility of their presence, or when appropriate habitat is available and the species is known to occur in the general region.

Past surveys have noted and confirmed eight listed species as well as two natural communities of note occurring in the management area as listed in Table 4.4.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

There are no high conservation value areas or ecological reference areas identified for the Emmet Moraines management area as illustrated in Figure 4.4.5.

Table 4.4.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Emmet Moraines management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Mesic northern forest		S3/G4	Confirmed				Northern Hardwood	Late
Open dunes		S3/G3	Confirmed				Upland open/semi-open	N/A
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Black tern	*Chlidonias niger*	SC/G4/S3	Confirmed	MV	Very High	Great Lakes marsh	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Emergent Marsh	Lowland open/semi-open	N/A
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Osprey	*Pandion haliaetus*	SC/G5/S2-3	Confirmed	PS	Low	Coastal fen	Lowland open/semi-open	N/A
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland Mixed	Mid
						Hardwood-conifer swamp	Lowland Mixed	Mid
Mammal								
Woodland vole	*Microtus pinetorum*	SC/G5/S3S4	Confirmed	PS	Very High	Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
						Floodplain forest	Lowland mixed	Mid
						Oak-pine barrens	Oak	Mid
						Bur oak plains	Upland open/semi-open	N/A
Plants								
Ram's head lady's-slipper	*Cypripedium arietinum*	SC/G3/S3	Confirmed			Rich conifer swamp	Tamarack	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
						Volcanic bedrock lakeshore	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Poor fen	Lowland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Great Lakes barrens	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Volcanic bedrock glade	Upland open/semi-open	N/A
						Granite bedrock glade	Upland open/semi-open	N/A
Michigan monkey flower	*Mimulus glabratus michiganensis*	LE/E/G5T1/S1	Confirmed			Rich conifer swamp	Tamarack	Late

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

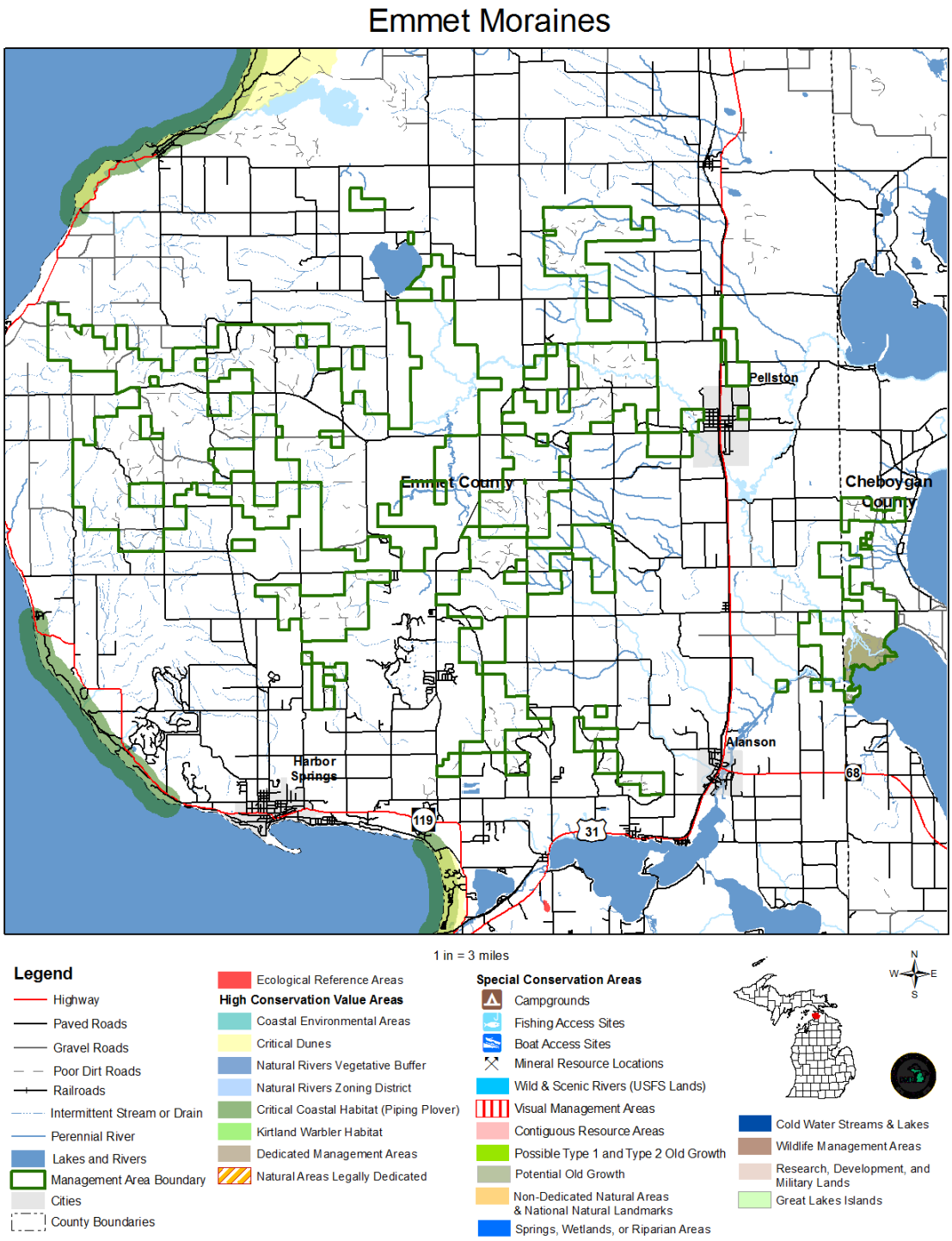

Figure 4.4.5. A map of the Emmet Moraines management area showing the special resource areas.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

4.4.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include emerald ash borer and beech bark disease and management should be adapted as follows:

- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important;
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow; and
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration (see Beech Bark Disease and Emerald Ash Borer guidelines for more information).

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.4.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.4.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Emmet Moraines - FMD Management Areas	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	19	28	47	9

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
Common Buckthorn *Rhamnus cathartica*	1	Common Buckthorn *Rhamnus cathartica*	1
Garlic Mustard *Alliaria petiolata*	2	Garlic Mustard *Alliaria petiolata*	3
Glossy Buckthorn *Rhamnus frangula*	6	Glossy Buckthorn *Rhamnus frangula*	5
Japanese Knotweed *Fallopia japonica*	2	Japanese Knotweed *Fallopia japonica*	1
Spotted Knapweed *Centaurea stoebe*	3	Phragmites (Common Reed) *Phragmites australis*	2
Tatarian Honeysuckle *Lonicera tatarica*	3	Purple Loosestrife *Lythrum salicaria*	1
Wild Parsnip *Pastinaca sativa*	2	Spotted Knapweed *Centaurea stoebe*	2
-	-	Tatarian Honeysuckle *Lonicera tatarica*	11
-	-	Wild Parsnip *Pastinaca sativa*	2

4.4.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.4.1 and listed in Appendix F.

4.4.6 Fire Management

Northern hardwoods which have historically been a major component of this management area are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance small inclusions of aspen or grass/upland brush types. Wildfire risk and fuel loading is increased in young dense conifer plantations.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- When feasible, seek opportunities to use fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- When feasible, seek opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.4.7 Public Access and Recreation

Access for management and/or recreation is generally good throughout this management area, as there is very little lowland and a well-developed road/trail system which including a portion of the North Country Trail (Figure 4.4.1). In accordance with the DNR's *Sustainable Soil and Water Quality Practices of Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Taking advantage of the undulating terrain and abundant snow in the lee of Lake Michigan, many miles of snowmobile cross the management area as shown in Figure 4.4.1. In addition, the North Country Trail bisects the entire management area from north to south and there are miles of off-road vehicle trails (Figure 4.4.1).

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single-track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42, and the Department of Natural Resources Within Stand Retention Guidance.

4.4.8 Oil, Gas and Mineral Development

Surface sediments consist of coarse textured glacial till (the uplands), lacustrine (lake) sand and gravel, glacial outwash sand and gravel, postglacial alluvium and peat and muck. The glacial drift thickness varies between 400 and 1,000 feet. Gravel pits are located in this management area and there is potential for additional gravel pits on the upland areas.

The Devonian Traverse Group, Bell Shale, Dundee Limestone and Detroit River Group subcrop below the glacial drift. Most of the bedrock formations have limestone/dolomite potential, especially in areas of thin glacial till.

The nearest oil and gas production, the Antrim Shale gas play, is located 15 miles to the south. The Collingwood Formation may have oil and gas potential in this area and approximately 90% of the state mineral rights in this management area are leased for oil and gas development. Drilling for the Collingwood Formation has occurred or is proposed along the eastern edge of the management area in Cheboygan County. If production is established, drilling could expand in the management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended, or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire, and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.5 MA 5 – Cheboygan Lake Plain Management Area

Summary of Use and Management

Management in the Cheboygan Lake Plain management area (MA) will emphasize balanced age classes of aspen, red pine, jack pine and lowland poplar and regenerating the aging oak resource. Management will strive to sustainably produce various forest products, enhance game and non-game wildlife habitat, protect areas of unique character and provide for forest-based recreational uses. Management activities may be constrained by poor access in the swampy (21% lowland) portions of this area. Expected trends within this 10-year planning period are increased recreational pressure, especially near the large lakes in the area, introduced pests and diseases and the restoration of the barrens community southwest of Black Lake.

Introduction

This management area is located near the northern tip of the northern Lower Peninsula in Cheboygan and Presque Isle counties and contains 61,004 acres of state forest (Figure 4.5.1). The primary attributes which identify the Cheboygan Lake Plain management area include:

- The management area falls mostly within Albert's Onaway sub-region (Albert, 1995).
- The historic cover types were dominated by red pine and jack pine with little aspen. The current vegetation composition is mostly aspen, red pine, jack pine and oak with 21% of the area being in relatively inaccessible lowland types.
- The dominant landform consists of rolling to moderately sloping ground moraines topography. Drumlins are common and are typically separated by poorly drained outwash.
- This management area's proximity to and use-demand by population centers along Burt, Mullett and Black lakes and the town of Onaway. The forest resources contribute social and economic values to the area due to the proximity of this management area to the population centers.
- Department of Natural Resources recreation facilities in this management area include nearby Burt Lake, Onaway and Aloha state parks and Ocqueoc River state forest campground.
- Snowmobile and off-road vehicle trails, the Northeast State Trail and the High Country Pathway cross this management area.
- Surveys have located the several threatened, endangered or special concern species including red-shouldered hawk, common loon, secretive locust, Hill's thistle and Alleghany plum.
- Much of the topography in this management area was sculpted by re-advancing glaciers that left drumlin fields interspersed with poorly drained outwash. During the early Algonquin period when Lake Huron was receding, the drumlins and moraines were islands. Small areas of exposed limestone bedrock are common and karst topography is present.

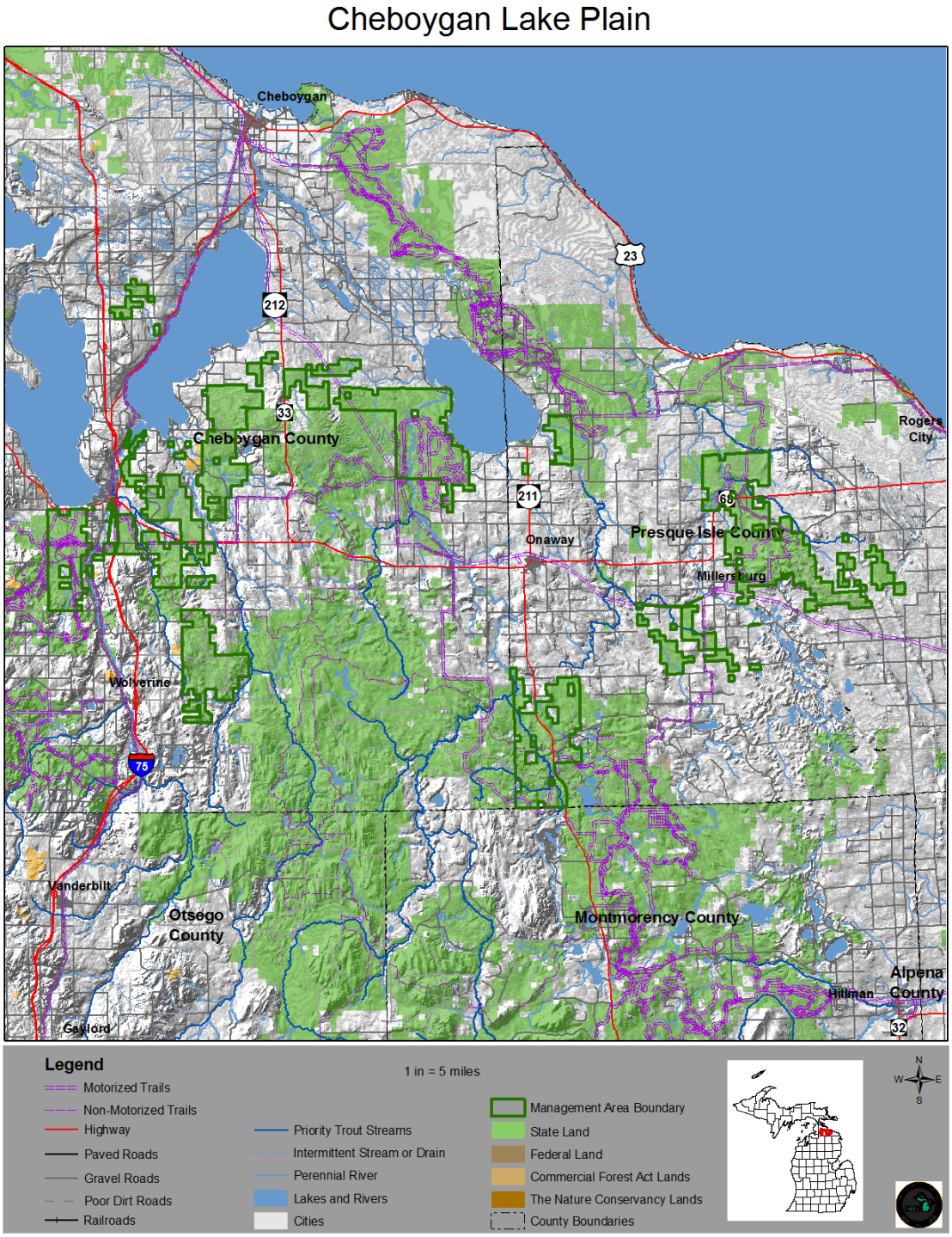

Figure 4.5.1. A map of the Cheboygan Lake Plain management area (dark green boundary) in relation to state forest and other lands in Cheboygan and Presque Isle counties, Michigan.

Table 4.5.1. Current cover types, acreages, projected harvests and projected acreages at the end of the ten-year planning period for the Cheboygan Lake Plains management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	27%	16,386	993	15,393	2,737		16,386	2,566	
Red Pine	13%	7,924	1,078	6846	2,298	2,890	7,924	761	3,863
Jack Pine	12%	7,409	498	6911	93		7,409	1,152	
Oak	8%	4,742	1,673	3069	44	590	4,742	384	611
Cedar	7%	3,974	3,974				3,974		
Lowland Conifers	5%	3,343	2,674	669	77		3,343	77	
Lowland Deciduous	3%	1,952	1,394	558	62		1,952	62	
Lowland Aspen/Balsam Poplar	3%	1,710	855	855	143		1,710	143	
Northern Hardwood	2%	1,447	69	1378		638	1,447		638
Upland Open/Semi-Open Lands	3%	1,617		1617			1,617		
Lowland Open/Semi-Open Lands	6%	3,934		3934			3,934		
Misc Other (Water, Local, Urban)	1%	890		890			890		
Others	9%	5,676	1,051	4625	210	973	5,676	495	973
Total		61,004	14,258	46,746	5,665	5,091	61,004	5,640	6,085

4.5.1 Forest Cover Type Management Direction

The following sections contain information on the management direction in the form of **Current Forest Condition, Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of tree species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.5.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 16,386 or 27% of the management area (Table 4.5.1). Aspen is distributed throughout the management area on habitat classes ParVHa, PVCd, ParVCo, and AFO/AFOCa (see Appendix E). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. Aspen occurs throughout the area. Accessible aspen has been consistently harvested over the last 40 years.

There are 993 acres of aspen (Figure 4.5.2) have met harvest criteria, but have site conditions that limit harvest (hard factor-limited acres). There are 1,615 acres that have a final harvest pending and these acres are shown in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for a balanced harvest of forest products and a balanced amount of wildlife habitat.

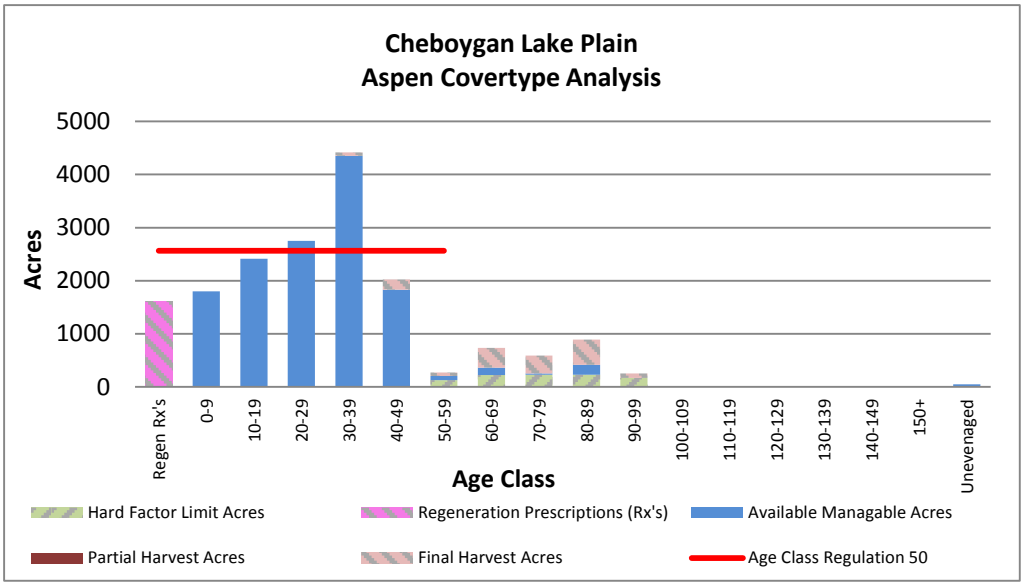

Figure 4.5.2. Age-class distribution for aspen in the Cheboygan Lake Plain management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct final harvests on a projected 2,737 acres of aspen in this 10-year planning period targeting the oldest age classes first; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- A desired future harvest level is projected at 2,566 acres per 10-year period which is an increase over projected final harvest acres in this 10-year planning period; and
- This will continue management to balance age class distributions.

4.5.1.2 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 7,924 acres or 13% of the management area (Table 4.5.1), with most being 50-59 or 70-79 years old (Figure 4.5.3). Most of the red pine in this management area is concentrated in Presque Isle County and southwest of Black Lake in the barrens restoration area where it is performing poorly. Red pine is found on coarse textured sands and level plains and gentle slopes associated with glacial outwash plains, sandy beach ridges and coarse textured moraines (habitat classes: PVCd, ParVHa, PArVVb).

Red pine in this management area is commercially valued for pulp, saw logs and utility poles. There are 1,078 acres of red pine have met harvest criteria, but have site conditions that limit harvest. There are 884 acres with a partial harvest pending (partial harvest acres) and these acres are included in the same age class.

Desired Future Condition

- Red pine on dry-mesic sites (PArVVb) will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0 and 89 years of age to provide for continual harvest and a balanced amount of wildlife habitat.

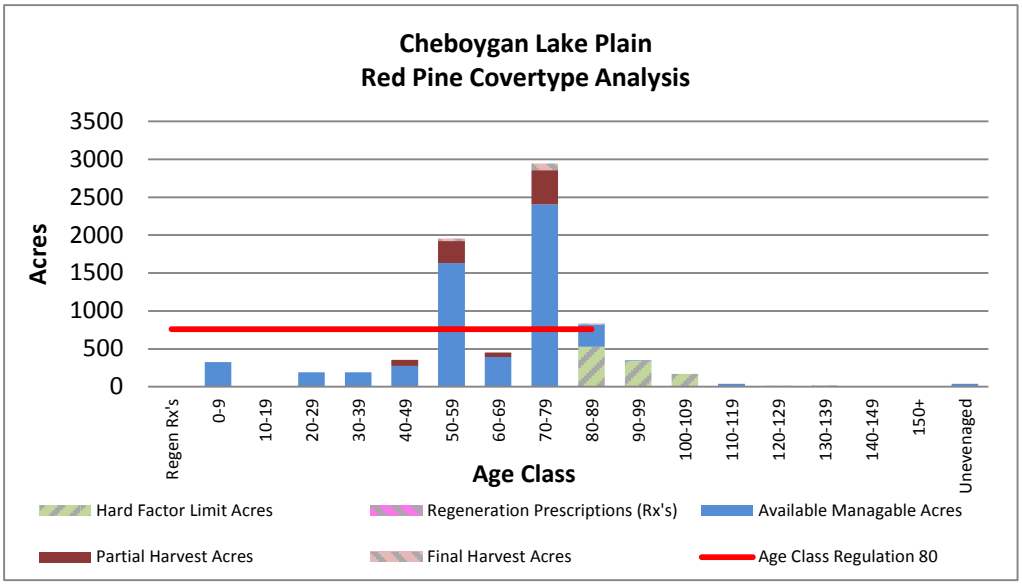

Figure 4.5.3. Age-class distribution for red pine in the Cheboygan Lake Plain management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age-class distribution;
- Conduct partial harvests on a projected 2,890 acres, concentrating on stands of better quality red pine with the potential for a higher product value in larger size classes; and
- Conduct stand replacement harvests on projected on a projected 2,298 acres, beginning with the oldest age classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- In identified special conservation areas, consider management of red pine to a biological rotation of 200+years;
- Consider allowing red pine on very dry sites (PVCd) to convert to jack pine;
- Over the next several decades, continue thinning red pine that are currently in the 40-69 year age classes. For most stands at age 80, conduct stand replacement harvests for either natural or planted regeneration;
- Desired future harvest acres are projected at 761 acres per 10-year period which is a decrease over projected final harvest acres in this 10-year planning period;
- This will continue management to balance age-class distributions;
- A desired future harvest level is projected at 3,863 acres per 10-year period which is an increase over the projected partial harvest acres in this 10-year planning period; and
- This represents management to increase the value of the older red pine in preparation for future final harvests.

4.5.1.3 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 7,409 acres or 12% of the management area (Table 4.5.1). Jack pine is found on level plains and gentle slopes, associated with glacial outwash plains, sandy beach ridges and coarse textured moraines, poorly drained outwash sands and sandy outwash plains (habitat classes: PArVHa, PArVCo and PVCd). Forest communities dominated primarily by jack pine in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation. Most of the jack pine occurs in Presque Isle County and in the delta outwash area southwest of Black Lake.

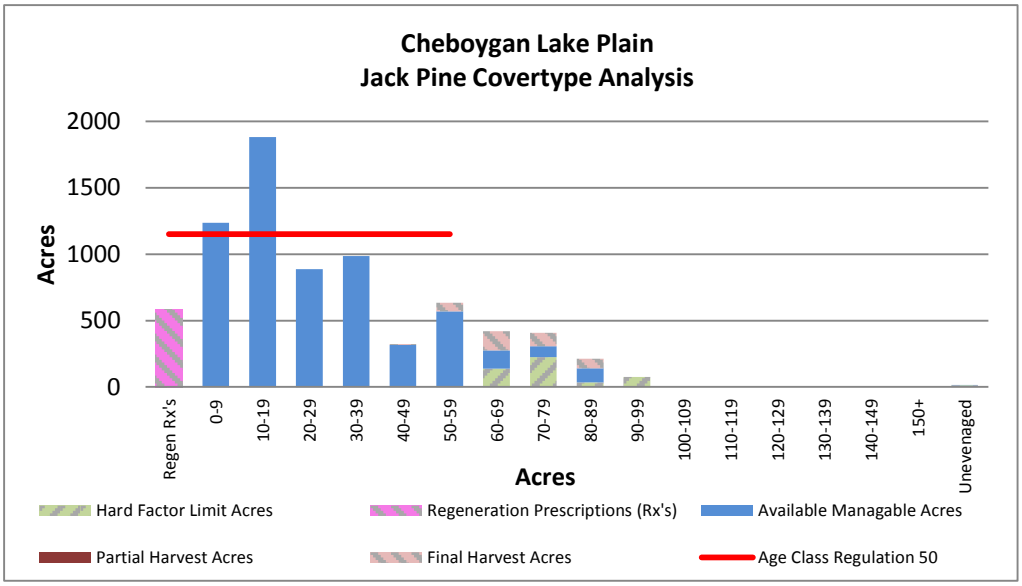

Figure 4.5.4. Age-class distribution for jack pine in the Cheboygan Lake Plain management area (2012 Department of Natural Resources inventory data).

There are 498 acres of jack pine (Figure 4.5.4) that have met silvicultural harvest criteria, but have site conditions that limit harvest. There are 585 acres that have final a harvest pending and these acres are included in the regeneration prescription class. The graph displays the projected number of acres converted to the cover type as a result of final harvests of another type and replanting with jack pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Jack pine will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for continual harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct stand replacement harvests on a projected 93 acres of jack pine currently age 50 and older.

Long-Term Management Objectives

- Continue management of jack pine on appropriate sites with an emphasis on reducing over mature stands to minimize losses from jack pine budworm and associated risks due to increased fuel loads; and

- A desired future harvest level is projected at 1,152 acres for final harvest which is an increase over projected final harvest acres in this 10-year planning period. This will continue management to balance age-class distributions and reduce over-mature acres.

4.5.1.4 Forest Cover Type Management – Oak

Current Condition

Oak acres total 4,742 or 8% of the management area (Table 4.5.1). Oak is found throughout the management area on sandy outwash plains, level plains and gentle slopes associated with glacial outwash plains, sandy beach ridges and coarse textured moraines and beach ridges along Lake Huron (habitat classes: PVCd, ParVHA and PArVVb).

Oak quality is highly variable across the management area. Forest communities dominated primarily by oak in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, white-tailed deer, squirrels and various birds; commercially for firewood; and industrial lumber.

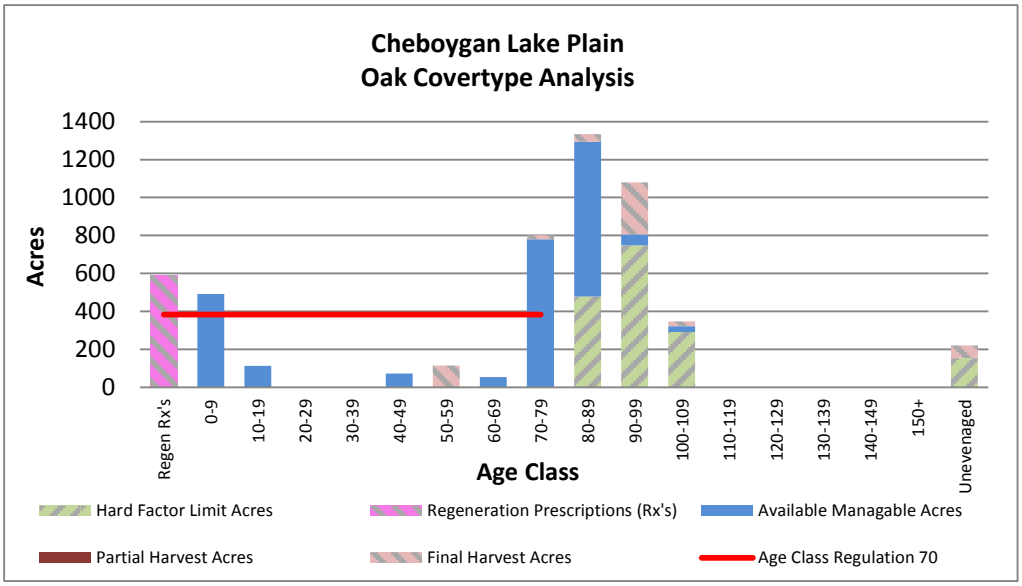

Figure 4.5.5. Age-class distribution for oak in the Cheboygan Lake Plain management area (2012 Department of Natural Resources inventory data).

The age-class distribution (Figure 4.5.5) is heavily skewed toward the older age classes 70 and above. A total of 1,673 acres of oak have met harvest criteria, but have site conditions that limit harvest. There are 587 acres of stands that have a final harvest pending (final acres) and these acres are included in the regeneration prescription class. Figure 4.5.5 includes the projected number of acres converted to oak as a result of treatments that remove an overstory species resulting in release of understory oak. These acres are included in the regeneration prescription class.

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management to provide for timber products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Conduct partial harvests on a projected 590 acres;
- Conduct final harvests on a projected 44 acres; and
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types.

Long-Term Management Objectives

- Continue work towards maintaining oak as the predominant species in selected stands through final harvests;
- It is acceptable that some oak stands may become mixed stands through partial removal of an oak overstory, planting pine in oak stands or through natural regeneration of other species;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area;
- A desired future harvest level is projected at 384 acres per 10-year period which is an increase over projected final harvest acres in this 10-year planning period. This will continue management to balance age-class distributions and to maintain oak on the landscape through regeneration of older oak acres; and
- A desired future harvest level is projected at 611 acres for partial harvest per 10-year period, which is a slight increase over the projected partial harvest acres in the current 10-year planning period.

4.5.1.5 Forest Cover Type Management – Cedar and Lowland Conifer

Cedar (Figure 4.5.6) acres total 3,974 or 7% of the management area (Table 4.5.1) and lowland conifers (Figure 4.5.7) acres total 3,343 or 5% of the management area (Table 4.2.1), constituting a significant portion of the management area. However, all 3,974 acres of cedar and 2,674 acres of lowland conifers are factor limited due to access and operability issues. These lowland species may offer only limited opportunities for management.

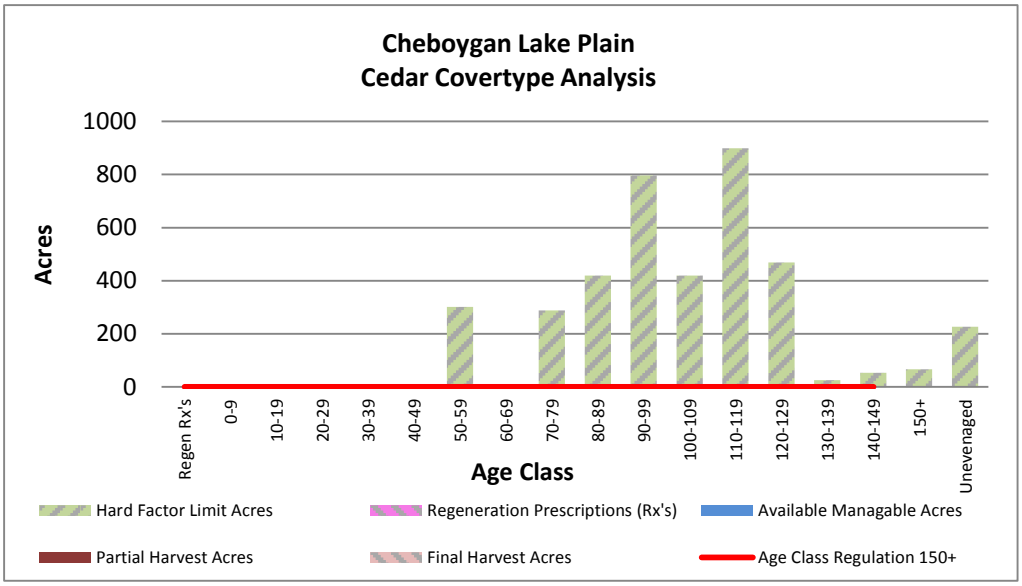

Figure 4.5.6. Age-class distribution for cedar in the Cheboygan Lake Plain management area (2012 Department of Natural Resources inventory data).

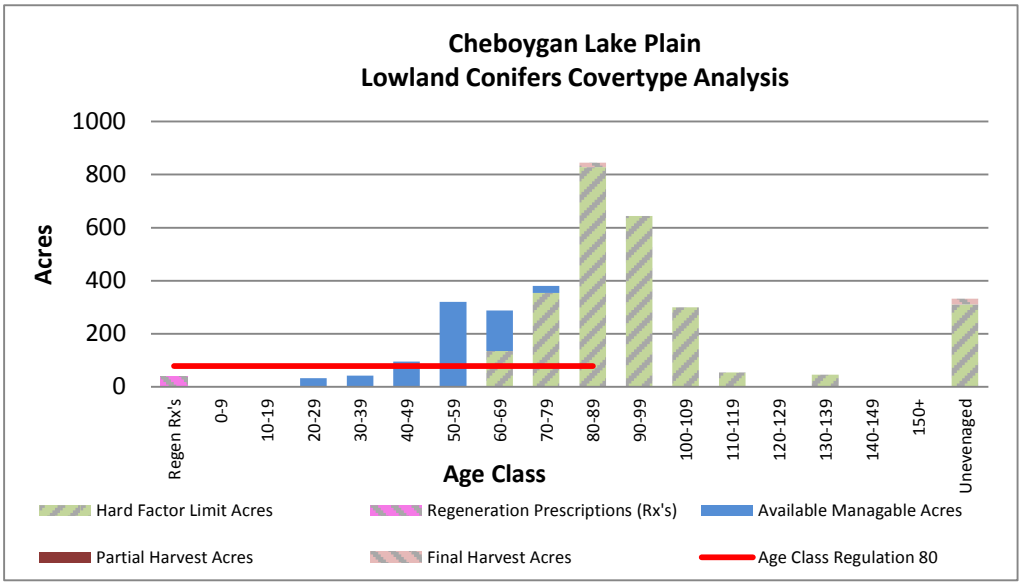

Figure 4.5.7. Age-class distribution for lowland conifers in the Cheboygan Lake Plain management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape and wildlife habitat while providing forest products.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 77 acres of lowland conifers;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years of entry; and
- Consider methods to ensure adequate regeneration of cedar and lowland conifer.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- The desired future harvest level of 77 acres for final harvest of lowland conifer is projected per 10-year period.

4.5.1.6 Forest Cover Type Management - Lowland Deciduous

Current Condition

Lowland deciduous forests are characterized by areas that show evidence of flooding in the past five years or support lowland indicator plants. The lowland type is typically a mixture of ash, red maple, birch, lowland aspen/balsam poplar, oak and other minor species. Lowland deciduous acres total 1,952 acres or 3% of the management area (Table 4.5.1). A large portion of the lowland deciduous cover type is in predominantly older age classes above 70 years (Figure 4.5.8).

There are 1,394 acres that have a site condition that precludes harvest, most frequently due to a lack of accessibility in wet areas. Currently, 50 acres have a final harvest pending and these acres are included in the regeneration prescriptions (Rx's) class. The ash component has been heavily impacted by the emerald ash borer.

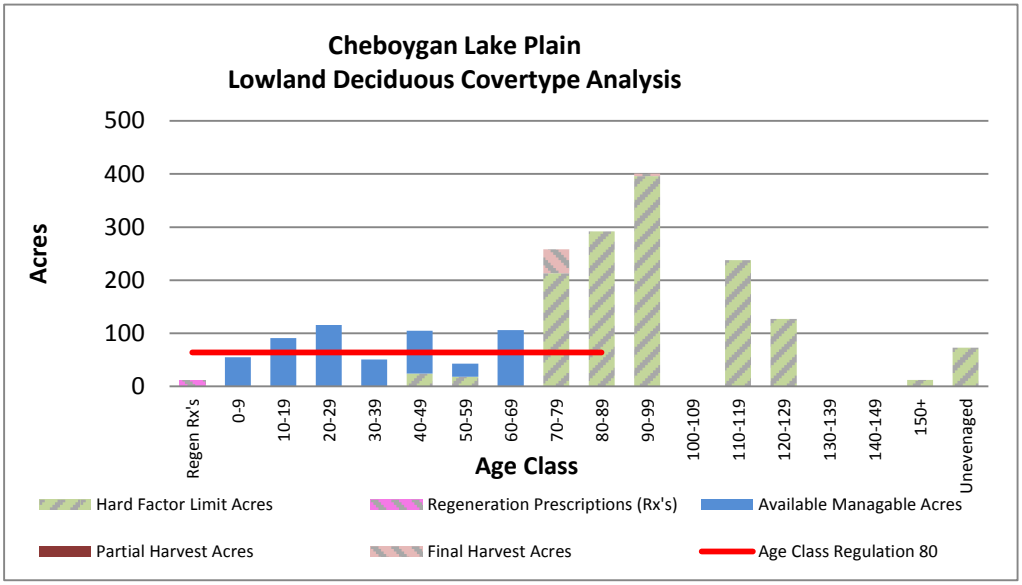

Figure 4.5.8. Age-class distribution for lowland deciduous in the Cheboygan Lake Plain management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland deciduous types will be sustainably managed with acres balanced between 0 and 89 years for a continuous supply of forest products and as a source of mast and habitat for wildlife.

10-Year Management Objectives

- Seek opportunities to harvest where it can be done in a manner that will not adversely impact wetland soils;
- Conduct regeneration harvests on a projected 62 acres to begin the process of producing multiple age classes;
- Follow the Emerald Ash Borer Guidelines for managing ash in lowland deciduous stands; and
- Consider opportunities to conduct non-commercial harvests to manage for habitat and a balanced age-class distribution.

Long-Term Management Objectives

- Where feasible, continue to seek opportunities to conduct regeneration harvests;
- It is acceptable that due to the emerald ash borer the amount of ash in lowland deciduous forests will decrease significantly and will be replaced by other lowland species; and
- Desired future harvest levels for final harvest are projected at 62 acres per 10-year period.

4.5.1.7 Forest Cover Type Management – Lowland Aspen/Balsam Poplar

Current Condition

Lowland aspen/balsam poplar (Figure 4.5.9) (primarily balsam poplar, swamp aspen and swamp white birch) acres total 1,710 or 3% of the management area.

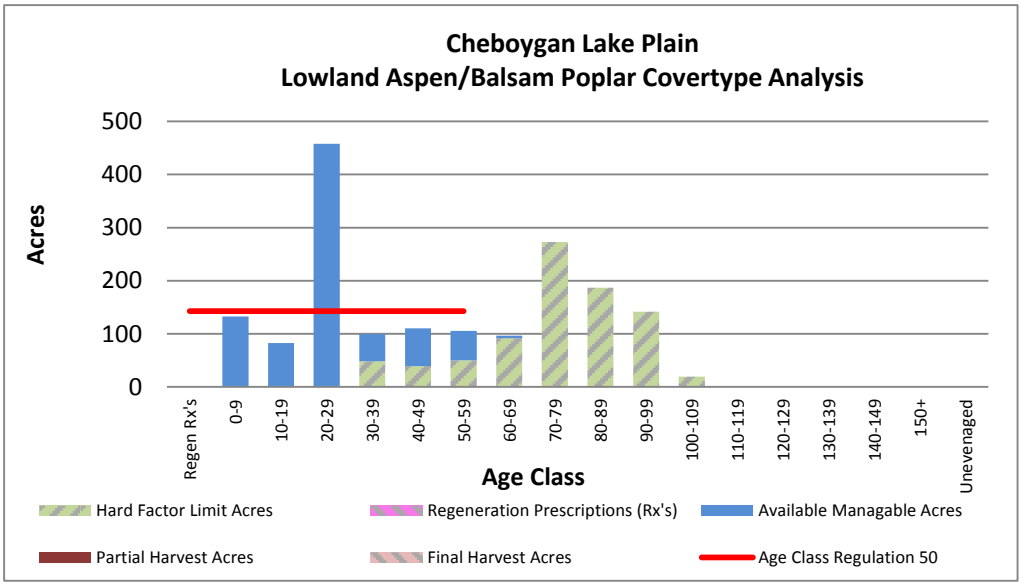

Figure 4.5.9. Age-class distribution for lowland aspen/balsam poplar in the Cheboygan Lake Plain management area (2012 Department of Natural Resources inventory data).

Forest communities dominated primarily by lowland aspen/balsam poplar in this management area are valued ecologically as sources of habitat for numerous species of wildlife including woodcock, ruffed grouse, bear, white-tailed deer (a featured species in this management area) and various song birds; and commercially for pulp. Data show that 855 acres of lowland poplar have met harvest criteria, but have site conditions that limit harvest.

There is a spike of acres above the regulation level in the 20-29 year age class. There are few acres available above the 50-year age class regulation target and consideration should be given to harvesting from younger age classes to expedite balancing the age-class distribution.

Desired Future Condition

- Lowland poplar-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 69 years of age to provide for a regulated and sustainable harvest, wildlife habitat and to contribute to the preservation of regional biodiversity.

10-Year Management Objectives

- Conduct final harvests on a projected 143 acres of lowland aspen/balsam poplar, if it can be done in a manner that will not adversely impact wetland soils; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite balancing of age-class distributions.

Long-Term Management Objectives

- It is acceptable that the older lowland poplar, much of it inaccessible for commercial harvest, will continue to experience natural processes (windthrow, flooding and senescence);
- Consider alternatives to managing ash in lowland areas due to impacts from the emerald ash borer; and
- A desired future harvest level is projected at 143 acres for final harvest per 10-year period which is a decrease from the current planning period. This reflects continued management to balance the age-class distribution.

4.5.1.8 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwoods acres (Figure 4.4.2) total 19,294 or 54% of the management area (Table 4.4.1). Northern hardwoods are distributed throughout the management area, including coarse textured end moraines, ground moraines, drumlins and outwash plains, till plains and undifferentiated end moraine-ground moraine complexes (habitat classes: AFOCa and AFO (see Appendix E)).

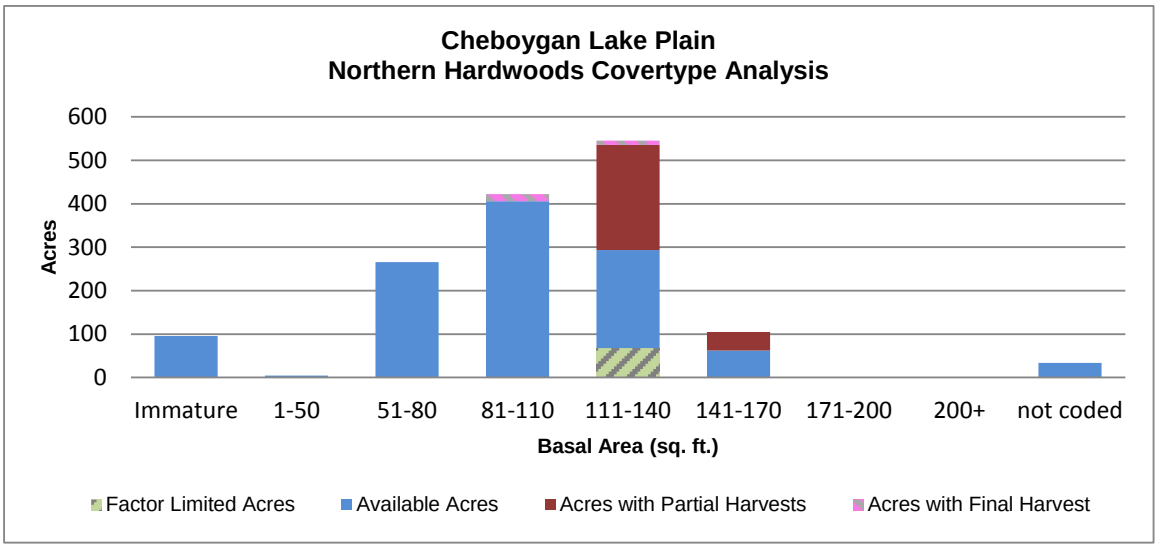

Figure 4.5.10. Basal area distribution for northern hardwoods in the Cheboygan Lake Plain management area (2012 Department of Natural Resources inventory data).

Forest communities dominated by northern hardwoods in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, marten and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. Many of the stands have portions that are located on steep slopes or have seeps that may limit treatment options. There are 69 acres of northern hardwoods have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 275 acres with a partial harvest pending and 26 acres with a final harvest pending and these acres are included in their current basal area range.

Desired Future Condition

- Northern hardwoods-dominated forest communities will be maintained on operable sites through selective harvesting to achieve an uneven-aged stand structure, to provide for a continuous supply of timber products, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Conduct partial harvests on a projected 638 acres of northern hardwood from the higher basal area ranges; and
- Consider harvesting stands in lower basal area ranges to expedite the balancing of basal area distributions.

Long-Term Management Objectives

- Seek opportunities to collect more detailed quantitative data to assess impacts of loss of ash and beech due to insect and disease;
- Management may need to take into consideration the impacts of emerald ash borer and beech bark disease on northern hardwood stand compositions in this management area;
- Consider delaying treatments where ash and beech have been salvaged resulting in reduced basal area;
- As these species lessen in the northern hardwood stands, consider managing for other mast producing species where available;
- A desired future harvest level is projected at 638 acres for partial harvest per 10-year period; and
- This reflects continued management to produce uneven-aged northern hardwood stands.

4.5.1.9 Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog, bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open lands acres total 3,934 or 6% of the management area (Table 4.5.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.5.1.10 Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open lands occur on approximately 1,617 acres (3%) of the management area. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub and bare/sparsely vegetated and low density trees. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management, if necessary, to maintain upland open/semi-open lands at or above current levels.

Long-Term Management Objectives

- Continue to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.5.1.11 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: cedar with 3,974 acres (6% of the management area) and lowland conifer with 3,343 acres (5%) as a significant portion of the other types and may offer limited opportunities for management. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape in addition to providing wood products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years of entry;
- Consider methods to ensure cedar and lowland conifer regeneration;
- Conduct final harvests on a projected 165 acres of planted mixed pines, 17 acres of lowland mixed forest and 34 acres of upland conifers; and
- Conduct partial harvests on a projected 281 acres of natural mixed pines, 184 acres of upland mixed forest, 213 acres of white pine, 85 acres of mixed upland deciduous, 281 acres of natural mixed pines and 37 acres of upland conifers.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- Desired future harvest levels for lowland conifer (77 acres) and lowland deciduous (62 acres) are projected remain steady to reflect continued management to regenerate lowland types.

4.5.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management are during this 10-year planning period:

- Elk
- Pileated woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Wild turkey
- White-tailed deer.

The primary focus of wildlife habitat management in the Cheboygan Lake Plain management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest and large open grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

Elk

The goal for elk in the northern Lower Peninsula is to maintain the population at 500-900 animals as measured in the biennial aerial survey. Elk prefer open areas and regenerating deciduous forest. Mast crops, especially acorns, are important sources of food in fall and winter. State forest management should focus on maintaining/increasing early successional, opening and hard mast habitat components at/to desired levels in priority landscapes.

Wildlife Habitat Specifications:

The goals of habitat management in the elk range are described in the 2007 Pigeon River Country Concept of Management:

- Maintain 7-8% of the forest cover types managed by even-aged management in the 0-9 year-old age class;
- Maintain the existing aspen component;
- Increase the amount of opening and upland brush to 6-7 percent of the range; and
- Maintain the existing component of mast producing trees (red oak, white oak, northern pin oak and beech).

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees >12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-shouldered Hawk

The goal for red-shouldered hawk in the northern Lower Peninsula is to maintain available habitat. Red-shouldered hawks nest in contiguous, mature, closed canopy, hardwood forests. Nesting habitat consists primarily of well-stocked pole or sawtimber stands (stocking densities 6 and 9) with a closed canopy (80-100%) and basal area of at least 98 square feet per acre. Nests are usually found in deciduous trees with a mean 23 inches in diameter at breast height. State forest management activities should focus on the maintenance of large blocks (>385 acres) of mesic northern forest with the appropriate level of large diameter trees in priority landscapes.

Wildlife Habitat Specifications:

- All suspected red-shouldered hawk nests are to be reported to local wildlife staff and confirmed nests documented in accordance with the DNR Approach to the Protection of Rare Species on State Forest Lands (CI 4172) and included in Integrated Forest Monitoring, Assessment and Prescriptions Geographic Decision Support System when there is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan DNR's *Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands* (August 2012) will be followed.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In the northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.5.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in "*DNR's Approach to the Protection of Rare Species on State Forest Lands*" (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed nine listed species and no natural communities of note occurring in the management area as listed in Table 4.5.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

There are no high conservation value areas or ecological reference areas identified for the Cheboygan Lake Plain management area as illustrated in Figure 4.5.11.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.5.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Cheboygan Lake Plain management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Birds								
Red-shouldered hawk	***Buteo lineatus***	**T/G5/S3-4**	**Confirmed**	**PS**	**Very High**	**Floodplain forest**	**Lowland mixed**	**Mid**
						Dry-mesic northern forest	**White Pine**	**Late**
						Mesic northern Forest	**Northern Hardwood**	**Late**
Common loon	***Gavia immer***	**T/G5/S3-4**	**Confirmed**	**HV**	**Very High**	**Emergent Marsh**	**Lowland open/semi-open**	**N/A**
						Bog	**Lowland open/semi-open**	**N/A**
Bald eagle	***Haliaeetus leucocephalus***	**SC/G5/S4**	**Confirmed**	**IL**	**Moderate**	**Bog**	**Lowland open/semi-open**	**N/A**
						Hardwood-conifer swamp	**Lowland Mixed**	**Mid**
						Northern hardwood swamp	**Black Ash**	**Late**
						Poor conifer swamp	**Tamarack**	**Late**
						Floodplain forest	**Lowland mixed**	**Mid**
						Dry northern forest	**Jack Pine, Red Pine**	**Early**
						Dry-mesic northern forest	**White Pine**	**Late**
						Mesic northern Forest	**Northern Hardwood**	**Late**
Fish								
Lake sturgeon	***Acipenser fulvescens***	**T/G3G4/S2**	**Confirmed**	**HV**	**Moderate**	**Great Lakes**	**Aquatic**	**N/A**
						Rivers	**Aquatic**	**N/A**
						Mainstem streams	**Aquatic**	**N/A**
Insect								
Hungerford's crawling water beetle	***Byrchius hungerfordi***	**LE/E/G1/S1**	**Confirmed**	**MV**	**Very High**	**Northern shrub thicket**	**Upland open/semi-open**	**N/A**
						Northern wet meadow	**Lowland open/semi-open**	**N/A**
						Rich conifer swamp	**Tamarack**	**Late**
						Floodplain forest	**Lowland mixed**	**Mid**
Secretive locust	***Appalachia arcane***	**SC/S2S3/G2G3**	**Confirmed**	**MV**	**Very High**	**Bog**	**Lowland open/semi-open**	**N/A**
						Pine barrens	**Jack Pine**	**Early**
						Wet-mesic sand prairie	**Lowland open/semi-open**	**N/A**
						Intermittent wetland	**Lowland open/semi-open**	**N/A**
						Dry northern forest	**Jack Pine, Red Pine**	**Late**
Reptile								
Wood turtle	***Glyptemys insculpta***	**SC/G4/S2S3**	**Confirmed**	**MV**	**Moderate**	**Northern wet meadow**	**Lowland open/semi-open**	**N/A**
						Bog	**Lowland open/semi-open**	**N/A**
						Rich conifer swamp	**Tamarack**	**Late**
						Hardwood-conifer swamp	**Lowland Mixed**	**Mid**
						Northern shrub thicket	**Upland open/semi-open**	**N/A**
						Mesic northern forest	**Northern Hardwood**	**Late**
Plants								
Hill's thistle	***Cirsium hillii***	**SC/G3/S3**	**Confirmed**			**Alvar**	**Upland open/semi-open**	**N/A**
						Oak-pine barrens	**Oak**	**Mid**
						Pine barrens	**Jack Pine**	**Early**
						Boreal forest	**Upland open/semi-open**	**N/A**
						Dry northern forest	**Upland open/semi-open**	**N/A**
						Dry sand prairie	**Upland open/semi-open**	**N/A**
						Dry-mesic northern forest	**Upland open/semi-open**	**N/A**
						Dry-mesic prairie	**Upland open/semi-open**	**N/A**
						Limestone bedrock glade	**Upland open/semi-open**	**N/A**
						Mesic prairie	**Upland open/semi-open**	**N/A**
						Mesic sand prairie	**Upland open/semi-open**	**N/A**
						Open dunes	**Upland open/semi-open**	**N/A**
Ram's head lady's-slipper	***Cypripedium arietinum***	**SC/G3/S3**	**Confirmed**			**Rich conifer swamp**	**Tamarack**	**Late**
						Boreal forest	**Upland & Lowland Sp/F**	**Mid**
						Volcanic bedrock lakeshore	**Upland open/semi-open**	**N/A**
						Hardwood-conifer swamp	**Lowland Mixed**	**Mid**
						Poor fen	**Lowland open/semi-open**	**N/A**
						Wooded dune & swale complex	**Upland open/semi-open**	**N/A**
						Dry northern forest	**Jack Pine, Red Pine**	**Late**
						Dry-mesic northern forest	**White Pine**	**Late**
						Great Lakes barrens	**Upland open/semi-open**	**N/A**
						Limestone bedrock glade	**Upland open/semi-open**	**N/A**
						Volcanic bedrock glade	**Upland open/semi-open**	**N/A**
						Granite bedrock glade	**Upland open/semi-open**	**N/A**

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

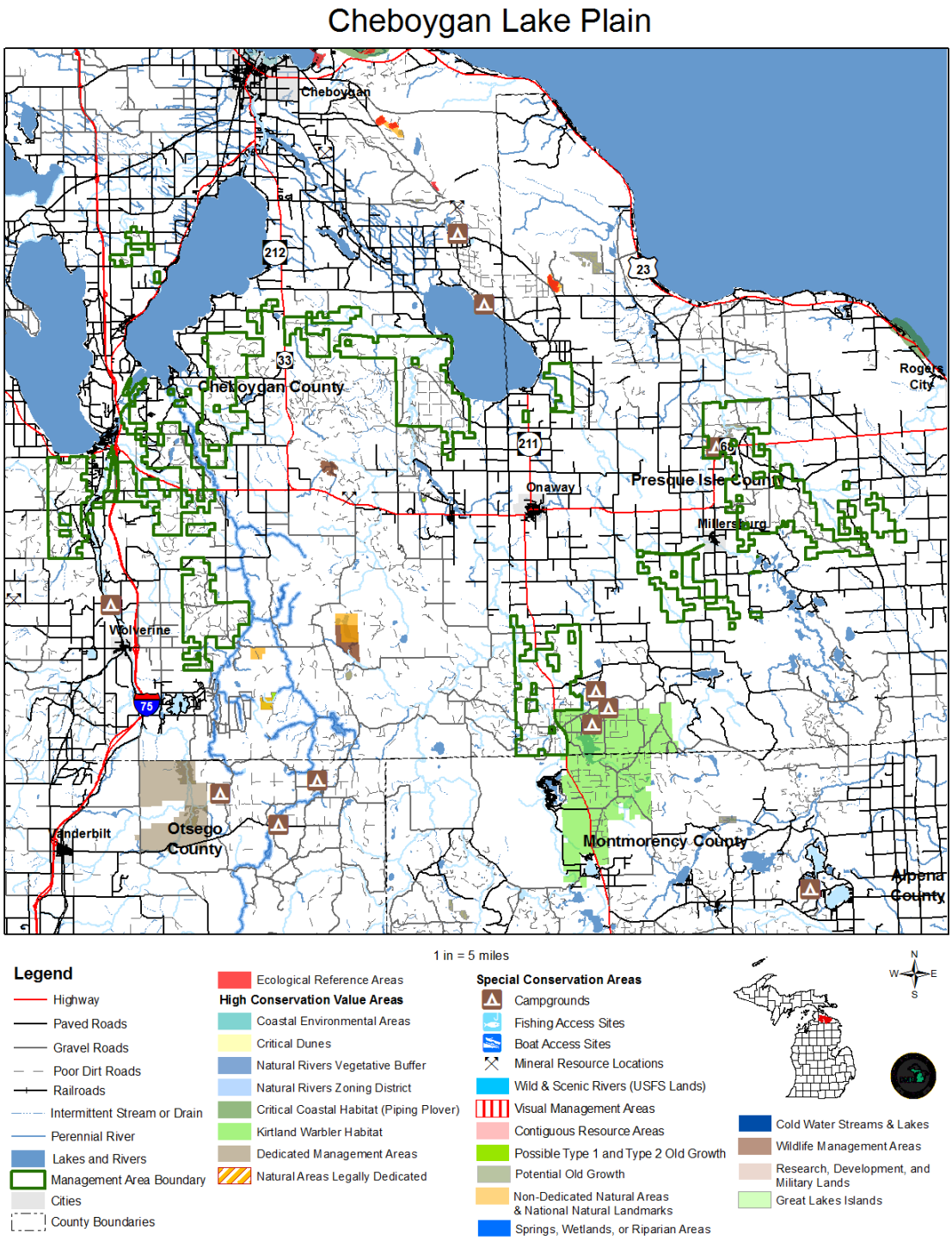

Figure 4.5.11. A map of the Cheboygan Lake Plain management area showing the special resource areas.

4.5.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Currently, the area has no significant forest health issues.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.5.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information, and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.5.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Cheboygan Lake Plain - FMD Management Areas	**Cases within FMD Areas**	**Cases within 5-Mile Buffer**	**Total number of cases**	**Total number of different Invasive Species**
	1	**13**	**14**	**5**

Invasive Species within FMD Areas	**Occurrences**	**Invasive Species within 5-Mile Buffer**	**Occurrences**
Tatarian Honeysuckle *Lonicera tatarica*	1	Japanese Knotweed *Fallopia japonica*	2
-	-	Purple Loosestrife *Lythrum salicaria*	3
-	-	Reed Canary Grass *Phalaris arundinacea*	1
-	-	Spotted Knapweed *Centaurea stoebe*	1
-	-	Tatarian Honeysuckle *Lonicera tatarica*	6

4.5.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.5.1 and listed in Appendix F.

4.5.6 Fire Management

Swamp types which are a major component of this management area are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- When feasible, seek opportunities to use fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- When feasible, seek opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.5.7 Public Access and Recreation

Access for management and/or recreation is generally limited throughout much of this management area due to wet sites and limited access from adjacent landowners. In accordance with the department's *Sustainable Soil and Water Quality Practices of Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the Department's timber management policies may be considered. Specifications and Guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42, and the Department of Natural Resources Within Stand Retention Guidance.

4.5.8 Oil, Gas and Mineral Development

Surface sediments consist of lacustrine (lake) sand and gravel, dune sand, glacial outwash sand and gravel and postglacial alluvium, ice-contact outwash sand and gravel and coarse-textured till. The glacial drift thickness varies between 0 and 400 feet. Sand and gravel pits are located in this management area and there is potential for additional gravel pits.

The Devonian Antrim Shale, Traverse Group, Bell Shale, and Dundee Limestone subcrop below the glacial drift. Most of the bedrock formations have limestone/dolomite potential, especially in areas of thin glacial till.

Oil and gas production, the Guelph (former Niagaran) reef play, is located in the Presque Isle County part of the management area. The Collingwood Formation may have oil and gas potential in this area and most of the management area is currently leased. If drilling is sucessful for the Collingwood, additional leasing and drilling in the management area could occur.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the DEQ, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended, or a site designated by the Secretary of State to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire, and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.6 MA 6 – Cheboygan Basin Moraines Management Area

Summary of Use and Management

Management in the Cheboygan Basin Moraines management area (MA) will emphasize balancing age classes of aspen, red pine and lowland poplar and the continuation of selective management of the northern hardwood resource. Management will strive to sustainably produce various forest products, enhance game and non-game wildlife habitat, protect areas of unique character and provide for forest-based recreational uses. With about 7% of the management area being lowland, management activities are expected to be minimally constrained. Expected trends within this 10-year planning period are increased recreational pressure; introduced pests and diseases; elk browsing that influences forest regeneration and increased development; and the resulting increase in the use of state forest lands that has resulted in adverse impacts, particularly off-road vehicle damage.

Introduction

This management area is located near the northern tip of the northern Lower Peninsula in Cheboygan and Presque Isle counties and contains 41,793 acres of state forest (Figure 4.1). The primary attributes which identify the Cheboygan Basin Moraines management area include:

- The management area falls mostly within Albert's Onaway sub-region (Albert, 1995).
- The historic cover types were dominated by northern hardwoods with very small acreages of aspen. In areas influenced by frequent fire from adjacent drier areas, pine was prominent. The current vegetation composition is mostly aspen, red pine, northern hardwoods, lowland poplar and jack pine. This management area has very limited (7%) relatively inaccessible lowland types.
- The dominant landform consists of rolling to moderately sloping ground moraines topography. Drumlins are common and are typically separated by poorly drained outwash.
- This management area's proximity to and use-demand by population concentrations Black Lake and the town of Onaway. The forest resources contribute social and economic values to the area due to the proximity of this management area to the population centers.
- Department of Natural Resource recreation facilities in the area include nearby Onaway State Park, Black Mountain Recreation Area, Tomahawk and Shoepac state forest campgrounds.
- Snowmobile and off-road vehicle trails, the Shoepac Sinkholes Pathway and Northeast State Trail cross the area.
- Surveys have located the several threatened, endangered or special concern species including red-shouldered hawk, common loon, secretive locust, hill's thistle and Alleghany plum.
- This management area contains one or more of the northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.

Table 4.6.1. Current cover types, acreages, projected harvests and projected acreages at the end of the ten-year planning period for the Cheboygan Basin Moraines management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	37%	15,361	1,501	13,860	2,636		15,361	2,310	
Red Pine	11%	4,652	271	4381	1,310	1,427	4,652	487	2,216
Northern Hardwood	7%	2,816	50	2766		1,311	2,816		1,311
Lowland Conifers	6%	2,372	1,898	474	53		2,372	53	
Oak	5%	1,915	878	1037	191	289	1,915	115	296
Cedar	4%	1,738	1,738				1,738		
Lowland Aspen/Balsam Poplar	4%	1,695	848	848	141		1,695	141	
Jack Pine	4%	1,684	430	1254			1,684	179	
Lowland Deciduous	3%	1,097	768	329	40		1,097	40	
Upland Open/Semi-Open Lands	6%	2,579		2579			2,579		
Lowland Open/Semi-Open Lands	6%	2,464		2464			2,464		
Misc Other (Water, Local, Urban)	1%	313		313			313		
Others	7%	3,107	1,025	2082	337	280	3,107	244	567
Total		41,793	9,406	32,387	4,708	3,307	41,793	3,569	4,390

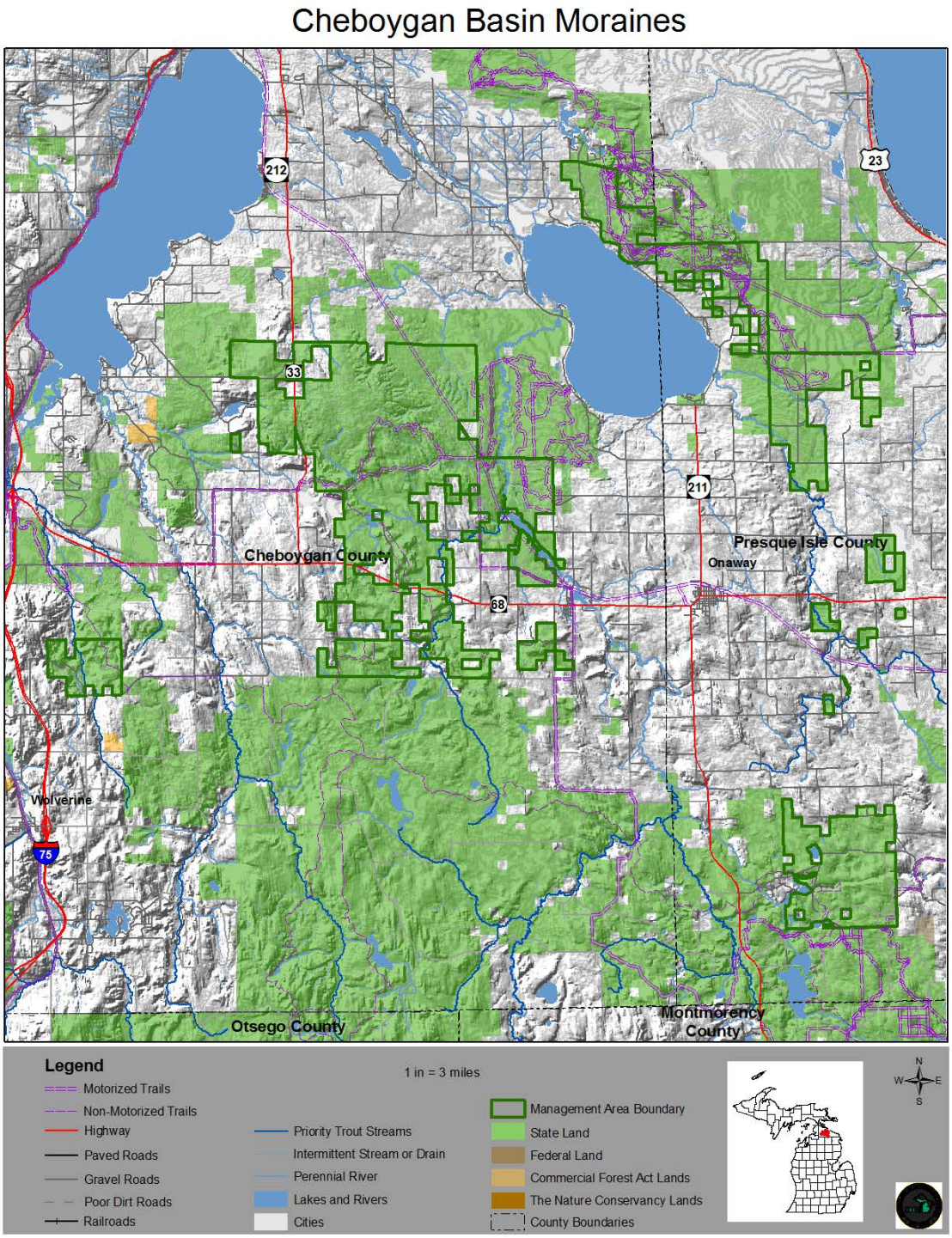

Figure 4.6.1. A map of the Cheboygan Basin Moraines management area (dark green boundary) in relation to state forest and other lands in Cheboygan and Presque Isle counties, Michigan.

4.6.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.6.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 15,361 or 37% of the management area (Table 4.1). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. Aspen occurs throughout the area. Most of the aspen in this management area is younger than the 50-year rotation age (Figure 4.6.2) as accessible aspen has been consistently harvested over the last 50 years. There are 1,501 acres of aspen have met harvest criteria but have site conditions that limit harvest (hard factor limited acres).

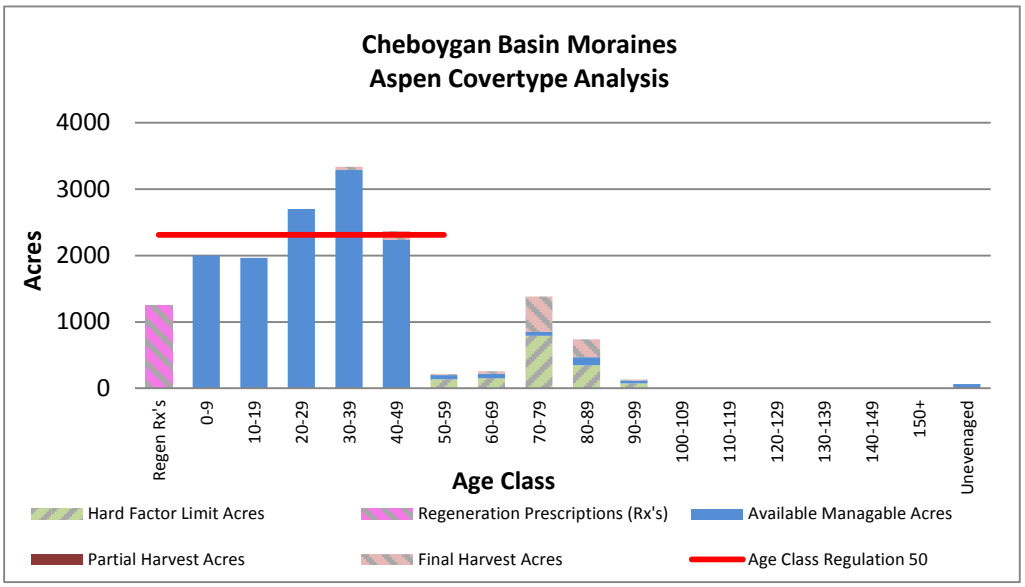

Figure 4.6.2. Age-class distribution for aspen in the Cheboygan Basin Moraines management area (2012 Department of Natural Resources inventory data).

There are 1,253 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0-59 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct final harvests on a projected 2,636 acres targeting the oldest age class first;
- Consider harvesting stands below the rotation age (50 years) to expedite balancing the age-class distribution; and
- Aspen within the identified Grouse Enhanced Management Systems area may be managed differently than the rest of the aspen within the management area, with a shorter rotation age**,** small patch cuts and carefully considered stand adjacency.

Long-Term Management Objectives

- Continue final harvests to balance the aspen age-class distribution; and
- Desired future harvest levels are projected at 2,310 acres of final harvest per 10-year period.

4.6.1.2 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 4,652 acres or 11% of the management area (Table 4.6.1), with most being 70 to 79 years old. Red pine in this management area is commercially valued for pulp, saw logs and utility poles. Nearly all of the pine is of planted origin. There are 271 acres of red pine that have met harvest criteria but have site conditions that limit harvest.

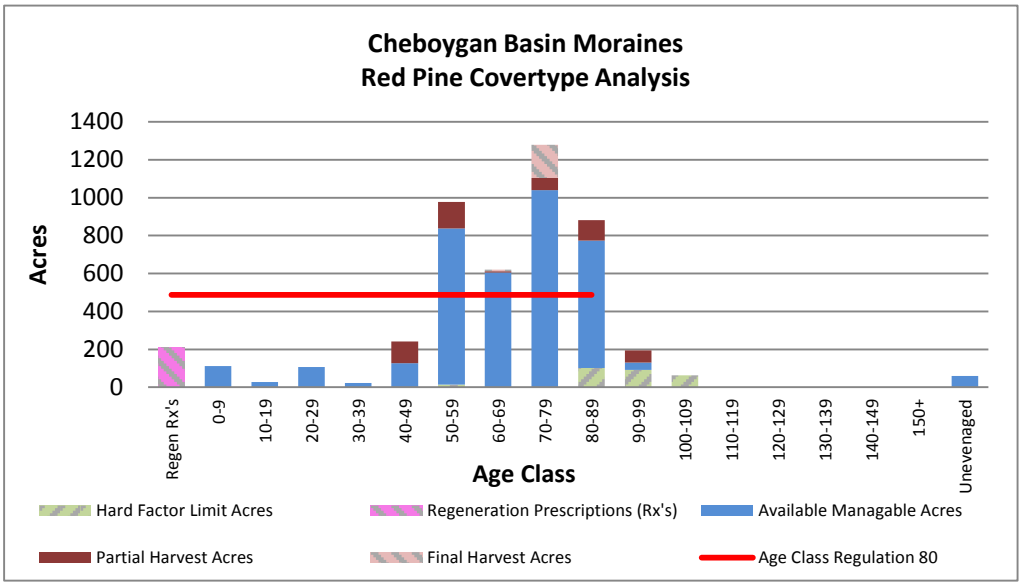

Figure 4.6.3. Age-class distribution for red pine in the Cheboygan Basin Moraines management area (2012 Department of Natural Resources inventory data).

There are approximately 208 acres that have a regeneration harvest pending and these acres are shown in the regeneration prescription class (Figure 4.6.3). There are another 494 acres of red pine with a partial harvest pending and these acres are shown in their current age classes.

Desired Future Condition

- Red pine on dry-mesic sites will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0 and 89 years of age to provide for continual harvest, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age-class distribution;
- Conduct partial harvests on a projected 1,427 acres;
- Conduct final harvests on a projected 1,310 acres; and
- Much of the red pine is concentrated in the Black Mountain Recreation Area where proximity to the many trails in the area may limit management options.

Long-Term Management Objectives

- In identified special conservation areas, consider management of red pine to a biological rotation of 200+ years; and
- Desired future harvest levels are projected at 487 acres of final harvest and 2,216 acres of partial harvest per 10-year period.

4.6.1.3 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwoods acres total 2,816 acres or 7% of the management area (Table 4.6.1). Forest communities dominated by northern hardwoods, primarily northern hardwoods, in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation. Currently there are 23 acres with a regeneration harvest pending and 313 with a partial harvest pending and these acres are included basal area range (Figure 4.6.4).

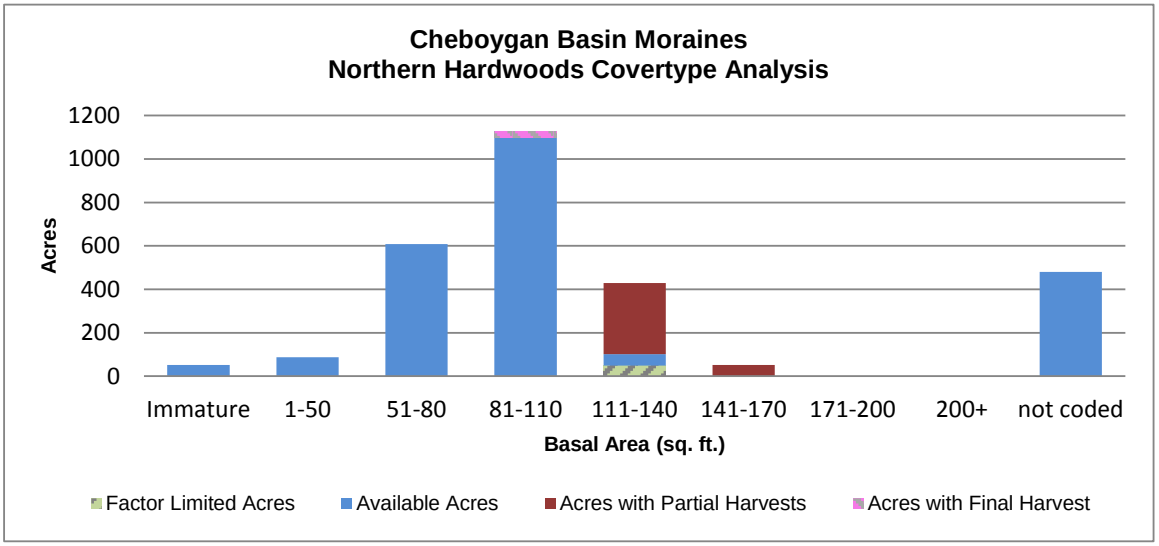

Figure 4.6.4. Basal area distribution for northern hardwoods in the Cheboygan Basin Moraines management area (2012 Department of Natural Resources inventory data).

Data show that 50 acres are unavailable for harvest due to access or some other issue that limits the ability to harvest.

Desired Future Condition

- Northern hardwood-dominated forest communities will be maintained on operable sites through selective harvesting to achieve an all-aged stand structure to provide for a continuous supply of timber products, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct partial harvests on a projected 1,311 acres of northern hardwood concentrating on those areas with a basal area above 110 square feet per acre.

Long-Term Management Objectives

- Emerald ash borer and beech bark disease will change the stand composition of the northern hardwoods in this management area. As these species lessen in the northern hardwood stands, consider introducing oak for mast;
- Continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer, in northern hardwood stands, using Beech Bark Disease Management Guidelines and Emerald Ash Borer Guidelines; and
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands.

4.6.1.4 Forest Cover Type Management – Cedar and Lowland Conifer

Cedar (Figure 4.6.5) acres total 1,738 or 4% of the management area (Table 4.6.1) and lowland conifers (Figure 4.6.6) acres total 2,372 or 6% of the management area (Table 4.6.1) constituting a significant portion of the management area. However, all 1,738 acres of cedar and 1,898 acres of lowland conifers are factor limited due to access and operability issues. These lowland species may offer only limited opportunities for management.

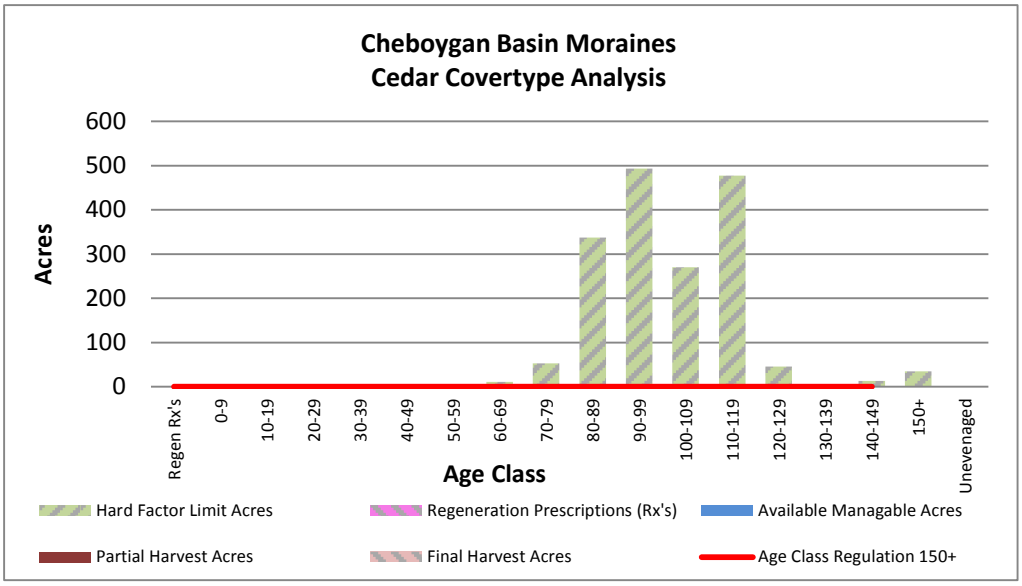

Figure 4.6.5. Age-class distribution for cedar in the Cheboygan Basin Moraines management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape and wildlife habitat while providing forest products.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 53 acres of lowland conifers;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years of entry; and
- Consider methods to ensure adequate regeneration of cedar and lowland conifer.

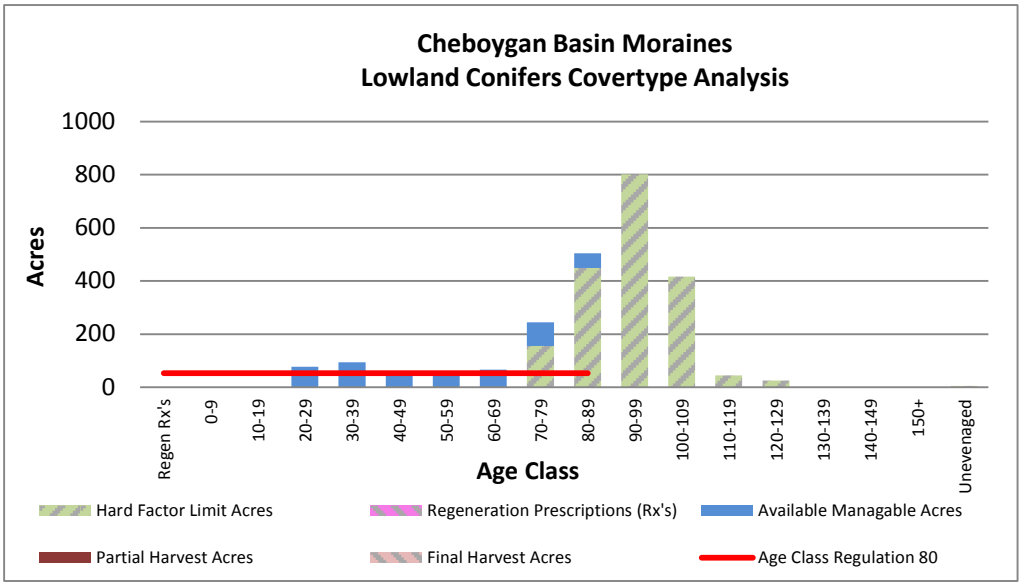

Figure 4.6.6. Age-class distribution for lowland conifers in the Cheboygan Basin Moraines management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- The desired future harvest level of 53 acres for final harvest of lowland conifer is projected per 10-year period.

4.6.1.5 Forest Cover Type Management – Oak

Current Condition

Oak acres total 1,915 acres or 5% of the management area (Table 4.6.1). Oak occurs on glacial outwash plains, sandy beach ridges and coarse textured moraines (habitat classes: PArVHa and ParVHa/PArVVb (see Appendix E)).

The age-class distribution of oak (Figure 4.6.5) is heavily skewed toward the older age classes above 70 and there has been very little regeneration in the last 60 years. Forest communities dominated by oak in this management area, are valued ecologically as sources of habitat for numerous species of wildlife including white-tailed deer, commercially for pulp and saw logs and for a wide range of forest recreation. There are 878 acres of oak have met harvest criteria, but have site conditions that limit harvest.

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management to provide for timber products, wildlife habitat and recreational opportunities.

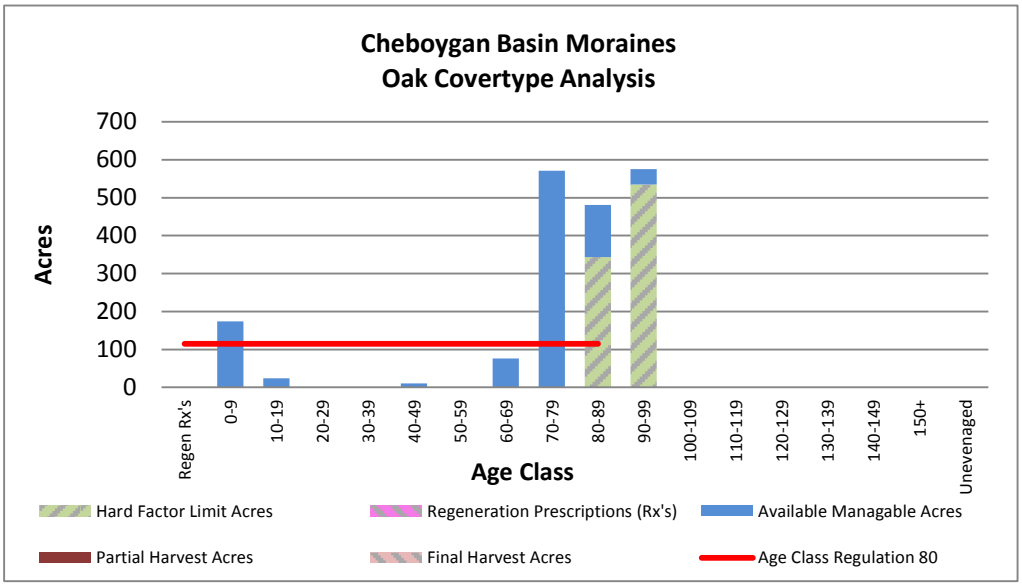

Figure 4.6.7. Age-class distribution for oak in the Cheboygan Basin Moraines management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct partial harvests on a projected 289 acres;
- Conduct final harvests on a projected 191 acres; and
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types.

Long-Term Management Objectives

- Continue work towards maintaining oak as the predominant species in selected stands through final harvests;
- It is acceptable that some oak stands may become mixed stands through partial removal of an oak over story, planting pine in oak stands or through natural regeneration of other species;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area; and
- Desired future harvest levels are projected at 115 acres for final harvest and 296 acres for partial harvest per 10-year period.

4.6.1.6 Forest Cover Type Management – Lowland Aspen/Balsam Poplar

Current Condition

Lowland aspen/balsam poplar acres (Figure 4.6.6) (primarily a mix of balsam poplar, swamp aspen and swamp white birch) total 4,603 acres or 12% of the management area (Table 4.2.1).

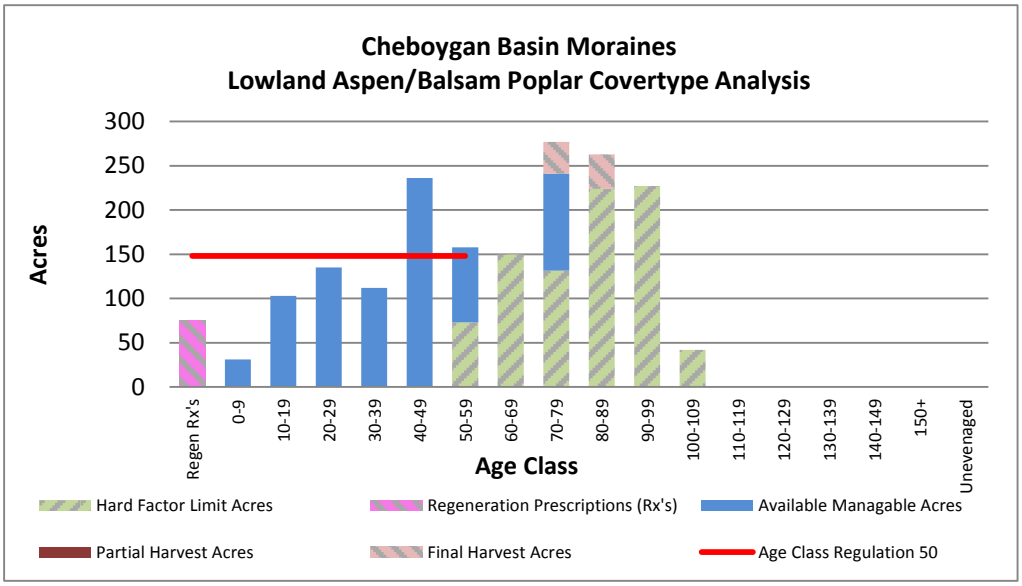

Figure 4.6.8. Age-class distribution for lowland aspen/balsam poplar in the Cheboygan Basin Moraines management area (2012 Department of Natural Resources inventory data).

Lowland aspen/balsam poplar is distributed throughout the management area on areas with a perched water table or seasonally flooded and unclassified lowlands (habitat class: PArVCo). Forest cover types dominated primarily by lowland aspen/balsam poplar in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds and commercially for pulp. There are 848 acres of lowland poplar that have met harvest criteria, but have site conditions that limit harvest. Currently, 75 acres of stands have a final harvest pending and these acres are included in the regeneration prescriptions (Rx's) class.

Management may be severely constrained by access issues due to the wet nature of the management area and/or stands that may be too wet for operations. However, young-dense stands of lowland aspen/balsam poplar are an important habitat for species such as ruffed grouse and snowshoe hare.

Desired Future Condition

- Lowland aspen/balsam poplar-dominated forest cover types will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for a sustainable harvest, wildlife habitat and to contribute to the preservation of regional biodiversity.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 141 acres of lowland aspen/balsam poplar that is age 50 and greater, if it can be done in a manner that will not adversely impact wetland soils; and
- If necessary and feasible, consider habitat cuts in inaccessible or inoperable sites to improve early successional habitat.

Long-Term Management Objectives

- It is acceptable that the older factor-limited lowland poplar, much of it inaccessible for management, will continue to experience natural processes (windthrow, flooding and senescence) resulting in other species encroaching into the understory;
- Consider adaptations to management as a result of emerald ash borer impacts on black ash;
- Continue management on operable sites to provide forest products, wildlife habitat and biodiversity values; and
- Desired future harvest levels are projected at 141 acres of final harvest per 10-year period.

4.6.1.7 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog, bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 2,464 acres or 6% of the management area (Table 4.6.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.6.1.8 Forest Cover Type Management – Upland Open/Semi- Open Lands

Current Condition

Upland open/semi-open acres total 2,579 acres, or 6% of the management area. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub and bare/sparsely vegetated and low density trees. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal foo-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.6.1.9 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: Lowland conifer, 2,372 acres (6% of the management area) and cedar, 1,738 acres (4%) and are a significant portion of the other types and may offer limited opportunities for management. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape in addition to providing wood products, wildlife habitat, and recreational opportunities.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry;
- Consider methods to ensure regeneration of lowland types; and
- Other species which make up a small percentage of the management area contribute to the balance of the projected 363 final harvest acres and 280 partial harvest acres.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- Desired future harvest levels are for lowland deciduous (40 acres) and lowland conifer (53 acres) is projected to remain steady per 10-year period.

4.6.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

This management area includes a northern Lower Peninsula Grouse Enhanced Management System area. The boundary will be delineated during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager. Aspen stands that fall within the Grouse Enhanced Management System area boundary may be managed on a shortened rotation with multiple age classes and smaller stand sizes to enhance hunting opportunities for ruffed grouse, woodcock, deer, turkey and hare. The remainder of the management area (outside the boundary) will be managed based on the direction in the management area write up.

The following have been identified as featured species for this management area during this cycle of state forest planning:

- Elk
- Pileated woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Cheboygan Basin Moraines management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest, extensive mature forest and large open grassland complexes, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

Elk

The goal for elk in the northern Lower Peninsula is to maintain the population at 500-900 animals as measured in the biennial aerial survey. Elk prefer open areas and regenerating deciduous forest. Mast crops, especially acorns, are important sources of food in fall and winter. State forest management should focus on maintaining/increasing early successional, opening and hard mast habitat components at/to desired levels in priority landscapes.

Wildlife Habitat Specifications:

The goals of habitat management in the elk range are described in the 2007 Pigeon River Country Concept of Management:

- Maintain 7-8% of the forest cover types managed by even aged management in the 0-9 year-old age class;
- Maintain the existing aspen component;
- Increase the amount of opening and upland brush to 6-7 percent of the range; and
- Maintain the existing component of mast producing trees (red oak, white oak, northern pin oak and beech).

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees >12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
    - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-shouldered Hawk

The goal for red-shouldered hawk in the northern Lower Peninsula is to maintain available habitat. Red-shouldered hawks nest in contiguous, mature, closed canopy, hardwood forests. Nesting habitat consists primarily of well-stocked pole or sawtimber stands (stocking densities 6 and 9) with a closed canopy (80-100%) and basal area of at least 98 square feet per acre. Nests are usually found in deciduous trees with a mean 23 inches in diameter at breast height. State forest management activities should focus on the maintenance of large blocks (>385 acres) of mesic northern forest with the appropriate level of large diameter trees in priority landscapes.

Wildlife Habitat Specifications:

- All suspected red-shouldered hawk nests are to be reported to local wildlife staff and confirmed nests documented in accordance with the DNR *Approach to the Protection of Rare Species on State Forest Lands* (CI 4172) and included in Integrated Forest Monitoring, Assessment and Prescriptions Geographic Decision Support System when there is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan *DNR's Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands (*August 2012) will be followed.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old) even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age-classes allows for different life history requirements to be met within a small area, and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered

harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.
- Manage the aspen cover type for smaller patch size, a shorter rotation and a more deliberate habitat configuration within the designated Grouse Enhanced Management Systems areas where appropriate.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.)
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.

- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.6.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed six listed species and no natural communities of note occurring in the management area as listed in Table 4.6.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

Table 4.6.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Cheboygan Basin Moraines management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Reptile								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Plants								
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

There are no high conservation value areas or ecological reference areas identified for the Cheboygan Basin Moraines management area as illustrated in Figure 4.6.7.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

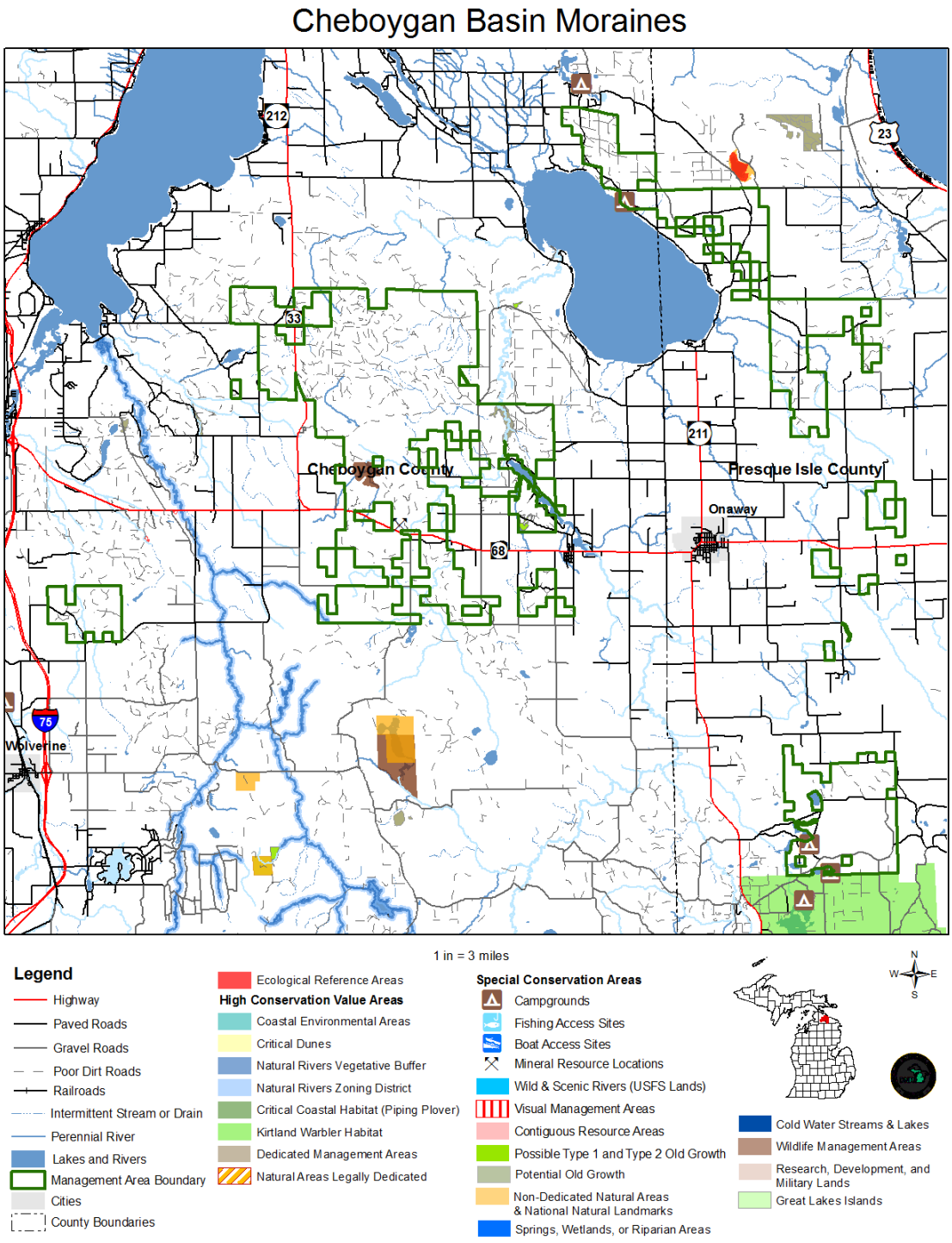

Figure 4.6.7. A map of the Cheboygan Basin Moraines management area showing the special resource areas.

4.6.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include oak decline, emerald ash borer and beech bark disease and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce the risk of decline;
- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important;
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow; and
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.6.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.6.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Cheboygan Basin Moraines - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	3	3	3

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Reed Canary Grass *Phalaris arundinacea*	1
-	-	Spotted Knapweed *Centaurea stoebe*	1

4.6.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.6.1 and listed in Appendix F.

4.6.6 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types. The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money

frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be considered in the management area:

- When feasible, seek opportunities to use fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- When feasible, seek opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.6.7 Public Access and Recreation

Access for management and/or recreation is generally limited throughout much of this management area due to wet sites and limited access from adjacent landowners. The department will continue to seek access across adjacent private property. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Specific hunting recreation improvements such as parking lots, gates, trail planting and trail establishment, as well as the preparation and dissemination of specific promotional material, may be made as a result of Grouse Enhanced Management Systems areas planning in this management area.

Opportunities for recreation on state forest lands are abundant in the management area. The Shore-to-Shore horse trail provides opportunities for horseback riding and the Bummer's Roost and Black Lake trails serve off-road vehicle riders. The Shoepac Sinkholes Pathway and Northeast State Trail give hikers a chance explore on foot, while the Tomahawk to Red Bridge Michigan Coast-to-Coast to Cycle Trail provides opportunities for motorcycle riders and the Black Mountain-Silver Creek Snowmobile Trail serves winter enthusiasts. The trails are shown in Figure 4.6.1. State forest campgrounds (Figure 4.6.3) include Black Lake, Shoepac Lake and Tomahawk Lake and there are boating access sites at Black Lake, Shoepac Lake and Little Tomahawk Lake.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single-track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42, and the Department of Natural Resources Within Stand Retention Guidance.

4.6.8 Oil, Gas and Mineral Development

Surface sediments consist of coarse-textured till, ice-contact outwash sand and gravel, lacustrine (lake) sand and gravel and dune sand. The glacial drift thickness varies between 0 and 600 feet. Sand and gravel pits are located in this management area and there is good potential for additional gravel pits.

The Devonian Antrim Shale, Traverse Group, Bell Shale, Dundee Limestone and Detroit River Group subcrop below the glacial drift. Many of the bedrock formations have limestone/dolomite potential, especially in areas of thin glacial till.

In oil and gas production, the Guelph (former Niagaran) reef play, is located in the Presque Isle County part of the management area. The Collingwood Formation may have oil and gas potential in this area and most of the management area is currently leased. If drilling is sucessful for the Collingwood Formation, additional leasing and drilling in the management area could occur.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.7 MA 7 – Chandler Hills Management Area

Summary of Use and Management

Management in the Chandler Hills management area (MA) will emphasize the selective management of the northern hardwood resource, balancing the age class of aspen and starting the conversion of red pine to hardwood where suited. Management will strive to sustainably produce various forest products, enhance game and non-game wildlife habitat, protect areas of unique character and provide for forest-based recreational uses. Management activities may be constrained by poor access on the steep slopes and areas of seeps and springs. Expected trends within this 10-year planning period are increased recreational pressure; introduced pests and diseases, especially beech bark disease and emerald ash borer (beech and ash are significant species in northern hardwood stands); and the conversion of red pine stands currently located on hardwoods sites to northern hardwoods.

Introduction

This management area is located in the high plains of southern Cheboygan County and eastern Charlevoix counties in northern Lower Peninsula and contains 67,110 acres of state forest (Figure 4.1). The primary attributes which identify the Chandler Hills management area include:

- The management area falls mostly within Albert's Vanderbilt Moraines sub-region (Albert, 1995). State forest ownership does include several outlying parcels and ownership connectivity within the main block is impacted by numerous private in holdings.
- Prior to European settlement, the uplands in this landscape were predominantly northern mesic forest dominated by sugar maple and hemlock. Much of the hemlock was removed for tannins in the bark around the turn of the 20th century. The current cover types are dominated by northern hardwoods species including beech, sugar maple, hemlock, basswood, ironwood and yellow birch. Red pine, a minor component circa-1800, was planted on cleared hardwood sites. Aspen occurs on 14% of the management area.
- The Department of Natural Resources hardwood nursery was located in this management area, now not in use.
- The dominant landforms consist of sandy, well-drained moraine ridges surrounded by poorly drained outwash channels and plains.
- Due to the proximity of this management area to the communities of Petoskey, Wolverine, Vanderbilt and Boyne Falls, the forest resources contribute social and economic values to the area. Off-road vehicle or snowmobile trails are located on all but one of the state forest compartments in this management area. The Annual National Morel Mushroom Festival in Boyne City draws hundreds of people, many of whom participate in mushroom hunts in the area.
- Snowmobile and hiking trails cross the area, including a portion of the North Country Trail.
- Surveys have located the several threatened, endangered or special concern species including red-shouldered hawk, loon, osprey, grasshopper sparrow, northern goshawk and limestone oak fern. Communities of special concern include mesic northern forest, emergent marsh and rich conifer swamp.
- The topography of this management area is some of the steepest in Lower Michigan where elevation can change more than 200 feet over distances of less than a mile.

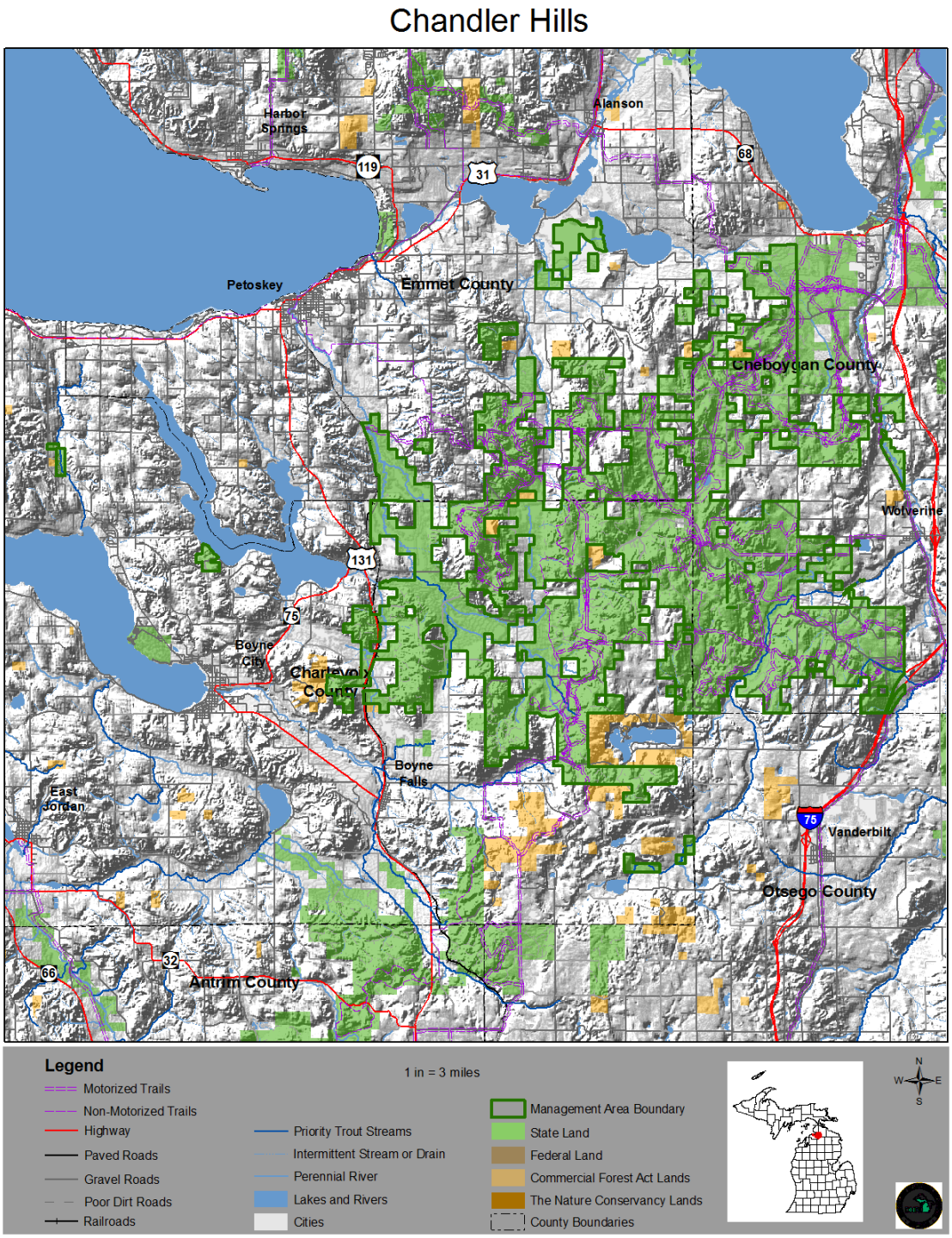

Figure 4.7.1. A map of the Chandler Hills management area (dark green boundary) in relation to surrounding state forest and other lands in Charlevoix, Cheboygan, Emmet and Otsego counties, Michigan.

Table 4.7.1. Current cover types, acreages, projected harvests and projected acreages at the end of the ten-year planning period for the Chandler Hills management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Net Change (Acres)	Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest			Final Harvest	Partial Harvest
Northern Hardwood	57%	38,226	2,030	36,196		3,692	600	38,826		16,527
Aspen	14%	9,347	671	8676	774			9,347	1,240	
Red Pine	7%	4,529	138	4391	1,800	1,393	-1200	3,329	355	2,220
Cedar	6%	3,861	3,861		0			3,861	1	
Lowland Conifers	4%	2,615	2,092	523	58			2,615	58	
Lowland Deciduous	2%	1,361	953	408	45			1,361	45	
Upland Mixed Forest	0%	70		70	252		600	670	74	21
Upland Open/Semi-Open Lands	5%	3,161		3161				3,161		
Lowland Open/Semi-Open Lands	2%	1,117		1117				1,117		
Misc Other (Water, Local, Urban)	1%	350	0	350				350		
Others	4%	2,473	769	1704	423	429		2,473	214	454
Total		67,110	10,514	56,596	3,352	5,514		67,110	1,987	19,222

4.7.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.7.1.1 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres (Figure 4.7.2) total 38,226 or 57% of the management area (Table 4.7.1). Northern hardwoods may vary significantly in quality and are found throughout the management area on coarse textured end moraines, ground moraines, outwash plains, till plains and undifferentiated end moraine-ground moraine complexes and drumlins (habitat classes: AFO and AFOCa (see Appendix E)). Forest communities dominated by northern hardwoods in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, marten and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation.

Many of the stands have portions that are located on steep slopes or have seeps that limit treatment options. During the past ten years, 8,500 acres were treated in the management area. The inventory shows 2,030 acres factor-limited as unavailable for harvest due to either inaccessibility or classified as potential old growth (hard factor limited). Extensive salvage harvests are currently being conducted in stands with a high basal area of ash and American beech species due to the presence of the emerald ash borer and beech bark disease in the management area. There are 3,088 acres of stands that have a partial harvest pending and these acres are included in the same basal area range.

Desired Future Condition

- Northern hardwoods-dominated forest communities will be maintained on operable sites through small patch clearcuts on poorer sites and selective harvesting on better sites to provide for a continuous supply of timber products, wildlife habitat and recreation opportunity.

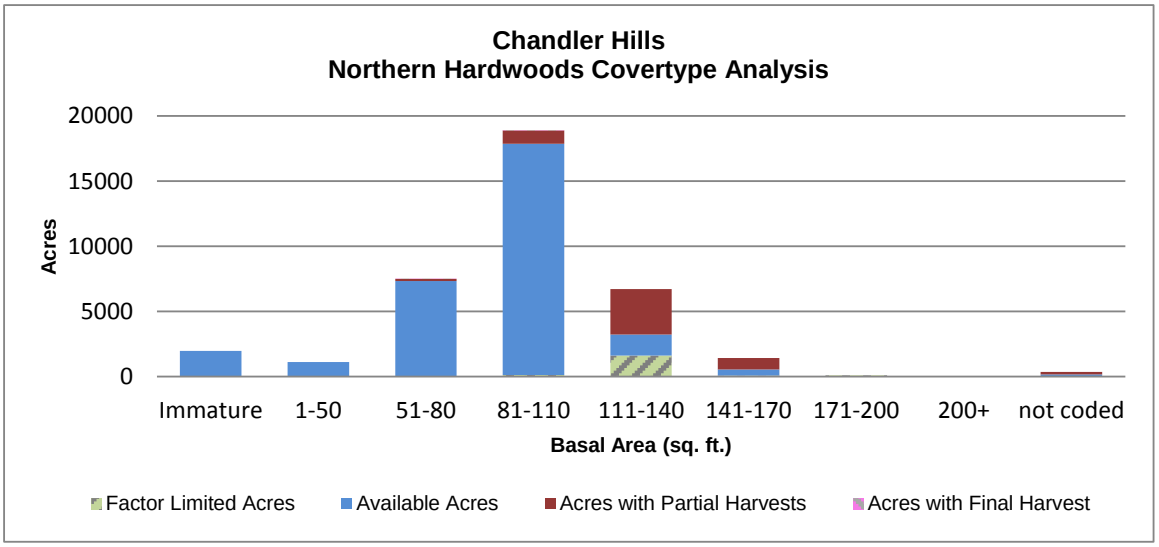

Figure 4.7.2. Basal area distribution for northern hardwood in the Chandler Hills management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct partial harvests on a projected 3,692 acres of northern hardwood characterized as a having a basal area of 111 square feet per acre or greater; and
- This will primarily be for stands without a significant amount of ash or beech which is currently targeted for salvage harvest due to emerald ash borer and beech bark disease.

Long-Term Management Objectives

- Emerald ash borer and beech bark disease will change the stand composition of the northern hardwoods in this management area. As these species lessen in the upland hardwood stands, consider introducing oak for mast in stands without oak;
- Continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer, in northern hardwood stands, using Beech Bark Disease Management Guidelines and Emerald Ash Borer Guidelines; and
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands.

4.7.1.2 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 9,347 acres or 14% of the management area (Figure 4.7.1). Aspen is located throughout the management area on habitat classes: AFO and AFOCa. Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. Aspen occurs throughout the area. Most of the aspen in this management area is younger than the 60-year rotation age as accessible aspen has been consistently harvested over the last 40 years. There are 671 acres of aspen (Figure 4.7.3) have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres).

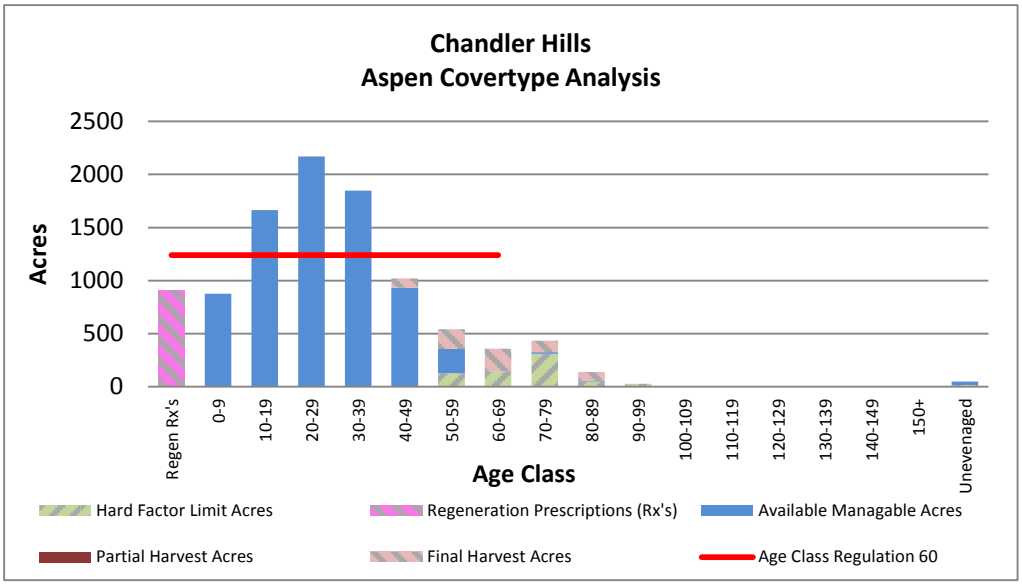

Figure 4.7.3. Age-class distribution for aspen in the Chandler Hills management area (2012 Department of Natural Resources inventory data).

There are 903 acres of stands that have a regenerating harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 69 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 774 acres by concentrating on the oldest age classes; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue to work towards balancing age-classes to provide a continual harvest, wildlife habitat and recreational opportunities; and
- Desired future harvest levels are projected at 1,240 acres for final harvest per 10-year period.

4.7.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine communities occur on approximately 4,529 acres (7%) of the management area, with most being 70-79 and 40-59 years old.

Red pine is located throughout the management area on coarse textured end moraines, ground moraines, outwash plains, till plains and undifferentiated end moraine-ground moraine complexes and drumlins (habitat classes: AFO and AFOCa).

Red pine plantations in this management area are commercially valued for pulp, saw logs and utility poles. Nearly all of the pine is of planted origin. There are 138 acres of red pine that have met harvest criteria, but have site conditions that limit harvest. There are 467 acres with a partial harvest pending are included in their current age classes (Figure 4.7.4).

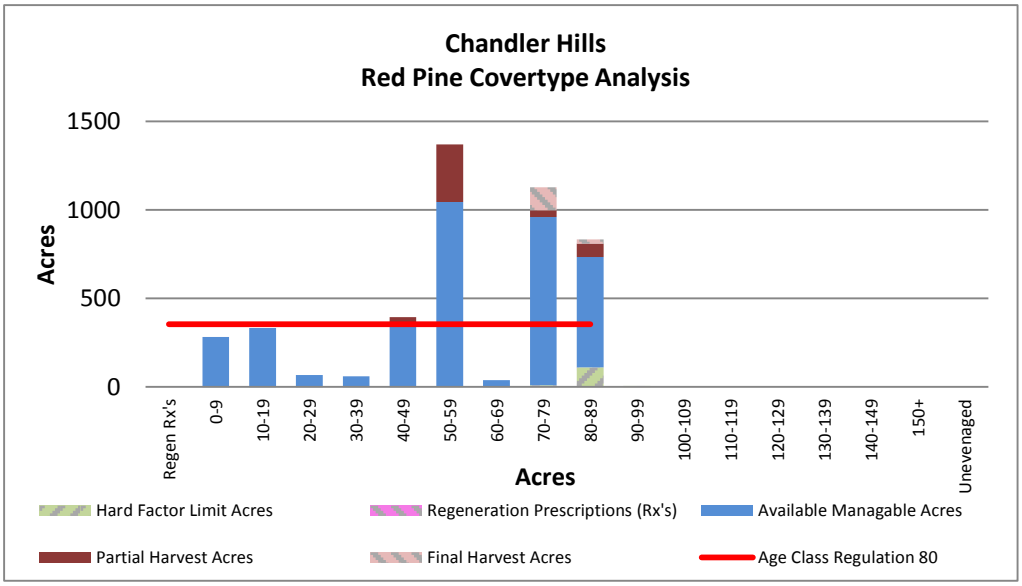

Figure 4.7.4. Age-class distribution for red pine in the Chandler Hills management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Red pine will be on sites most suitable for red pine (habitat classes PArVVb and AFO) and may be mixed with other species to provide a continuous flow of timber products, wildlife habitat and opportunities for recreation. Red pine harvested from sites more suitable for northern hardwoods (habitat class AFOCa and some AFO sites) will be allowed to regenerate as upland mixed forest or northern hardwoods (Table 4.7.1).

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distribution;
- Conduct final harvests on a projected 1,800 acres targeting stands above 70 years of age;
- Some of the harvested sites (habitat class: PArVVB, AFO) will be converted to a pine/oak mix while allowing other species to regenerate to provide for timber products along with a diverse wildlife habitat;
- Some of the harvested sites more suitable for northern hardwoods (habitat class: AFOCa and some AFO) will be regenerated to upland mixed forest/northern hardwood stands;
- Some red pine sites will be replanted to red pine where understory hardwood is sparse or lacking; and
- Conduct partial harvests on a projected 1,393 acres.

Long-Term Management Objectives

- In identified special conservation areas, consider management of red pine to a biological rotation of 200+years;
- Continue work toward a sustainable balanced age-class distribution of red pine through final regeneration harvests above 80 years of age and thinning red pine in the younger age classes; and
- Desired future harvest levels are projected at 355 acres for final harvest and 2,220 for partial harvest per 10-year period.

4.7.1.4 Forest Cover Type Management – Cedar

Current Condition

Cedar (Figure 4.7.5) occurs on approximately 3,861 acres (6%) of the management area and is primarily located on unclassified lowlands (lowlands have not been assessed for habitat classification) throughout the management area. All 3,861 acres of cedar are hard factor limited and cedar may offer only limited opportunities for management.

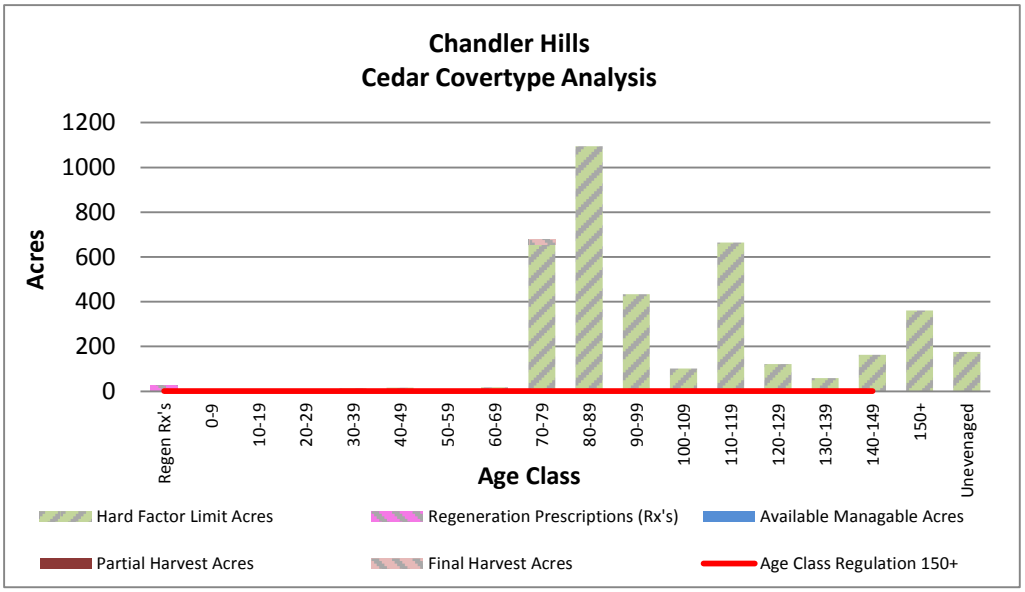

Figure 4.7.5. Age-class distribution for cedar in the Chandler Hills management area (2012 Department of Natural Resources inventory data).

Forest cover types dominated primarily by cedar in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, hare and various song birds, and commercially for pulp.

The age-class distribution is heavily skewed toward the older age classes (70 and above) and there has been virtually no regeneration.

Desired Future Condition

- Cedar will contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species. By storing high levels of sequestered carbon and serving as carbon sinks, cedar swamps will play an important role in global geochemical cycles.

10-Year Management Objectives

- Opportunities to increase harvest prescriptions in cedar and other lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years of entry.

Long-Term Management Objectives

- Over the next several decades, the older lowland conifer and cedar stands, much of it inaccessible for harvest, will continue to experience natural processes (fire, windthrow, insect defoliation and beaver flooding) resulting in the formation of a range of successional stages.

4.7.1.5 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 1,117 acres or 2% of the management area (Table 4.7.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to ensure an adequate level of wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use;
- Where feasible and necessary, use control methods on invasive non-native species.

4.71.6 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open lands acres total 3,161 acres or 5% of the management area (Table 4.7.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, consider using control methods on invasive non-native species.

4.7.1.7 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: lowland conifers, 2,615 acres (4% of the management area), lowland deciduous, 1,361 acres (2%), lowland aspen/balsam poplar, 627 acres (1%), oak, 614 acres (1%), white pine, 382 acres (1%), lowland mixed forest, 356 acres (1%), mixed upland deciduous, 132 acres (<1%), upland spruce/fir, 114 acres (<1%) and upland mixed forest, 70 acres (<1%). Other small-scattered species comprise the balance of the other types. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape in addition to providing wood products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct regeneration harvests on a projected 58 acres of lowland conifer and 45 acres of lowland deciduous;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years-of-entry;
- Consider methods to protect ensure regeneration of lowland types;

- Conduct final harvests on a projected 49 acres of lowland aspen/balsam poplar, 244 acres of oak, 86 acres of white pine, 44 acres of upland spruce/fir and 252 acres of upland mixed forest; and
- Conduct partial harvests on a projected 260 acres of oak and 161 acres of white pine.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- Desired future harvest levels for lowland conifer (58 acres) and lowland deciduous (45 acres) for final harvest per 10-year period are projected to remain steady.

4.7.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management are during this cycle of state forest planning:

- American marten
- Black bear
- Black-throated blue warbler
- Golden-winged warbler
- Pileated woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Wild turkey
- White-tailed deer
- Wood thrush.

The primary focus of wildlife habitat management in the Chandler Hills management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; extensive mature forest; large open grassland complexes and marsh/grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast, understory shrub and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Marten

The goal for American marten in the northern Lower Peninsula is to increase available habitat. American marten needs mature mixed forest stands or old conifer-dominated stands, with dead and down material for maintaining a stable and sufficient supply of small mammals as prey. American marten are rarely found outside the forest canopy. This species depends upon live-tree dens, snags and coarse woody debris for loafing (resting) and denning sites. State forest management should address the maintenance and improvement of extensive and mature forest tracts, corridors, dead wood and conifer components in priority landscapes.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore large forested tracts and forested corridors.
- In even-aged management systems, within-stand retention should focus on large diameter (>15 inches in diameter at breast-height) trees, known cavity trees and/or mesic conifers to maintain/increase denning and loafing sites.
- Where possible, increase both standing-dead and downed-dead wood by:
  - Applying at least the minimum level of within-stand retention to all stands in management area.
  - Writing harvest specifications to leave slash at the stump or to minimize the removal of slash.
  - Limiting or prohibiting firewood permits at marten-occupied sites.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Black-throated Blue Warbler

The goal for black-throated blue warbler in the northern Lower Peninsula is to maintain available habitat. Black-throated blue warbler is an area-sensitive species (e.g., densities increase exponentially with increasing patch size) mainly occurring in mesic deciduous forest tracts >50 years in age and >250 acres in size, with a dense understory layer for nesting and foraging. State forest management for the species should focus on maintaining mature, large (>50 years old and >250 acres) mesic deciduous forest tracts with a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance

is positively related to the density of trees >12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-shouldered Hawk

The goal for red-shouldered hawk in the northern Lower Peninsula is to maintain available habitat. Red-shouldered hawks nest in contiguous, mature, closed canopy, hardwood forests. Nesting habitat consists primarily of well-stocked pole or sawtimber stands (stocking densities 6 and 9) with a closed canopy (80-100%) and basal area of at least 98 square feet per acre. Nests are usually found in deciduous trees with a mean 23 inches in diameter at breast height. State forest management activities should focus on the maintenance of large blocks (>385 acres) of mesic northern forest with the appropriate level of large diameter trees in priority landscapes.

Wildlife Habitat Specifications:

- All suspected red-shouldered hawk nests are to be reported to local wildlife staff and confirmed nests documented in accordance with the DNR *Approach to the Protection of Rare Species on State Forest Lands* (CI 4172) and included in Integrated Forest Monitoring, Assessment and Prescriptions Geographic Decision Support System when there is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan DNR's *Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands* (August 2012) will be followed.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area, and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest

management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.)
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Thrush

The goal for wood thrush in the northern Lower Peninsula is to maintain available habitat. Wood thrush occur primarily in upland, mesic deciduous and mixed forests with large trees, diverse tree communities, moderate undergrowth and a well-developed litter layer.

Wood thrush is highly susceptible to nest predation and brood parasitism, which increases with forest fragmentation. State forest management for the species should focus on maintaining large (>250 acres) forest tracts, minimizing edge and promoting a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

4.7.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed seven listed species as well as three natural communities of note occurring in the management area as listed in Table 4.7.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

There is one potential Type 2 old growth area at Walloon Lake. It is a 32-acre site representing the mesic northern forest natural community type as shown in Figure 4.7.6.

There are no high conservation value areas or ecological reference areas identified for the Chandler Hills MA as illustrated in Figure 4.7.6.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.7.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Chandler Hills management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Emergent marsh		S4/GU	Confirmed				Lowland open/semi-open	N/A
Mesic northern forest		S3/G4	Confirmed				Northern Hardwood	Late
Rich conifer swamp		S3/G4	Confirmed				Tamarack	Late
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Grasshopper sparrow	*Ammodramus savannarum*	SC/G5/S3S4	Confirmed	PS	Moderate	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Lakeplain wet prairie	Lowland open/semi-open	N/A
						Lakeplain wet-mesic prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Hillside prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Reptile								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Plants								Late
Limestone oak fern	*Gymnocarpium robertianum*	T/G5/S2	Confirmed			Rich conifer swamp	Tamarack	Late
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone lakeshore cliff	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

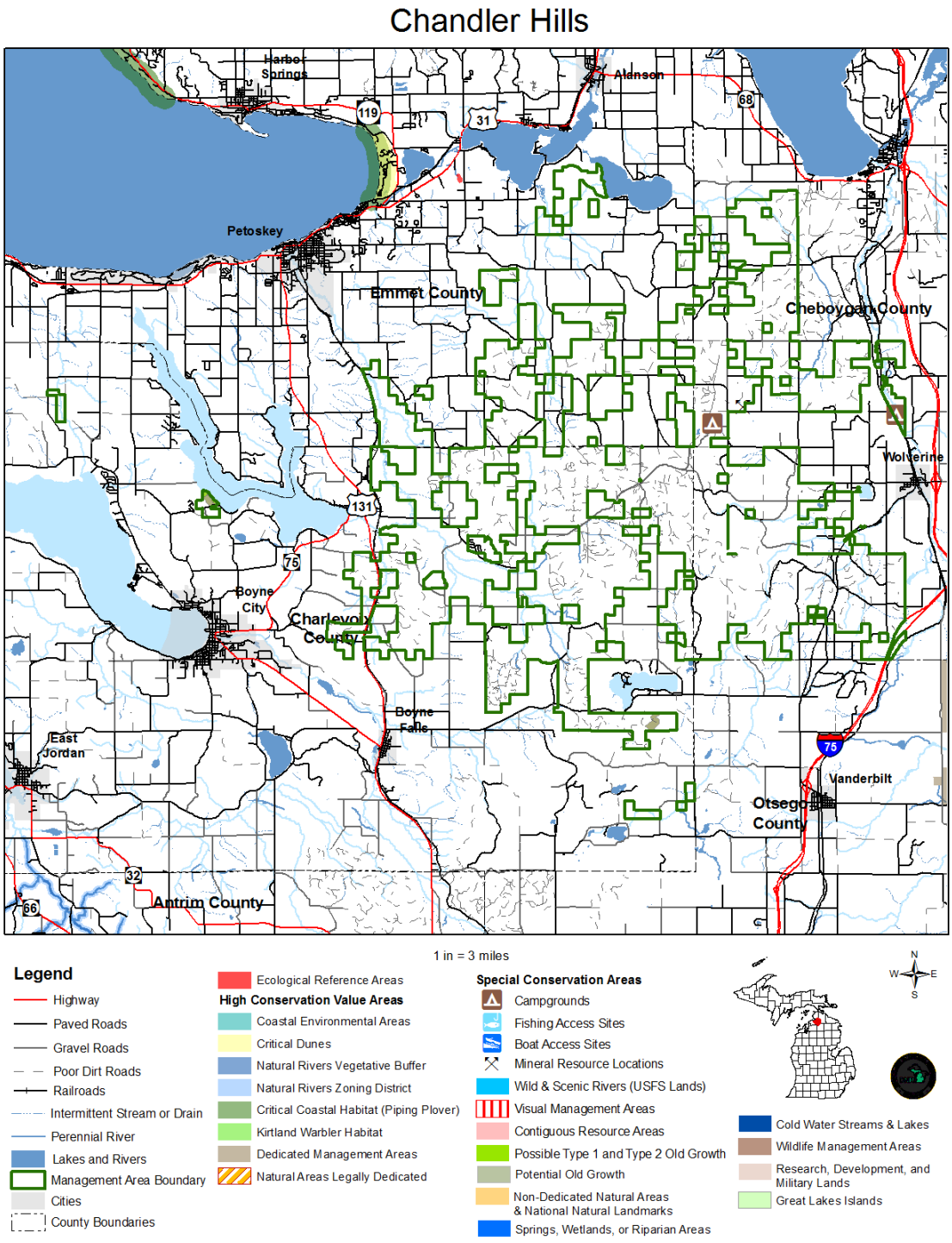

Figure 4.7.6. A map of the Chandler Hills management area showing the special resource areas.

4.7.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include emerald as borer, beech bark disease and oak decline and management should be adapted as follows:

Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important. Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow. Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.7.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information, and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.7.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Chandler Hills - FMD MAs	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	2	17	19	8

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
Tatarian Honeysuckle *Lonicera tatarica*	2	Black Swallow-worts *Vincetoxicum nigrum*	2
-	-	Garlic Mustard *Alliaria petiolata*	1
-	-	Japanese Knotweed *Fallopia japonica*	1
-	-	Phragmites (Common Reed) *Phragmites australis*	1
-	-	Purple Loosestrife *Lythrum salicaria*	2
-	-	Spotted Knapweed *Centaurea stoebe*	2
-	-	Tatarian Honeysuckle *Lonicera tatarica*	6
-	-	Wild Parsnip *Pastinaca sativa*	2

4.7.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.7.1 and listed in Appendix F.

4.7.6 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependant on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be considered in the management area:

- Where feasible, seek opportunities to use fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Where feasible, seek opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.7.7 Public Access and Recreation

Where access is limited on state forest land, the DNR will continue to seek access across adjacent private property. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts. There are two state forest campgrounds in or immediately adjacent to the management area as shown in Figure 4.7.6.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single-track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and Guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.7.8 Oil and Gas Development

Surface sediments consist of coarse-textured till, ice-contact outwash sand and gravel, an end moraine of coarse-textured till, lacustrine (lake) sand and gravel, glacial outwash sand and gravel and postglacial alluvium. The glacial drift thickness varies between 10 and 1,000 feet. Sand and gravel pits are located in this management area and there is good potential for additional gravel pits.

The Devonian Antrim Shale and Traverse Group subcrop below the glacial drift. The Traverse Formation has limestone/dolomite potential, especially in areas of thin glacial till.

Gas production from the Antrim Shale is located in the southern part of this management area. The Collingwood Formation may also have oil and gas potential in this area and most of the management area is currently leased. If drilling is sucessful for the Collingwood Formation, additional leasing and drilling in the management area could occur.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended, or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire, and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or reforested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.8 MA 8 – Pigeon River Country Management Area

Summary of Use and Management

The Pigeon River Country management area (MA) has been a "special management unit" since 1919 with a goal of protecting its wild character from overuse by restricting development and access. Management in the Pigeon River Country management area will be in accordance with the Concept of Management plan (updated 2007) which emphasizes the protection of natural features while providing for cover type management on suitable sites in order to enhance game and non-game wildlife habitat, sustainably produce various timber products, protect areas of unique character, and provide for forest-based recreational uses.

Expected trends within the next decade are increased recreational pressure, introduced pests and diseases, especially beech bark disease and emerald ash borer (beech and ash are significant species in northern hardwood stands). Pigeon River Country is the heart of Michigan's elk range.

Introduction

The Pigeon River Country management area, designated as a "special management unit" (now classified as a forest management unit) by the Department of Natural Resources early in the 20th century, has 105,695 acres of state forest land. The Pigeon River Country is centrally located between the communities of Gaylord, Indian River, Onaway and Atlanta. The primary attributes which identify the Pigeon River Country management area include:

- The Pigeon River Country management area straddles Albert's Onaway and Vanderbilt Moraines sub-regions (Albert, 1995).
- The Onaway sub-region landform features drumlin fields on course-textured ground moraines and the Vanderbilt Moraines landform features steep sandy ground moraine ridges.
- Pre-settlement and current vegetation of both sub-regions featured northern hardwoods with swamps between the morainal areas and conifers in the drier areas.
- The state forest land in the Pigeon River Country management area is very concentrated, with only 7,450 acres of private land in-holdings.
- The state forest land in the Pigeon River Country management area was acquired over time through Game and Fish Fund purchases, Michigan Natural Resources Trust Fund purchases, tax reversion, private and government exchanges and through various grants. Over 53,000 acres of the management area have been acquired through Pittman-Robertson Act related funds.
- A major oil and gas discovery in the Pigeon River Country was made in 1970 resulting in associated industrial activity that caused concern about undesirable changes to the area. Oil and gas development was eventually restricted to the southern third of the management area. The oil and gas development led to the creation of the Kammer Land Trust Fund (now the Michigan Natural Resources Trust Fund) where royalties from state-owned lands would be used to purchase new recreational lands for public use.
- Management is guided by the "concept of management" document which lists the primary objectives of the forest, most of which are related to wildlife management.
- The Pigeon River Country Forest Management Unit has an advisory council whose responsibilities include advising the DNR director on plans, programs, activities and proposed management conducted within or affecting the Pigeon River Country.
- Pigeon River Country is the heart of Michigan's elk population.
- Recreational developments are present including eight state forest campgrounds. Equestrian, cycling and hiking trails cross the area including a portion of the High Country Pathway.
- There are three nominated natural areas in this management area:
  - Dog Lake Special management area (680 acres) features dry-mesic northern forest and northern wet meadow communities;
  - Grindstone Creek (53 acres) features mesic northern forest community; and
  - Pigeon River Pines (220 acres) features dry-mesic northern forest, poor conifer swamp and rich conifer swamp communities.

- This management area contains one or more of the Northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse and elk. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.

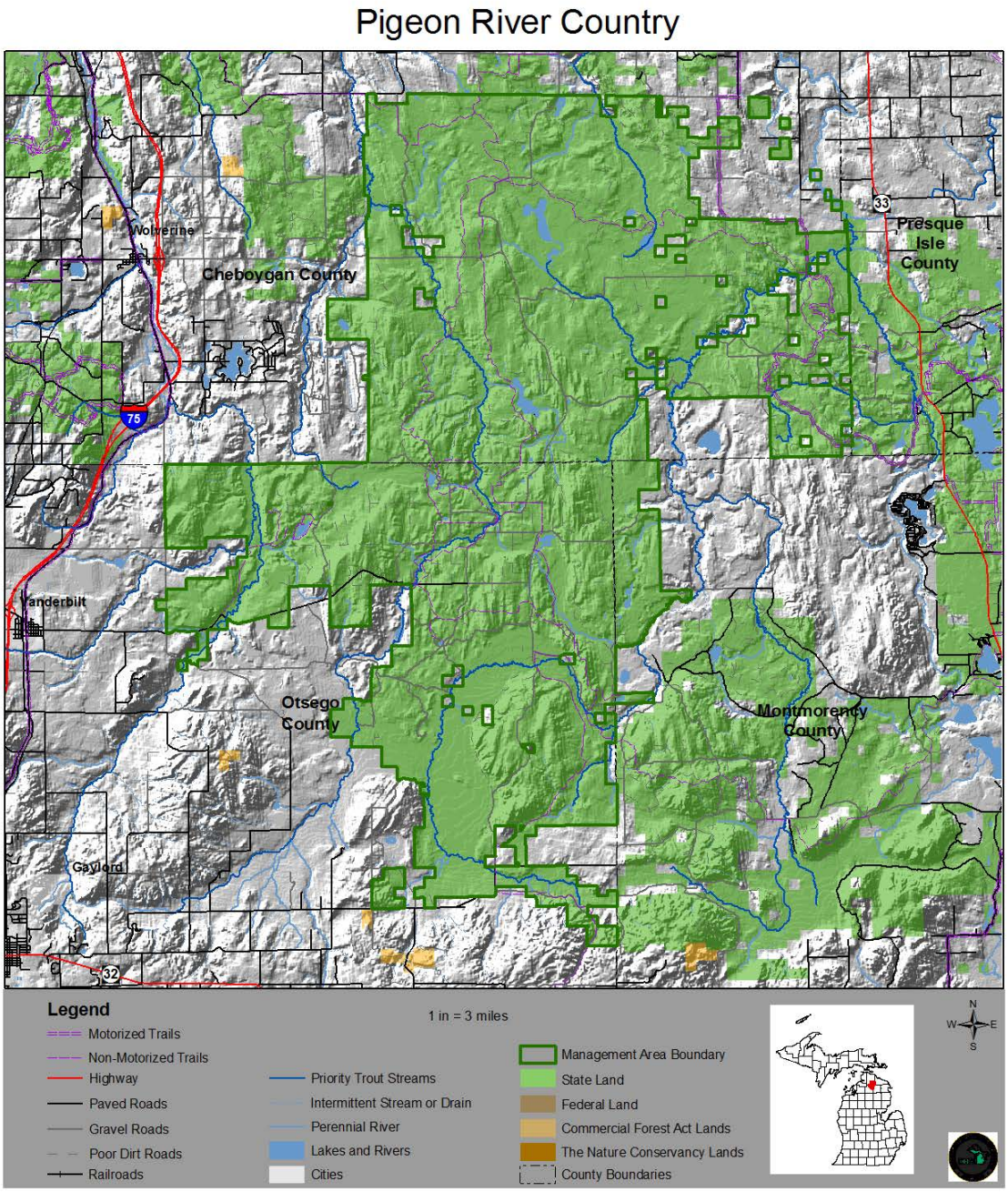

Figure 4.8.1. A map of the Pigeon River Country management area (dark green boundary) in relation to surrounding state forest and other lands in Otsego and Cheboygan counties, Michigan.

Table 4.8.1. Current cover types, acreages, projected harvests and projected acreages at the end of the ten-year planning period for the Pigeon River Country management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	27%	28,311	974	27,337	8,926		28,311	4,556	
Northern Hardwood	16%	17,092	1,187	15905		7,122	17,092		7,122
Red Pine	10%	10,545	2,130	8415	3,587		10,545	935	3,850
Lowland Conifers	10%	10,248	8,162	2086	647		10,248	232	
Cedar	6%	6,223	6,223				6,223		
White Pine	5%	4,878	424	4454	1,073	1,270	4,878	405	1,691
Jack Pine	4%	4,476	286	4190	600		4,476	599	
Oak	3%	3,507	708	2799	944	619	3,507	311	982
Lowland Deciduous	2%	2,012	1,419	593	224		2,012	66	
Upland Open/Semi-Open Lands	5%	5,632		5632			5,632		
Lowland Open/Semi-Open Lands	5%	5,486		5486			5,486		
Misc Other (Water, Local, Urban)	1%	1,146	3	1143			1,146		
Others	6%	6,139	2,004	4135	682	574	6,139	469	577
Total		105,695	23,519	82,176	16,684	9,585	105,695	7,573	14,222

4.8.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, they stands or communities are classified by the species which has the dominant canopy coverage.

4.8.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 28,311 or 27% of the management area (Table 4.8.1). Aspen is found throughout the MA on habitat types AFOCa, AFO, PArVVb and PArVHa (see Appendix E). Forest communities dominated primarily by aspen in this MA are valued ecologically as sources of habitat for numerous species of wildlife including elk, ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation. Aspen occurs throughout the area. Most of the aspen in this management area is younger than the 50-year rotation age (Figure 4.8.2) as accessible aspen has been consistently harvested over the last 50 years. There are 974 acres of aspen have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 2,430 acres that have a final harvest pending and these acres are included in the regeneration prescription class.

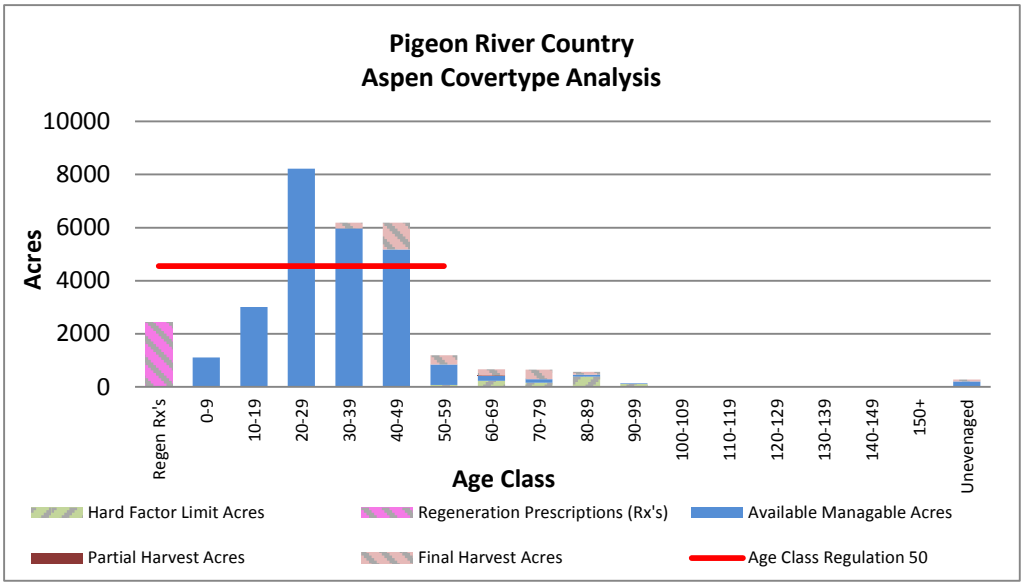

Figure 4.8.2. Age-class distribution for aspen in the Pigeon River Country management area (2012 Department of Natural Resousces inventory data).

Desired Future Condition

- Aspen-dominated forest communities will be maintained at or above the current level through even-aged management with acres balanced between 0 and 59 years of age to provide for wildlife habitat and recreational opportunity while providing forest products.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 8.926 acres; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.
- Aspen within the identified Grouse Enhanced Management Systems area may be managed differently than the rest of the aspen within the management area, with a shorter rotation age**,** small patch cuts and carefully considered stand adjacency.

Long-Term Management Objectives

- Future management decisions will need to consider that the trend towards fewer elk will lessen the impact on aspen regeneration; and
- Desired future harvest levels for final harvest are projected at 4,556 acres per 10-year period.

4.8.1.2 Forest Cover Type Management – Northern Hardwood

Current Condition

Northern hardwoods acres total 17,092 or 16% of the management area (Table 4.8.1). Northern hardwoods in this management area are valued ecologically as sources of habitat for numerous species of wildlife including elk, bear, white-tailed deer, marten and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation. Almost all stands are accessible for treatment. There are 1,187 acres of northern hardwood that have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 2,839 acres with a partial harvest pending and these acres are included in their current basal area range (Figure 4.8.3).

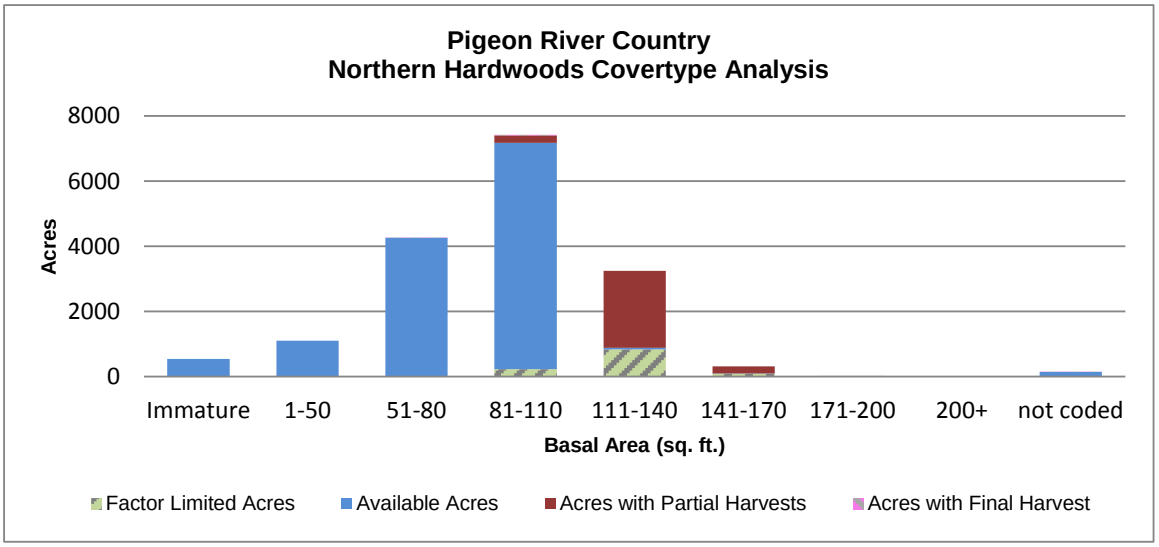

Figure 4.8.3. Basal area distribution for northern hardwood in the Pigeon River Country management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Northern hardwoods-dominated forest communities will be maintained through selective harvesting to achieve an uneven-aged stand structure to provide for a sustainable supply of timber products, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct partial harvests on a projected 7,122 acres of northern hardwood characterized as having a basal area of 111 square feet or greater; and
- Where necessary and feasible, consider harvesting stands with lower basal areas to expedite the balancing of basal area distributions.

Long-Term Management Objectives

- Continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer, in northern hardwood stands, using Beech Bark Disease Management Guidelines and Emerald Ash Borer Guidelines;
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands.; and
- As beech and ash species decline in the northern hardwood stands, consider introducing oak for mast in stands without oak.

4.8.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 10,545 or 10% of the management area (Table 4.8.1), with most being 70-89 years old. Red pine is found on AFO, PArVVb and PArVHa habitat class sites. Red pine in this management area is commercially valued for pulp, saw logs and utility poles. Approximately 70% of the pine is of Civilian Conservation Corps-era planted origin. There are 2,130 acres of red pine that have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 1,609 acres that have a partial harvest pending are included in the current age classes (Figure 4.8.4). Figure 4.8.4 includes the projected number of acres converted to red pine as a result of final harvests of another type and planting to red pine. These acres are included in the regeneration prescription class.

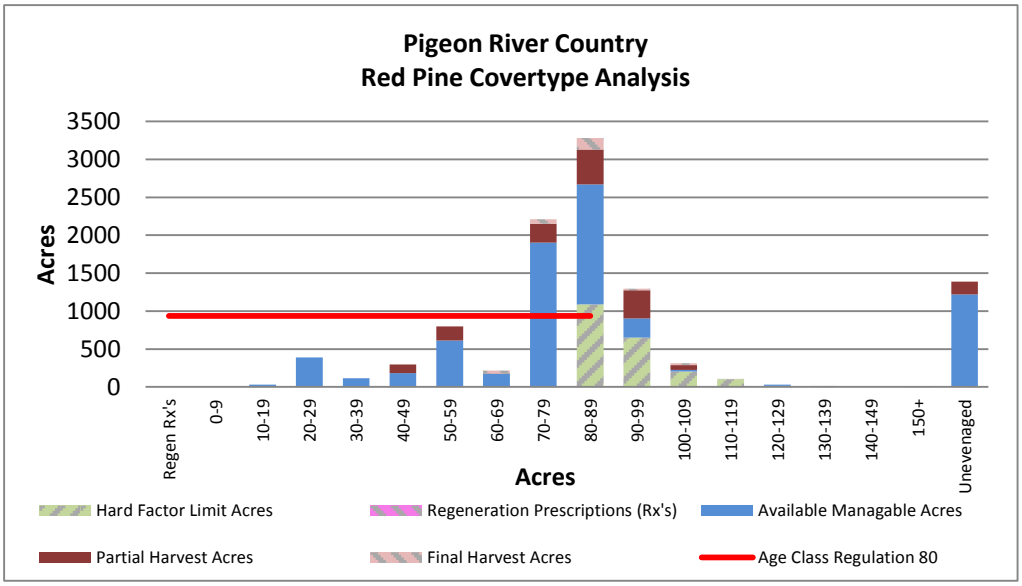

Figure 4.8.4. Age-class distribution for red pine in the Pigeon River Country management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Red pine stands between 0 and 89 years of age will be located on mesic sites lacking high-quality natural hardwood regeneration.; and
- Red pine on sites more suitable for northern hardwoods will be allowed to convert, with a residual component of red pine to provide vertical structure.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distribution;
- Conduct regeneration harvests on a projected 3,587 acres beginning with the oldest age-classes; and
- Consider whether to allow natural hardwood conversion on sites more suitable for hardwoods.

Long-Term Management Objectives

- Continue to conduct stand-replacement harvests as stands reach the silvicultural rotation (80 years) for natural regeneration on sites lacking high-quality natural hardwood regeneration;
- On sites being converted to hardwoods, consider leaving a scattering of a few pine trees per acre to provide a super-canopy of red pine and vertical structure for various wildlife species;
- Seek opportunities to manage red pine to a biological rotation of 200+ years; and
- Desired future harvest levels are projected at 935 acres of final harvest and 3,850 acres of partial harvest per 10-year period.

4.8.1.4 Forest Cover Type Management – Cedar and Lowland Conifers

Current Condition

Cedar acres total 6,223 or 6% of the management area and lowland conifer acres total 10,248 or 10% of the management area (Table 4.8.1). Cedar and lowland conifer are primarily located on unclassified lowlands (lowlands have not been assessed for habitat classification) throughout the management area. The age classes for both cover types (Figures 4.8.5 and 4.8.6) are heavily skewed toward the older age classes above 70 years of age and there has been virtually no regeneration.

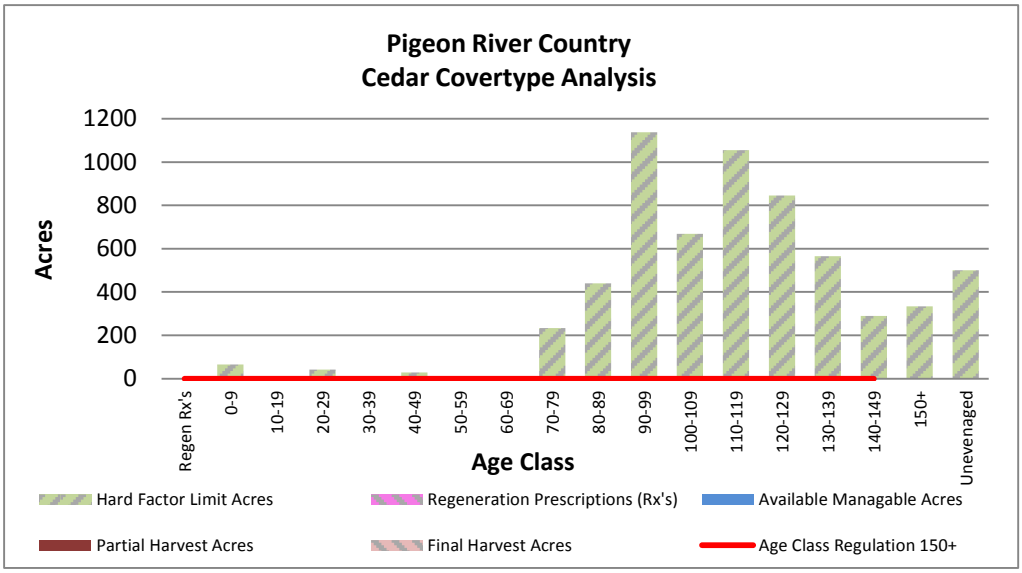

Figure 4.8.5. Age-class distribution for cedar in the Pigeon River Country management area (2012 Department of Natural Resources inventory data).

Forest cover types dominated primarily by cedar and lowland conifers in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, hare and various song birds and commercially for pulp.

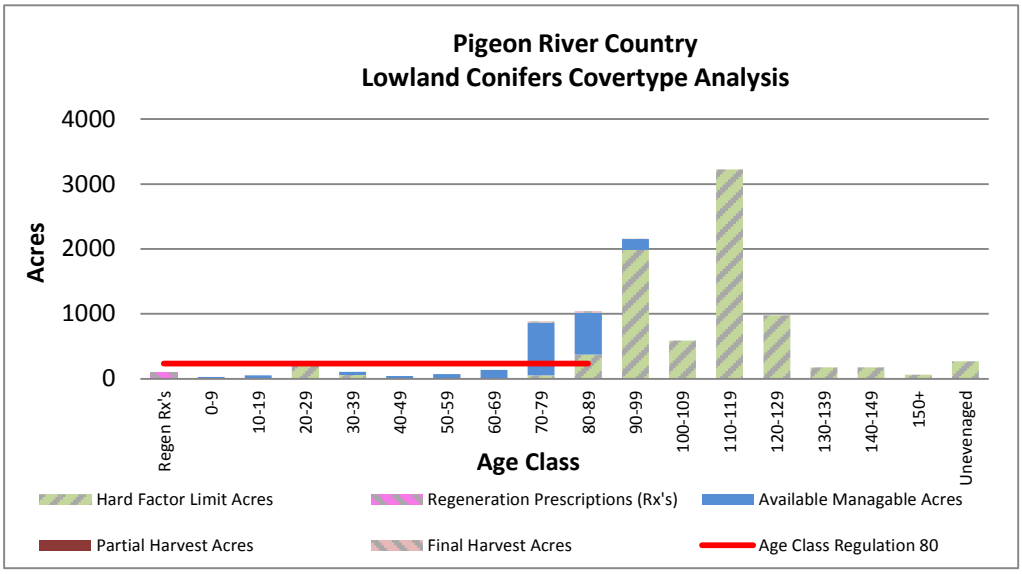

Figure 4.8.6. Age-class distribution for lowland conifer in the Pigeon River Country management area (2012 Department of Natural Resources inventory data).

All of the 6,223 acres of cedar and 8,162 acres of lowland conifers have site conditions that may limit the ability to commercially harvest (hard factor limited acres).

Desired Future Condition

- Lowland conifer dominated forest cover types will be maintained on operable sites through even-aged management with acres balanced between 0 and 89 years to provide for a sustainable harvest. These types will also contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species. By storing high levels of sequestered carbon and serving as carbon sinks, cedar and lowland conifer swamps will play an important role in global geochemical cycles.

10-Year Management Objectives

- If harvests can be done in a manner that will not impact wetland soils, conduct regeneration harvests on a projected 232 acres of lowland conifer;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years-of-entry; and
- Consider methods to ensure adequate regeneration of cedar and lowland conifer.

Long-Term Management Objectives

- It is acceptable that over the next several decades, the older cedar and lowland conifer, much of it inaccessible for harvest, will continue to experience natural processes (fire, windthrow, insect defoliation and beaver flooding) resulting in the formation of a range of successional stages; and
- The desired future harvest level for final harvest of lowland conifer (232 acres) is projected per 10-year period.

4.8.1.5 Forest Cover Type Management – White Pine

Current Condition

White pine acres total 4,878 acres or 5% of the management area (Table 4.8.1) with most being 70-99 years old (Figure 4.8.7) White pine is found on AFO and PArVVb habitat class sites. White pine in this management area is commercially valued for pulp and saw logs. There are 424 acres of white pine that have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres).

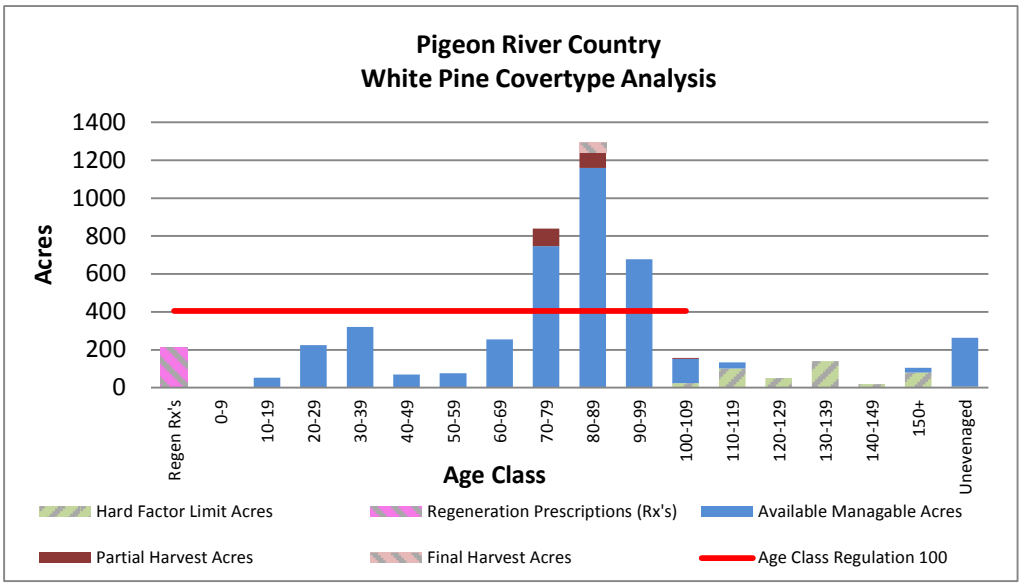

Figure 4.8.7. Age-class distribution for white pine in the Pigeon River Country management area (2012 Department of Natural Resources inventory data).

The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of white pine or final harvests and planting to white pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- White pine will be managed with a thinning regime until 100 years of age;
- Stands on mesic sites will be managed to economic maturity, while allowing natural hardwood conversion on sites more suitable for hardwoods;
- White pine will be regenerated on sites lacking high quality northern hardwood regeneration; and
- On sites being converted to hardwoods, a scattering of a few pine trees per acre will be retained providing a super-canopy of white pine and providing vertical structure for various wildlife species.

10-Year Management Objectives

- Conduct final harvests on a projected 1,073 acres beginning with the oldest age classes and with a concentration on stands with less potential for a higher product value; and
- Conduct partial harvests on a projected 1,270 acres.

Long-Term Management Objectives

- Continue thinning white pine in the 40-99 year age classes;
- It is acceptable that some white pine stands may become mixed stands through partial removal of the white pine over story and allowing natural regeneration of other species;
- Continue to seek opportunities to maintain or expand super-canopy white pine as a component of stands throughout the management area; and
- Desired future harvest levels are projected at 405 acres for final harvest and 1,691 acres of partial harvest per 10-year period.

4.8.1.6 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 4,476 or 4% of the management area (Table 4.8.1). Age classes are well distributed in the 0-69 age-classes, (Figure 4.8.8). Data show that 286 acres of jack pine have met harvest criteria, but have site conditions that preclude harvest (hard factor limited acres). There are 426 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class.

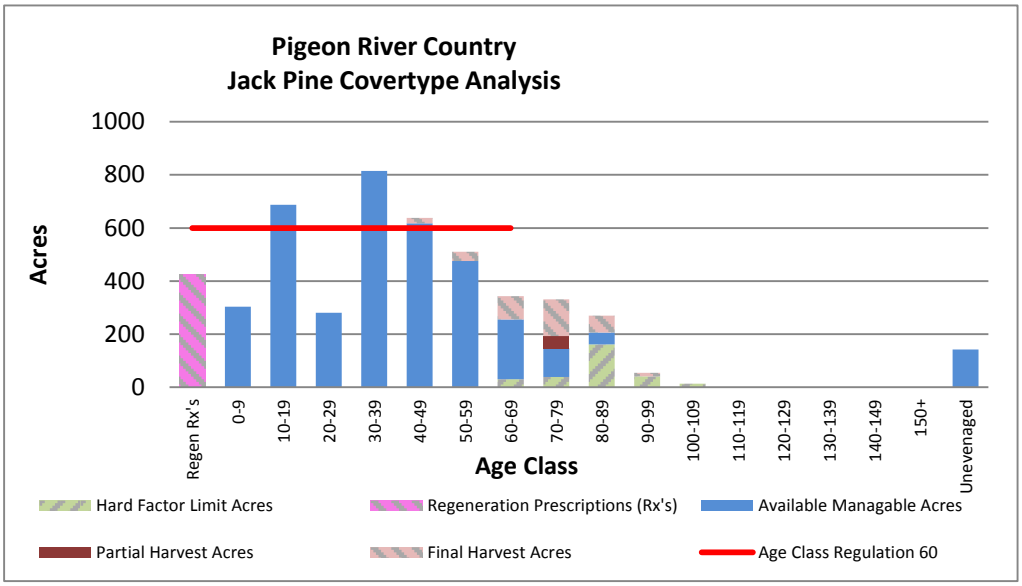

Figure 4.8.8. Age-class distribution for jack pine in the Pigeon River Country management area (2012 Department of Natural Resources inventory data).

Jack pine is managed for timber products with the objective of balancing the age-class distribution and managing jack pine on suitable sites. Jack pine budworm outbreaks may result in increased mortality in older age classes and work continues to reduce the number of acres in the older age classes.

Desired Future Condition

- Jack pine will have balanced age classes between zero and 69 years of age to provide a sustainable timber production and wildlife habitat which will provide recreational opportunities.

10-Year Management Objectives

- Conduct stand final harvests on a projected 600 acres concentrating on stands older than 60 years to reduce the risk of jack pine budworm in older age classes.

Long-Term Management Objectives

- Continue to manage jack pine for a balanced age-class distribution at a projected regulation level of 286 acres over 10 years to produce a sustainable timber supply and wildlife habitat which will provide recreational opportunities;
- Where necessary and feasible, future planning may need to consider harvesting additional acres above the rotation regulation level from younger age classes to expedite the balancing of age class distributions; and
- Desired future harvest levels for final harvest are projected at 599 acres per 10 year period.

Section 4.8.1.7 Forest Cover Type Management – Oak

Current Condition

Oak acres total 3,507 acres or 3% of the management area (Table 4.23.1). The origin of the oak resource was the aftermath of the logging era in the late 1800s and early 1900s when most of the red and white pines were removed. This cutting combined with frequent wildfires resulted in a period of oak regeneration during the late 1800s and early 1900s. There are 708 acres of oak have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 56 acres of stands that have a final harvest pending and these acres are shown in the regeneration prescription class (Figure 4.8.9). There are 388 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in the release of oak. These acres are included in the regeneration prescription class.

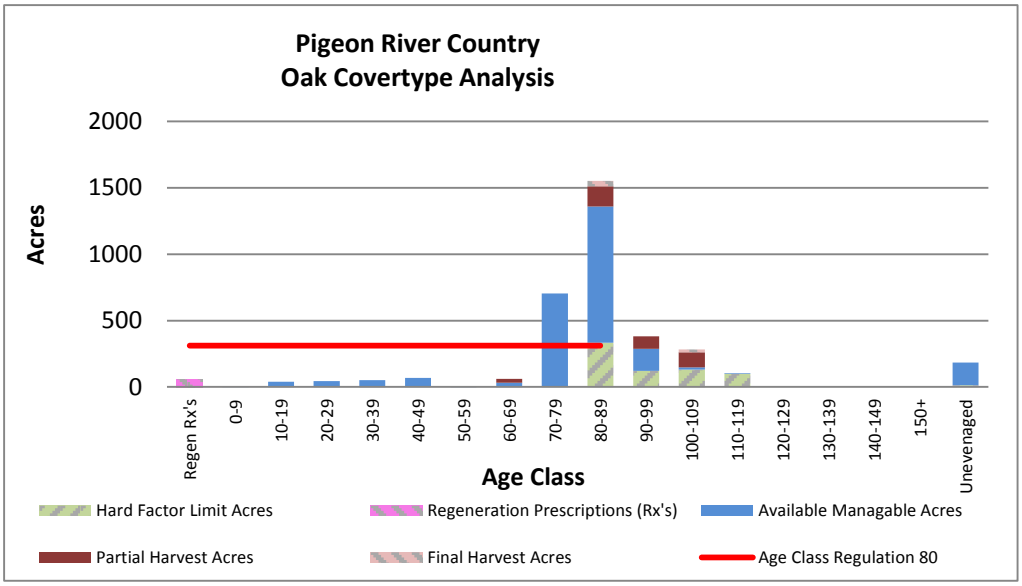

Figure 4.8.9. Age-class distribution for oak in the Pigeon River Country management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management to provide for timber products, wildlife habitat and recreational opportunities; and
- Oak will become more valuable as a mast source as a result of beech bark disease which will cause a decline in the amount of beech.

10-Year Management Objectives

- Conduct partial harvests on a projected 619 acres to prepare stands for eventual regeneration harvests;
- Conduct restarting harvests on a projected 944 acres;
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types; and
- Seek opportunities to manage existing oak for wildlife values and a sustainable yield of wood products in pine and low-quality hardwoods.

Long-Term Management Objectives

- Continue work towards maintaining oak as the predominant species in selected stands through restarting harvests;
- It is acceptable that some oak stands may become mixed stands through partial removal of an oak over story, planting pine in oak stands or through natural regeneration of other species.
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area; and
- Desired future harvest levels are projected at 311 acres for final harvest and 982 acres for partial harvest per 10-year period.

4.8.1.8 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 5,486 acres or 5% of the management area (Table 4.8.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.8.1.9 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open lands acres total 5,632 or 5% of the management area (Table 4.8.1). This category is a combination of herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated areas. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.8.1.10 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: jack pine, 4,476 acres (4% of the MA), oak, 3,507 acres (3%) and lowland deciduous, 2,012 acres (2%). Other types including non-forested types and small scattered acres total 6,139 acres or 6% of the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These communities will be managed on operable sites, contributing to the compositional diversity of the landscape while providing for sustainable harvest and to contribute to the conservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species.

10-Year Management Objectives

- Seek opportunities to manage through harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- The following species are projected for restarting or regeneration harvests: upland spruce/fir, 224 acres, upland mixed deciduous 67 acres, lowland aspen/balsam poplar, 95 acres, lowland spruce/fir 19 acres, upland mixed forest 28 acres, paper birch 74 acres, tamarack 6 acres and lowland mixed forest 1 acre; and
- The following species are projected for partial harvests: mixed upland deciduous, 84 acres, upland mixed forest 188 acres, hemlock 64 acres, planted mixed pines 24 acres and natural mixed pines, 210 acres.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible.

4.8.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management are during this cycle of state forest planning:

- American marten
- Black-throated blue warbler
- Elk
- Golden-winged warbler
- Pileated woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Wild turkey
- White-tailed deer
- Wood thrush.

The primary focus of wildlife habitat management in the Pigeon River Country management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest, extensive mature forest, large open grassland complexes, and marsh/grassland complexes, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast, understory shrub and mesic conifer components.

This management area will include one or more Northern Lower Peninsula Grouse Enhanced Management System areas. The boundaries will be delineated during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager. Aspen stands that fall within the Grouse Enhanced Management System area boundary may be managed on a shortened rotation with multiple age classes and smaller stand sizes to enhance hunting opportunities for ruffed grouse, woodcock, deer, turkey and hare. The remainder of the management area (outside the boundary) will be managed based on the direction in the management area write up.

A more detailed overview of featured species is included in Section 3.

American Marten

The goal for American marten in the northern Lower Peninsula is to increase available habitat. American marten needs mature mixed forest stands or old conifer-dominated stands, with dead and down material for maintaining a stable and sufficient supply of small mammals as prey. American marten are rarely found outside the forest canopy. This species depends upon live-tree dens, snags and coarse woody debris for loafing (resting) and denning sites. State forest management should address the maintenance and improvement of extensive and mature forest tracts, corridors, dead wood and conifer components in priority landscapes.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore large forested tracts and forested corridors.
- In even-aged management systems, within-stand retention should focus on large diameter (>15 inches in diameter at breast-height) trees, known cavity trees and/or mesic conifers to maintain/increase denning and loafing sites.
- Where possible, increase both standing-dead and downed-dead wood by:
  - Applying at least the minimum level of within-stand retention to all stands in the management area;
  - Writing harvest specifications to leave slash at the stump or to minimize the removal of slash; and
  - Limiting or prohibiting firewood permits at marten-occupied sites.

Black-throated Blue Warbler

The goal for black-throated blue warbler in the northern Lower Peninsula is to maintain available habitat. Black-throated blue warbler is an area-sensitive species (e.g., densities increase exponentially with increasing patch size) mainly occurring in mesic deciduous forest tracts >50 years in age and >250 acres in size, with a dense understory layer for nesting and foraging. State forest management for the species should focus on maintaining mature, large (>50 years old and >250 acres) mesic deciduous forest tracts with a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

Elk

The goal for elk in the northern Lower Peninsula is to maintain the population at 500-900 animals as measured in the biennial aerial survey. Elk prefer open areas and regenerating deciduous forest. Mast crops, especially acorns, are important sources of food in fall and winter. State forest management should focus on maintaining/increasing early successional, opening and hard mast habitat components at/to desired levels in priority landscapes.

Wildlife Habitat Specifications:

- The goals of habitat management in the elk range are described in the 2007 Pigeon River Country Concept of Management:
  - Maintain 7-8% of the forest cover types managed by even aged management in the 0-9 year-old age class;
  - Maintain the existing aspen component;
  - Increase the amount of opening and upland brush to 6-7 percent of the range; and
  - Maintain the existing component of mast producing trees (red oak, white oak, northern pin oak and beech).

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninusla is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within the management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches diameter at breast-height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management, and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-shouldered Hawk

The goal for red-shouldered hawk in the northern Lower Peninsula is to maintain available habitat. Red-shouldered hawks nest in contiguous, mature, closed canopy, hardwood forests. Nesting habitat consists primarily of well-stocked pole or sawtimber stands (stocking densities 6 and 9) with a closed canopy (80-100%) and basal area of at least 98 square feet per acre. Nests are usually found in deciduous trees with a mean of 23 inches in diameter at breast height. State forest management activities should focus on the maintenance of large blocks (>385 acres) of mesic northern forest with the appropriate level of large diameter trees in priority landscapes.

Wildlife Habitat Specifications:

- All suspected red-shouldered hawk nests are to be reported to local wildlife staff and confirmed nests documented in accordance with the DNR's *Approach to the Protection of Rare Species on State Forest Lands* (CI 4172) and included in Integrated Forest Monitoring, Assessment, and Prescriptions Geographic Decision Support System when there is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan DNR's *Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands* (August 2012) will be followed.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area, and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.

- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.
- Manage the aspen cover type for smaller patch size, a shorter rotation and a more deliberate habitat configuration within the designated GEM.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management are.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.

- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Thrush

The goal for wood thrush in the northern Lower Peninsula is to maintain available habitat. Wood thrush occur primarily in upland, mesic deciduous and mixed forests with large trees, diverse tree communities, moderate undergrowth and a well-developed litter layer.

Wood thrush is highly susceptible to nest predation and brood parasitism, which increases with forest fragmentation. State forest management for the species should focus on maintaining large (>250 acres) forest tracts, minimizing edge and promoting a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

4.8.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations, following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed nine listed species and no natural communities of note occurring in the management area as listed in Table 4.8.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

Table 4.8.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Pigeon River Country management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Insect								
Hungerford's crawling water beetle	*Byrchius hungerfordi*	LE/E/G1/S1	Confirmed	HV	Very High	Northern shrub thicket	Upland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Reptile								
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Plants								
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Hill's pondweed	*Potamogeton hillii*	T/G3/S2	Confirmed			Emergent marsh	Lowland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

As shown in Figure 4.8.10, there are three non-dedicated natural areas: Dog Lake wild area (659 acres), Grindstone Creek wild area (160 acres) and Pigeon River Pines (180 acres). There is also one potential Type 2 old growth area (160 acres) at Grindstone Creek representing the mesic northern forest natural community type.

There are no high conservation value areas or ecological reference areas identified for the Pigeon River Country MA as illustrated in Figure 4.8.10.

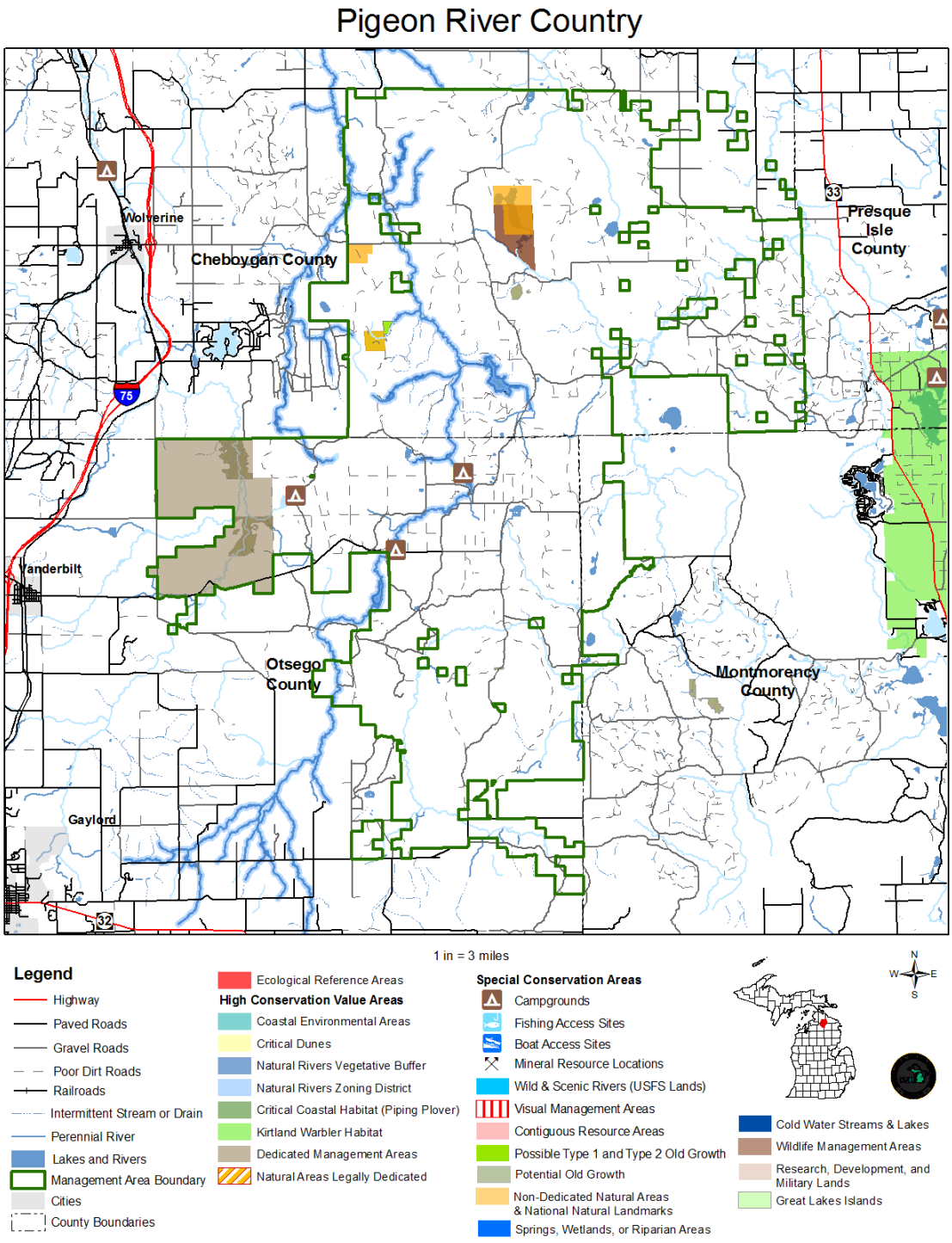

Figure 4.8.10. A map of the Pigeon River Country MA showing the special conservation areas.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

4.8.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include emerald ash borer, beech bark disease and oak decline and management should be adapted as follows:

- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important;
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow; and
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.

Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.

In addition, invasive exotic species, specifically plants, pose a significant forest health threat to forested and non-forested areas throughout the management area. Although there exists no current list of species that pose the greatest threat and surveys of invasive species are generally incomplete, populations of invasive species detected through regular forest inventory or other means and determined to merit control measures should be assessed and handled on a case-by-case basis.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species are summarized in Table 4.8.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. Local staff has noted the presence of garlic mustard, purple loosestrife, wild parsnip and *Phragmites*. This information, and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.8.3. Locations of invasive species (Midwest Invasive Species Information Network database).

Pigeon River Country - FMD Management Areas	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	4	4	8	5

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
Purple Loosestrife *Lythrum salicaria*	1	Japanese Knotweed *Fallopia japonica*	2
Spotted Knapweed *Centaurea stoebe*	2	Purple Loosestrife *Lythrum salicaria*	1
Tatarian Honeysuckle *Lonicera tatarica*	1	Reed Canary Grass *Phalaris arundinacea*	1

4.8.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.8.1 and listed in Appendix F.

4.8.6 Fire Management

Historically, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen or grass/upland brush types. Wildfire risk and fuel loading is increased in young dense conifer stands and mature jack pine affected by jack pine budworm.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependant on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- When feasible, consider opportunities to re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- When feasible, consider opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased development in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.8.7 Public Access and Recreation

Access in Pigeon River Country is guided by the Concept of Management Plan for the Pigeon River and an access plan. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Equestrian and hiking trails cross the management area including the High Country Pathway as shown in Figure 4.8.1. There is also a motorized vehicle trail through a portion of the western part of the management area (Figure 4.8.1).

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Specific hunting recreation improvements such as parking lots, gates, trail planting and trail establishment, as well as the preparation and dissemination of specific promotional material, may be made as a result of Grouse Enhanced Management Systems areas planning in this management area.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the Department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.8.8 Oil, Gas and Mineral Development

Oil, gas and mineral development is regulated by the Pigeon River Country Consent Agreement and other legal agreements. As oil and gas production falls below economically viable levels, surface developmnet and production of oil and gas will be phased out. Mineral development may occur on state and private property for privately held mineral leases. Some portions of the management area outside the Pigeon River Country Consent Agreement may be leasable, but surface development will not be permitted.

Surface sediments consist of coarse-textured till, glacial outwash sand and gravel and postglacial alluvium and dune sand. The glacial drift thickness varies between 10 and 600 feet. Only a few inactive sand and gravel pits are located in this management area.

The Mississippian Coldwater and Sunbury Shales and Devonian Berea Sandstone, Bedford and Antrim Shales and Traverse Group subcrop below the glacial drift. The Traverse Limestone has limestone/dolomite potential, especially in areas of thin glacial till.

Oil and gas production from the Antrim Shale and Guelph (formerly Niagaran) reefs is located in part of this management area. The Collingwood Formation may also have oil and gas potential in this area. Most of the management area is not leased and drilling within the area is unlikely. If drilling is sucessful for the Collingwood, additional leasing and directional drilling along the border of the management area might be allowed to prevent hydrocarbon drainage of state mineral rights.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations nor would it be allowed under the Concept of Management.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended, or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.9 MA 9 – Jordan Valley Management Area

Summary of Use and Management

The Jordan Valley management area (MA) is a "special management area" going back to 1974 with the intent of preserving the land for multi-use outdoor recreation in a near-natural setting. Management will underscore special emphasis on quiet recreational use. Mineral exploration and extraction is not permitted in the valley portion of the management area though Antrim gas development occurs nearby. Management will emphasize the continuation of selective management of the northern hardwood resource and the balancing of the aspen age classes so as to sustainably produce various forest products, enhance game and non-game wildlife habitat, protect areas of unique character and provide for forest-based recreational uses, including the North Country Trail, campgrounds and snowmobile trails. Management activities are constrained by Natural River Zoning District along the Jordan River and its tributaries, areas proposed as old growth, scenic vistas, natural area and connector between the two and three large swamp complexes: Jordan River, Hitchcock and Deer Lake. Expected trends within this 10-year planning period are increased recreational pressure; petroleum development pressure; introduced pests and diseases, especially beech bark disease and emerald ash borer (beech and ash are significant species in northern hardwood stands); and continued acquisition of private in-holdings.

Introduction

This management area is mostly a valley located within the moraines in Antrim, Charlevoix and Otsego counties in the northern Lower Peninsula and contains 35,214 acres of state forest (Figure 4.9.1).

In 1972, the Department of Natural Resources Natural Resource Commission dedicated the Jordan River and its tributaries under the Natural Rivers Act as a wild and scenic river, Michigan's first such dedication. The Forestry Division (now Forest Resources Division) of the DNR followed up with a comprehensive management plan for the enhancement, control and protection of the state forest lands within the valley. The goals stated in the plan are:

- Maintain the high water quality in the Jordan River and its tributaries.
- Manage and control use in order to maintain and enhance the environmental integrity of the Jordan River Valley, with special emphasis on quiet recreational use.
- Mange the trees, shrubs, forbs and grasses in order to maintain a vigorous biological community and to protect water quality.
- Manage and maintain fish and wildlife under a scientific basis for the benefit of man.
- Acquire through purchase or exchange those private lands within the Jordan Valley Block State Forest boundary.

The primary attributes which identify the Jordan Valley management area include:

- The management area falls within Albert's Vanderbilt sub-region (Albert, 1995). State forest ownership includes several outlying parcels and ownership connectivity within the main block is impacted by numerous private in-holdings.
- Prior to European settlement, the uplands in this landscape were predominantly northern mesic forest dominated by sugar maple and hemlock. The swampy riparian zone along the river was historically and is presently dominated by mixed swamp conifers. The current upland cover types are dominated by northern hardwoods species including beech, sugar maple, hemlock, basswood, ironwood and yellow birch. Red pine, a minor component circa-1800, was planted on cleared hardwood sites. Aspen occurs on 10% of the management area.
- Due to the proximity of this management area to the communities of Gaylord, Boyne City, East Jordan and Mancelona, the forest resources contribute social and economic values to the area.
- Snowmobile and hiking trails cross the area, including the Jordan River Pathway and a portion of the North Country Trail.
- Campgrounds include the Pinney Bridge hike-in only campground and the Graves Crossing State Forest Campground.
- Designated scenic vista locations are Deadman's Hill and Landslide Creek.
- The Jordan Valley Management Plan classifies the topography of this management area as having 29% of the area as having slight-moderate slope limitations, 54% severe-very severe slope limitations and 17% wet area limitations.

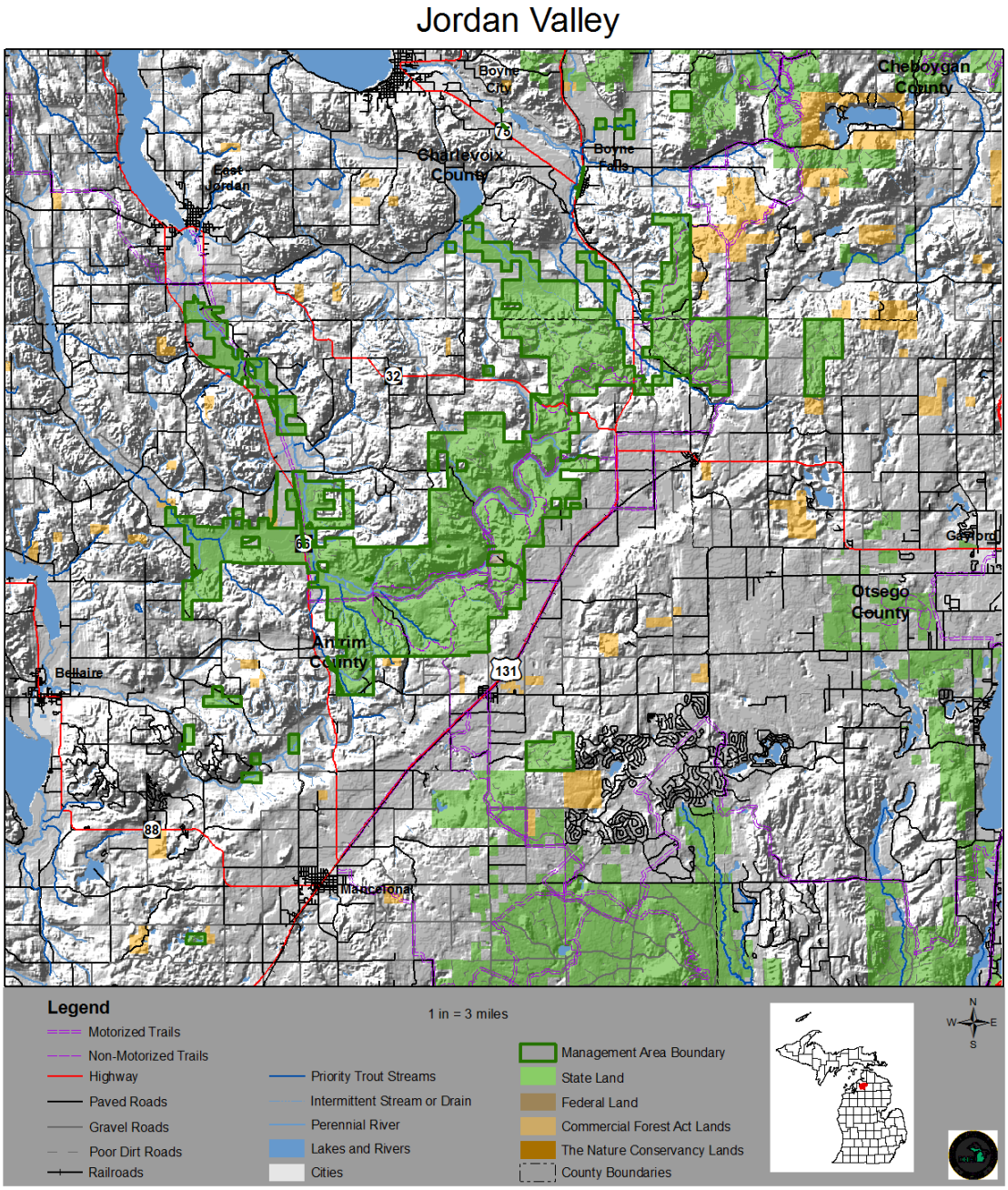

Figure 4.9.1. A map of the Jordan Valley management area (dark green boundary) in relation to surrounding state forest and other lands in Antrim County with small portions in Charlevoix and Otsego counties, Michigan.

Table 4.9.1. Current cover types, acreages, projected harvests and projected acreages at the end of the ten-year planning period for the Jordan Valley management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Northern Hardwood	62%	21,721	2,338	19,383		9,269	21,721		9,269
Lowland Conifers	11%	3,957	3,166	791	88		3,957	88	
Aspen	10%	3,518	888	2630	401		3,518	376	
Cedar	3%	967	967				967		
Lowland Deciduous	2%	801	561	240	27		801	27	
Upland Open/Semi-Open Lands	6%	2,200		2200			2,200		
Lowland Open/Semi-Open Lands	3%	973		973			973		
Misc Other (Water, Local, Urban)	1%	225		225			225		
Others	2%	852	239	613	113	116	852	74	162
Total		35,214	8,157	27,057	630	9,385	35,214	565	9,431

4.9.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.9.1.1 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres (Figure 4.9.2) total 21,721 acres or 62% of the management area (Table 4.9.1), and are located throughout the management area on habitat class AFOCa and AFO sites (see Appendix E).

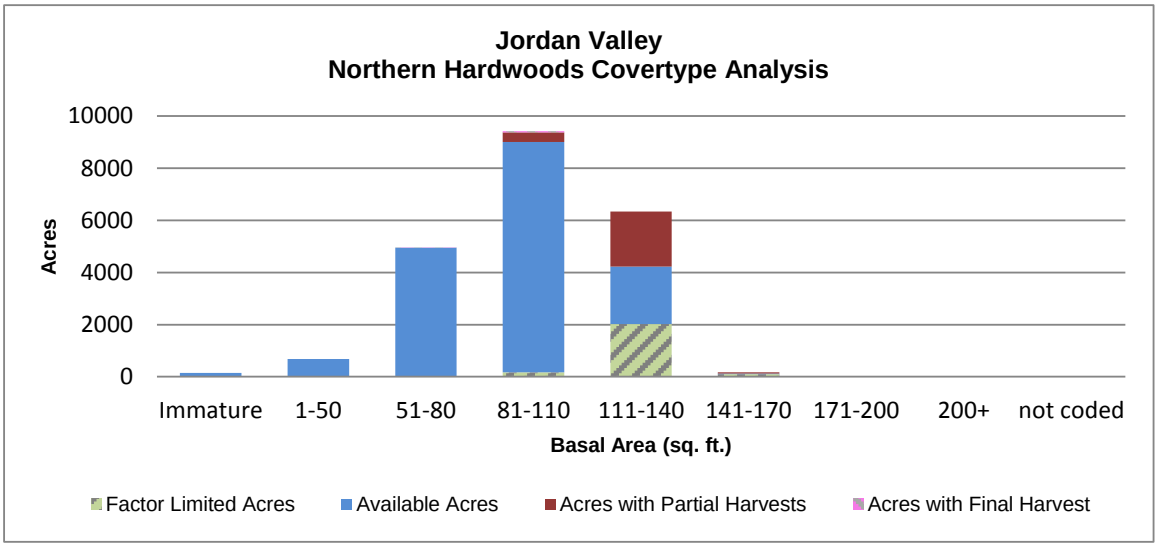

Figure 4.9.2. Basal area distribution for northern hardwoods in the Jordan Valley management area (2012 Department of Natural Resources inventory data).

Northern hardwoods are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, marten and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation.

Many of the stands have portions located on steep slopes or have seeps that limit treatment options. During the past 10 years, 5,000 acres were treated in the management area. There are 2,338 acres of northern hardwoods have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 2,550 acres that have a partial harvest pending and these acres are included in the current basal area range.

Desired Future Condition

- Northern hardwoods-dominated forest communities will be maintained on operable sites through selective harvesting to achieve an uneven-aged stand structure to provide for a continuous supply of timber products, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Selectively harvest a projected 9,269 acres of northern hardwood characterized as having a basal area of 111 square feet per acre or greater; and
- Where necessary and feasible, consider harvesting stands from the lower basal area ranges to expedite the balancing of basal area distributions.

Long-Term Management Objectives

- Emerald ash borer and beech bark disease will change the stand composition of the northern hardwoods in this management area. As these species lessen in the upland hardwood stands, consider introducing oak for mast in stands without oak;
- Continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer, using Beech Bark Disease Management Guidelines and Emerald Ash Borer Guidelines; and
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands.

4.9.1.2 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 3,518 or 10% of the management area (Table 4.9.1). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation.

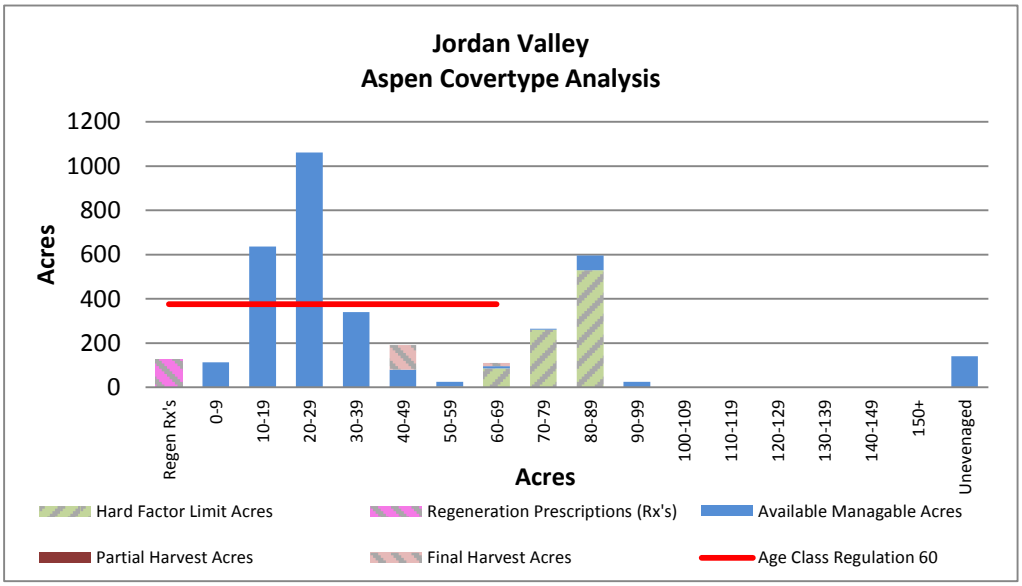

Figure 4.9.3. Age-class distribution for aspen in the Jordan Valley management area (2012 Department of Natural Resources inventory data).

Aspen occurs throughout the area on AFOCa and AFO sites. Accessible aspen has been consistently harvested over the last 40 years and most of the accessible aspen in this management area is younger than the 60-year rotation age (Figure 4.9.3). Approximately 888 acres of aspen have met harvest criteria but have site conditions that limit harvest. There are 126 acres that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0-69 years of age to provide for a sustainable harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- In accordance with the Jordan Valley Management Plan, the size of clearcuts will be kept to 20 acres or less where possible;
- Conduct final harvests on a projected 401 acres of aspen in this 10-year planning period; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue management to balance the age-class distribution; and
- Desired future harvest levels are projected at 376 acres for final harvest per 10-year period.

4.9.1.3 Forest Cover Type Management – Cedar and Lowland Conifer

Cedar (Figure 4.9.4) acres total 967 acres or 3% of the management area and lowland conifer (Figure 4.9.5) acres total 3,957 or 11% of the management area. These acres constitute a significant portion of the management area.

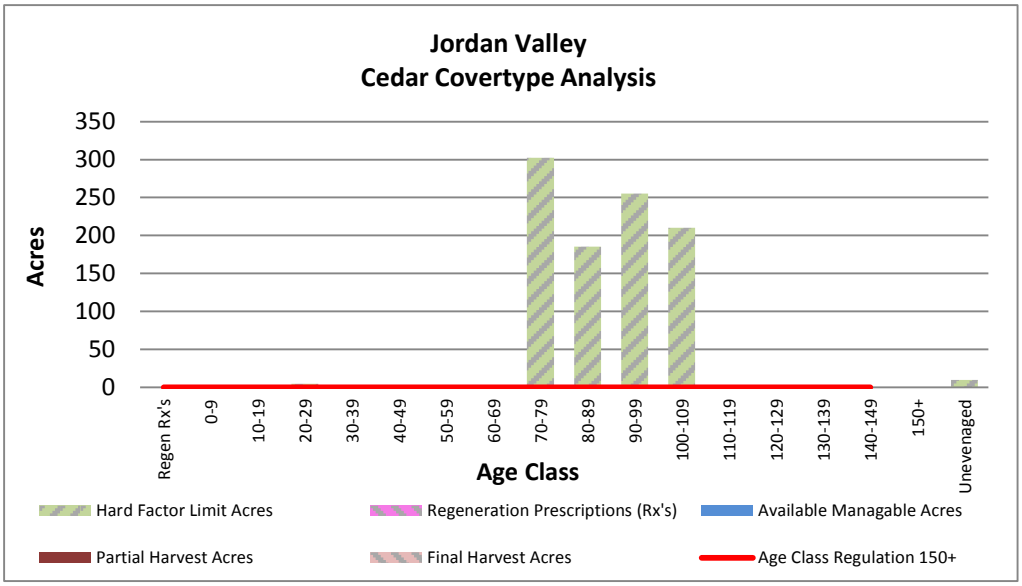

Figure 4.9.4. Age-class distribution for cedar in the Jordan Valley management area (2012 Department of Natural Resources inventory data).

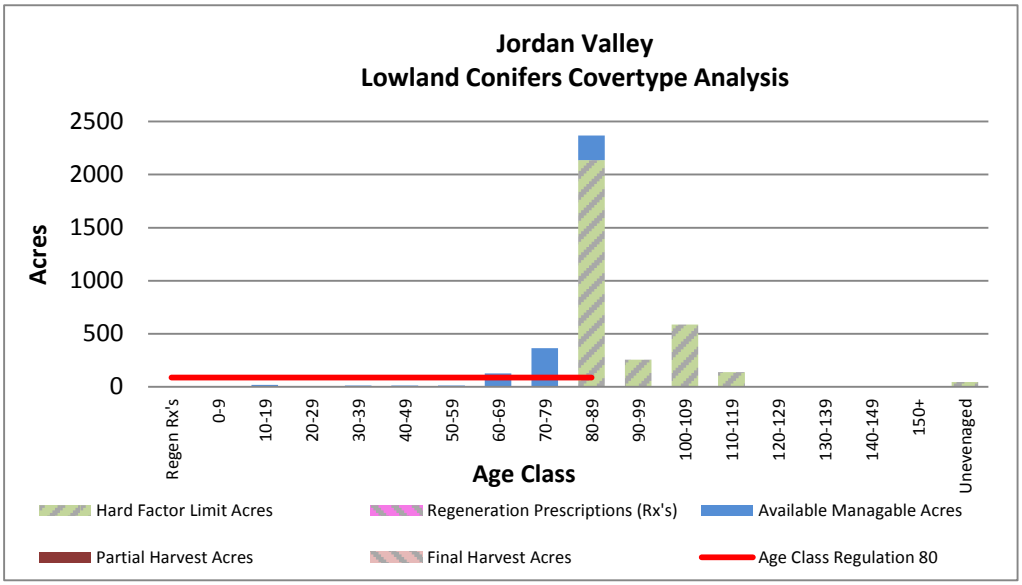

Figure 4.9.5. Age-class distribution for lowland conifers in the Jordan Valley management area (2012 Department of Natural Resources inventory data).

All 967 acres of cedar and 1,832 acres of lowland conifers are hard factor limited due to access and operability issues and may offer only limited opportunities for management.

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape and wildlife habitat while providing forest products.

10-Year Management Objectives

- Conduct final harvests on a projected 88 acres of lowland conifer where feasible;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years-of-entry; and
- Consider methods to ensure adequate regeneration of lowland types.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- Desired future harvest levels are projected at 88 acres for lowland conifer final harvests per 10-year period.

4.9.1.4 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open lands acres total 2,200 or 6% of the management area. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated.

These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands; and
- If necessary and feasible, use herbicides to control invasive exotic species.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels; and
- Continue to protect stands from illegal off-road vehicle use.

4.9.1.5 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 973 acres or 3% of the management area (Table 4.9.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.9.1.6 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: lowland deciduous, 801 acres or (2% of the management area) (Table 4.9.1), red pine, 244 acres (1%) and upland spruce/fir, 140 acres (<1%). Other types including non-forested types and small scattered acres total 852 acres (2%). All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These communities will be managed on operable sites, contributing to the compositional diversity of the landscape while providing for continual harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- The following species are projected for regeneration harvests: upland spruce/fir 58 acres, red pine 22 acres and lowland deciduous 27 acres; and
- Partial harvests are projected for 58 acres of red pine and 17 acres of upland conifers and 20 acres of natural mixed pines.

Long-Term Management Objectives

- Future management decisions need to consider the continuing Antrim gas development pressure in the area;
- Continue management decisions to consider the intensive recreation use at overlooks, snowmobile trails, the North Country Trail, fishing, mushrooming, etc.;
- Continue management of other types to produce a sustainable level of forest products, habitat and recreational opportunities; and
- Continue management to regenerate lowland types where feasible.

4.9.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management are during this 10-year planning period:

- American marten
- Black bear
- Black-throated blue warbler
- Golden-winged warbler
- Pileated woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Wild turkey
- White-tailed deer
- Wood thrush

The primary focus of wildlife habitat management in the Jordan Valley management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; extensive mature forest; large open grassland complexes and marsh/grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast, understory shrub and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Marten

The goal for American marten in the northern Lower Peninsula is to increase available habitat. American marten needs mature mixed forest stands or old conifer-dominated stands, with dead and down material for maintaining a stable and sufficient supply of small mammals as prey. American marten are rarely found outside the forest canopy. This species depends upon live-tree dens, snags and coarse woody debris for loafing (resting) and denning sites. State forest management should address the maintenance and improvement of extensive and mature forest tracts, corridors, dead wood and conifer components in priority landscapes.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore large forested tracts and forested corridors.
- In even-aged management systems, within-stand retention should focus on large diameter (>15 inches in diameter at breast-height) trees, known cavity trees and/or mesic conifers to maintain/increase denning and loafing sites.
- Where possible, increase both standing-dead and downed-dead wood by:
  - Applying at least the minimum level of within-stand retention to all stands in management area;
  - Writing harvest specifications to leave slash at the stump or to minimize the removal of slash; and
  - Limiting or prohibiting firewood permits at marten-occupied sites.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Black-throated Blue Warbler

The goal for black-throated blue warbler in the northern Lower Peninsula is to maintain available habitat. Black-throated blue warbler is an area-sensitive species (e.g., densities increase exponentially with increasing patch size) mainly occurring in mesic deciduous forest tracts >50 years in age and >250 acres in size, with a dense understory layer for nesting and foraging. State forest management for the species should focus on maintaining mature, large (>50 years old and >250 acres) mesic deciduous forest tracts with a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres; minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge); and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

Golden-winged Warbler

The goal for golden-winged warbler nest in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler nest habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees >12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-shouldered Hawk

The goal for red-shouldered hawk in the northern Lower Peninsula is to maintain available habitat. Red-shouldered hawks nest in contiguous, mature, closed canopy, hardwood forests. Nesting habitat consists primarily of well-stocked pole or sawtimber stands (stocking densities 6 and 9) with a closed canopy (80-100%) and basal area of at least 98 square feet per acre. Nests are usually found in deciduous trees with a mean of 23 inches in diameter at breast height. State forest management activities should focus on the maintenance of large blocks (>385 acres) of mesic northern forest with the appropriate level of large diameter trees in priority landscapes.

Wildlife Habitat Specifications:

- All suspected red-shouldered hawk nests are to be reported to local wildlife staff and confirmed nests documented in accordance with the DNR *Approach to the Protection of Rare Species on State Forest Lands* (CI 4172) and included in Integrated Forest Monitoring, Assessment and Prescriptions Geographic Decision Support System when there is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan DNR's *Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands* (August 2012) will be followed.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two 1-3--acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.

- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Thrush

The goal for wood thrush in the northern Lower Peninsula is to maintain available habitat. Wood thrush occur primarily in upland, mesic deciduous and mixed forests with large trees, diverse tree communities, moderate undergrowth and a well-developed litter layer.

Wood thrush is highly susceptible to nest predation and brood parasitism, which increases with forest fragmentation. State forest management for the species should focus on maintaining large (>250 acres) forest tracts, minimizing edge and promoting a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge); and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

4.9.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed six listed species and no natural communities of note occurring in the management area as listed in Table 4.9.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.9.6, the Jordan Valley is a 1,569 acre non-dedicated natural area that is a special conservation area as are Dead Man's Hill and Landslide Creek overlooks.

The Jordan River and its tributaries have been identified as a natural river and along with its corridor are also designated as a high conservation value area as shown in Figure 4.9.6.

There are no ecological reference areas identified for the Jordan Valley management area.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.9.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Jordan Valley management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Grasshopper sparrow	*Ammodramus savannarum*	SC/G5/S3S4	Confirmed	PS	Moderate	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Lakeplain wet prairie	Lowland open/semi-open	N/A
						Lakeplain wet-mesic prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Hillside prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Mammal								
Woodland vole	*Microtus pinetorum*	SC/G5/S3S4	Confirmed	PS	Very High	Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
						Floodplain forest	Lowland mixed	Mid
						Oak-pine barrens	Oak	Mid
						Bur oak plains	Upland open/semi-open	N/A
Snail								
Spike-lip crater snail	*Appalachina sayanus*	SC/G5/SU	Confirmed	HV	Low	Mesic northern forest	Northern Hardwood	Late
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Floodplain forest	Lowland mixed	Mid
Reptile								
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Plant								
Ram's head lady's-slipper	*Cypripedium arietinum*	SC/G3/S3	Confirmed			Rich conifer swamp	Tamarack	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
						Volcanic bedrock lakeshore	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Poor fen	Lowland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Great Lakes barrens	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Volcanic bedrock glade	Upland open/semi-open	N/A
						Granite bedrock glade	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

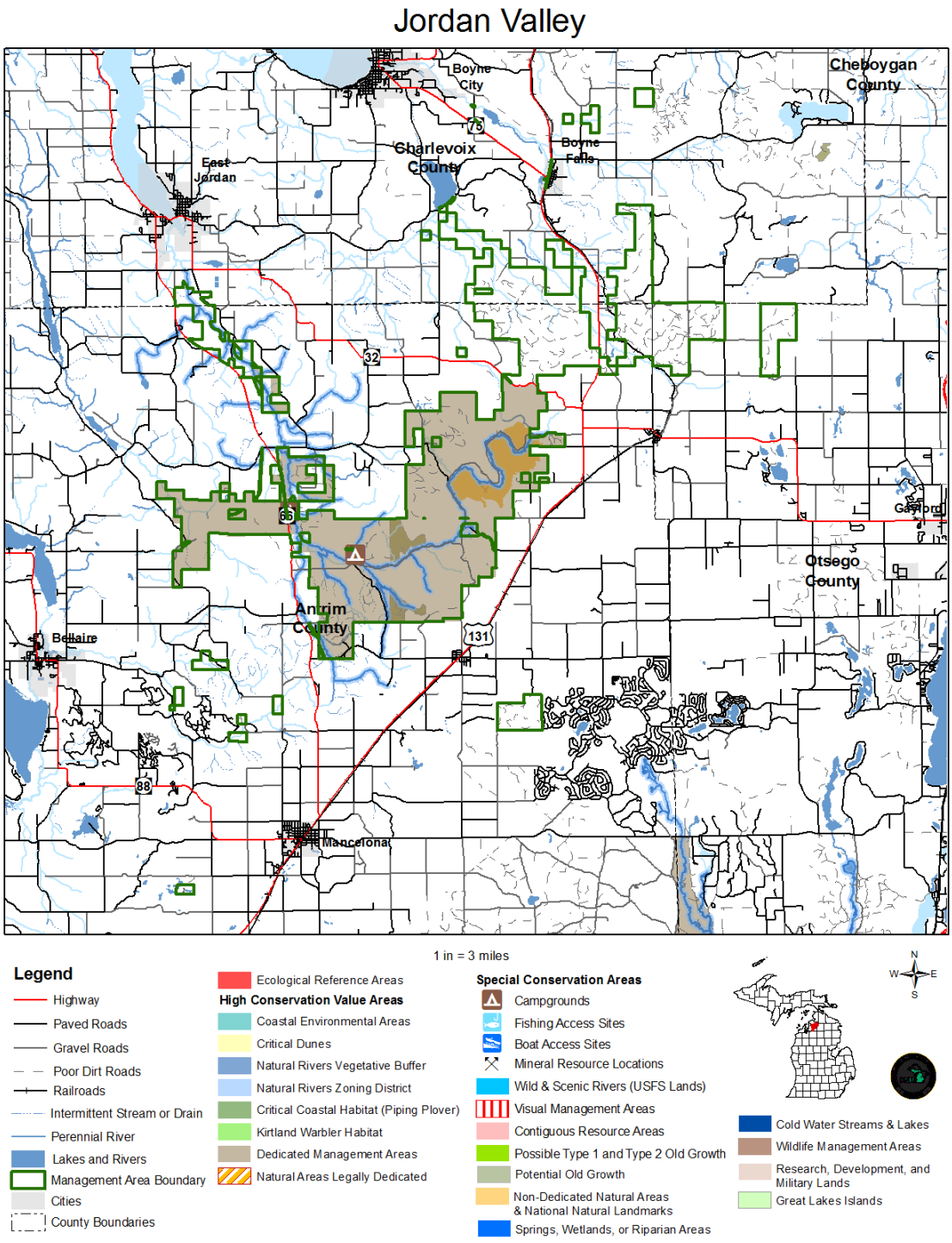

Figure 4.9.6. A map of the Jordan Valley management area showing the special resource areas.

4.9.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include emerald ash borer and beech bark disease and management should be adapted as follows:

- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important;
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow; and

- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.9.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. Local staff has located *Phragmites* in the management area. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.9.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Jordan Valley - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	5	5	4

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Amur Honeysuckle *Lonicera maackii*	1
-	-	Garlic Mustard *Alliaria petiolata*	1
-	-	Glossy Buckthorn *Rhamnus frangula*	2
-	-	Japanese Knotweed *Fallopia japonica*	1

4.9.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest* Land) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.9.1 and listed in Appendix F.

4.9.6 Fire Management

Northern hardwoods which have historically been a major component of this management area are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance small inclusions of aspen or grass/upland brush types. Wildfire risk and fuel loading is increased in young dense conifer plantations.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependant on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings; and

- Recognize that increased recreational use within the management area will present more wildland fire challenges to wildfire suppression.

4.9.7 Public Access and Recreation

Access for management and/or recreation is generally limited throughout much of this management area due to wet sites and limited access from adjacent landowners. The Department will continue to seek access across adjacent private property. In accordance with the Department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts. There is one state forest campground in the management area as shown in Figure 4.9.6.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the Department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

Access for management and/or recreation is generally limited throughout much of this management area due to wet sites and limited access from adjacent landowners. The Department will continue to seek access across adjacent private property. In accordance with the Department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

4.9.8 Oil, Gas and Mineral Development

Surface sediments consist of coarse-textured till, glacial outwash sand and gravel and postglacial alluvium, end moraines of coarse-textured till and lacustrine (lake) sand and gravel. The glacial drift thickness varies between 10 and 800 feet. Sand and gravel pits are located in this management area and there is good potential for additional pits.

The Mississippian Coldwater and Sunbury Shales and Devonian Berea Sandstone, Bedford, Antrim and Ellsworth Shales and Traverse Group subcrop below the glacial drift. The Traverse Limestone has limestone/dolomite potential, especially in areas of thin glacial till.

Oil and gas production from the Antrim Shale is located throughout this management area. Antrim development has been allowed along the edges of the official Jordan Valley management area with horizontal drilling from outside the boundary to reduce hydrocarbon drainage of state lands. The Collingwood Formation may also have oil and gas potential in this area and over half of the management area is leased, primarily for the Antrim. If drilling is sucessful for the Collingwood, additional drilling in the management area as well as along the border of the Jordan Valley management area could occur.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize

negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire, and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.10 MA 10 – Rattlesnake Hills Management Area

Summary of Use and Management

Management in the Rattlesnake Hills management area (MA) (Figure 4.10.1) will emphasize balancing age-classes of aspen, red pine and jack pine, regenerating the aging oak resource and the continuation of selective management of the northern hardwood resource. Management will strive to sustainably produce various timber products, enhance game and non-game wildlife habitat, protect areas of unique character, such as Green Swamp and provide for forest-based recreational uses. Management activities may be constrained by poor access on the steep slopes. Expected trends within the next decade are increased recreational pressure, illegal off-road vehicle use, introduced pests and diseases, especially beech bark disease and emerald ash borer (beech and ash are significant species in northern hardwood stands), managing oil and gas development, an increased need to regenerate oak, and elk browsing that influences forest regeneration.

The current predominant cover types, acreages and projected harvest acres in the management area are shown in Table 4.10.1.

Introduction

This management area is located in the northeast Lower Peninsula in the northwest part of Montmorency County and contains 31,217 acres of state forest (Figure 4.10.1). The primary attributes which identify the Rattlesnake Hills management area include:

- The management area falls mostly within Albert's (1995) Vanderbilt Moraines sub-region.
- Historically, northern hardwoods, red and jack pines mixed with oak, wetlands and to a lesser degree, aspen were present. Fires were fairly frequent in the drier northern part of the management area.
- Currently, the majority of the vegetation is northern hardwoods, aspen and red pine, with about 10% in relatively inaccessible lowland types which includes cedar. Elk concentrations have resulted in some cover type changes, the most significant being conversions to upland brush.
- The dominant landform consists of sandy, well drained moraine ridges surrounded by poorly drained outwash channels and plains. Green Swamp, a very large, extremely diverse high-quality rich conifer swamp is located in this management area.
- The Rattlesnake Hills management area is a popular area for the nearby communities of Atlanta and Onaway for game hunting, hiking, mushroom hunting and other activities. Along with the Pigeon River Country management area to the west, this area represents the core of Michigan's elk range.
- This area has intensive Antrim and Niagaran gas development.
- DNR recreation facilities in this management area include Clear Lake State Park. A portion of the High Country Pathway crosses the area.
- Surveys have located the several threatened, endangered or special concern species including red-shouldered hawk, secretive locust, Hungerford's crawling water beetle, Blanding's turtle, eastern massasauga rattlesnake, rough fescue, calypso orchid, Hill's thistle and ram's head lady slipper.
- Much of the topography of this management area is dominated by steep moraine ridges surrounded by outwash channels and plains.

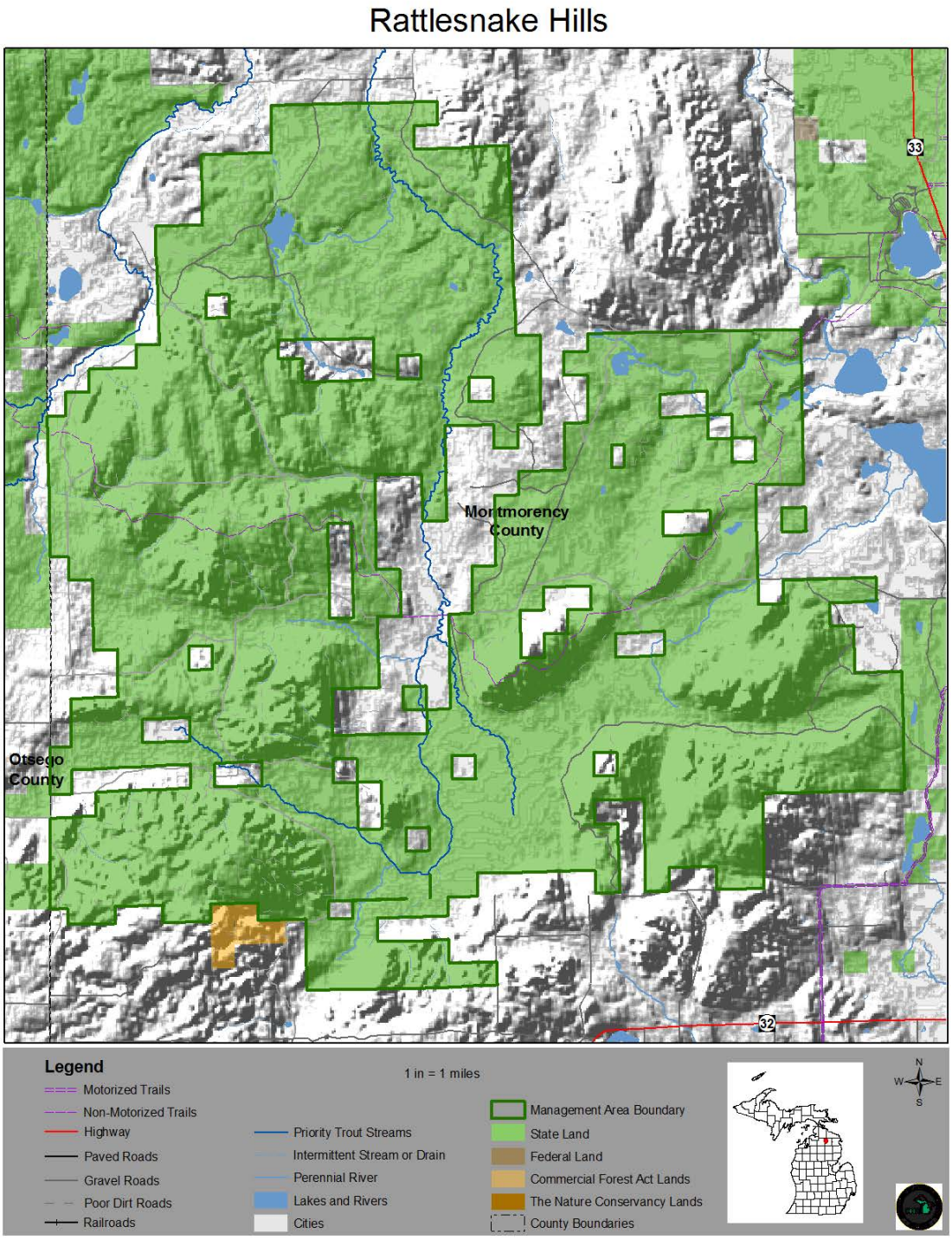

Figure 4.10.1. A map of the Rattlesnake Hills management area (dark green boundary) in relation to surrounding state forest and other land in western Montmorency County, Michigan.

Table 4.10.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Rattlesnake Hills management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Northern Hardwood	21%	6,555	993	5,562		2,521	6,555		2,521
Aspen	19%	6,001	262	5739	2,243		6,001	957	
Cedar	11%	3,302	3,302				3,302		
Red Pine	9%	2,809	80	2729	778	761	2,809	303	1,182
Jack Pine	8%	2,547	169	2378	410		2,547	340	
Oak	7%	2,084	1,120	964	260	407	2,084	88	407
Lowland Conifers	5%	1,708	1,366	342	38		1,708	38	
Mixed Upland Deciduous	4%	1,294		1294	470	387	1,294	185	480
Upland Open/Semi-Open Lands	7%	2,173		2173			2,173		
Lowland Open/Semi-Open Lands	2%	678		678			678		
Misc Other (Water, Local, Urban)	1%	247		247			247		
Others	6%	1,819	559	1260	256	262	1,819	135	290
Total		31,217	7,851	23,366	4,455	4,338	31,217	2,046	4,880

4.10.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions**, **10-Year Management Objectives** and **Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.10.1.1 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwoods (Figure 4.10.2) acres total 6,555 acres or 21% of the management area (Table 4.10.1). Northern hardwoods are found throughout the management area on AFO, PArVVb/AFO, PArVHa/PArVVb habitat sites. Forest communities dominated by northern hardwoods in this management area are valued ecologically as sources of habitat for numerous species of wildlife including elk, bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation. Hemlock may be found in stands throughout the management area. Portions of many stands may be on steep slopes that limit treatment options. In some locations, elk browsing can affect stand density and regeneration.

Data show that 993 acres of northern hardwoods have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 1,277 acres with a partial harvest pending and these acres are included in their current basal area class. There are 53 acres with a final harvest pending and these acres are included in their current basal area class.

Desired Future Condition

- Northern hardwood-dominated forest communities will be maintained on operable sites through selective harvesting to achieve an uneven-aged stand structure to provide for a continuous supply of timber products, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Selectively harvest a projected 2,521 acres of northern hardwood characterized as having a management area of 111 square feet per acre or greater;
- Where necessary and feasible, consider harvesting stands from lower basal area ranges to expedite the balancing of basal area distributions; and
- If present, retain hemlock and other under-represented species in harvest areas for within stand diversity.

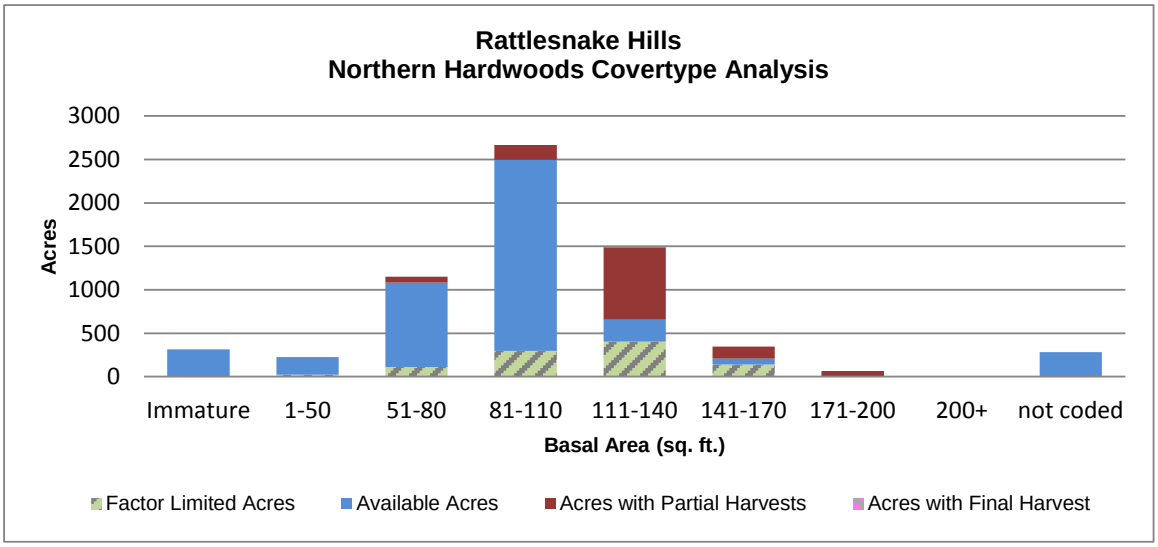

Figure 4.10.2. Basal area distribution for northern hardwoods in the Rattlesnake Hills management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Emerald ash borer and beech bard disease will change the stand composition of the northern hardwoods in this management area. As these species lessen in the northern hardwood stands, consider introducing oak for mast in stands without oak; and
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands.

4.10.1.2 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 6,001 or 21% of the management area (Table 4.10.1). Aspen is found throughout the management area on AFOCa, AFO, PARVVb/AFO, PArVVb and PARVHa/PArVVB habitat sites (see Appendix E). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, elk, bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation. Accessible aspen has been consistently harvested over the last 50 years resulting in most of the aspen being less than 50 years old (Figure 4.10.3).

There are 262 acres of aspen have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 324 acres that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for a regulated harvest, wildlife habitat and recreation opportunity.

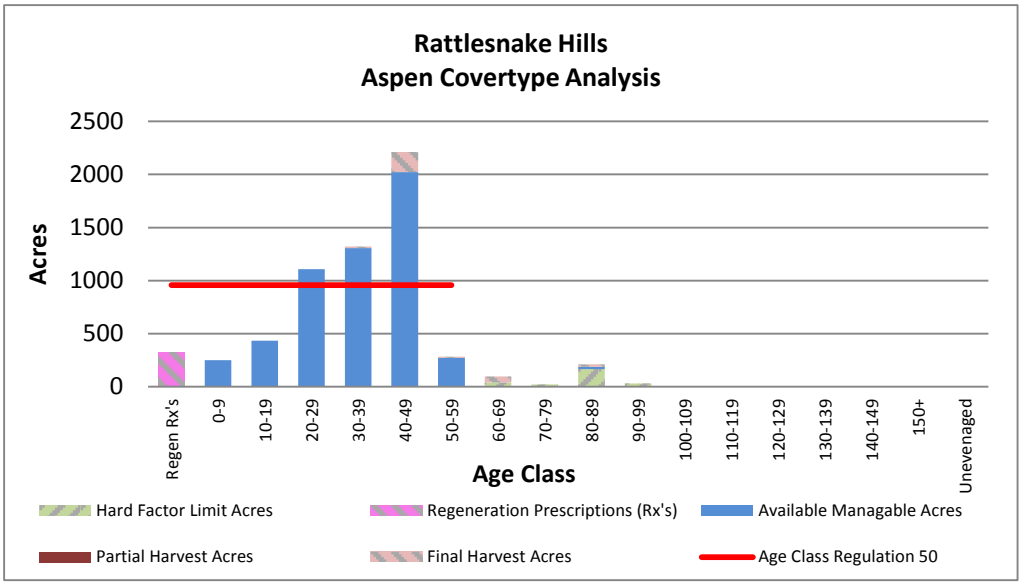

Figure 4.10.3. Age-class distribution for aspen in the Rattlesnake Hills management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct regeneration harvests on a projected 2,243 acres;
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age class distributions; and
- Consider the need for larger harvest areas to minimize possible elk browsing impacts.

Long-Term Management Objectives

- Continue regeneration harvests to balance the age-class distribution; and
- Desired future harvest levels are projected at 957 acres for final harvest per 10-year period.

4.10.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine communities, mostly planted during the Civilian Conservation Corps-era, acres total 2,809 acres or 9% of the management area (Table 4.10.1), with most being 70-79 years old (Figure 4.10.4). Red pine is found on PARVHa, PArVHa/PArVVb and PVCd habitat sites. Red pine plantations in this management area are commercially valued for pulp, saw logs and utility poles. Some of the dry red pine sites are converting to jack pine.

There are 80 acres of red pine have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 118 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class and there are 23 acres with a partial harvest pending and these acres are included in their current age classes.

Desired Future Condition

- Red pine on dry-mesic sites will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0 and 89 years of age to provide for continual harvest, wildlife habitat, and recreational opportunity.

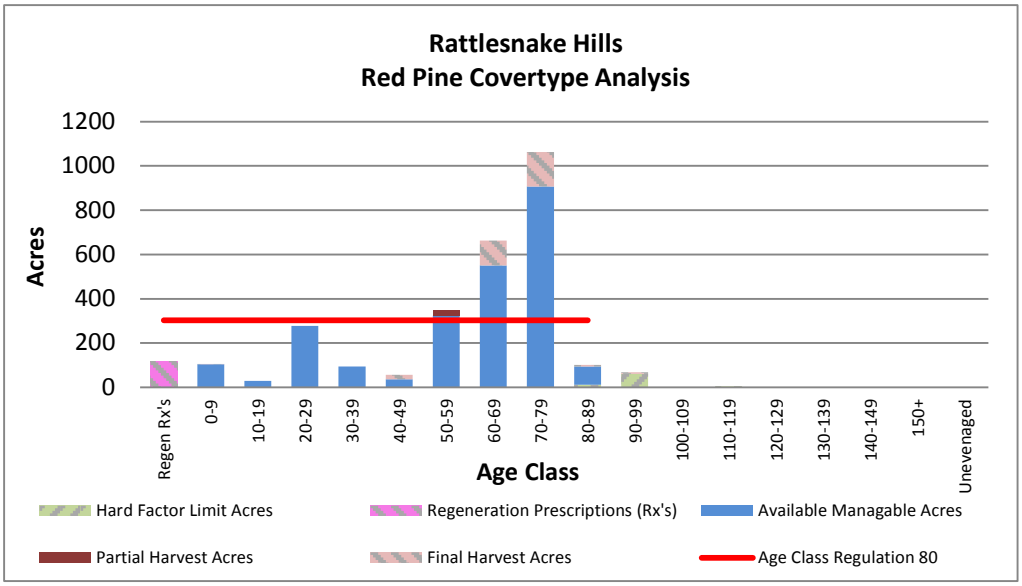

Figure 4.10.4. Age-class distribution for red pine in the Rattlesnake Hills management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age class distribution;
- Conduct partial harvests on a projected 761 acres, concentrating on stands of better quality red pine that has the potential for a higher product value in larger size classes; and
- Conduct regeneration harvests on a projected 778 acres, beginning with the oldest age classes.

Long-Term Management Objectives

- In identified special conservation areas, especially those with natural red pine on dry-mesic sites, consider management of red pine to a biological rotation of 200+ years;
- Over the next several decades, continue thinning red pine that are currently in the 40-69 year age classes. For most stands at age 80, conduct stand-replacement harvests for either natural or planted regeneration; and
- Desired future harvest levels are projected at 303 acres of final harvest and 1,182 acres of partial harvest per 10-year period.

4.10.1.4 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 2,547 or 8% of the management area (Table 4.10.1). Jack pine is found throughout the management area on habitat class PArVVb, PARVHa and PVCd sites. Forest communities dominated primarily by jack pine in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation. Accessible jack pine has been consistently harvested over the last 50 years.

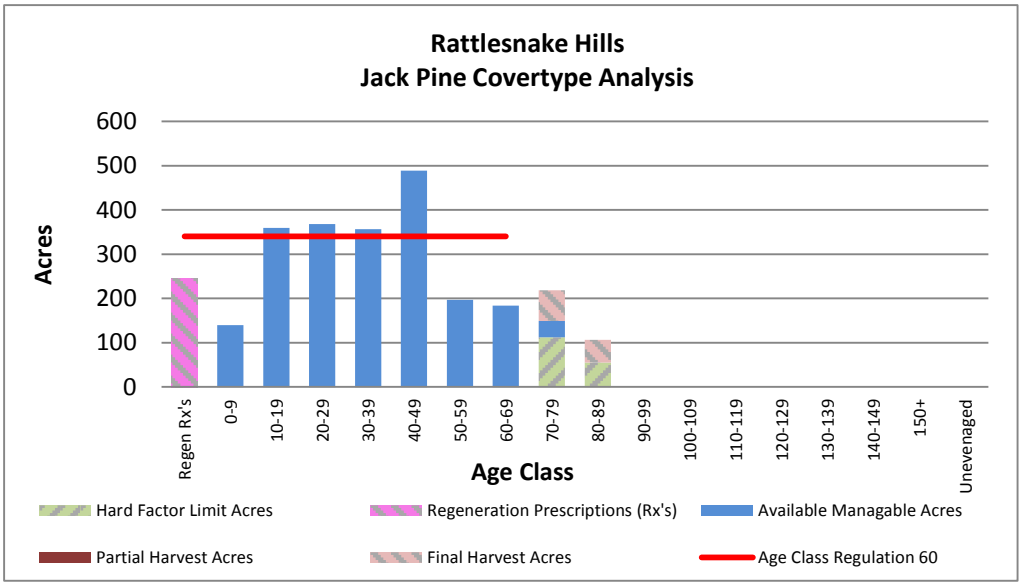

Figure 4.10.5. Age-class distribution for jack pine in the Rattlesnake Hills management area (2012 Department of Natural Resources inventory data).

There are 169 acres of jack pine have met harvest criteria (Figure 4.10.5), but have site conditions that limit harvest (hard factor limit acres). There are 246 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class. Conversions of other cover types to jack pine as a result of treatments that harvest another species and planting to jack pine are included in the regeneration prescription class.

10-Year Management Objectives

- Conduct stand-replacement harvests on a projected 410 acres concentrating on the oldest age classes first.

Long-Term Management Objectives

- Consider the potential for jack pine budworm outbreaks in management decisions;
- Continue management to balance the age-class distributions; and
- Desired future harvest levels are projected at 340 acres of final harvest per 10-year period.

4.10.1.5 Forest Cover Type Management – Oak

Current Condition

Oak acres total 2,084 or 8% of the management area (Table 4.10.1) on PArVHa/PVCd habitat classes. Forest communities dominated primarily by oak in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, deer, squirrels and various birds and commercially for firewood and industrial lumber. There are 1,120 acres of oak have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres).

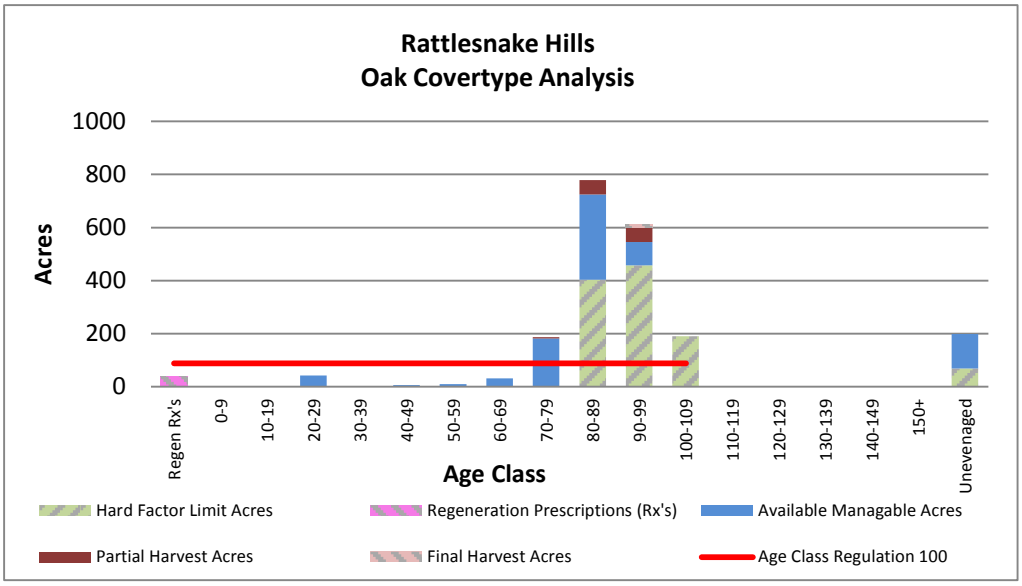

Figure 4.10.6. Age-class distribution for oak in the Rattlesnake Hills management area (2012 Department of Natural Resources inventory data).

There are 13 acres of stands that have regeneration harvest pending and these acres are included in the 0-9 year-old age class (regenerating acres) (Figure 4.10.6) and there are 113 acres with a partial harvest pending and these acres are included in their current age class.

Desired Future Condition

- Northern pin oak will be maintained on operable sites through even-aged management with acres balanced between 0 and 89 years of age;
- Northern red oak will be maintained on operable sites through selection management until age 100; and
- Oak management will provide a sustained yield of forest products along with wildlife mast and habitat and recreation opportunity.

10-Year Management Objectives

- Manage northern pin oak on an 80-year rotation and northern red oak on a 100-year rotation;
- Conduct regeneration harvests on a projected 260 acres;
- Conduct partial harvests on a projected 407 acres concentrating on stands that have not had any harvests or those stands that have a sufficient basal area for a partial harvest; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Over the next several decades, continue stand replacement harvests to balance age-class structure;
- Consider whether to introduce pine as a seed source or stand component to provide cover for oak regeneration and for stand diversity; and
- Desired future harvest levels are projected at 88 acres of final harvest and 407 acres of partial harvest per 10-year period.

4.10.1.6 Forest Cover Type Management – Cedar and Lowland Conifers

Current Condition

Cedar acres total 3,302 or 11% of the management area and lowland conifer acres total 1,708 or 5% of the management area (Table 4.10.1). Cedar and lowland conifer are primarily located on unclassified lowlands (lowlands have not been assessed for habitat classification) throughout the management area. The age-classes for both cover types are heavily skewed toward the older age classes above 70 years of age (Figure 4.10.7 and 4.10.8) and there has been virtually no regeneration.

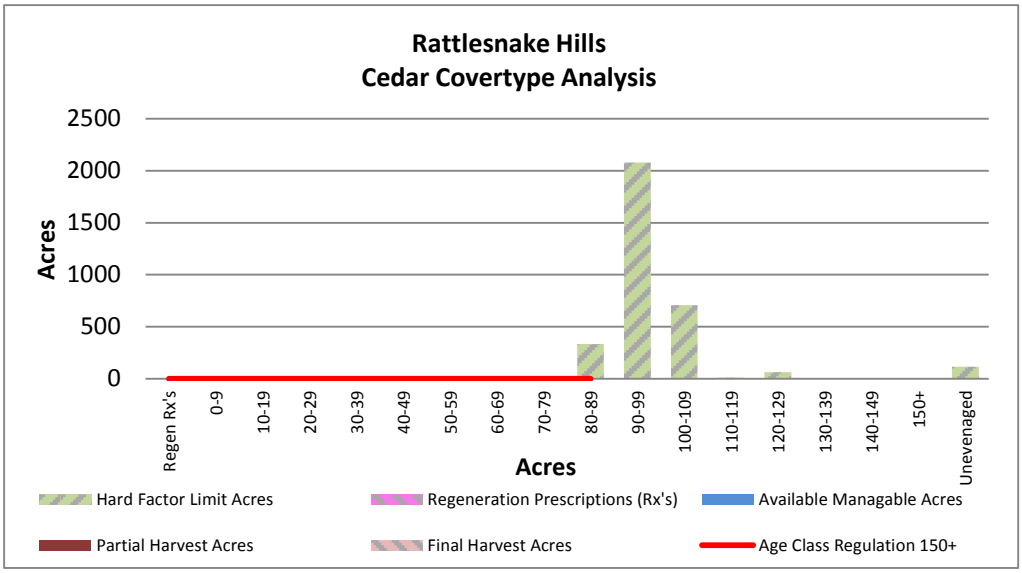

Figure 4.10.7. Age-class distribution for cedar in the Rattlesnake Hills management area (2012 Department of Natural Resources inventory data).

Forest cover types dominated primarily by cedar and lowland conifers in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, hare and various song birds, and commercially for pulp.

There are 871 acres of lowland conifers and all 3,302 acres of cedar that have met harvest criteria, but have a site conditions that may limit the ability to commercially harvest (hard factor limit acres).

Desired Future Condition

- Lowland conifer dominated forest cover types will be maintained on operable sites through even-aged management with acres balanced between 0 and 89 to provide for a sustainable harvest;
- These types will also contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species; and
- By storing high levels of sequestered carbon and serving as carbon sinks, cedar and lowland conifer swamps will play an important role in global geochemical cycles.

10-Year Management Objectives

- If harvests can be done in a manner that will not impact wetland soils, conduct regeneration harvests on a projected 38 acres of lowland conifer;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years-of-entry; and
- Consider methods to ensure adequate regeneration lowland types.

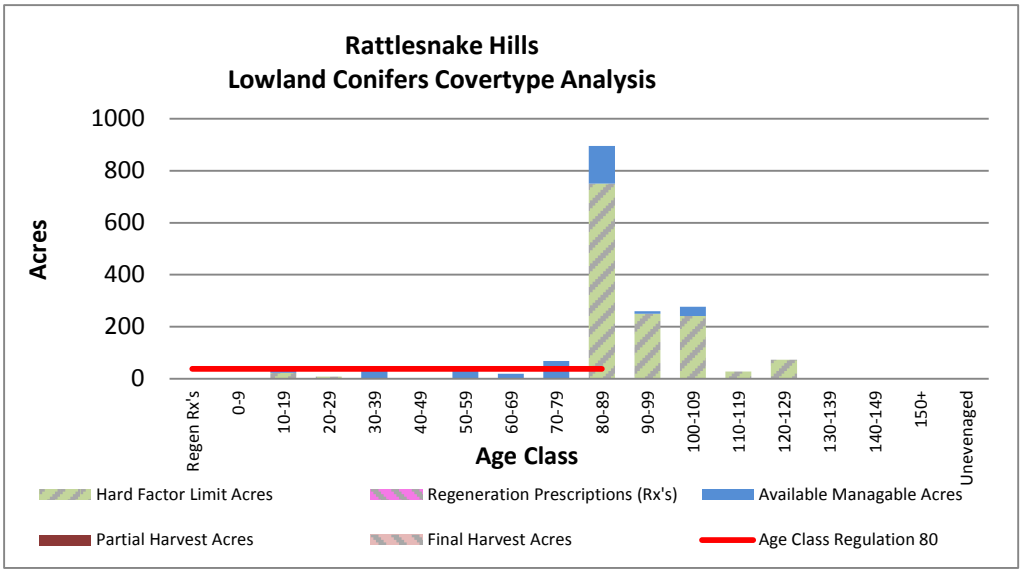

Figure 4.10.8. Age-class distribution for lowland conifer in the Rattlesnake Hills management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- It is acceptable that over the next several decades, the older cedar and lowland conifer, much of it inaccessible for harvest, will continue to experience natural processes (fire, windthrow, insect defoliation and beaver flooding) resulting in the formation of a range of successional stages; and
- Desired future harvest levels are projected at 38 acres of lowland conifer final harvest per 10-year period.

4.10.1.7 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 678 acres or 2% of the management area (Table 4.10.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.10.1.6 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open lands total 2,173 acres or 7% of the management area. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, bare/sparsely vegetated and low-density

trees. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.10.1.7 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: mixed upland deciduous 1,294 acres or 4% of the management area. Other species including non-forested types which are scattered in small stands cover 1,819 acres or 6% of the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These communities will be managed on operable sites, contributing to the compositional diversity of the landscape while providing for sustainable harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- The following species are projected for regeneration harvests: mixed upland deciduous 470 acres, lowland aspen/balsam poplar 115 acres, white pine, 51 acres, natural mixed pines 59 acres and upland mixed forest, 96 acres and:
- The following species are projected for partial harvests: 387 acres of mixed upland deciduous, 27 acres of white pine, 107 acres of natural mixed pines, 99 acres of upland mixed forest and 21 acres of upland conifers.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible.

4.10.2 Featured Wildlife Species

The following have been identified as featured species for this management area during this cycle of state forest planning:

- Black bear
- Eastern massasauga rattlesnake
- Elk
- Golden-winged warbler
- Pileated woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Rattlesnake Hills management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; extensive mature forest; large open grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

Black Bear

The goal for black bear in the management area is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
    - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
    - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Elk

The goal for elk in the management area is to maintain the population at 500-900 animals as measured in the biennial aerial survey. Elk prefer open areas and regenerating deciduous forest. Mast crops, especially acorns, are important sources of food in fall and winter. State forest management should focus on maintaining/increasing early successional, opening and hard mast habitat components at/to desired levels in priority landscapes.

Wildlife Habitat Specifications:

The goals of habitat management in the elk range are described in the 2007 Pigeon River Country Concept of Management:

- Maintain 7-8% of the forest cover types managed by even aged management in the 0-9 year-old age class;
- Maintain the existing aspen component;
- Increase the amount of opening and upland brush to 6-7 percent of the range; and
- Maintain the existing component of mast producing trees (red oak, white oak, northern pin oak and beech).

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
    - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Golden-winged Warbler

The goal for golden-winged warbler in the management area is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
    - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Pileated Woodpecker

The goal for pileated woodpecker in the management area is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees >12 inches in diameter at breast-height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
    - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management, and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-shouldered Hawk

The goal for red-shouldered hawk in the management area is to maintain available habitat. Red-shouldered hawks nest in contiguous, mature, closed canopy, hardwood forests. Nesting habitat consists primarily of well-stocked pole or sawtimber stands (stocking densities 6 and 9) with a closed canopy (80-100%) and basal area of at least 98 square feet per acre. Nests are usually found in deciduous trees with a mean diameter of 23 inches at breast height. State forest management activities should focus on the maintenance of large blocks (>385 acres) of mesic northern forest with the appropriate level of large diameter trees in priority landscapes.

Wildlife Habitat Specifications:

- All suspected red-shouldered hawk nests are to be reported to local wildlife staff and confirmed nests documented in accordance with the DNR *Approach to the Protection of Rare Species on State Forest Lands* (CI 4172) and included in Integrated Forest Monitoring, Assessment and Prescriptions Geographic Decision Support Environment when there is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan DNR's *Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands* (August 2012) will be followed.

Ruffed Grouse

The goal for grouse in the management area is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Wild Turkey

The goal for turkey in the management area is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak, and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the management area are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.10.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed nine listed species and no natural communities of note occurring in the management area as listed in Table 4.10.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

There are no high conservation value areas or ecological reference areas identified for the Rattlesnake Hills management area as illustrated in Figure 4.10.9.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.10.3. Occurrence information for special concern, rare, threatened and endangered communities and species for the Rattlesnake Hills management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Rich conifer swamp		S3/G4	Confirmed				Tamarack	Late
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Insect								
Hungerford's crawling water beetle	*Byrchius hungerfordi*	LE/E/G1/S1	Confirmed	HV	Very High	Northern shrub thicket	Upland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Reptile								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Plants								
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Ram's head lady's-slipper	*Cypripedium arietinum*	SC/G3/S3	Confirmed			Rich conifer swamp	Tamarack	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
						Volcanic bedrock lakeshore	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Poor fen	Lowland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Great Lakes barrens	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Volcanic bedrock glade	Upland open/semi-open	N/A
						Granite bedrock glade	Upland open/semi-open	N/A
Rough fescue	*Festuca scabrella*	T/G5/S2S3	Confirmed			Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Limestone oak fern	*Gymnocarpium robertianum*	T/G5/S2	Confirmed			Rich conifer swamp	Tamarack	Late
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone lakeshore cliff	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

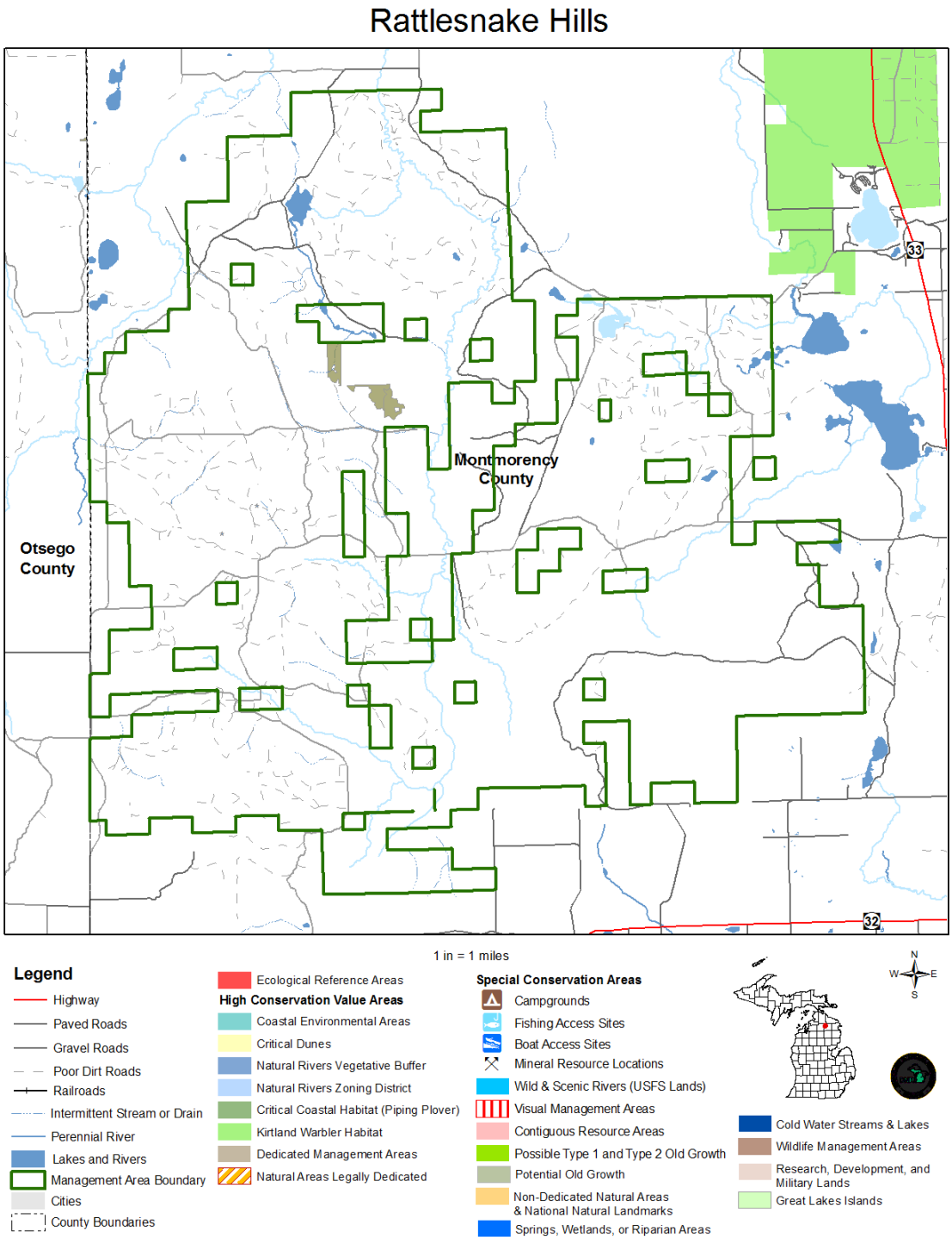

Figure 4.10.9. A map of the Rattlesnake Hills management area showing the special resource areas.

4.10.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include oak decline, emerald ash borer, beech bard disease and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.

- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important.
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow.
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.10.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.10.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Rattlesnake Hills- FMD MAs	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	2	2	1

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Japanese Knotweed *Fallopia japonica*	2

4.10.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC4011. Designated high priority trout streams for this management area are shown in Figure 4.10.1 and listed in Appendix F.

4.10.6 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependant on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources. The following fire management concepts should be applied in the management area:

- Reintroduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition; and
- Incorporate fire as a tool to restore or maintain managed openings.

4.10.7 Public Access and Recreation

Where access is limited on state forest land, the DNR will continue to seek access across adjacent private property. In accordance with the DNR's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts. The High Country Pathway is located in this management area as shown in Figure 4.10.1.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management to protect trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.10.8 Oil, Gas and Mineral Development

Surface sediments consist of coarse-textured till, glacial outwash sand and gravel and postglacial alluvium and an end moraine of medium-textured till. The glacial drift thickness varies between 200 and 600 feet. Sand and gravel pits are located in this management area, and there is good potential.

The Mississippian Coldwater and Sunbury Shales and Devonian Berea Sandstone and Bedford and Antrim Shales subcrop below the glacial drift. The Antrim is quarried for cement products elsewhere in the state.

Oil and gas production from the Antrim Shale throughtout the management area and a few Guelph (former Niagaran) reefs are located in the southwest corner. The Collingwood Formation may also have oil and gas potential in this area and nearly all of the management area is leased for the Antrim. If drilling is sucessful for the Collingwood Formation, additional drilling in the management area could occur.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended, or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.11 MA 11 – Thunder Bay Outwash Management Area

Summary of Use and Management

Management in the Thunder Bay Outwash management area (MA) (Figure 4.11.1) will emphasize balancing the age classes of aspen, jack pine and red pine and regenerating the aging oak resource to sustainably produce various timber products, enhance game and non-game wildlife habitat and provide for forest-based recreational uses. Areas of unique character will be identified and managed accordingly. With about 12% of the management area being lowland conifers or cedar in addition to other small amounts of lowland types, management activities may be minimally constrained. Expected trends within this 10-year planning period are increased recreational pressure, introduced pests and diseases and managing oil and gas development.

The current predominant cover types, acreages and projected harvest acres in the management area are shown in Table 4.11.1.

Introduction

This management area is located in northeastern Lower Peninsula in Montmorency and Presque Isle counties and contains 56,111 acres of state forest (Figure 4.11.1). The primary attributes which identify the Thunder Bay Outwash management area include:

- The management area falls mostly within Albert's Onaway sub-region (Albert, 1995).
- Historically fires were fairly frequent resulting in red and jack pines mixed with oak being prominent and there was little aspen. The current vegetation composition is mostly aspen, red pine, oak and jack pine with only 6% in relatively inaccessible lowland types.
- The dominant landform consists of rolling to moderately sloping ground moraine topography. Drumlins are common and are typically separated by areas of poorly drained outwash.
- The Thunder Bay Outwash management area is a popular destination for game hunting, hiking, mushroom hunting, etc. for the nearby communities of Atlanta, Hillman and Onaway. There are also snowmobile and off-road vehicle trials that are popular with recreationists.
- Due to the proximity of this management area to the populated areas, the forest resources contribute social and economic values to the area.
- The Rainy River and Sportsman's Flooding Wildlife Management Area are located in the management area.
- Department of Natural Resources recreation facilities in this management area include nearby Clear Lake State Park, Ess Lake and Jackson Lake state forest campgrounds and the High Country pathway, along with snowmobile and off-road vehicle trails in the area.
- Much of the topography in this management area was sculpted by re-advancing glaciers that left drumlin fields interspersed with poorly drained outwash. During the early Algonquin period when Lake Huron was receding, the drumlins and moraines were islands. Small areas of exposed limestone bedrock are common and karst topography is present.

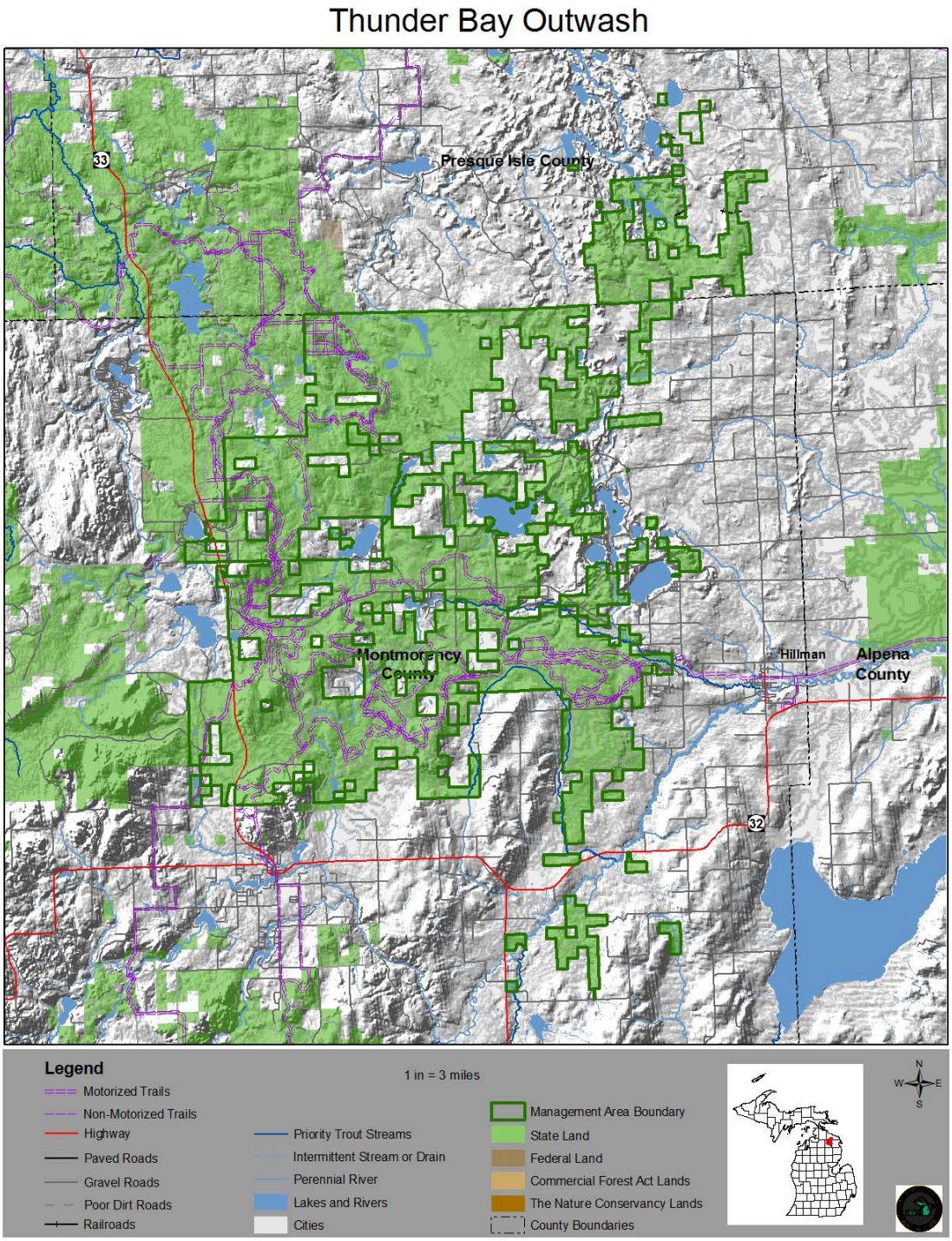

Figure 4.11.1. A map of the Thunder Bay Outwash management area (dark green boundary) in relation to surrounding state forest and other lands in northeast Montmorency and southern Presque Isle counties, Michigan.

Table 4.11.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Thunder Bay Outwash management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	33%	18,357	515	17,842	5,805		18,357	2,974	
Red Pine	9%	4,789	379	4410	960	1,152	4,789	490	1,550
Oak	8%	4,715	1,335	3380	296	875	4,715	307	924
Jack Pine	7%	4,207	160	4047	189		4,207	578	
Cedar	7%	4,106	4,106				4,106		
Lowland Conifers	5%	2,872	2,308	564	66		2,872	66	
Lowland Aspen/Balsam Poplar	3%	1,787	897	891	152		1,787	152	
Northern Hardwood	3%	1,608	3	1605		512	1,608		607
Mixed Upland Deciduous	3%	1,589		1589	16	307	1,589	227	337
Upland Open/Semi-Open Lands	4%	2,204		2204			2,204		
Lowland Open/Semi-Open Lands	5%	2,950		2950			2,950		
Misc Other (Water, Local, Urban)	1%	839		839			839		
Others	11%	6,088	2,496	3592	661	711	6,088	395	896
Total		56,111	12,199	43,912	8,144	3,557	56,111	5,189	4,314

4.11.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.11.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 18,357 acres or 33% of the management area (Table 4.11.1). Aspen is found throughout the management area on PARVVb/AFO, PARVVb, PArVHa and PVCd habitat sites (see Appendix E). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation. Aspen occurs throughout the area. Most of the aspen in this management area is younger than the 60-year rotation (Figure 4.11.2). There are 515 acres of aspen that have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres).

There are 2,034 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

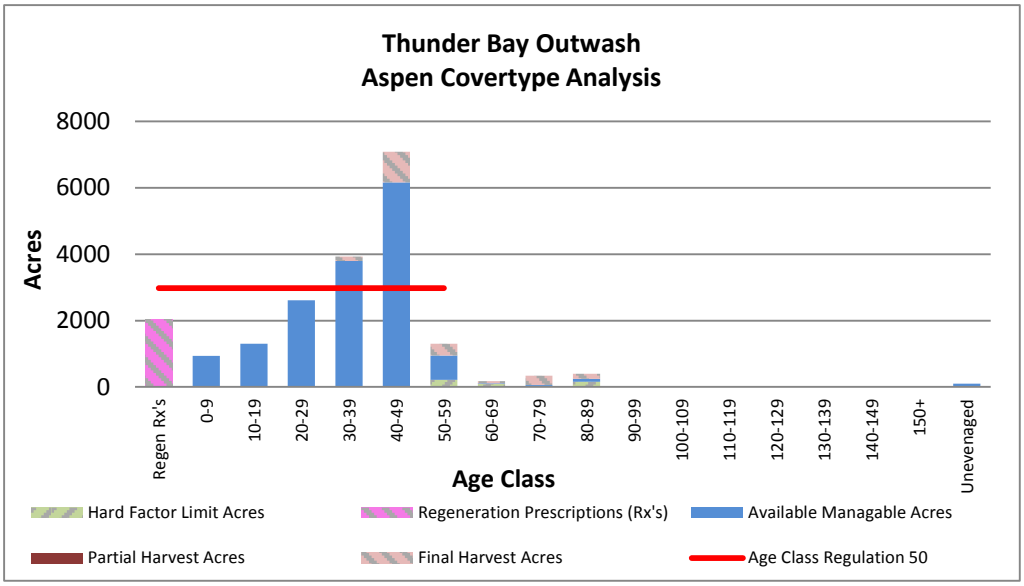

Figure 4.11.2. Age-class distribution for aspen in the Thunder Bay Outwash management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct regeneration harvests a projected 5,805 acres in the next 10 years; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue to work towards balancing the age-class distribution of aspen; and
- Desired future harvest levels are projected at 2,974 acres of final harvest per 10-year period.

4.11.1.2 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 4,789 acres or 9% of the management area (Table 4.11.1), with most being 70-89 years old. Nearly all of the pine is of planted origin on PARVVb, PArVHa/PArVVb, PArVHa and PVCd habitat sites. The acreage of red pine on very dry sites (PVCd) may decrease because of conversion to jack pine. Red pine in this management area is commercially valued for pulp, saw logs and utility poles. Various regeneration techniques have been prescribed in this landscape. There are 379 acres of red pine have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 413 acres with a regeneration harvest pending and these acres are included in the regeneration prescription class. Figure 4.11.3 includes the projected number of acres converted to red pine as a result of treatments that remove an overstory species resulting in planting to red pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine on dry-mesic sites will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0 and 89 years of age to provide for continual harvest, wildlife habitat and recreational opportunity.

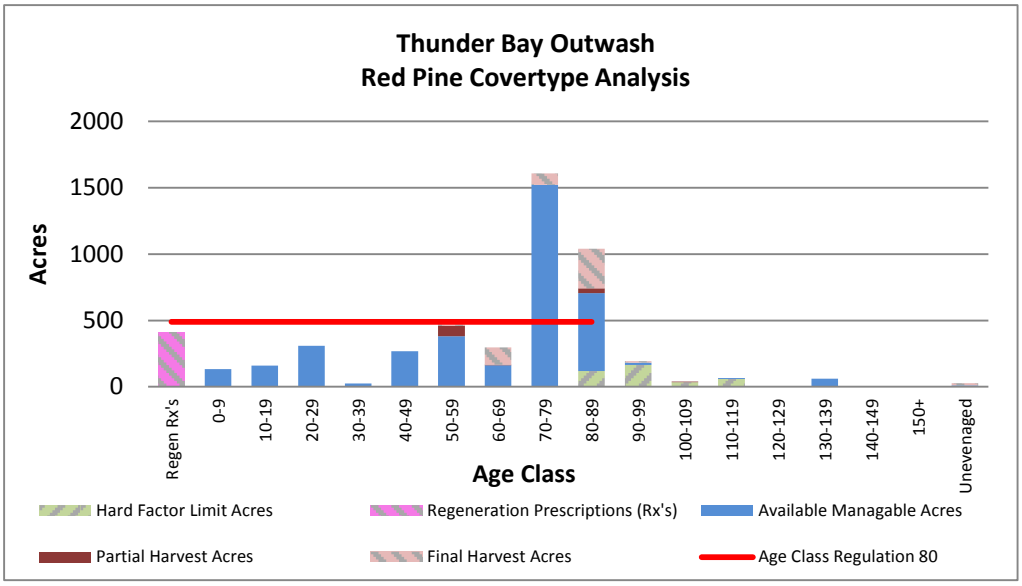

Figure 4.11.3. Age-class distribution for red pine in the Thunder Bay Outwash management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age-class distribution;
- Conduct thinning harvests on a projected 1,152 acres, concentrating on stands of better quality red pine that has the potential for a higher product value in larger size classes; and
- Conduct stand replacement harvests, on a projected 960 acres, beginning with the oldest age classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- Continue work towards balancing the age-class distribution between the ages of 0 and 89 years through final harvests and replanting;
- Seek opportunities to move red pine to suitable sites which may include managing red pine in mixed stands with oak or other species;
- Red pine found in riparian buffers or other sensitive sites may remain until biological maturity; and
- Desired future harvest levels are projected at 490 acres for final harvest and 1,550 acres for partial harvest per 10-year period.

Section 4.11.1.3 Forest Cover Type Management – Oak

Current Condition

Oak acres total 4,715 or 9% of the management area (Table 4.11.1) on PArVHa/PVCd habitat classes. The oak quality varies from better-quality red oak to poorer-quality pin oak. Forest communities dominated primarily by oak in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, deer, squirrels and various birds and commercially for firewood and industrial lumber. On northern pin oak sites (PVCd), clearcuts have a history of producing regeneration better than 5-spot patch cuts, especially on low site-index sites.

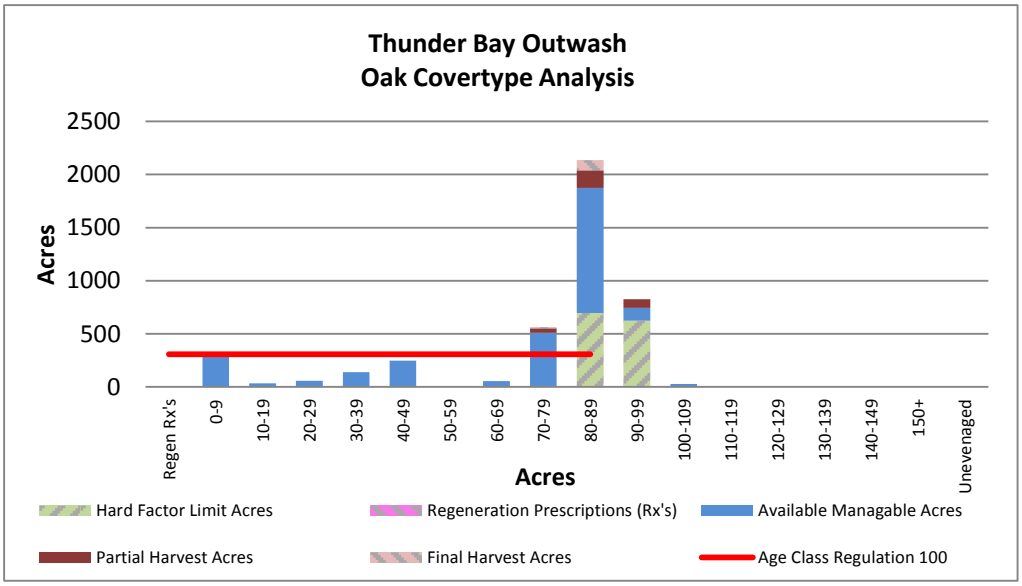

Figure 4.11.4. Age-class distribution for oak in the Thunder Bay Outwash management area (2012 Department of Natural Resources inventory data).

Some poor-performing oak stands are suitable for reintroducing red pine. Many stands have good natural white pine regeneration in the understory. There are 1,335 acres of oak that have met harvest criteria (Figure 4.11.4), but have site conditions that limit harvest (hard factor limit acres). There are two acres that have harvest regeneration harvest pending and these acres are included in the regeneration prescription class. There are 289 acres that have partial harvests pending and these acres are included in the current age classes. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in a release of oak. These acres are included in the regeneration prescription class.

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management to provide for timber products, wildlife habitat and recreational opportunities; and
- Northern pin oak will be maintained on operable sites through even-aged management with acres balanced between 0 and 89 years of age. Northern red oak will be maintained on operable sites through selection management between 0 and 109 years of age.

10-Year Management Objectives

- Manage northern pin oak on an 80-year rotation and red oak on a 100-year rotation;
- Conduct final harvests on a projected 296 acres;
- Conduct partial harvests on a projected 875 acres; and
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration in other cover types.

Long-Term Management Objectives

- Continue work towards maintaining oak as the predominant species in selected stands through restarting harvests;
- It is acceptable that some oak stands may become mixed stands through partial removal of an oak overstory, planting pine in oak stands or through natural regeneration of other species;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area; and
- Desired future harvest levels are projected at 307 acres for final harvest and 924 acres for partial harvest per 10-year period.

4.11.1.4 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 4,207 acres or 8% of the management area on PArVHa/PArVVb and PVCd habitat classes. Forest communities dominated primarily by jack pine in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation.

Some jack pine plantings were historically used by Kirtland's warbler. Accessible jack pine has been consistently harvested over the last 40 years. The acreage of jack pine is expected to increase as red pine on dry sites (PVCd) is converted to jack pine. There are 160 acres of jack pine have met harvest criteria (Figure 4.11.5), but have site conditions that limit harvest (hard factor limit acres). There are 96 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species and planting to jack pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Jack pine-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 69 years of age to provide for a sustainable harvest of wood products along with wildlife habitat and recreation opportunity.

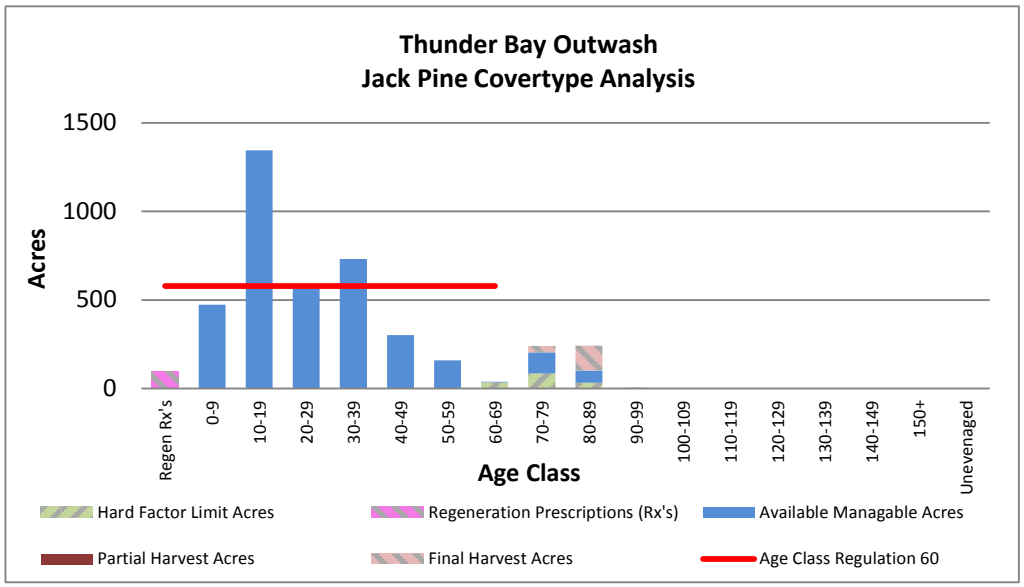

Figure 4.11.5. Age-class distribution for jack pine in the Thunder Bay Outwash management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct final harvests on a projected 189 acres with a concentration on the oldest age classes.

Long-Term Management Objectives

- Consider management strategies to minimize the impact of jack pine budworm outbreaks; and
- Desired future harvest levels are projected at 578 acres for final harvest per 10-year period.

4.11.1.5 Forest Cover Type Management – Cedar and Lowland Conifers

Current Condition

Cedar acres total 4,106 or 7% of the management area and lowland conifer acres total 2,872 or 5% of the management area (Table 4.11.1). Cedar (Figure 4.11.6) and lowland conifer (Figure 4.11.7) are primarily located on unclassified lowlands (lowlands have not been assessed for habitat classification) throughout the management area. The age classes

for both cover types are heavily skewed toward the older age classes above 70 years of age and there has been virtually no regeneration.

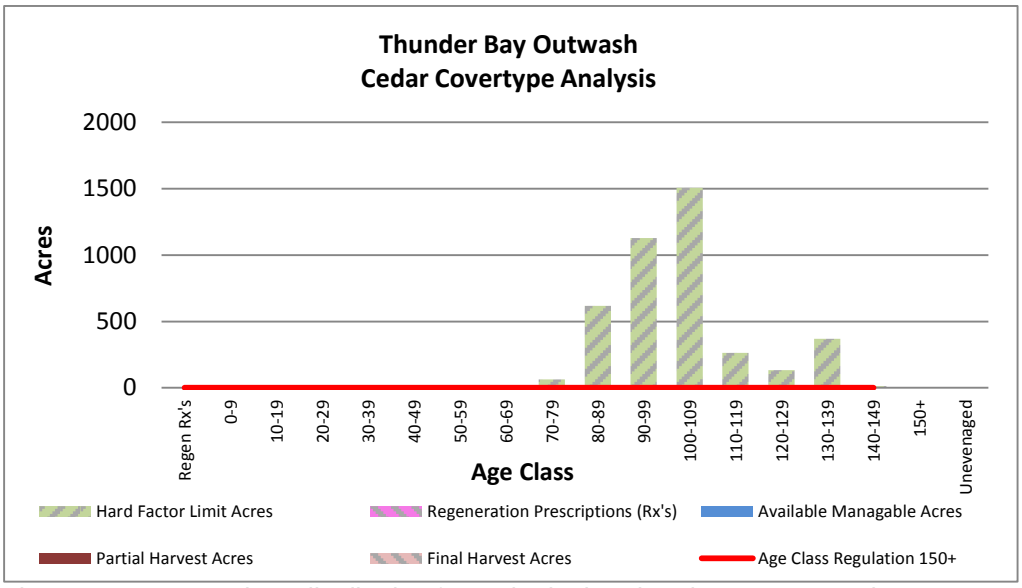

Figure 4.11.6. Age-class distribution for cedar in the Thunder Bay Outwash management area (2012 Department of Natural Resources inventory data).

Forest cover types dominated primarily by cedar and lowland conifers in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, hare and various song birds and commercially for pulp.

There are 871 acres of lowland conifers and all 4,106 acres of cedar that have met harvest criteria, but have a site conditions that may limit the ability to commercially harvest (hard factor limit acres).

Desired Future Condition

- Lowland conifer-dominated forest cover types will be maintained on operable sites through even-aged management with acres balanced between 0 and 89 to provide for a sustainable harvest;
- These types will also contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species; and
- By storing high levels of sequestered carbon and serving as carbon sinks, cedar and lowland conifer swamps will play an important role in global geochemical cycles.

10-Year Management Objectives

- If harvests can be done in a manner that will not impact wetland soils, conduct regeneration harvests on a projected 66 acres of lowland conifer;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years-of-entry; and
- Consider methods to ensure adequate regeneration of lowland types.

Long-Term Management Objectives

- It is acceptable that over the next several planning periods, the older cedar and lowland conifer, much of it inaccessible for harvest, will continue to experience natural processes (fire, windthrow, insect defoliation and beaver flooding) resulting in the formation of a range of successional stages; and
- Desired future harvest levels are projected at 66 acres of lowland conifer for final harvest per 10-year period.

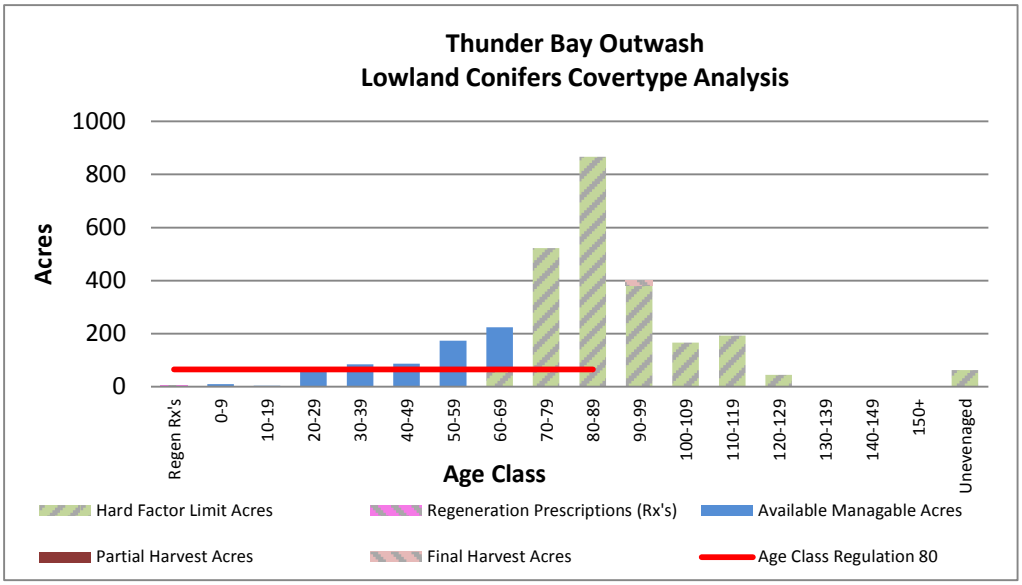

Figure 4.11.7. Age-class distribution for lowland conifer in the Thunder Bay Outwash management area (2012 Department of Natural Resources inventory data).

4.11.1.6 Forest Cover Type Management – Lowland Aspen/Balsam Poplar

Current Condition

Lowland aspen/balsam poplar (Figure 4.11.8) (primarily balsam poplar, swamp aspen and swamp white birch) acres total 1,787 or 3% of the management area.

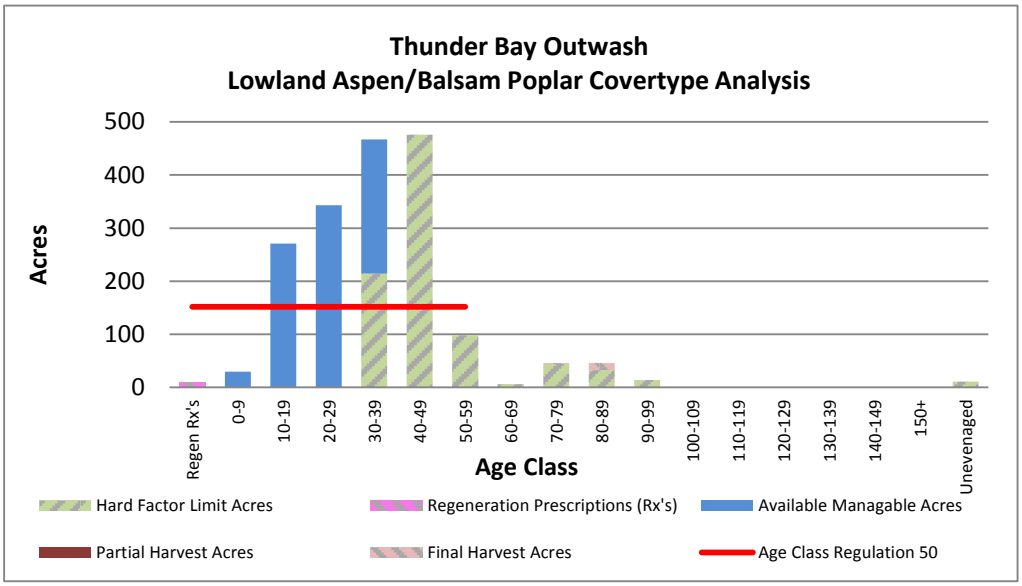

Figure 4.11.8. Age-class distribution for lowland aspen/balsam poplar in the Thunder Bay Outwash management area (2012 Department of Natural Resources Inventory Data).

Forest communities dominated primarily by lowland poplar in this management area are valued ecologically as sources of habitat for numerous species of wildlife including woodcock, ruffed grouse, bear, white-tailed deer (a featured species in this management area) and various song birds and commercially for pulp. Data show that 96 acres of lowland poplar have met harvest criteria, but have site conditions that limit harvest. There are 9 acres with a final harvest prescribed and these acres are included in the regeneration prescriptions (Rx's) class.

There are spikes of acres above the regulation level in the 20 through the 49 year age classes. There are few acres available above the 50-year age class regulation target and consideration should be given to harvesting from younger age classes to expedite balancing the age-class distribution.

Desired Future Condition

- Lowland poplar-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for a regulated and sustainable harvest, available wildlife habitat and to contribute to the preservation of regional biodiversity.

10-Year Management Objectives

- Conduct final harvests on a projected 152 acres of lowland aspen/balsam poplar, if it can be done in a manner that will not adversely impact wetland soils; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite balancing of age-class distributions.

Long-Term Management Objectives

- It is acceptable that the older lowland poplar, much of it inaccessible for commercial harvest, will continue to experience natural processes (windthrow, flooding and senescence);
- Consider alternatives to managing ash in lowland areas due to impacts from the emerald ash borer; and
- Final harvests are projected to be 152 acres in the next 10-year planning period.

Section 4.11.1.7 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 1,608 acres or 3% of the management area (Table 4.11.1). Northern hardwood forest communities in this management area are valued ecologically as sources of habitat for numerous plants (i.e.' spring ephemeral herbs, ferns and shrubs) and wildlife species including black bear, red shouldered hawk, wood thrush and red-backed salamander; commercially for firewood, high value sawlogs and veneer; and recreationally for hiking, biking, hunting and mushrooming.

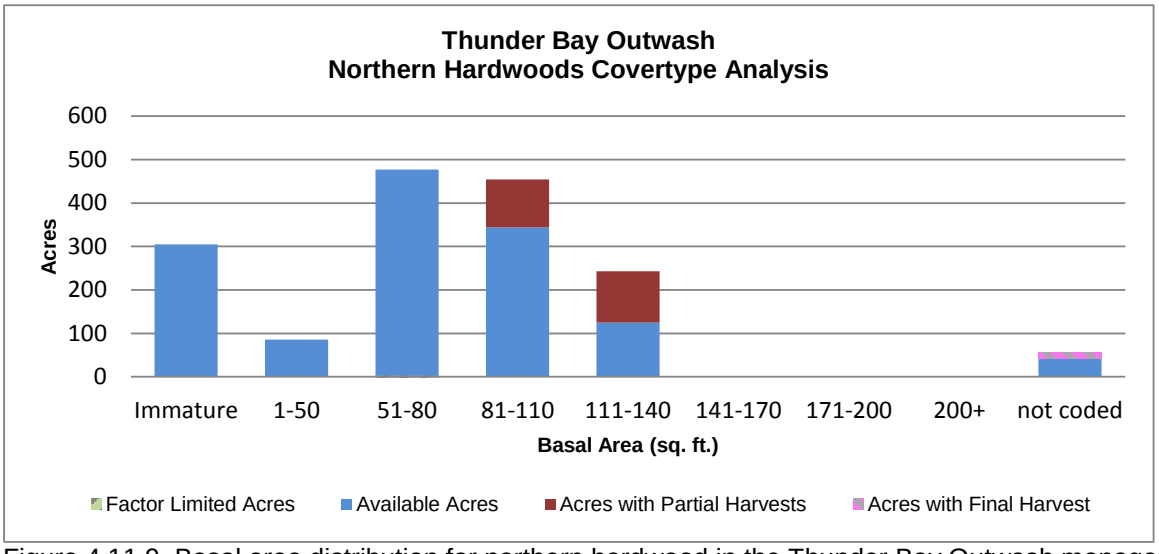

Figure 4.11.9. Basal area distribution for northern hardwood in the Thunder Bay Outwash management area (2012 Department of Natural Resources inventory data).

There are 59 acres of stands that have regeneration harvest pending and these acres are included in the current age class. There are 228 acres with a partial harvest pending and these acres are included in their current age class.

Desired Future Condition

- Northern hardwood stands will be maintained and managed through selection harvests on better quality hardwood sites and through regeneration harvests on poorer quality hardwood sites to provide a sustainable timber supply, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- On better quality hardwood sites a projected 512 acres will be harvested through selection harvests to produce uneven-aged stands;
- Where present, retain oak for mast and hemlock and white pine for within-stand diversity; and
- Where necessary and feasible, consider harvesting stands from lower basal area ranges to expedite the balancing of basal area distributions.

Long-Term Management Objectives

- Continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer, in northern hardwood stands, using Beech Bark Disease Management Guidelines and Emerald Ash Borer Guidelines;
- Consider whether to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands;
- Continue to manage northern hardwoods for stand quality, age and species diversity, wildlife values and a sustainable yield of wood products; and
- Continue to manage for stands with an uneven-age class on better-quality hardwood sites.

4.11.1.8 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 2,950 acres or 5% of the management area (Table 4.11.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.11.1.9 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 2,204 or 4% of the management area (Table 4.11.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management opportunities to maintain openings.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.11.1.10 Forest Cover Type Management – Other Types

Current Condition

Other species including non-forested types which are scattered in small stands cover 6,088 acres (11%). All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape in addition to providing wood products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct regeneration harvests on a projected 41 acres of lowland deciduous; 17 acres of planted mixed pines; 168 acres of upland mixed forest; 22 acres of lowland spruce/fir; 255 acres of white pine; 18 acres of tamarack; 85 acres of upland spruce/fir; and 54 acres of upland conifers;
- Conduct partial harvests on a projected 307 acres of mixed upland deciduous; 299 acres of upland mixed forest; 217 acres of white pine; 130 acres of natural mixed pines; and 65 acres of upland conifers; and
- Consider methods to ensure regeneration of lowland types.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible.

4.11.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this cycle of state forest planning:

- Black bear
- Eastern massasauga rattlesnake
- Golden-winged warbler
- Pileated woodpecker
- Ruffed grouse
- White-tailed deer

The primary focus of wildlife habitat management in the Thunder Bay Outwash management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast and mesic conifer components. An overview of featured species is included in Section 3.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
  - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than12 inches diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management, and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous, and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.

- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-uear management direction for aspen, lowland aspen, lowland deciduous, and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.11.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed eight listed species and no natural communities of note occurring in the management area as listed in Table 4.11.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

There are no high conservation value areas or ecological reference areas identified for the Thunder Bay Outwash management area as illustrated in Figure 4.11.10.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.11.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Thunder Bay Outwash management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Fish								
Cisco (lake herring)	*Coregonus artedi*	T/G5/S3	Confirmed	MV	Low	Great Lakes	Aquatic	N/A
						Inland lake	Aquatic	N/A
						Rivers	Aquatic	N/A
Insect								
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Reptile								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Plants								
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Ram's head lady's-slipper	*Cypripedium arietinum*	SC/G3/S3	Confirmed			Rich conifer swamp	Tamarack	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
						Volcanic bedrock lakeshore	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Poor fen	Lowland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Great Lakes barrens	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Volcanic bedrock glade	Upland open/semi-open	N/A
						Granite bedrock glade	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

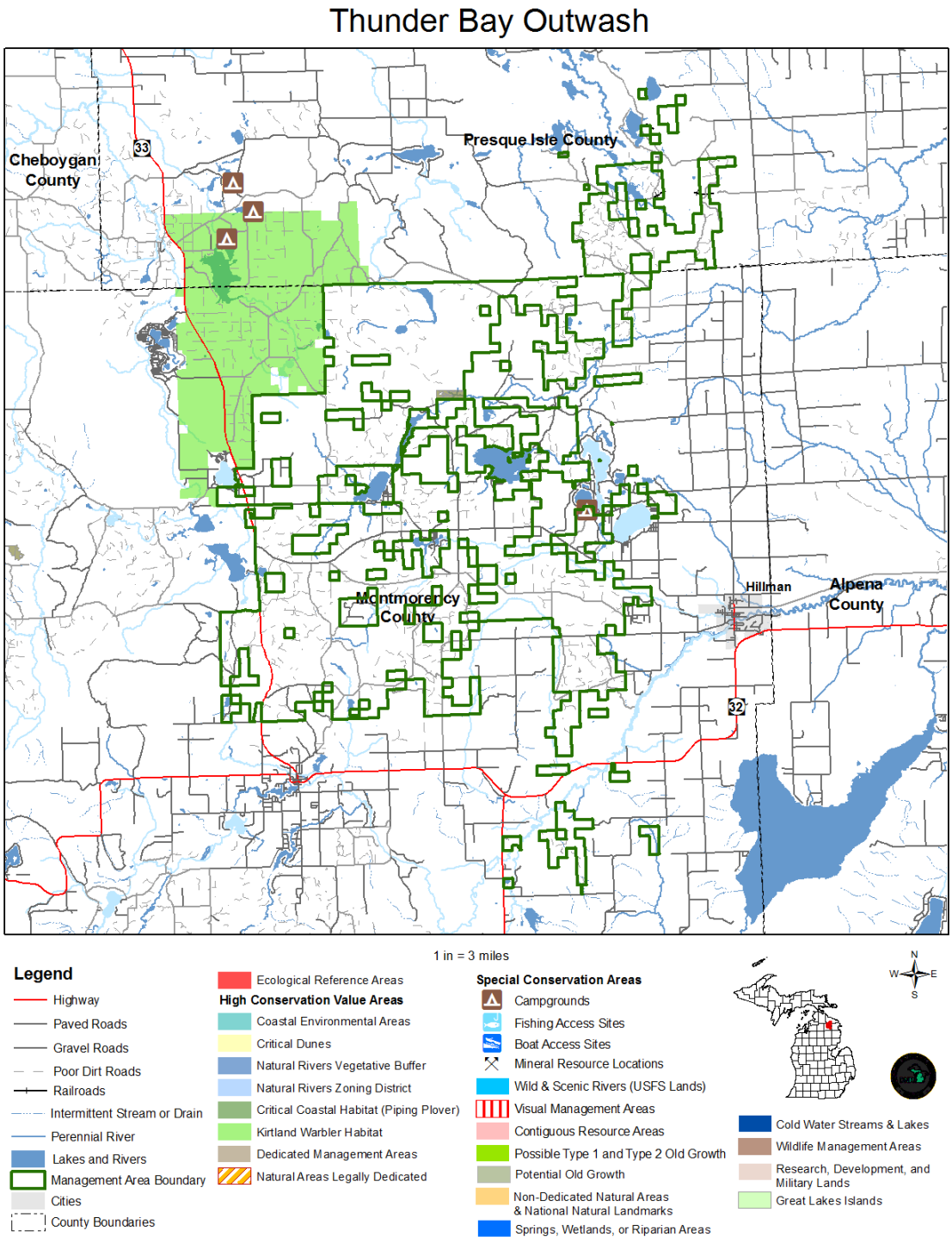

Figure 4.11.10. A map of the Thunder Bay Outwash management area showing the special resource areas.

4.11.5 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area includes oak decline and management will be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains;
- Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot; and
- Shorter rotations will reduce risk of decline.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species are mapped in and within a five-mile buffer of the management area. Currently, there are no invasive species recorded within this management area or within a five-mile radius. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

4.11.6 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.11.1 and listed in Appendix F.

4.11.6 Fire Management

Historically, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or herbaceous openland/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependant on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be considered in the management area:

- Where feasible, use fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition, particularly from red maple.
- Where feasible, incorporate fire as a tool to restore or maintain managed openings.
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.11.7 Public Access and Recreation

Access may be minimally constrained by lowland areas that cover more than 12% of the management area. Where access is limited on state forest land, the DNR will continue to seek access across adjacent private property. In accordance with the DNR's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts. There is one state forest campground located within this management area as shown in Figure 4.11.10. The Atlanta Off-Road Vehicle Trail and route is located throughout the management area as shown in Figure 4.11.1.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review

process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single-track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.11.8 Oil, Gas and Mineral Development

Surface sediments consist of coarse-textured till, glacial outwash sand and gravel and postglacial alluvium. The glacial drift thickness varies between 50 and 600 feet. Sand and gravel pits are located in this management area and there is good potential for additional pits.

The Mississippian Coldwater and Sunbury Shales and Devonian Berea Sandstone, Bedford and Antrim Shales and the Traverse Formation subcrop below the glacial drift. The Traverse Limestone has limestone/dolomite potential, especially in areas of thin glacial till.

The southern portion of the management area has been developed for gas production from the Antrim Shale. Well spacing is currently 80 acres and most of the Antrim potential has already been drilled. The Collingwood Formation may also have oil and gas potential in this area and probably will have a well spacing of 320-640 acres per well (or possibly larger). Most of the southern area of the management area is leased for the Antrim and drilling, if sucessful for the Collingwood, would use existing sites. Drilling and leasing for the Collingwood could expand into the northen portion of the management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended, or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.12 MA 12 – Alpena Lake Plain Management Area

Summary of Use and Management

Management in the Alpena Lake Plain management area (MA) emphasizes balancing age classes of aspen and lowland poplar and regenerating the aging swamp hardwood and conifer resource where possible. Management will strive to sustainably produce various forest products; enhance game and non-game wildlife habitat; protect areas of unique character, such as archeological sites in the Devil's Lake/Indian Reserve Recreation Area; and provide for forest-based recreational uses. Management activities are severely constrained by poor access in the swampy (78% lowland) portions of this management area. Expected trends within this 10-year planning period are increased recreational pressure, especially near Alpena, introduced pests and diseases and difficulty in regenerating swamp types.

Introduction

The Alpena Lake Plain management area is located in the extreme northeast corner of the northern Lower Peninsula in Alpena and Presque Isle counties and contains 53,805 acres of state forest (Figure 4. 1). The primary attributes which identify the Alpena Lake Plains management area include:

- The management area falls within Albert's Onaway and Cheboygan sub-regions (Albert, 1995).
- The historic and current predominant wetland types with isolated red pine on the higher elevations mixed with jack pine. Aspen is currently more predominate than historically. The Alpena Lake Plain is 78% swampy.
- The dominant landforms of sandy lake plain over limestone bedrock near the surface. Much of the topography is a series of beach ridges and adjacent swales. There are several large wetland complexes in this management area.
- Due to the proximity of this management area to the population centers of Alpena and Rogers City, the forest resources contribute social and economic values to the area.
- A snowmobile trail crosses through part of the area as well as the Ossineke State Forest Campground, off-road vehicle trails (such as the Devil's Lake Off-Road Vehicle Trail) and the Northeast State Trail.

Much of the topography of this management area is dominated by a series of beaches and swales extending inland several miles. Further inland the wet areas between beaches become better drained and in some cases are excessively drained. Early logging greatly changed the composition of the upland forests of this management area, particularly those originally dominated by white pine, red pine and hemlock. While most of the wetlands have also been logged, wetland types have remained the same as they were circa-1800.

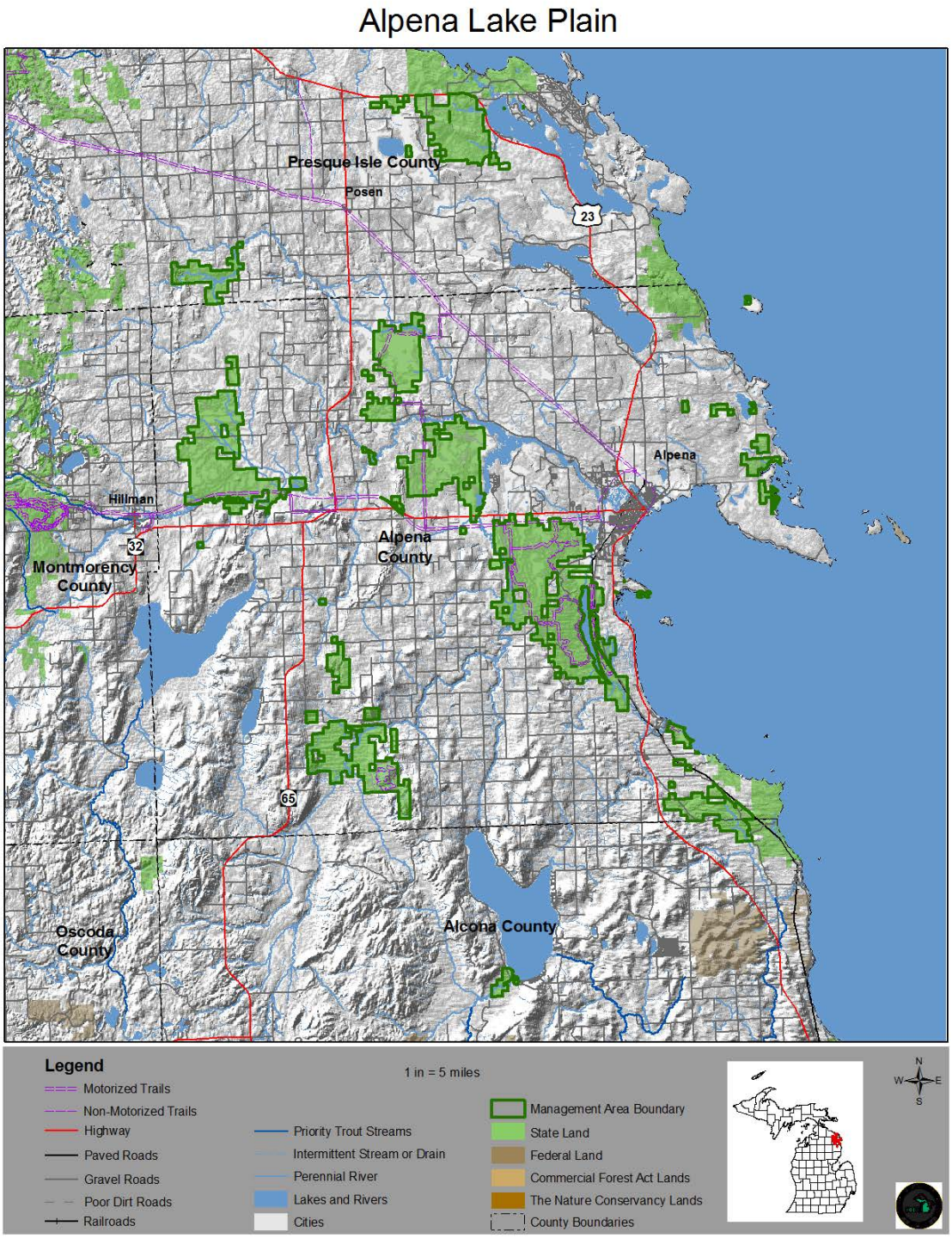

Figure 4.12.1. A map of the Alpena Lake Plain management area (dark green boundary) in relation to surrounding state forest and other lands in Alpena and Presque Isle counties, Michigan.

Table 4.12.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Alpena Lake Plain management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Lowland Deciduous	17%	9,011	6,308	2,703	302		9,011	302	
Lowland Aspen/Balsam Poplar	16%	8,598	4,299	4299	717		8,598	717	
Cedar	14%	7,472	7,472		0		7,472	1	
Aspen	12%	6,257	410	5847	1,251		6,257	974	
Lowland Conifers	6%	3,093	2,474	619	69		3,093	69	
Lowland Spruce/Fir	2%	990	792	198	22		990	22	
Upland Open/Semi-Open Lands	2%	1,234		1234			1,234		
Lowland Open/Semi-Open Lands	14%	7,540		7540			7,540		
Misc Other (Water, Local, Urban)	1%	545		545			545		
Others	9%	4,651	1,222	3429	655	995	4,651	322	1,023
Total		53,805	24,628	29,177	3,789	1,590	53,805	2,720	2,379

4.12.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.12.1.1 Forest Cover Type Management – Lowland Deciduous

Current Condition

Lowland deciduous acres total 9,011 or 17% of the management area (Table 4.12.1) and are located on PArVCo or unclassified wetland habitat class sites (see Appendix E). Forest communities dominated primarily by lowland deciduous species in this management area are valued ecologically as sources of habitat for numerous species of wildlife including woodcock, bobcats, bears and various song birds and commercially for pulp. Most of the acres are in the age classes above the age of 60 (Figure 4.12.2). There are approximately 6,308 acres factor-limited that are not available for harvest, often because the sites are too wet or due to other site factors. There are 96 acres with a current final harvest prescription and these acres are shown in the regeneration prescription class. Lowland deciduous stands may be managed as even-aged stands on drier sites. On wetter sites, uneven-aged management is preferred. The residual trees keep the sites from becoming even wetter, resulting in a conversion to marsh.

Tip-overs and windthrow may also be an issue in stands that have been reduced below a residual basal area of 80 square feet per acre. Green ash, red maple and aspen are frequent components of lowland deciduous stands and treatments on more mesic sites may convert lowland deciduous stands to aspen or red maple.

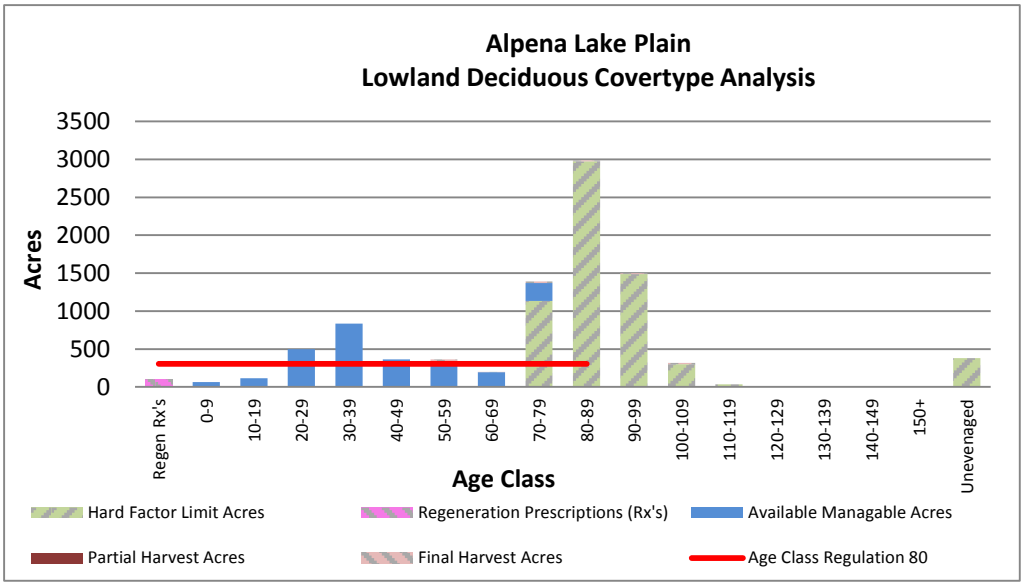

Figure 4.12.2. Age-class distribution for lowland deciduous in the Alpena Lake Plain management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland deciduous stands will be located on suitable sites in a compositionally diverse forest which contains coarse woody debris, scattered large trees and scattered snags;
- These final harvests may be in the form of an overstory removal, which leaves understory trees to keep stands from becoming too wet and to minimize windthrow; and
- These lowland types will provide a sustainable level of forest products along with wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Conduct final (regeneration) harvests on a projected 302 acres.

Long-Term Management Objectives

- Continue to manage lowland deciduous stands final harvests to produce a sustainable level of forest products and wildlife habitat;
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands; and
- Desired future harvests are projected to be 302 acres of final harvests per 10-year period.

4.12.1.2 Forest Cover Type Management – Lowland Aspen/Balsam Poplar

Current Condition

Lowland aspen/balsam poplar (Figure 4.12.3) (primarily balsam poplar, swamp aspen and swamp white birch) acres total 8,598 acres or 16% of the management area (Table 4.12.1). Forest communities dominated primarily by lowland poplar in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, woodcock, white-tailed deer and various song birds and commercially for pulp. There are 4,299 acres of lowland aspen/balsam poplar in this management area considered inaccessible or otherwise unavailable for harvest (hard factor limit acres). There are currently 174 acres with a final harvest prescription and these acres are shown in the regeneration prescription class.

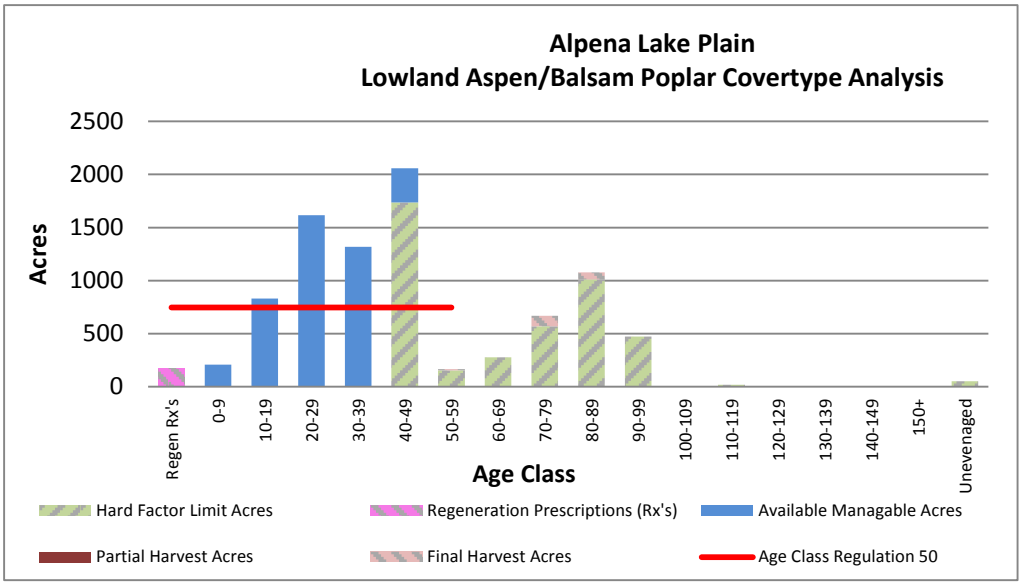

Figure 4.12.3. Age-class distribution for lowland aspen/balsam poplar in the Alpena Lake Plain management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland aspen/balsam poplar-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for a sustainable harvest, available wildlife habitat and to contribute to the preservation of regional biodiversity.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 717 acres.

Long-Term Management Objectives

- It is acceptable that the older lowland poplar, much of it inaccessible to human management, will continue to experience natural processes (wind throw, flooding and senescence) resulting in black ash and other species coming into the under story;
- Consider the loss of ash due to emerald ash borer in future management decisions;
- Continue to harvest lowland aspen/balsam poplar to balance age-class distributions where operations will not adversely impact wetland soils; and
- Desired future harvest levels are projected to be 717 acres of lowland aspen/balsam poplar for final harvest per 10-year period.

4.12.1.3 Forest Cover Type Management – Cedar and Lowland Conifers

Current Condition

Cedar acres total 7,472 or 14% of the management area and lowland conifer acres total 3,093 acres (Table 4.12.1). Cedar (Figure 4.12.4) and lowland conifers (Figure 4.12.5) are primarily located on unclassified lowlands (lowlands have not been assessed for habitat classification) throughout the management area.

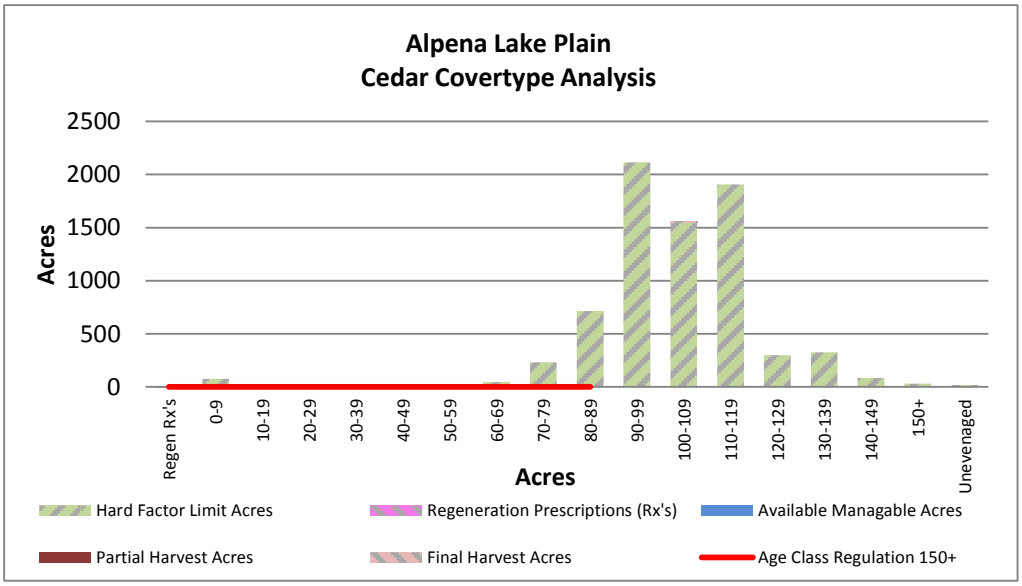

Figure 4.12.4. Age-class distribution for cedar in the Alpena Lake Plain management area (2012 Department of Natural Resources inventory data).

Forest cover types dominated primarily by cedar and lowland conifer in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, hare and various song birds and commercially for pulp. The age-class distribution for cedar is heavily skewed toward the older age classes (70 and above) and there has been virtually no regeneration in the last 70 years.

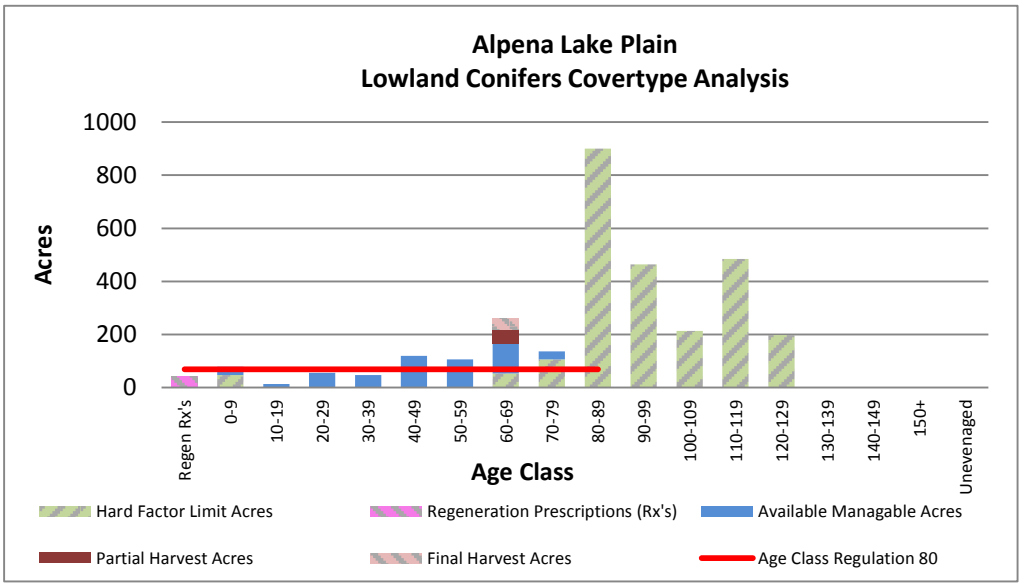

Figure 4.12.5. Age-class distribution for lowland conifers in the Alpena Lake Plain management area (2012 Department of Natural Resources inventory data).

All cedar acres (7,472) and 2,474 acres of lowland conifer have been assigned a hard factor limit due to access or issues with operability that may limit the ability to commercially harvest these lowland types.

Desired Future Condition

- These coniferous lowland cover types will be maintained on operable sites through even-aged management with acres balanced between 0 and 159 for cedar and 0 and 89 for lowland conifer to provide for regulated harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species; and
- By storing high levels of sequestered carbon and serving as carbon sinks, coniferous lowland types will play an important role in global geochemical cycles.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 69 acres of lowland conifer if it can be done in a manner that will not adversely impact wetland soils;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years-of-entry; and
- Consider methods to ensure cedar and lowland conifer regeneration.

Long-Term Management Objectives

- It is acceptable that over the next several planning perios, the older cedar stands, much of it inaccessible for harvest, will continue to experience natural processes (fire, windthrow, insect defoliation and beaver flooding) resulting in the formation of a range of successional stages; and
- Desired future harvest levels are projected to be 69 acres of lowland conifers for final harvest per 10-year period.

4.12.1.4 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 6,257 or 12% of the management area. Aspen is found throughout the management area on PArVVb/AFO, PArVVb, PArVHa and PVCd habitat sites. Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation.

Most of the aspen in this management area is younger than the 60-year rotation. Approximately 410 acres of aspen have met harvest criteria (Figure 4.12.6), but have site conditions that limit harvest (hard factor limited acres).

There are 831 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for a sustainable harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 1,251 acres;
- Concentrate on the oldest acres first; and
- Where necessary and feasible, consider harvesting stands below the rotation age (50 years) to expedite the balancing of age-class distributions.

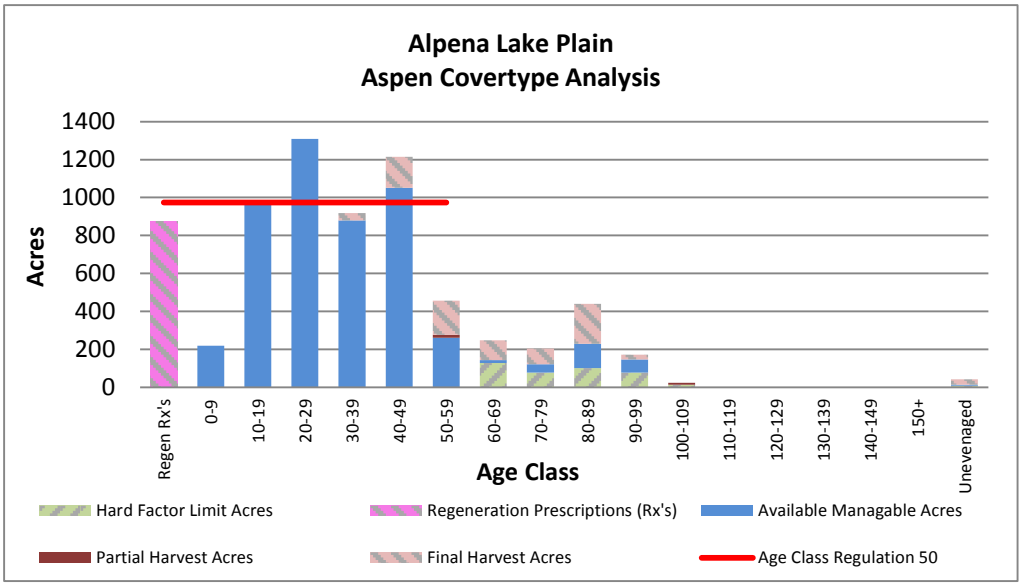

Figure 4.12.6. Age-class distribution for aspen in the Alpena Lake Plain management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue to balance the age-class distributions through regeneration harvests; and
- Desired future harvest levels are projected to be 974 acres of aspen for final harvest per 10-year period.

4.12.1.5 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 1,234 acres or 2% of the management area (Table 4.12.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.12.1.6 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 7,540 acres or 14% of the management area (Table 4.12.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to ensure an adequate level of wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.12.1.7 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: red pine, 2,227 acres (4% of the management area), oak, 1,294 acres (2%), lowland spruce fir, 990 acres (2%) and tamarack, 893 acres (2%). Other types including non-forested cover types total 4,651 acres (9%) and are scattered in small stands throughout the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These communities will be managed on operable sites, contributing to the compositional diversity of the landscape while providing for continual harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- The following species are projected for regeneration harvests: red pine, 378 acres, oak 369 acres, white pine 207 acres, lowland spruce/fir 22 acres, upland spruce/fir 81 acres, mixed upland deciduous 95 acres, jack pine 119 acres, upland mixed forest 129 acres and paper birch 24 acres; and
- Partial harvests are projected for 595 acres of red pine, 265 acres of northern hardwood, 325 acres of white pine, 160 acres of mixed upland deciduous and 153 acres of upland mixed forest.

Long-Term Management Objectives

- Continue regeneration harvests to regenerate lowland types where feasible and to balance the age-class distributions of the remaining types.

4.12.2 – Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this 10-year planning period:

- American woodcock
- Beaver
- Black bear
- Eastern Massasauga rattlesnake
- Golden-winged warbler
- Mallard
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse

- Snowshoe hare
- Wild turkey
- White-tailed deer
- Wood duck

The primary focus of wildlife habitat management in the Alpena Lake Plain management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest and large open grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less than 15% and other inland bodies of water.
  - Implementation of the Dingman Marsh and French Farm Flooding master plans and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
  - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting and brood rearing. Mallard pair-bonding wetlands are typically 0.25 to 20 acres in size and brood rearing wetlands are typically 1.2 to 30 acres in size. Optimal hemi-marsh sites are >2.5 acres with open water portions having extensive portions less than three feet deep and 4:1 area ratio of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within ~200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plan for Hubbard Lake State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than five acres in size with a savannah-like dispersion of large trees (<50% canopy cover) with open understory and include tall trees or snags of large diameter (>12 inches in diameter at breast height). State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than 12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres, and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.

- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
    - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
    - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
    - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak, and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
    - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
    - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
    - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood duck are most limited by available nesting and brood rearing habitat. Wood duck nest in tree cavities near rivers, streams, swamps, beaver ponds and marshes. Nests require mature hardwood trees with 10 inches in diameter at breast height or larger. Brood-rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority state wildlife management areas with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plan for Hubbard Lake State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification.
- Maintain stable water levels at managed floodings from April through August.

4.12.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed fourteen listed species and seven natural communities of note occurring in the management area as listed in Table 4.12.2. A colony of great blue herons has also been identified. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.12.7, there is one potential Type 2 old growth area (37 acres) at the Besser Natural Area representing the dry-mesic northern forest natural community type which is a special conservation area.

Although there are no high conservation value areas, there are five ecological reference areas (Figure 4.12.7) that are partially or mostly on state land. The ecological reference areas represent the following natural communities: coastal fen (7.05 acres), Great Lakes marsh (1.03 acres), limestone bedrock glade (104.5 acres), sinkhole (46.36 acres) and wooded

dune and swale complex (485.3 acres). These ecological reference areas will be managed to enhance and protect their natural vegetative and associated wildlife communities as directed by an ecological reference area-specific management plan. These individual management plans will be developed over the life of this planning period.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.12.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Alpena Lake Plain management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Coastal fen		S2/G1G2	Confirmed				Lowland open/semi-open	N/A
Floodplain forest		S3/G3?	Confirmed				Lowland mixed	Mid
Great Lakes marsh		S3/G2	Confirmed				Lowland open/semi-open	N/A
Limestone bedrock glade		S2/G2G4	Confirmed				Upland open/semi-open	N/A
Limestone cliff		S2/G4G5	Confirmed				Upland open/semi-open	N/A
Sinkhole		S2/G3G5	Confirmed				Special Feature	N/A
Wooded dune and swale complex		S3/G3	Confirmed				Upland open/semi-open	N/A
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Black tern	*Chlidonias niger*	SC/G4/S3	Confirmed	MV	Very High	Great Lakes marsh	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Emergent Marsh	Lowland open/semi-open	N/A
Osprey	*Pandion haliaetus*	SC/G5/S2-3	Confirmed	PS	Low	Coastal fen	Lowland open/semi-open	N/A
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland Mixed	Mid
						Hardwood-conifer swamp	Lowland Mixed	Mid
Common tern	*Stema hirundo*	T/G5/S2	Confirmed	MV	Moderate	Sand & gravel beach	Upland open/semi-open	N/A
Fish								
Channel darter	*Percina capelandi*	E/G4/S1S2	Confirmed	HV	Moderate	Rivers	Aquatic	N/A
						Mainstem streams	Aquatic	N/A
						Inland lake	Aquatic	N/A
Dragonfly								
Hine's emerald dragonfly	*Somatochlora hineana*	E/LE/G2G3/S1	Confirmed	EV	Very High	Headwater Stream	Aquatic	N/A
						Bog	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Patterned fen	Lowland open/semi-open	N/A
						Poor fen	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Coastal fen	Lowland open/semi-open	N/A
Insect								
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Reptile								
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Plants								
Cooper's milk vetch	*Astragalus neglectus*	SC/G4/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Boreal forest	Upland & Lowland Sp/F	Mid
						Hillside prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone bedrock lakeshore	Upland open/semi-open	N/A
						Limestone cobble shore	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
Pitcher's thistle	*Cirsium pitcheri*	LT/T/G3/S3	Confirmed			Open dunes	Upland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Great Lakes barrens	Upland open/semi-open	N/A
						Sand and gravel beach	Upland open/semi-open	N/A
Douglas's hawthorn	*Crataegus douglasii*	SC/G5/S3S4	Confirmed			Volcanic bedrock glade	Upland open/semi-open	N/A
						Volcanic bedrock lakeshore	Upland open/semi-open	N/A
						Boreal forest	Upland & Lowland Sp/F	Mid
						Mesic northern forest	Northern Hardwood	Late
						Northern bald	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
						Sand and gravel beach	Upland open/semi-open	N/A
						Sandstone bedrock lakeshore	Upland open/semi-open	N/A
						Volcanic cliff	Upland open/semi-open	N/A
						Volcanic cobble shore	Upland open/semi-open	N/A
						Volcanic lakeshore cliff	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

Table 4.12.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Alpena Lake Plain management area (Continued).

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Plants (Cont'd)								
Ram's head lady's-slipper	*Cypripedium arietinum*	SC/G3/S3	Confirmed			Rich conifer swamp	Tamarack	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
						Volcanic bedrock lakeshore	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Poor fen	Lowland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Great Lakes barrens	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Volcanic bedrock glade	Upland open/semi-open	N/A
						Granite bedrock glade	Upland open/semi-open	N/A
Dwarf lake iris	*Iris lacustris*	LT/T/G3/S3	Confirmed			Open dunes	Upland open/semi-open	N/A
						Alvar	Upland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Boreal forest	Upland & Lowland Sp/F	Mid
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone cobble shore	Upland open/semi-open	N/A
						Limestone bedrock lakeshore	Upland open/semi-open	N/A
Pine-drops	*Pterospora andromedea*	T/G5/S2	Confirmed			Boreal forest	Upland & Lowland Sp/F	Mid
						Dry-mesic northern forest	White Pine	Late
						Dry northern forest	Jack Pine, Red Pine	Late
						Granite bedrock glade	Upland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
Houghton's goldenrod	*Solidago houghtonii*	LT/T/G3/S3	Confirmed			Open dunes	Upland open/semi-open	N/A
						Alvar	Upland open/semi-open	N/A
						Limestone bedrock lakeshore	Upland open/semi-open	N/A
						Interdunal wetland	Lowland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Limestone cobble shore	Upland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

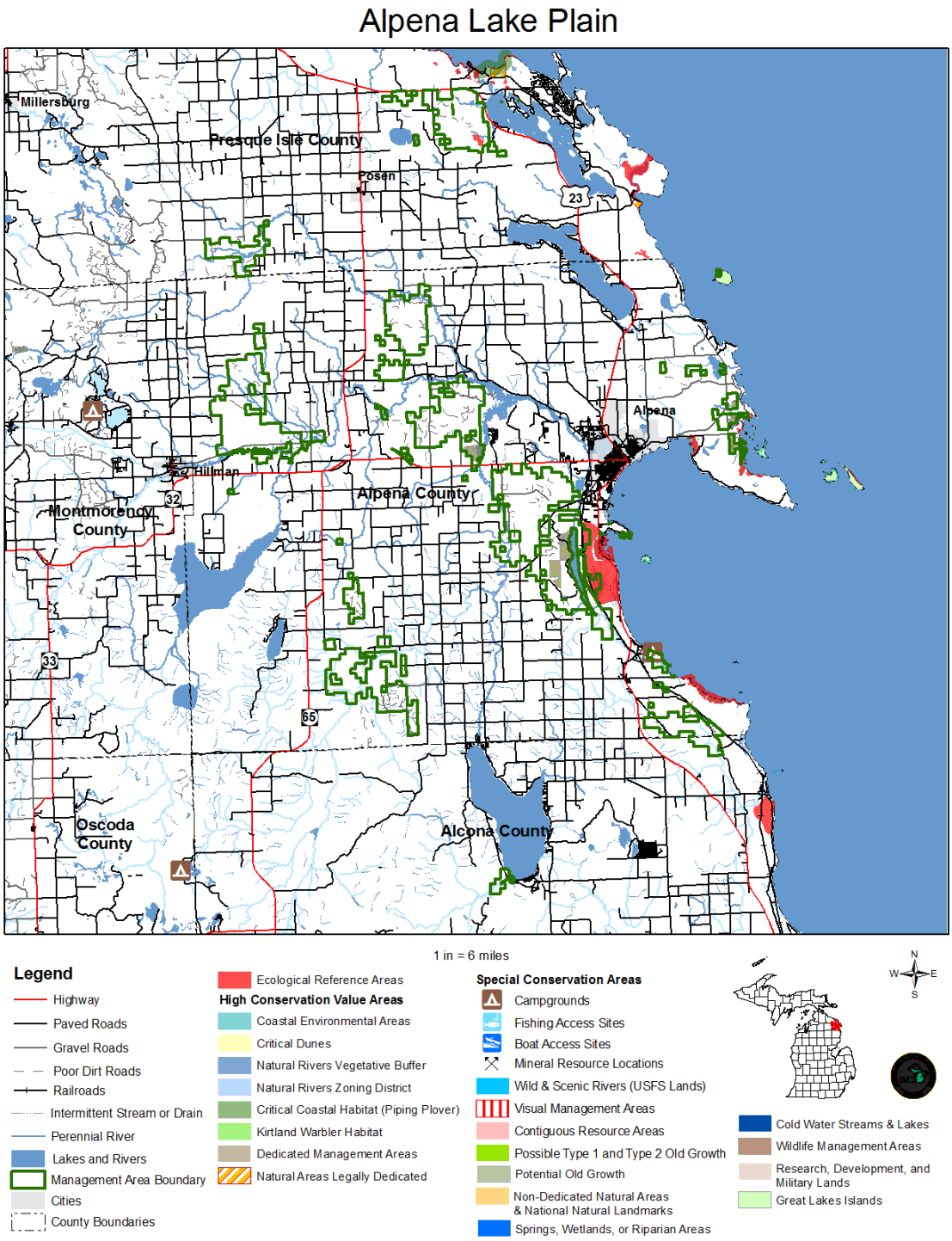

Figure 4.12.7. A map of the Alpena Lake Plain management area showing the special resource areas.

4.12.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Currently, there are no major forest health issues in the management area.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.12.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but

it should not be considered complete. This information, and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.12.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Alpena Lake Plain - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	1	98	99	3

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
Japanese Knotweed *Fallopia japonica*	1	Glossy Buckthorn *Rhamnus frangula*	1
-	-	Phragmites (Common Reed) *Phragmites australis*	97

4.12.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.12.1 and listed in Appendix F.

4.12.6 Fire Management

Swamp types which are a major component of this management area are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types. The following fire management concepts should be applied in the management area:

- Consider opportunities to re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.12.7 Public Access and Recreation

Access for management and/or recreation is generally limited throughout much of this management area due to wet sites and limited access from adjacent landowners. The department will continue to seek access across adjacent private property. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

There is an extensive system of trails (Figure 4.12.1) throughout the management area which includes the following:

Brush Creek Off-Road Vehicle Trail
Wah-Was-Tas-See Pathway
Devil's Lake Off-Road Vehicle Trail
Chippewa Hills Pathway
Ossineke Pathway
Norway Ridge Pathway

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be

considered to minimize these impacts. There is one state forest campground within the management area boundary as shown in Figure 4.12.7.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single-track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.12.8 Oil, Gas and Mineral Development

Surface sediments consist of lacustrine (lake) sand and gravel, coarse-textured till, glacial outwash sand and gravel and postglacial alluvium, peat and muck and dune sand. The glacial drift thickness varies between 0 and 400 feet. Sand and gravel pits are located in this management area and there is potential for additional pits.

The Devonian Antrim and Bell Shales,Traverse Formation and Dundee limestone subcrop below the glacial drift. The Traverse and Dundee Limestones have limestone/dolomite potential, especially in areas of thin glacial till.

Part of Alpena County has been developed for gas production from the Antrim Shale. Well spacing is currently 80 acres and most of the area of Antrim potential has already been drilled. The Collingwood Formation may also have oil and gas potential in this area and probably will have a well spacing of 320 to 640 acres per well (or possibly larger). The part of Alpena County already leased and drilled for the Antrim could use existing well sites to drill for the Collingwood Formation. Another portion of Alpena, possibly for the CollingwoodFoamation, is leased and drilling, if sucessful could, expand into the rest of the management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended, or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.13 MA 13 – Grayling Outwash Management Area

Summary of Use and Management

Management in the Grayling Outwash management area (MA) will emphasize continuing balancing the age class of aspen on suitable sites and thinning the northern hardwoods, balancing age classes of red pine and jack pine and regenerating the aging swamp hardwood and conifer resource where possible. Management will strive to sustainably produce various timber products, enhance game and non-game wildlife habitat, protect areas of unique character, such as the historic Deward Tract and provide for forest-based recreational uses, including the Wetzel Lake Day Use Area leased to Antrim County. Management activities are constrained by poor access in the swampy (16% lowland) portions of this area, some of which fall in the riparian zone of the Manistee River, a dedicated natural river. Expected trends within this 10-year planning period are increased recreational pressure, introduced pests and diseases and the difficulty in regenerating swamp types.

Introduction

This management area is located in east central Lower Peninsula in Kalkaska, Otsego and Crawford counties and contains 65,160 acres of state forest (Figure 4.13.1). The primary attributes which identify the Grayling Outwash management area include:

- The management area falls mostly within Albert's Grayling Outwash Plain sub-region (Albert, 1995).
- Historically fires were very frequent in this management area and were important in determining species composition. Jack pine and northern pin oak dominated the outwash, while vegetation varied on the ridges – some dominated by northern hardwoods and others dominated by red oak, hemlock and white pine. Currently areas of aspen, red pine and upland hardwoods with isolated pockets of lowland types cover the majority of the state forest land. In the past, a number of harvests and plantings were done in a checkerboard pattern, now there is interest in consolidating types and reducing cover type fragmentation.
- This management area lies at the northwestern edge of the Grayling Outwash Plain sub-region where there are two narrow end-moraine ridges separated by an outwash channel which is eight miles wide at its widest point. The Manistee River, a dedicated natural river runs through this management area.
- The Grayling Outwash management area is a popular destination for game hunting, hiking, mushroom hunting, etc. for the nearby communities of Gaylord, Grayling and Mancelona. Due to the proximity of this management area to the populated areas, the forest resources contribute social and economic values to the area.
- Department of Natural Resources recreation facilities in or near this management area include nearby Otsego Lake State Park, Lake Marjory state forest campground, Pickerel Lake Rustic campground, Goose Creek Trail Camp and Pine Barren pathway. Various snowmobile trails and the North Country Trail cross the area.
- Much of the topography in this management area was sculpted by melting glaciers that dissected some of the ice-contact ridges into steep ridges with flat sandy outwash plains between.

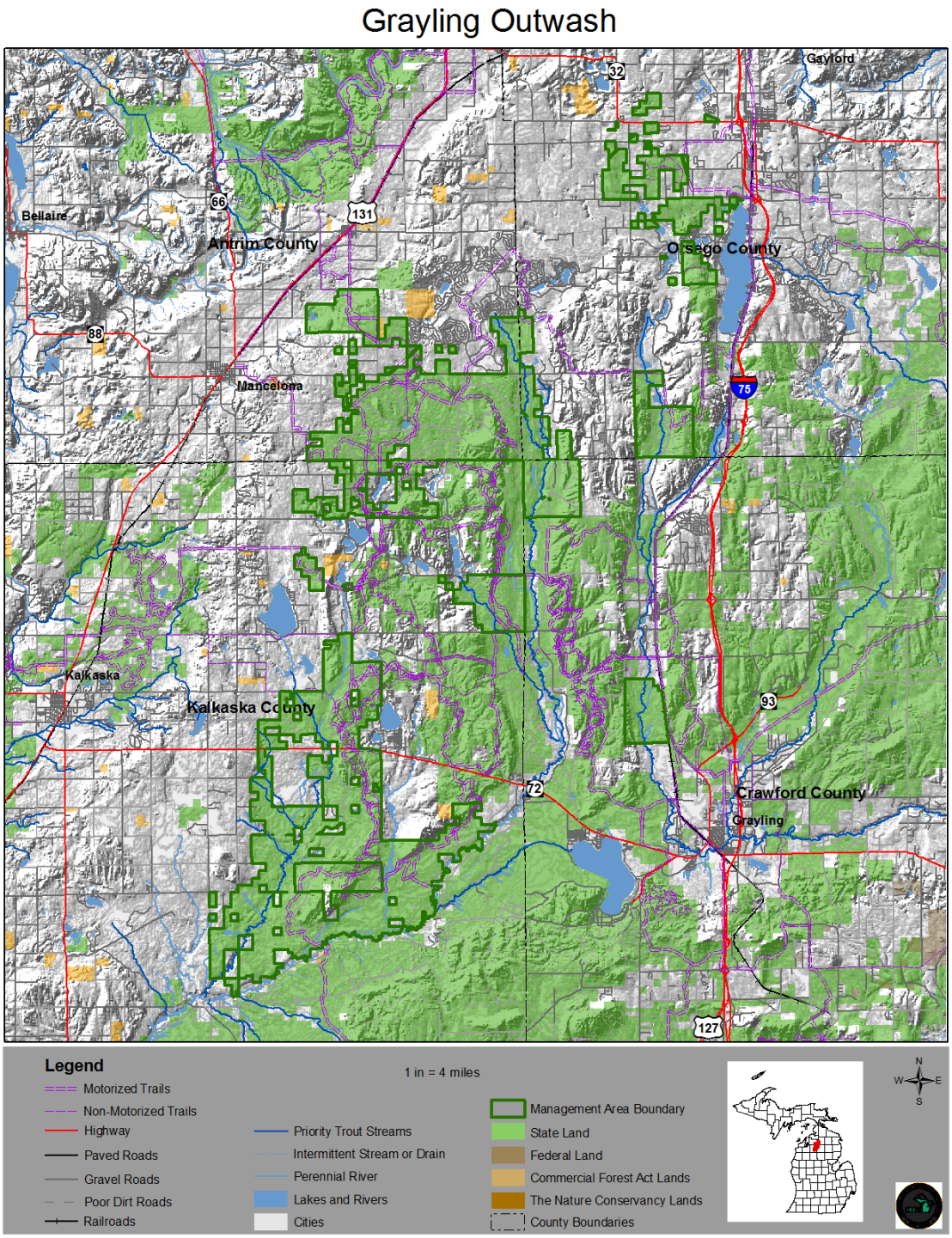

Figure 4.13.1. A map of the Grayling Outwash management area (dark green boundary) in relation to surrounding state forest and other lands in Kalkaska, Otsego and Crawford counties, Michigan.

Table 4.13.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Grayling Outwash management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	27%	17,896	1,143	16,753	2,986		17,896	2,792	
Red Pine	18%	11,708	100	11608	3,253	6,361	11,708	1,290	6,623
Northern Hardwood	17%	10,781	419	10362		4,685	10,781		4,685
Lowland Conifers	5%	3,055	2,444	611	68		3,055	68	
Cedar	3%	1,870	1,870				1,870		
Lowland Deciduous	3%	1,754	1,229	525	58		1,754	58	
White Pine	3%	1,651	114	1537	350	658	1,651	140	658
Jack Pine	2%	1,288	49	1239			1,288	207	
Upland Open/Semi-Open Lands	11%	6,850		6850			6,850		
Lowland Open/Semi-Open Lands	5%	3,511		3511			3,511		
Misc Other (Water, Local, Urban)	1%	640		640			640		
Others	6%	4,156	1,275	2881	436	536	4,156	364	696
Total		65,160	8,643	56,517	7,151	12,240	65,160	4,919	12,662

4.13.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.13.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 17,896 acres or 27% of the management area (Table 4.13.1). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. Aspen occurs throughout the management area on AFO/AFOCa and PARVVb/AFO habitat classes (see Appendix E). Accessible aspen has been consistently harvested over the last 60 years. There are 1,143 acres of aspen have met harvest criteria (Figure 4.13.2), but have site conditions that limit harvest (hard factor limited acres). There are 1,941 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0-59 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 2,986 acres beginning with the oldest age classes; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

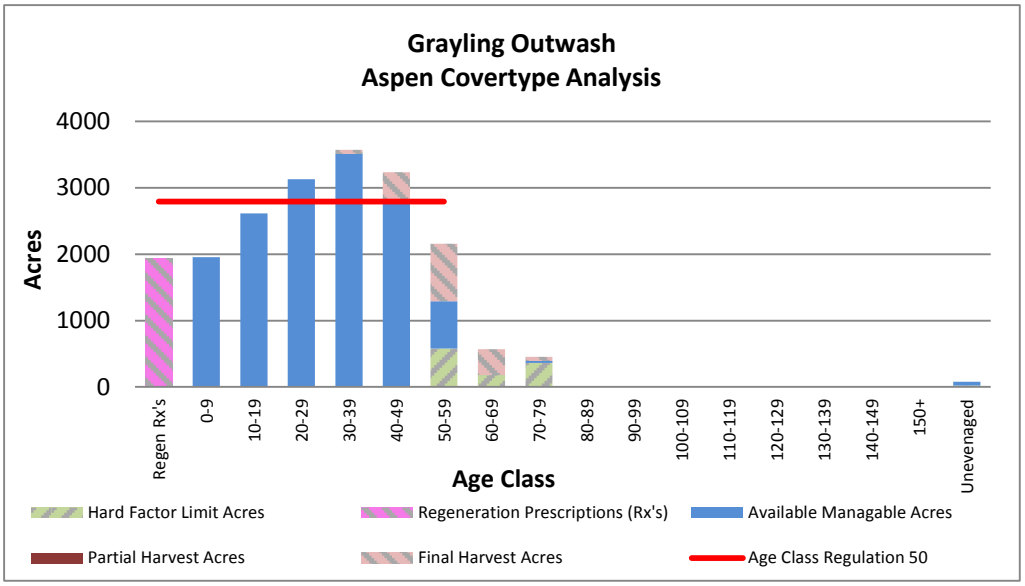

Figure 4.13.2. Age-class distribution for aspen in the Grayling Outwash management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue to manage through regeneration harvests to balance the age-class distribution; and
- Desired future harvest levels are projected at 2,792 acres of final harvest per 10-year period.

4.13.1.2 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 11,708 or 18% of the management area (Table 4.13.1), with most being 40 to 59 years old. Nearly all of the pine is of planted origin on AFO/AFOCa and PArVHa/PArVVb habitat classes. The acreage of red pine on very dry sites (PArVHa/PArVVb) may decrease as managers decide to convert them to jack pine. Red pine in this management area is commercially valued for pulp, saw logs and utility poles. Natural regeneration is occurring, particularly in jack pine plantings and underneath oak. There are 100 acres of red pine have met harvest criteria (Figure 4.13.3), but have site conditions that limit harvest (hard factor limited acres).

There are 233 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class. There are 1,533 acres with a partial harvest pending and these acres are included in their current age class. Figure 4.13.3 includes the projected number of acres converted to the cover type as a result of treatments and planting to red pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine on dry-mesic sites (habitat classes: AFO/AFOCa, PArVVb/AFO) will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0 and 89 years of age to provide for continual harvest, wildlife habitat and recreational opportunity.

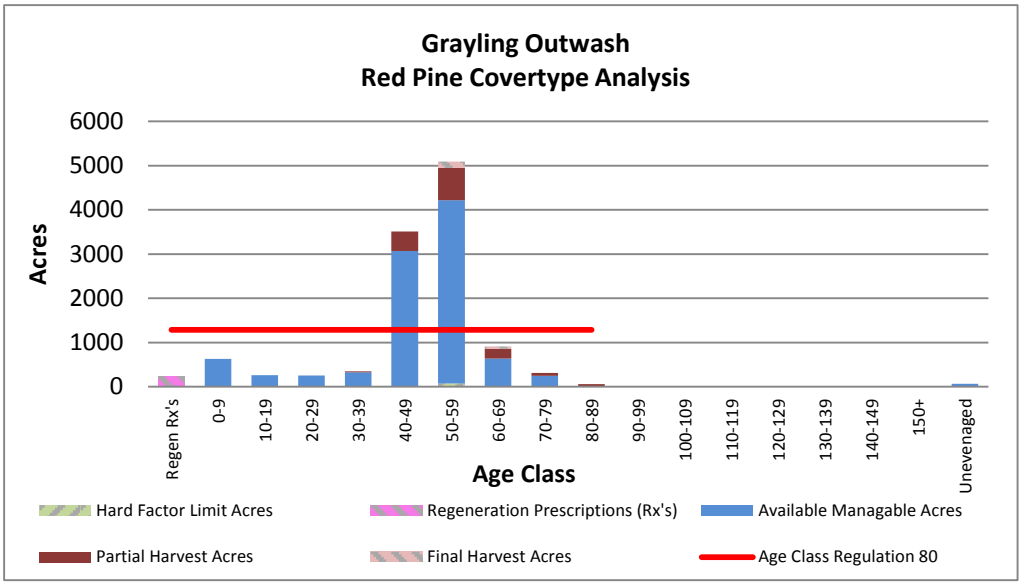

Figure 4.13.3. Age-class distribution for red pine in the Grayling Outwash management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct partial harvests on a projected 6,361 acres, concentrating on stands of better-quality red pine that have the potential for a higher product value in larger size classes; and
- Conduct regeneration harvests on a projected 3,253 acres of red pine beginning with the oldest age-classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- Over the next several planning periods, continue thinning red pine that are currently in the 40-69 year age classes. For most stands at age 80, conduct stand-replacement harvests for either natural or planted regeneration; and
- Desired future harvest levels are projected at 1,290 acres of final harvest and 6,623 acres of partial harvest per 10-year period.

4.13.1.3 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 10,781 acres or 17% of the management area (Table 4.13.1). Forest communities dominated by northern hardwoods in this management area are valued ecologically as sources of habitat for numerous species of wildlife including elk, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. There are 419 acres of upland hardwood have met harvest criteria (Figure 4.13.4) but have site conditions that limit harvest. There are 897 acres of stands that have a partial harvest pending and these acres are shown in their current basal area ranges.

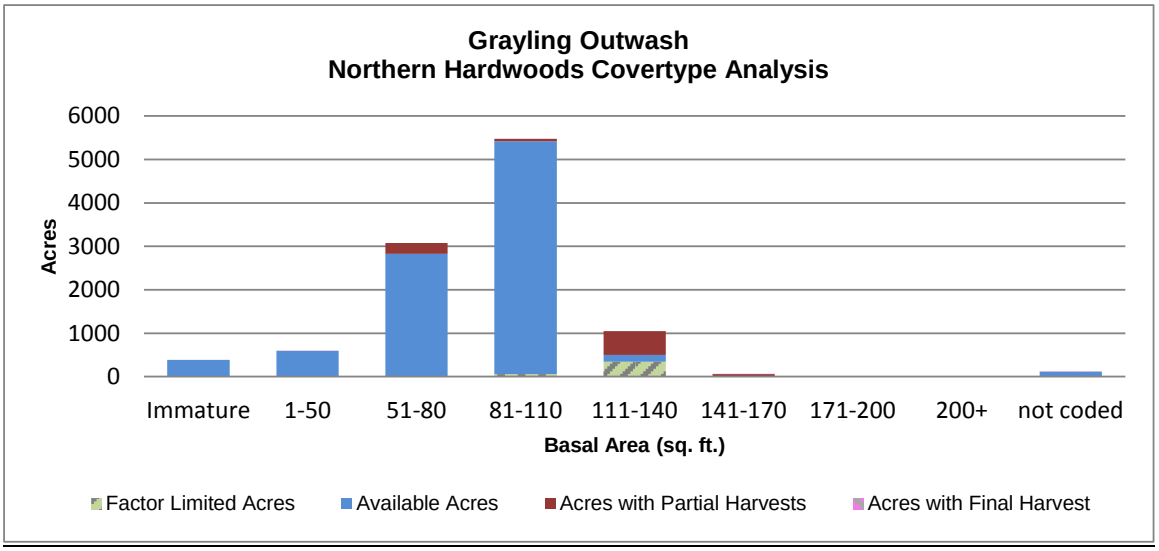

Figure 4.13.4. Basal area distribution for northern hardwood in the Grayling Outwash management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Northern hardwood stands will be maintained and managed through selection harvests on better-quality hardwood sites and through regeneration harvests on poorer-quality hardwood sites to provide a sustainable timber supply, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- On better quality hardwood sites a projected 4,685 acres will be harvested through selection harvests to produce uneven aged stands; and
- There are 8 acres with a final harvest and these acres are shown in the current basal area range.

Long-Term Management Objectives

- Continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer, in northern hardwood stands, using Beech Bark Disease Management Guidelines and Emerald Ash Borer Guidelines;
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands;
- As beech and ash decrease in the northern hardwood stands, consider introducing oak for mast in stands without oak;
- Continue to manage for stands with an uneven-age class on better-quality hardwood sites; and
- Consider managing poorer quality sites through final (regeneration) harvests.

4.13.1.4 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog, bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 3,511 acres or 5% of the management area (Table 4.13.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to ensure an adequate level of wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.13.1.5 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 6,850 acres or 11% of the management area (Table 4.13.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.13.1.6 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: lowland conifers, 3,055 acres (5% of the management area), cedar, 1,870 acres (3%), white pine, 1,651 acres (3%) and jack pine, 1,288 acres (2%). Other forest communities total 5,910 acres (9%) and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These communities will be managed on operable sites, contributing to the compositional diversity of the landscape while providing for continual harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- The following species are projected for restarting or regeneration harvests: lowland conifers 68 acres, lowland deciduous 58 acres, white pine 350 acres, oak 288 acres, upland mixed forest 71 acres, 18 acres of lowland aspen/balsam poplar, 43 acres of natural mixed pines and lowland mixed forest 78 acres;
- Partial harvests are projected for 658 acres of white pine, 264 acres of natural mixed pines, 58 acres of oak, 143 acres of mixed upland deciduous and 55 acres of upland mixed forest;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years-of-entry; and

- Consider methods to ensure adequate regeneration lowland types.

Long-Term Management Objectives

- The age-class structure of most of the other types will remain unbalanced for several decades; and
- Desired future harvest levels are projected as final harvests at 268 acres of lowland conifer and 181 acres of lowland deciduous per 10-year period.

4.13.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management are during this 10-year planning period:

- Eastern massasauga rattlesnake
- Pileated woodpecker
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Grayling Outwash management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest and large open grassland complexes, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
    - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management, and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area, and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous, and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak, and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-uear management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.13.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed nine listed species and one natural communities of note occurring in the management area as listed in Table 4.13.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.13.5, there is one potential Type 2 old growth area (292 acres) known as the Watson Swamp representing the rich conifer swamp natural community type.

Table 4.13.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Grayling Outwash management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Comminity								
Rich conifer swamp		S3/G4	Confirmed				Tamarack	Late
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Fish								
Cisco (lake herring)	*Coregonus artedi*	T/G5/S3	Confirmed	MV	Low	Great Lakes	Aquatic	N/A
						Inland lake	Aquatic	N/A
						Rivers	Aquatic	N/A
Butterfly								
Dusted skipper	*Atrytonopsis hianna*	Sc/G4G5/S2S3	Confirmed	MV	Low	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Reptile								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Plant								
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

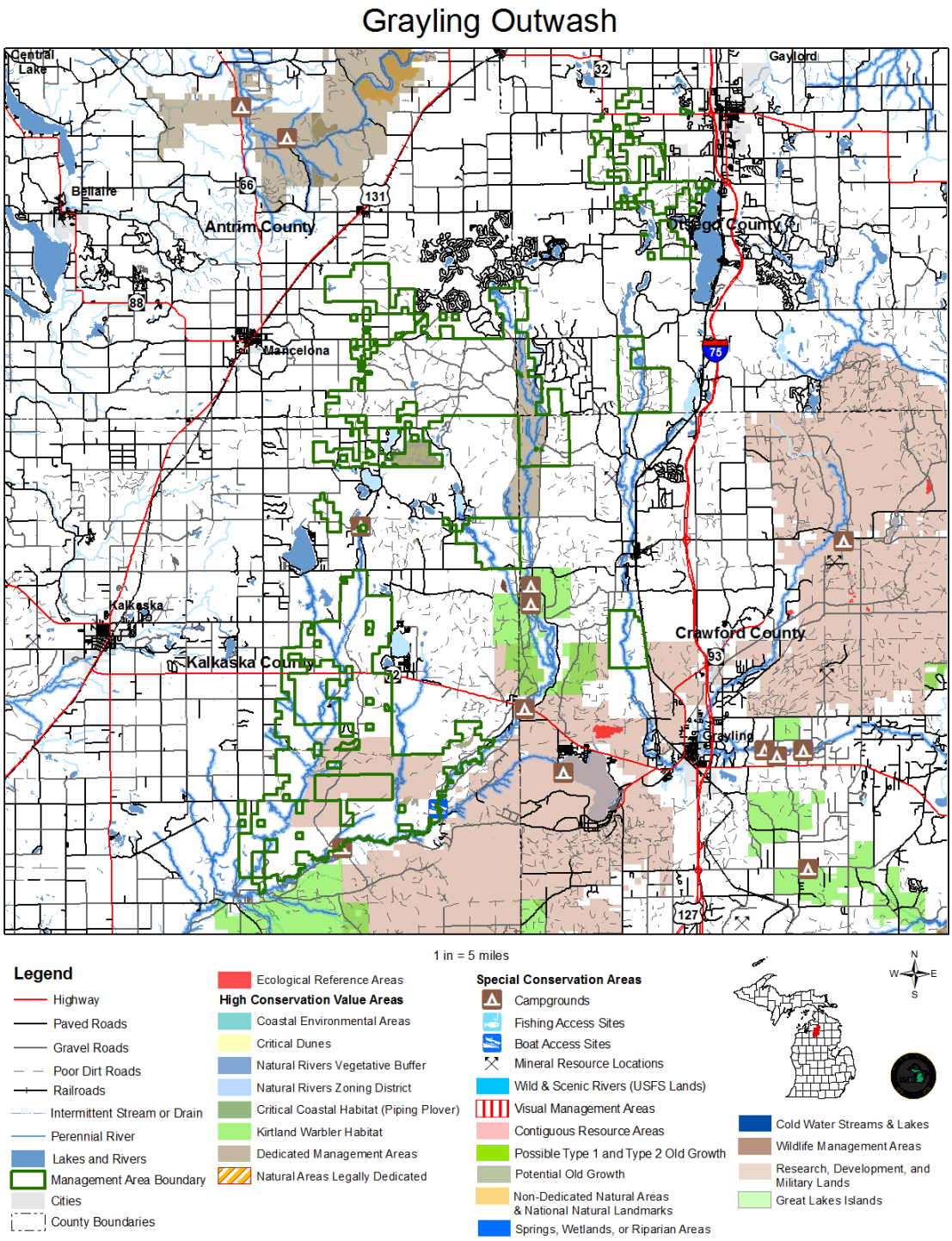

Figure 4.13.5. A map of the Grayling Outwash management area showing the special resource areas.

The Upper Manistee River and its tributaries have been identified as a natural river and along with its corridor are also designated as a high conservation value area as shown in Figure 4.13.5.

There are no ecological reference areas identified for the Grayling Outwash management area.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

4.13.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include emerald ash borer, beech bark disease, oak decline and branch mortality of seedling and sapling white pine and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.
- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important.
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow.
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.
- Monitor for branch mortality of seedling and sapling white pine along and adjacent to river corridors.
- Causal agent(s) responsible for this problem may include pine spittlebug feeding and various fungal pathogens.
- Until management guidelines can be developed, continue reporting incidence of this problem to the forest health specialist.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.13.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information, and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.13.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Grayling Outwash - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	1	1	1

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Garlic Mustard *Alliaria petiolata*	1

4.13.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.13.1 and listed in Appendix F.

4.13.6 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Reintroduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition, particularly from red maple; and
- Incorporate fire as a tool to restore or maintain managed openings.

4.13.7 Public Access and Recreation

Where access is limited on state forest land, the DNR will continue to seek access across adjacent private property. In accordance with the DNR's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Existing recreational opportunities vary across this management area. Pickerel Lake state forest campground (Figure 4.13.3) provides a rustic camping experience and a boat launch into Pickerel Lake. This campground is conveniently located near the Leetsville to Kalkaska Michigan Cross Country Cycle Trail and the non-motorized North Country Pathway. Trails are shown in Figure 4.13.1. Boating access sites in this management area are located on larger lakes in the area, offering excellent boating and fishing opportunities. This management area is located within Michigan's "snow belt" area, which contributes to the popularity of snowmobiling in the area. Equestrian users have the Shore-to-Shore Trail to ride, while non-motorized recreational enthusiasts can trek the Pine Baron Pathway and North Country Trail. Due to the proximity of this management area to population centers such as Gaylord, Grayling and Mancelona recreational activities will likely increase in the future. Existing recreational facilities within this management area are listed below:

Campgrounds

- Pickerel Lake State Forest Campground

Boating Access Sites (BSAs)

- Starvation Lake BAS
- Pickerel Lake BAS
- Cranberry Lake BAS

Off-Road Vehicle Trails

- Leetsville to Kalkaska Missaukee & Michigan Cycle Conservation Club Trail
- Kalkaska Trail and Route
- Kalkaska to Tomahawk Missaukee & Michigan Cycle Conservation Club Trail

Snowmobile Trails

- Various

Non-Motorized Trails

- Shore-to-Shore
- Pine Baron Pathway
- North Country Trail

Where it is necessary to remove trees adjacent to trails, stumps should be cut as low as possible.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single-track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.13.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium, ice-contact outwash sand and gravel and an end moraine of coarse-textured till. The glacial drift thickness varies between 200 and 1,000 feet. Sand and gravel pits are located in this management area, and there is good potential for additional pits.

The Mississippian Michigan Formation, Marshall Sandstone and Coldwater and Sunbury Shales and Devonian Berea Sandstone and Bedford, Antrim and Ellsworth Shales subcrop below the glacial drift. The Michigan is quarried for gypsum and the Antim for cement products elsewhere in the state.

Most of this management area has been developed for gas production from the Antrim Shale and some oil and gas production from Guelph (former Niagaran) reefs. Well spacing is currently 80 acres and most of the area of Antrim potential has already been drilled. The Collingwood Formation may also have oil and gas potential in this area and probably will have a well spacing of 320 to 640 acres per well (or possibly larger). The southern parts of Crawford and Kalkaska Counties, that have not been drilled yet, are leased for the Collingwood and drilling, if sucessful could expand into the rest of the management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended, or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special

wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.14 MA 14 – Grayling Ice Contact Management Area

Summary of Use and Management

Management in the Grayling Ice Contact management area (MA) will emphasize continuing to balance the age class of aspen on suitable sites and thinning the northern hardwoods, balancing age classes of red pine and jack pine and regenerating the aging oak resource. Management will strive to sustainably produce various forest products; enhance game and non-game wildlife habitat; protect areas of unique character, such as the historic Deward Tract; and provide for forest-based recreational uses. With about 3% of the management area being lowland, management activities will be minimally constrained. Expected trends within this 10-year planning period are increased recreational pressure, managing oil and gas development, introduced pests and diseases and the difficulty in regenerating oak.

Introduction

This management area is located in the central northern Lower Peninsula in Kalkaska, Crawford and Otsego counties and contains 55,348 acres of state forest (Figure 4.14.1). The primary attributes which identify the Graying Ice Contact management area include:

- The management area falls mostly within Albert's Grayling Outwash Plain sub-region (Albert, 1995).
- Historically vegetation varied on these ice-contact ridges – some ridges were dominated by northern hardwoods and others by red oak, hemlock and white pine. Fires which spread from the adjacent outwash areas were important in determining species composition. Current vegetation is primarily northern hardwoods, aspen, red pine and oak with only 3% of the area in relatively inaccessible lowland cover types.
- This management area, which lies in the central part of the Large Grayling Outwash Plain sub-region, is made up of ice-contact formed end-moraine ridges, separated by outwash areas. The headwaters of the Au Sable and Manistee rivers are in this management area.
- The Grayling Ice Contact management area is a popular destination for game hunting, hiking, mushroom hunting and other activities for the nearby communities of Grayling, Kalkaska and Gaylord. Due to the proximity of this management area to the populated areas, the forest resources contribute social and economic values to the area.
- Department of Natural Resources recreation facilities in this management area include nearby Otsego Lake and Hartwick Pines state parks, Lake Margrethe and Upper Manistee, Manistee River Bridge and Goose Creek state forest campgrounds and Goose Creek Trail Camp.
- Manistee River state forest campground, Upper Manistee River and Lake Marjory rustic campgrounds and Goose Creek Trail Camp. Snowmobile trails and an equestrian trail cross the management area.
- Much of the topography in this management area was sculpted by melting glaciers that dissected some of the ice-contact ridges into steep ridges with flat sandy outwash plains between.

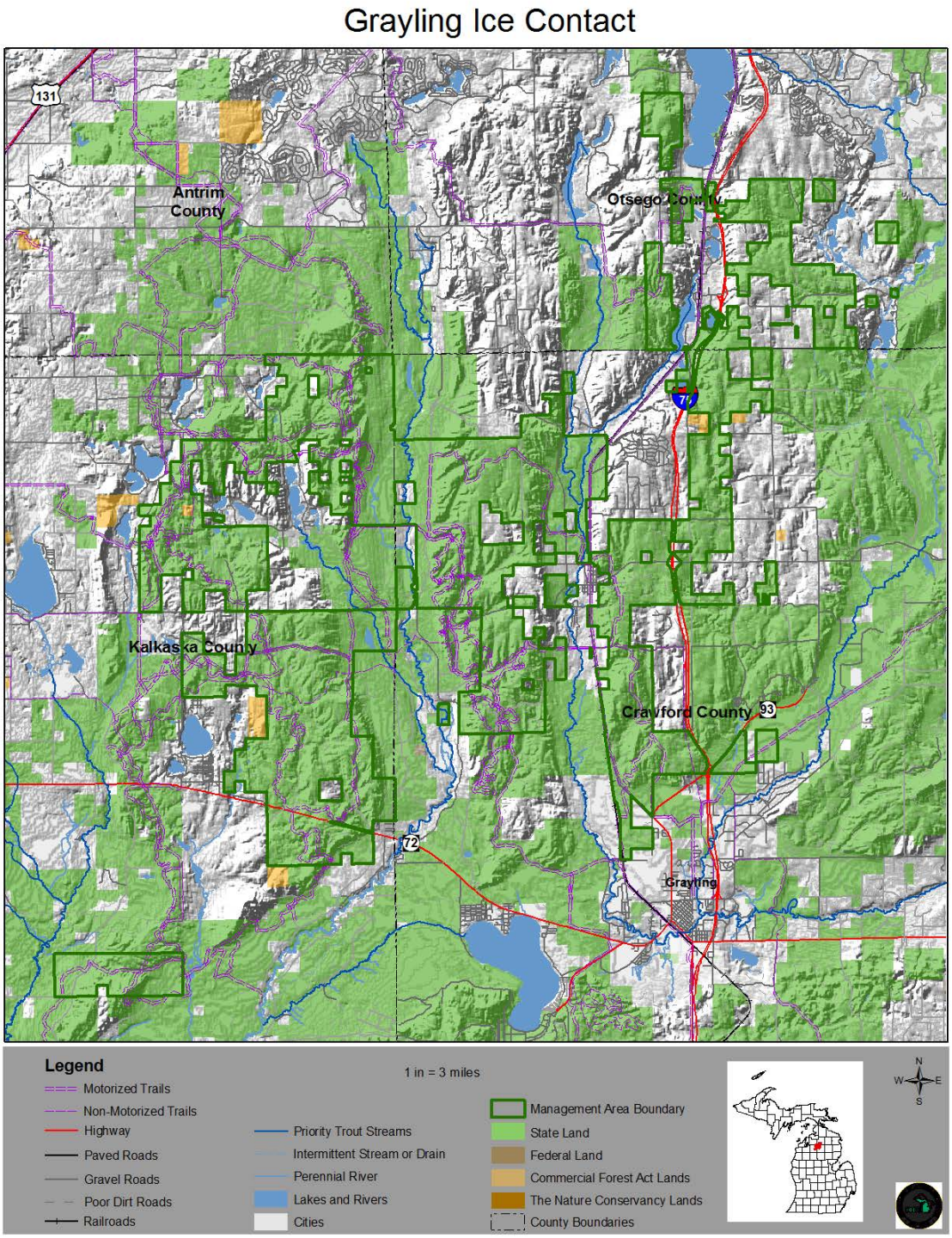

Figure 4.14.1. A map of the Grayling Ice Contact management area (dark green boundary) in relation to surrounding state forest and other lands in Kalkaska, Crawford and Otsego counties, Michigan.

Table 4.14.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Grayling Ice Contact management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Northern Hardwood	29%	16,174	952	15,222	400	6,683	16,174		6,886
Aspen	29%	15,881	566	15315	3,780		15,881	2,553	
Red Pine	12%	6,375	223	6152	1,264	2,398	6,375	618	2,992
Oak	10%	5,517	2,406	3111	222	782	5,517	346	795
Jack Pine	2%	1,277	125	1152	134		1,277	169	
Upland Open/Semi-Open Lands	9%	4,779		4779			4,779		
Lowland Open/Semi-Open Lands	2%	874		874			874		
Misc Other (Water, Local, Urban)	1%	339		339			339		
Others	5%	2,940	1,080	1860	525	304	2,940	218	583
Total		55,348	5,397	49,951	6,588	10,573	55,348	4,008	11,699

4.14.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands and communities are classified by the species which has the dominant canopy coverage.

4.14.1.1 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 16,174 or 29% of the management area (Table 4.14.1). Forest communities dominated by northern hardwoods in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation. Many of the stands have portions that are located on steep slopes that limit treatment options. There are 952 acres of northern hardwood have met harvest criteria (Figure 4.14.2), but have site conditions that limit harvest (hard factor limit acres). There are 255 acres that have regeneration harvest pending and these acres are included in the current basal area range.

There are 1,634 acres with a partial harvest pending and these acres are included in their current basal area range.

Desired Future Condition

- Northern hardwood forest communities will be maintained on operable sites through selective harvesting to achieve an uneven-aged stand structure to provide for a sustainable supply of timber products, wildlife habitat and recreation opportunity.

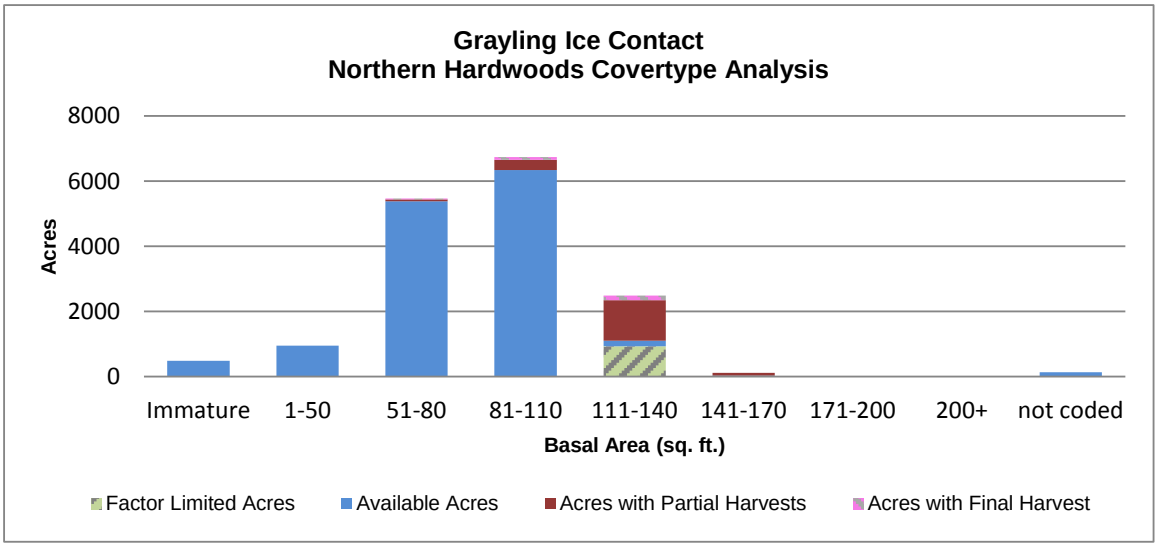

Figure 4.14.2. Basal area distribution for northern hardwood in the Grayling Ice Contact management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- On better quality hardwood sites a projected 6,683 acres will be harvested through selection harvests to produce uneven aged stands;
- On poorer quality hardwood sites (Habitat Class: PArVVb and PArVHa) a projected 400 acres will be harvested through final harvests; and
- Where necessary and feasible, consider harvesting stands from the lower basal area ranges to expedite the balancing of basal area distributions.

Long-Term Management Objectives

- Beech bark disease will change the stand composition of the northern hardwoods in this management area. As beech decreases in northern hardwood stands, consider introducing oak for mast in stands without oak;
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands;
- Continue to manage for stands with an uneven age-class distribution on better-quality hardwood sites; and
- Consider the need to continue to manage poorer quality sites through final harvests.

4.14.1.2 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 15,881 or 29% of the management area (Table 4.14.1). Aspen is found on the AFO/AFOCa, PARVVb/AFO, PArVHa/PArVVb, PArVHa and PVCd/PArVHa habitat class sites (see Appendix E). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. Aspen occurs throughout the area and many stands have a mixture of red maple and oak. Most of the aspen in this management area is younger than the 60 year rotation (Figure 4.14.3).

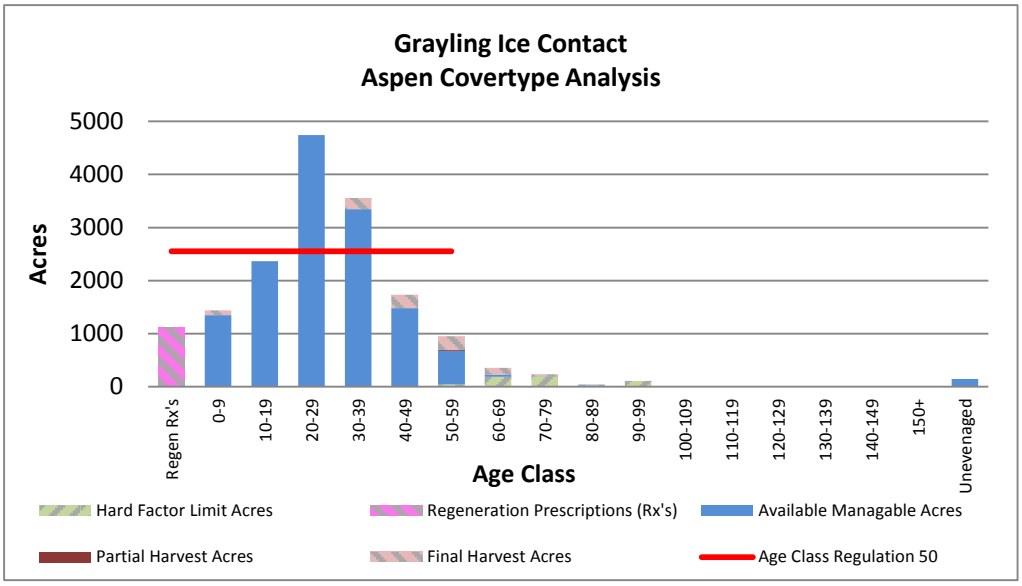

Figure 4.14.3. Age-class distribution for aspen in the Grayling Ice Contact management area (2012 Department of Natural Resources inventory data).

Accessible aspen has been consistently harvested over the last 50 years. There are 566 acres of aspen that have met harvest criteria but have site conditions that limit harvest (hard factor limit acres). There are 1,121 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct final harvests on a projected 3,780 acres from the oldest age-classes, where aspen is accessible; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue management of aspen through regeneration harvests to balance the age-class distribution; and
- Desired future harvests are projected at 2,553 acres of final harvest per 10-year period.

4.14.1.3 Forest Cover Type Management – Red Pine

Red pine acres total 6,375 or 12% of the management area (Table 4.14.1), with most being 40-59 years old. Nearly all the pine is of planted origin on the AFO/AFOCa. PArVVb/AFO, PArVVb, PArVHa/PVVb, PVCd/PArVHa and PArVHa habitat class sites. Red pine in this management area is commercially valued for pulp, saw logs and utility poles.

Some red pine is located on poor sites (PArVHa) and some on hardwood sites (AFO/AFOCa).

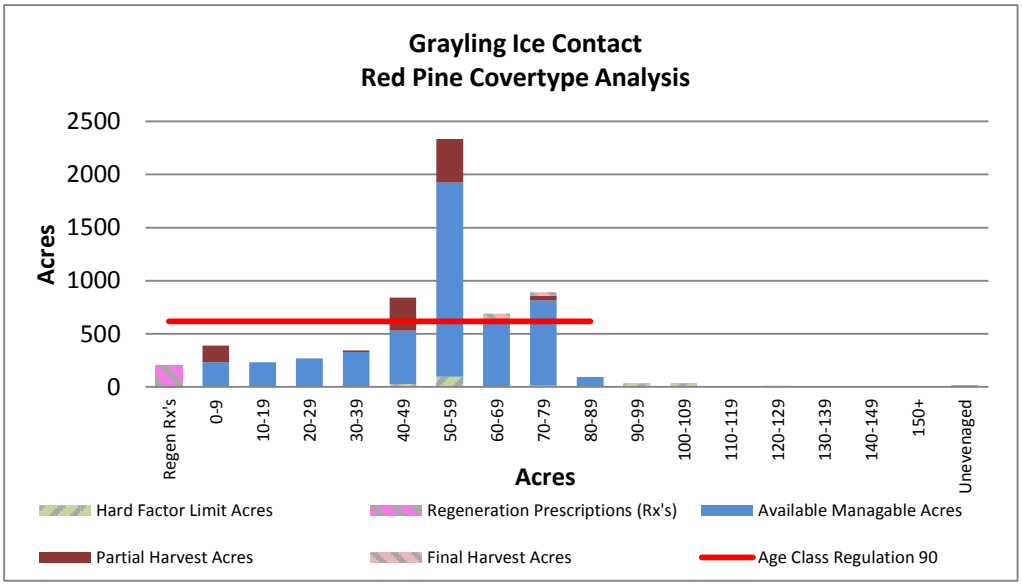

Figure 4.14.4. Age-class distribution for red pine in the Grayling Ice Contact management area (2012 Department of Natural Resources inventory data).

There are 223 acres of red pine have met harvest criteria (Figure 4.14.4), but have site conditions that limit harvest (hard factor limit acres).

There are 99 acres that have a final harvest pending and these acres are included in the regeneration prescription class. There are 945 acres with a partial harvest pending and these acres are included in their current age class. Figure 4.14.4 includes the projected number of acres converted to the cover type as a result of treatments and planting to red pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine on dry-mesic sites (PArVVb/AFO and PArVVb) will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0-99 years of age to provide for continual harvest, wildlife habitat and recreational opportunity;
- Plantation red pine on mesic sites (AFO/AFOCa) will be managed to economic maturity, while allowing natural hardwood conversion on sites more suitable for hardwoods;
- Red pine will be regenerated on sites lacking high-quality natural hardwood regeneration; and
- On sites being converted to hardwoods or aspen, a scattering of a few pine trees per acre will be left for legacy retention providing a super-canopy of red pine and providing vertical structure for various wildlife species.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distribution;
- Conduct partial harvests on a projected 2,398 acres concentrating on stands of better-quality red pine that have the potential for a higher product value in larger size classes; and
- Conduct final harvests on a projected 1,264 acres of red pine beginning with the oldest age-classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- Continue management of younger red pine stands with partial harvests with final harvests occurring near economic maturity (90 years); and
- Desired future harvest levels are projected at 618 acres of final harvest and 2,992 acres of partial harvest per 10-year period.

4.14.1.4 Forest Cover Type Management – Oak

Current Condition

Oak acres total 5,517 acres or 10%of the management area (Table 4.14.1). Oak is located on the PArVHa/PArVVb, PArVHa and PVCd/PArVHa habitat class sites. Forest communities dominated primarily by oak, some of it high-quality red oak and white oak, in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, white-tailed deer, squirrels and various birds and commercially for firewood and industrial lumber. There are 2,406 acres of oak have met harvest criteria (Figure 4.14.5), but have site conditions that limit harvest (hard factor limit acres). There are 469 acres that have a final harvest pending and these acres are shown in the regeneration prescriptions class.

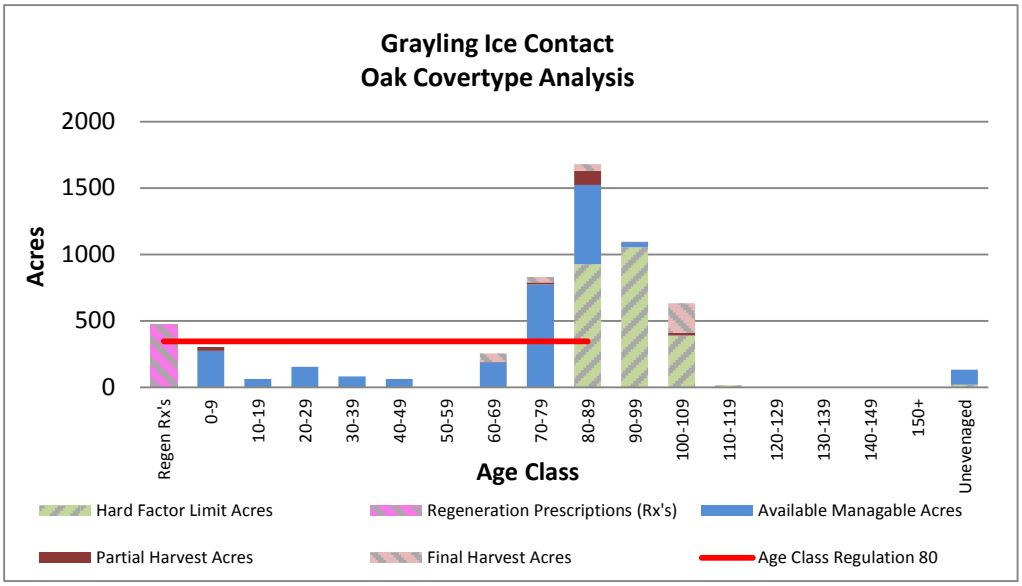

Figure 4.14.5. Age-class distribution for oak in the Grayling Ice Contact management area (2012 Department of Natural Resources inventory data).

There are 174 acres that have a partial harvest pending and these acres are included in their current age classes. Figure 4.14.5 includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in the release of oak. These acres are included in the regeneration prescription class.

Desired Future Condition

- Oak will be maintained on operable sites through even-aged management with acres balanced between 0 and 89 years of age to provide for continual harvest, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 222 acres in the 80+ age classes concentrating on the stands that have previously had partial harvests;
- Conduct partial harvests on a projected 782 acres concentrating on stands that have not had any harvests or those stands that have a sufficient basal area for a partial harvest; and
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types.

Long-Term Management Objectives

- Over the next several decades, continue to aggressively regenerate oak through harvests to balance the age-class structure;
- Management decisions need to consider that the oak community will become more mixed over time to include more red maple and white pine;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area; and

- Desired future harvest levels are projected at 346 acres of final harvest and 795 acres of partial harvest per 10-year period.

4.14.1.5 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 4,779 acres or 9% of the management area (Table 4.14.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.14.1.6 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 874 acres or 2% of the management area (Table 4.14.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.14.1.7 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: jack pine, 1,277 acres (2% of the management area) and white pine, 1,192 acres (2%). Other forest communities total approximately 2,940 acres (5%) and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- The following species are projected for final harvests over the next 10 years: jack pine 134 acres, white pine 263 acres, natural mixed pines 173 acres, mixed upland deciduous 169 acres, upland mixed forest 128 acres and upland spruce/fir 54 acres;
- Partial harvests are projected for 406 acres of white pine, 186 acres of natural mixed pines and 108 acres of upland mixed forest; and
- Consider methods to ensure regeneration of lowland types.

Long-Term Management Objectives

- It is acceptable that the age-class structure of most of the other types will remain unbalanced for several decades.

4.14.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management are during this 10-year planning period:

- American woodcock
- Beaver
- Eastern massasauga rattlesnake
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Grayling Ice Contact management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest and large open grassland complexes, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less than 15% and other inland bodies of water.
    - Implementation of the Dingman Marsh and French Farm Flooding master plans and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
    - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
    - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than

five acres in size with a savannah-like dispersion of large trees (<50% canopy cover) with open understory and include tall trees or snags of large than12 inches in diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than 12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within Stand Retention Guidance, factor-limited acres, and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old) even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.14.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed seven listed species and no natural communities of note occurring in the management area as listed in Table 4.14.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

The Upper Manistee River and its tributaries have been identified as a natural river and along with its corridor are also designated as a high conservation value area as shown in Figure 4.14.6.

There are no ecological reference areas identified for the Grayling Ice Contact management area.

Table 4.14.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Grayling Ice Contact management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Fish								
Cisco (lake herring)	*Coregonus artedi*	T/G5/S3	Confirmed	MV	Low	Great Lakes	Aquatic	N/A
						Inland lake	Aquatic	N/A
						Rivers	Aquatic	N/A
Butterfly								
Dusted skipper	*Atrytonopsis hianna*	Sc/G4G5/S2S3	Confirmed	MV	Low	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Reptile								
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Plant								
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Hill's pondweed	*Potamogeton hillii*	T/G3/S2				Emergent marsh	Lowland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

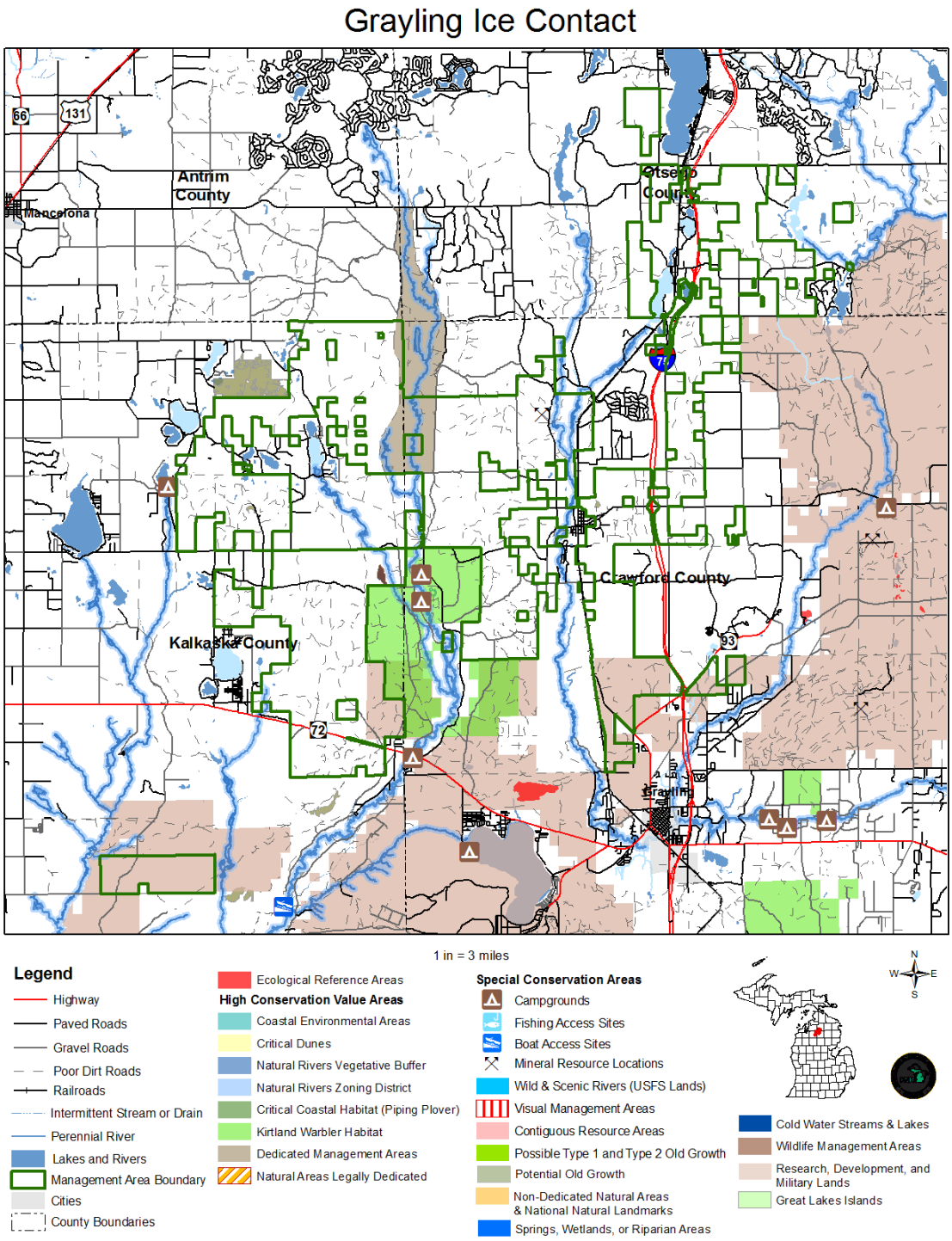

Figure 4.14.6. A map of the Grayling Ice Contact management area showing the special resource areas.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

4.14.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include oak decline, oak wilt, emerald ash borer, beech bark disease and branch mortality of seedling and sapling white pine and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.
- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important. Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow. Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.
- Monitor for branch mortality of seedling and sapling white pine along and adjacent to river corridors. Causal agent(s) responsible for this problem may include pine spittlebug feeding and various fungal pathogens. Until management guidelines can be developed, continue reporting incidence of this problem to the forest health specialist.
- Oak wilt is prevalent in this area. Epicenters need to be identified and treated. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced. Other management activities that can lead to damage of residual red oak trees (oil and gas development, recreational trail improvement, etc.) should be not be conducted during this high-risk period.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Currently there are no invasive species within the management area or within a five-mile radius of the management area. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information, and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

4.14.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.14.1 and listed in Appendix F.

4.14.6 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to reintroduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition.
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings.

4.14.7 Public Access and Recreation

Where access is limited on state forest land, the DNR will continue to seek access across adjacent private property. In accordance with the DNR's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Campgrounds (Figure 4.14.6)

- Lake Marjory, Lake Margrethe, Upper Manistee, Manistee River Bridge and Goose Creek state forest campgrounds and Goose Creek Trail Camp.

Boating Access Sites (BASs) (Figure 4.14.6)

- Lake Marjory BAS
- Bradford Lake BAS
- Horseshoe Lake BAS
- Bluegill Lake BAS

Off-Road Vehicle Trails (Figure 4.14.1)

- Kalkaska Trail and Route
- Frederic Trail and Route

Snowmobile Trails (Figure 4.14.1)

- Various

Non-Motorized Trails (Figure 4.14.1)

- Shore-to-Shore Trail

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to

minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single-track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42, and the Department of Natural Resources Within Stand Retention Guidance.

4.14.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium and ice-contact outwash sand and gravel. The glacial drift thickness varies between 200 and 1,000 feet. Sand and gravel pits are located in this management area and there is good potential for additional pits.

The Mississippian Marshall Sandstone and Coldwater Shale subcrop below the glacial drift. The Marshall was previously used as a building stone elsewhere in the state.

Much of this management area has been developed for gas production from the Antrim Shale and some oil and gas production from Guelph (former Niagaran) reefs. Well spacing is currently 80 acres and most of the area of Antrim potential has already been drilled. The Collingwood Formation may also have oil and gas potential in this area and probably will have a well spacing of 320 to 640 acres per well (or possibly larger). The southern parts of Crawford and Kalkaska Counties, that have not been drilled yet, are leased for the Collingwood Formation and drilling, if sucessful, could expand into the rest of the management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire, and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.15 MA 15 – Camp Grayling Management Area

Summary of Use and Management

The Camp Grayling management area management area (MA) is the Michigan National Guard training grounds used primarily for military exercises while allowing varying degrees of Department of Natural Resources (DNR) management on certain portions depending on classification of ownership. The department will coordinate all prescribed activities with the National Guard to ensure they are compatible with military training needs. On these lands military training has precedence over resource management activities. Management in the Camp Grayling management area will emphasize continued balancing the age-class of aspen on suitable sites and regenerating the aging oak resource. Management will strive to sustainably produce various forest products, enhance game and non-game wildlife habitat and protect areas of unique character while accommodating military training. Management activities will be constrained or modified based on military training needs. Expected trends within this 10-year planning period are introduced pests and diseases and the difficulty in regenerating oak.

Introduction

This management area is located in the central northern Lower Peninsula in Kalkaska and Crawford counties and contains 100,619 acres of state forest (Figure 4.15.1). The primary attributes which identify the Camp Graying management area include:

- The management area falls within Albert's Grayling Outwash Plain sub-region (Albert, 1995).
- This management area, which lies in the central part of the Large Grayling Outwash Plain sub-region, is made up of ice-contact formed end-moraine ridges, separated by outwash areas.
- Historically, fires were very frequent in this management area and were important in determining species composition. Jack pine and northern pin oak dominated the outwash plains, while vegetation varied on the ridges – some dominated by northern hardwoods and others dominated by red oak, hemlock and white pine. Currently areas of aspen, red pine and northern hardwoods with isolated pockets of lowland types cover the majority of the state forest land.
- Hanson Grant lands are managed jointly by the Michigan DNR and Department of Military and Veterans Affairs. As per deed restrictions, Hanson lands are to be used foremost for military training while the DNR manages fish, game and forestry interests on these lands.
- The Camp Grayling Cantonment Area is restricted.
- The Camp Grayling management area includes various military shooting and artillery ranges and other specialized training areas, where approximately 20,000 acres are off-limits to most natural resource management activities.
- The 3,500 acre all-season Hanson Hills recreation area is located with this management area and is managed by the Grayling Recreation Authority. Management needs to consider intense recreational use in this area and needs to coordinate with the Grayling Recreation Authority and Camp Grayling.
- The state manages the natural resources on these lands and some of the Military Board lands as long as management does not interfere with military training or military management objectives.
- The Camp Grayling Pine Barrens special management area (approximately 5,100 acres) is located in the Camp Grayling management area. A specific management plan, developed in conjunction with Camp Grayling, has the goal of improving the quality of the pine barrens area while allowing for the continuation of military training in the area.
- Portions of the Camp Grayling management area are popular destinations for game hunting, hiking, mushroom hunting, etc. for the nearby communities of Grayling and Kalkaska. Due to the proximity of this management area to these towns, the forest resources contribute social and economic values to the area.
- Department of Natural Resources recreation facilities in this management area include the Lake Margrethe, Civilian Conservation Corp Bridge, Manistee River Bridge, Shupac Lake and Jones Lake state forest campgrounds. It should be noted that some campgrounds are located on military lands and others on non-military lands within compartments that are primarily military ownership. Shupac Lake and the Manistee River Bridge are outside military areas. Margrethe campground is leased from the military. Jones Lake is on and surrounded by military lands. For sites on military lands the military has ultimate jurisdiction. Snowmobile trails and an equestrian trail cross the management area. Recreational authority on Military Board lands and Hanson Grant lands reside with the military.

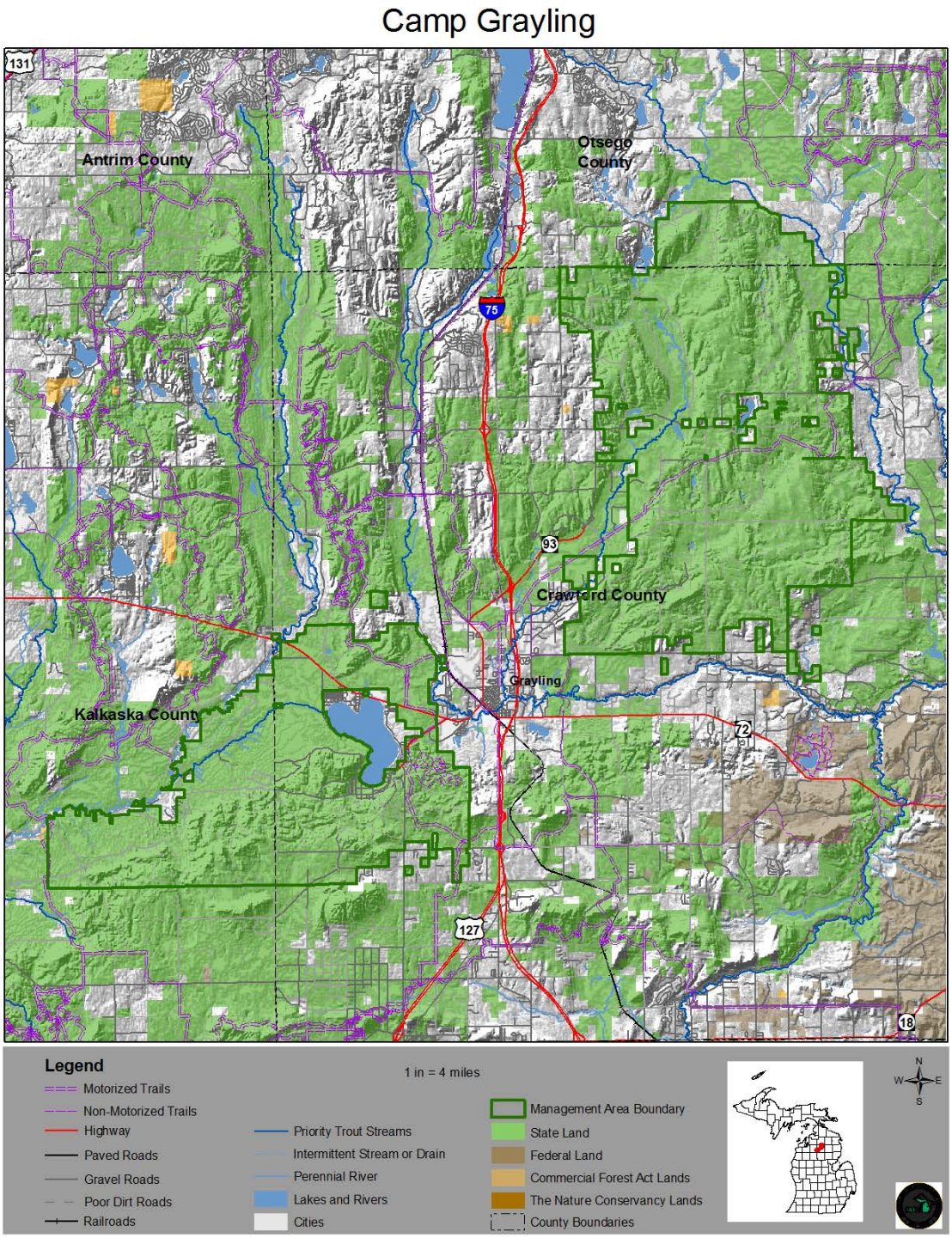

Figure 4.15.1. A map of the Camp Grayling management area (dark green boundary) in relation to surrounding state forest and other lands in Kalkaska and Crawford counties, Michigan.

Table 4.15.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Camp Grayling management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Oak	27%	26,711	16,376	10,335	897	2,297	26,711	1,387	2,297
Aspen	20%	20,456	12,061	8395			20,456	1,564	
Jack Pine	17%	16,647	8,197	8450			16,647	1,436	
Red Pine	5%	5,023	1,526	3497		655	5,023	350	1,209
Northern Hardwood	3%	2,872	2,583	289	18		2,872		
Mixed Upland Deciduous	2%	2,311	1,904	407		0	2,311	92	51
Lowland Conifers	2%	1,652	1,487	165	18		1,652	18	
Upland Open/Semi-Open Lands	16%	16,145	12,200	3945			16,145		
Lowland Open/Semi-Open Lands	2%	1,862	1,165	697			1,862		
Misc Other (Water, Local, Urban)	2%	1,636	3,032	-1396			1,636		
Others	5%	5,304	3,805	1499	87	319	5,304	166	326
Total		100,619	64,335	36,284	1,019	3,271	100,619	5,013	3,883

4.15.1 Forest Cover Type Management Direction

- The following sections contain information on vegetation management direction in the form of Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage. A significant portion of the management area has been assigned a hard factor limit due to military restrictions per deed restrictions or otherwise in areas where active management conflicts with military use and limitations to management in the Hanson Hills Recreation Area.

4.15.1.1 Forest Cover Type Management – Oak

Current Condition

Oak acres total 26,711 acres or 27% of the management area (Table 4.15.1). Most stands are moderate to well-stocked stands of almost pure oak is located on PArVHa/PArVVb, PArVHa and PVCd/PArVHa habitat classes (see Appendix E).

The oak resource is aged (Figure 4.25.2) and is difficult to regenerate from stump sprouts.

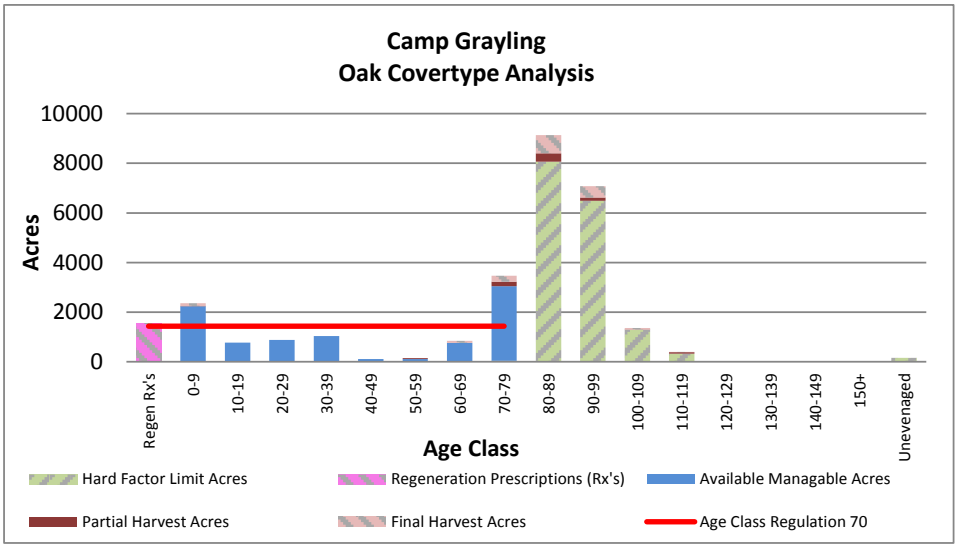

Figure 4.15.2. Age-class distribution for oak in the Camp Grayling management area (2012 Department of Natural Resources inventory data).

There are 16,376 acres of oak have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 1,546 acres of stands that have a final harvest pending and these acres are included in the regeneration prescription class.

There are 762 acres with a partial harvest pending and these acres are included in their current age class. Figure 4.15.2 includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of oak. These acres are included in the regeneration prescription class.

Oak is desirable as it provides valuable habitat for many wildlife species, including ruffed grouse, white-tailed deer and wild turkey, which are featured species in this management area. Oak also provides valuable timber products.

Conditions that existed around the turn of the last century that created the extensive oak stands (large clearcuts that minimized frost pockets, intense fires that minimized competition and a smaller deer population) cannot be replicated. Therefore, the oak resource in this management area is extremely skewed towards the older age classes due to a minimal amount of regeneration for the last 70 years (Figure 4.15.2). The oak in the 90+ age classes is approaching the end of the normal lifespan on outwash plains and is becoming increasingly susceptible to insects and diseases such as oak wilt and oak decline. Older oak also does not sprout as vigorously from stump sprouts.

Due to the advanced age of the oak and the challenges to regenerating oak, management should concentrate on maintaining oak in mixed stands. The current understory of white pine and red maple below oak will be released through partial oak harvests. Where oak is in the understory, such as under jack pine or other pine types, treatments to reduce the pine overstory will release oak. Considerations should also be given to planting pine in oak stands, which can help to shelter young oak from late spring freezes. Oak can be a component of other cover types, but will require management techniques to ensure regeneration.

Desired Future Condition

- Oak will be maintained as a mixed cover type and as a component in stands throughout the management area through management to provide for timber products, wildlife habitat and recreational opportunities; and
- Some oak sites will be allowed to become mixed with white pine or red maple.

10-Year Management Objectives

- Conduct final harvests on a projected 897 acres;
- Conduct partial harvests on a projected 2,297 acres;
- Consider competition control through methods such as prescribed burning or herbicide use to improve the chances for successful natural regeneration;
- Maintain or expand oak as a component in stands throughout the management area through retention and management to promote natural regeneration in other cover types;
- Consider opportunities to re-establish and maintain oak/pine barrens on poorer quality sites (primarily low-end PArVVb and PVCd). This will provide habitat for species, including wild turkey, that prefer openings; and
- Where site conditions allow, consider introduction of red pine in young oak stands to shelter oak from late spring freezes.

Long-Term Management Objectives

- Continue work towards maintaining oak on the landscape in mixed stands and as a component in other cover types;
- Continue management for mixed oak/pine stands through partial harvests to release understory species into the overstory or planting pine in young oak stands;
- Future management decisions will need to take into consideration the impact of oak wilt and oak decline as the cumulative impacts will likely increase over time;
- Continue aggressive management of the aging oak resource to promote regeneration; and
- Desired future harvest levels are projected at 1,387 acres for final harvest and 2,297 acres for partial harvest per 10-year period.

4.15.1.2 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 20,456 acres or 20%of the management area (Table 4.15.1) on PVCd/PArVHa habitat classes. Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs and for a wide range of forest recreation. Aspen occurs throughout the area. Accessible aspen has been consistently harvested over the last 40 years. There are 12,061 acres of aspen (Figure 4.15.3) that have site conditions that limit harvest (hard factor limit acres).

There are 1,910 acres of stands that have a final harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between zero and 59 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

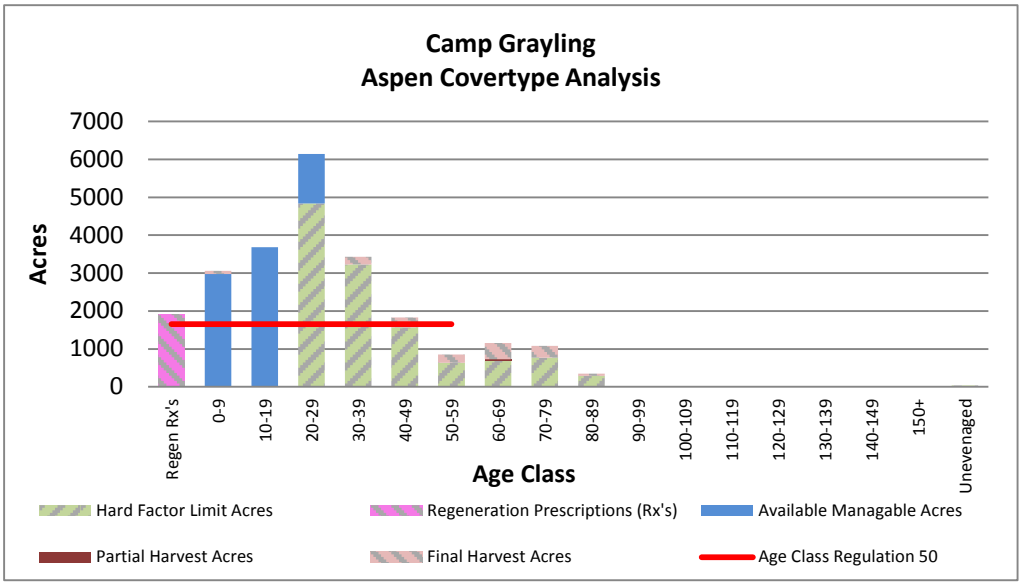

Figure 4.15.3. Age-class distribution for aspen in the Camp Grayling management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- There are very few acres available in the older age classes and the model does not project any harvests in the current planning period; and
- However, managers should consider harvesting stands below the rotation age to regenerate aspen.

Long-Term Management Objectives

- Continue management through regeneration harvests to balance the age-class distribution; and
- Desired future harvest levels are projected at 1,564 acres for final harvest per 10-year period.

4.15.1.3 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 16,647 or 17% of the management area (Table 4.15.1) on PArVHa/PArVVb, PArVHa and PVCd/PArVHa habitat classes. Forest communities dominated primarily by jack pine in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds;

commercially for pulp and saw logs and for a wide range of forest recreation. Accessible jack pine has been consistently harvested over the last 40 years. There are 8,197 acres of jack pine that have site conditions that limit harvest (hard factor limit acres). There are 657 acres that have a final harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Jack pine-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 69 years of age to provide for regulated harvest, wildlife habitat and recreational opportunity.

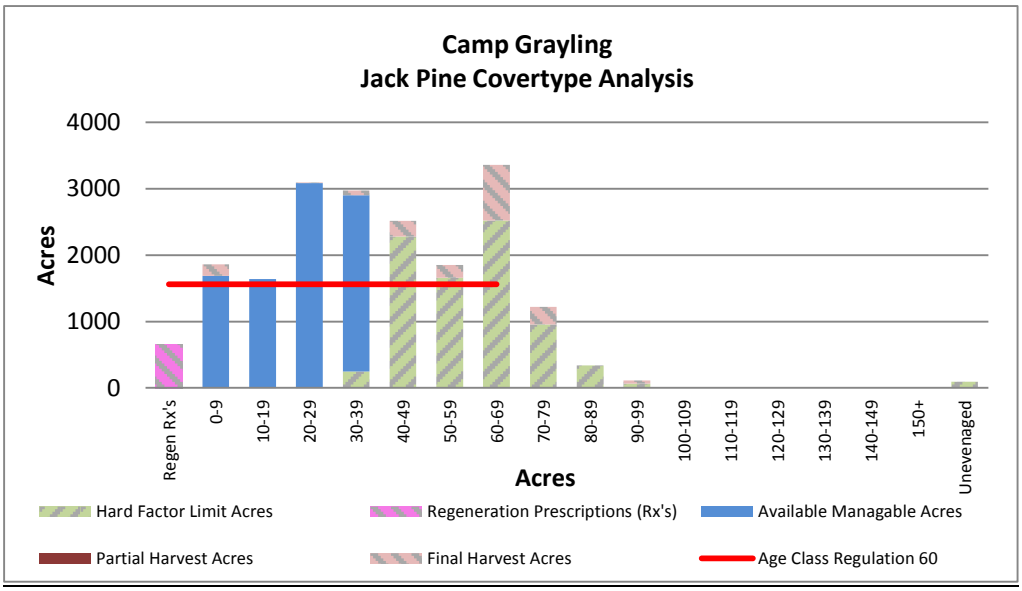

Figure 4.15.4. Age-class distribution for jack pine in the Camp Grayling management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Throughout the management area, consideration should be given to fire implications as well as potential restrictions on military use before reestablishment of jack pine; and
- There are few acres available for management from the older age classes and the model has no acres projected for harvest in the current planning period. On military lands, management prescriptions are subject to military approval. Primary emphasis will be on natural regeneration as these areas are subject to future military use that could impact an investment in planting. The only areas to consider for planting would be where there are visual concerns or areas that are of low risk for future military training.

Long-Term Management Objectives

- Future management decisions should consider the potential impact of jack pine budworm on older jack pine stands; and
- Desired future harvest levels are projected at 1,436 acres for final harvest per 10-year period.

4.15.1.4 Forest Cover Type Management – Red Pine

Red pine acres total 5,023 or 5% of the management area (Table 4.15.1). The largest spikes are in the regeneration prescription class and 70-79 year age classes. Red pine in this management area is commercially valued for pulp, saw logs and utility poles. There are 1,526 acres of red pine that (Figure 4.15.5) have site conditions that limit harvest (hard factor limit acres).

There are 937 acres that have a final harvest pending and these acres are included in the regeneration prescription class. There are 798 acres with a partial harvest pending and these acres are included in their current age class. Figure 4.15.5 includes the projected number of acres converted to the cover type as a result of treatments and planting to red pine. These acres are included in the regeneration prescription class.

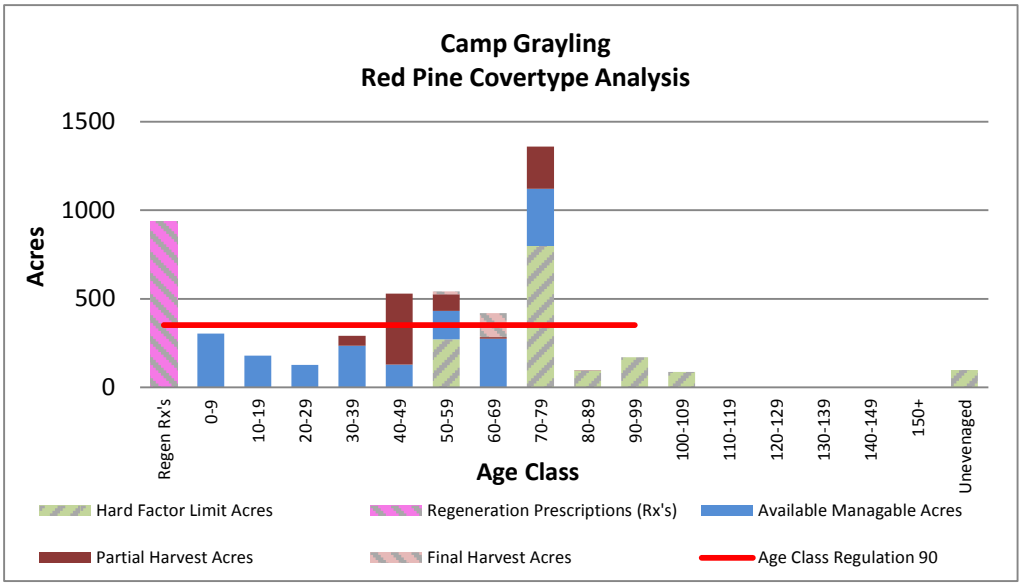

Figure 4.15.5. Age-class distribution for red pine in the Camp Grayling management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Red pine on dry-mesic sites (PArVVb/AFO and PArVVb) will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0 and 99 years of age to provide for continual harvest, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Throughout the management area, consideration should be given to potential management restrictions due to military use before reestablishment of red pine;
- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distribution; and
- Conduct partial harvests on a projected 655 acres concentrating on stands of better-quality red pine that have the potential for a higher product value in larger size classes.

Long-Term Management Objectives

- Continue management of younger red pine stands with partial harvests with final harvests occurring near economic maturity (90 years). Primary emphasis will be on natural regeneration as these areas are subject to future military use that could impact an investment in planting; and
- Desired future harvest levels are projected at 350 acres for final harvest and 1,209 acres for partial harvest per 10-year period.

4.15.1.5 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 16,145 acres or 16% of the management area (Table 4.15.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Upland open/semi-open lands will be maintained at or above the current level to provide habitat for species which use openings. On military lands, management prescriptions to achieve these objectives are subject to military approval.

10-Year Management Objectives

- Continue management to maintain upland open/semi-open lands; and
- It is expected that jack pine and red pine areas will be converted to open lands as a result of military activities.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands; and
- Protect stands from illegal off-road vehicle use and invasive non-native species.

4.15.1.6 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 1,862 acres or 2% of the management area (Table 4.15.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat. On military lands, management prescriptions to achieve these objectives are subject to military approval.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics with support of the military.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current level;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.15.1.5 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: northern hardwood, 2,872 acres (3% of the management area), mixed upland deciduous, 2,311 acres (2%) and lowland conifers, 1,652 (2%). Other forest communities total approximately 5,304 acres (5%) and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These communities will be managed on operable sites, contributing to the compositional diversity of the landscape while providing for continual harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species. On military lands, management prescriptions to achieve these objectives are subject to military approval.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas in cooperation with the military;

- The following species are projected for final harvests: mixed upland deciduous 206 acres, lowland conifers 18 acres, natural mixed pines 100 acres, upland mixed forest 71 acres, and white pine 98 acres;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry;
- Consider methods to ensure adequate regeneration of lowland types; and
- Partial harvests are projected for 959 acres of northern hardwood, 227 acres of mixed upland deciduous, 284 acres of natural mixed pines, 49 acres of upland mixed forest 184 acres of white pine and 30 acres of planted mixed pines.

Long-Term Management Objectives

- Continue management of other types to provide forest products, wildlife habitat and recreational opportunities; and
- Continue to seek opportunities to regenerate lowland types.

4.15.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management are during this cycle of state forest planning:

- American woodcock
- Eastern Massasauga
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Camp Grayling management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest and large open grassland complexes, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
    - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (greater than12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
    - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than five acres in size with a savannah-like dispersion of large trees (<50% canopy cover) with open understory and include tall trees or snags of large (greater than 12 inches) diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than12 inches in diameter at breast height.
    - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1:3 acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak, and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.

- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.15.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed seventeen listed species as well as five natural communities of note occurring in the management area as listed in Table 4.15.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.15.6, there are three special conservation areas. These are the Camp Grayling military area, the Hanson Hills recreation area (3500 acres) and the Camp Grayling Pine Barrens special resource area (5100 acres).

The Upper Manistee River and its tributaries have been identified as a natural river and along with its corridor are also designated as a high conservation value area as shown in Figure 4.15.6.

Table 4.15.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Camp Grayling management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Bog		S4/G3G5	Confirmed				Lowland open/semi-open	N/A
Dry northern forest		S3/G3?	Confirmed				Jack Pine, Red Pine	Late
Poor fen		S3/G3	Confirmed				Lowland open/semi-open	N/A
Wet-mesic sand prairie		S2/G2G3	Confirmed				Lowland open/semi-open	N/A
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Insect								
Red-legged spittlebug	*Prosapia ignipectus*	SC/G4/S2S3	Confirmed	EV	Moderate	Alvar	Upland open/semi-open	N/A
						Prairie fen	Upland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Mesic sand prairie	Upland open/semi-open	N/A
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Butterfly								
Dusted skipper	*Atrytonopsis hianna*	Sc/G4G5/S2S3	Confirmed	MV	Low	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Reptile								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Southern hardwood swamp		
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Plants								
Pale Agoseris	*Agoseris glauca*	T/G5/S2	Confirmed			Pine barrens	Jack Pine	Early
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry sand prairie	Upland open/semi-open	N/A
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

Table 4.15.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Camp Grayling management area (Continued).

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Plants (Cont'd)								
False violet	*Dalibarda repens*	T/G5/S1S2	Confirmed			Dry-mesic northern forest	White Pine	Late
						Mesic northern forest	Northern Hardwood	Late
Rough fescue	*Festuca scabrella*	T/G5/S2S3	Confirmed			Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Vasey's rush	*Juncus vaseyi*	T/G5?/S1S2	Confirmed			Intermittent wetland	Lowland open/semi-open	N/A
						Lakeplain wet prairie	Lowland open/semi-open	N/A
						Lakeplain wet-mesic prairie	Lowland open/semi-open	N/A
Canada rice grass	*Oryzopsis canadensis*	T/G5/S2	Confirmed			Pine barrens	Jack Pine	Early
Allegheny plum	*Prunus allighaiensis davisii*	SC/G4T3Q/S3	Confirmed			Dry sand prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Houghton's goldenrod	*Solidago houghtonii*	LT/T/G3/S3	Confirmed			Open dunes	Upland open/semi-open	N/A
						Alvar	Upland open/semi-open	N/A
						Limestone bedrock lakeshore	Upland open/semi-open	N/A
						Interdunal wetland	Lowland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Limestone cobble shore	Upland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
Prairie dropseed	*Sporobolus heterolepis*	SC/G5/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
Fleshy stitchwort	*Stellaria crassifolia*	E/G5/S1	Confirmed			Rich conifer swamp	Tamarack	Late
						Northern shrub thicket	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

There are also four ecological reference areas (Figure 4.15.6) that are partially or mostly on state land. The ecological reference areas represent the following natural communities: poor fen (14.0 acres), two intermittent wetlands (237.11 acres and 17.16 acres) and bog (42.08 acres). These ecological reference areas will be managed to enhance and protect their natural vegetative and associated wildlife communities as directed by an ecological reference area-specific management plan. These individual management plans will be developed over the life of this planning period.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

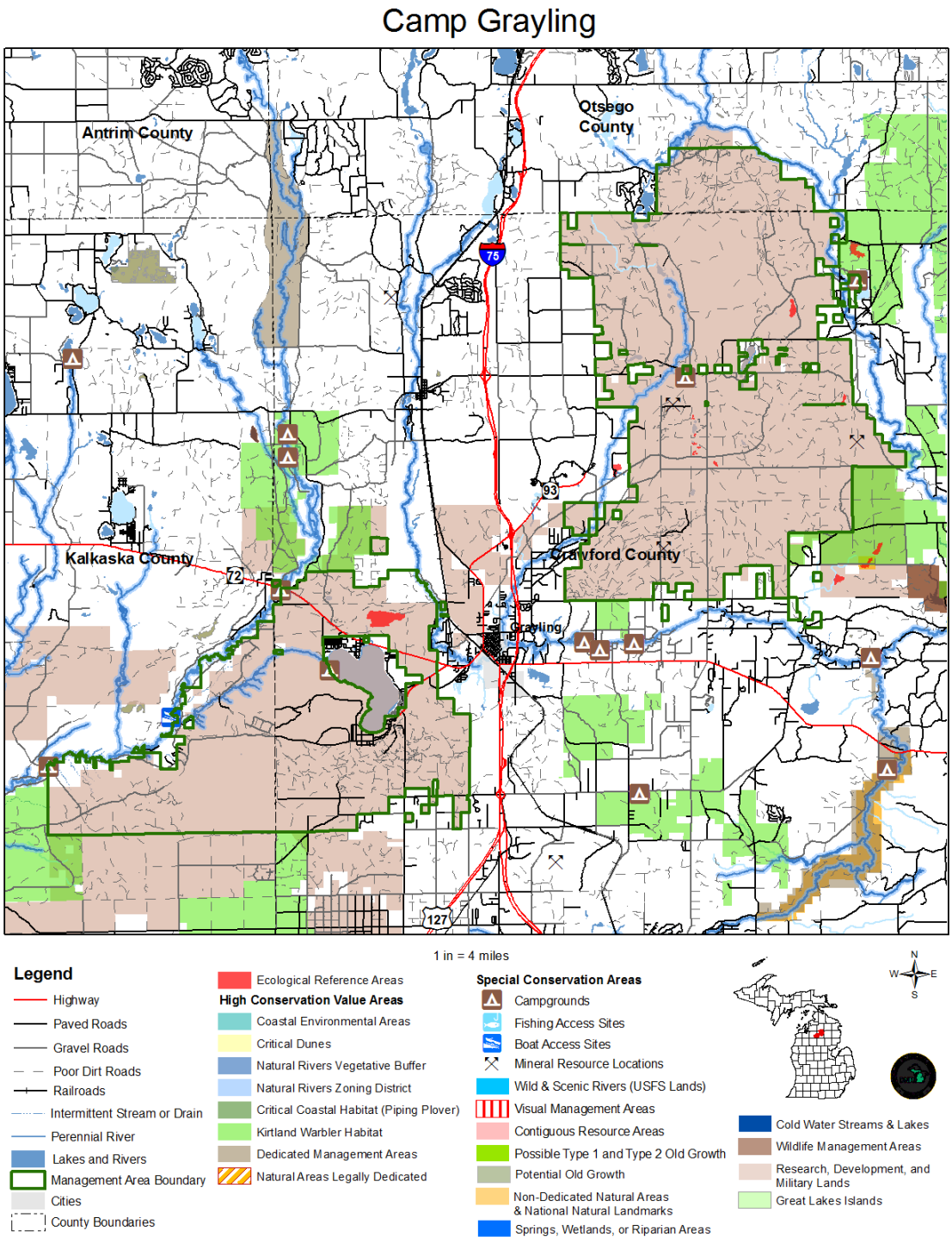

Figure 4.15.6. A map of the Camp Grayling management area showing the special resource areas.

4.15.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. It has been noted that there is a high risk of oak wilt in the management area due to the age and condition of the oak resource. Some of the more important forest health pests in this management area include oak decline and branch mortality of seedling and sapling white pine and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.

- Monitor for branch mortality of seedling and sapling white pine along and adjacent to river corridors. Causal agent(s) responsible for this problem may include pine spittlebug feeding and various fungal pathogens.
- Until management guidelines can be developed, continue reporting incidence of this problem to the forest health specialist (Form 4029-3).

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.15.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. Local staff have noted additional invasive species that are not on this list, and the Camp Grayling Environmental Office assists with funding, monitoring and treatment of invasive species as well as forest health issues. This information and other sources that show the extent and location of invasives will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.15.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Camp Grayling - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	1	1	1

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Common Buckthorn *Rhamnus cathartica*	1

4.15.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.15.1 and listed in Appendix F.

4.15.6 Fire Management

This area is a high risk for wildfire due to the timber types being dominated by jack pine, well-drained soils and a high incidence of ignition. Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependant on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- When feasible, reintroduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- When feasible, incorporate fire as a tool to restore or maintain managed openings; and
- Develop a comprehensive fire break program to minimize the risk of fire spread in areas of high-potential ignition (e.g., military ranges).

4.15.7 Public Access and Recreation

Access is limited in this management area due to permanent closures of Camp Grayling ranges and seasonally on other lands that are used for training and military maneuvers by Camp Grayling. Where access is limited on state forest land, the DNR will continue to seek access across adjacent private property. In accordance with the DNR's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Campgrounds (Figure 4.15.6)

- Jones Lake State Forest Campground
- CCC Bridge State Forest Campground
- Manistee River Bridge State Forest Campground
- Lake Margrethe State Forest Campground
- Shupac Lake State Forest Campground

Boating Access Sites (BSAs) (Figure 4.15.6)

- Jones Lake BAS
- Shupac Lake BAS
- Guthrie Lake BAS
- Section One Lake BAS
- KP Lake BAS
- Camp Grayling BAS (Not open to the public, located within Cantonment).
- CCC Bridge BAS
- Lake Margrethe BAS

Off-Road Vehicle Trails (Figure 4.15.1)

- Frederic Route
- Kalkaska Route

Snowmobile Trails (Figure 4.15.1)

- Various

Non-Motorized Trails (Figure 4.15.1)

- Hanson Hills Recreation Area XC Ski and Mountain Bike trails.

Development, expansion or any change to recreational trails and facilities will require military approval including Military Board and Hanson Grant lands. Recreational activities on leased lands are managed by Parks and Recreation Division and Forest Resources Division staff.

Although managing of most recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division, military staff and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management

system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single-track of-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.15.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium and ice-contact outwash sand and gravel. The glacial drift thickness varies between 200 and 1,000 feet. Sand and gravel pits are located in this management area and there is good potential for additional pits. The Department of Military and Veterans Affairs has two sand and gravel leases within the management area.

The Mississippian Michigan Formation, Marshall Sandstone and Coldwater Shale subcrop below the glacial drift. The Mississippian Michigan is quarried for gypsum and the Marshall was previously used as a building stone elsewhere in the state.

Generally, lands owned by the Department of Military and Veterans Affairs or under long-term lease to the military for training are classified as non-leasable for oil and gas development. The northern part of this management area has been developed for gas production from the Antrim Shale. Well spacing is currently 80 acres and most of the area of Antrim potential has already been drilled. Along the south edge of the management area, the Devonian Richfield and Detroit River Formations are producing oil on 40-acre spacing and the deeper Prairie du Chien producing gas on 320 to 640 acre units. Surface use in the management area is not allowed by the Department of Military and Veterans Affairs, but an agreement does allow for directional drilling under a one-mile border. The Collingwood Formation may also have oil and gas potential in this area and probably will have a well spacing of 320 to 640 acres per well (or possibly larger). Only portions of the management area, primarily within the one mile border area are leased. If drilling for the Collingwood Formation is sucessful a wider border may be requested.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire, and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.16 MA 16 – Avery Hills Management Area

Summary of use and management

Management in the Avery Hills management area (MA) will emphasize continuing balancing the age class of aspen on suitable sites and thinning the northern hardwoods, balancing age classes of red pine and regenerating the aging oak resource. Management will strive to sustainably produce various forest products; enhance game and non-game wildlife habitat such as Greasy Creek Grouse management area and Sage Lake Flooding; protect areas of unique character; and provide for forest-based recreational uses, especially the snowmobile trail system. Management activities may be constrained by poor access on the steep slopes. Expected trends within this 10-year planning period are increased recreational pressure; illegal off-road vehicle use; introduced pests and diseases, especially beech bark disease and emerald ash borer (beech and ash are significant species in northern hardwood stands); managing oil and gas development; and an increased need to regenerate oak.

Introduction

The Avery Hills management area is located in northeast Lower Peninsula in Montmorency and Oscoda Counties and contains approximately 45,313 acres of state forest (Figure 4.16.1). The primary attributes which identify the Avery Hills management area include:

- The management area falls mostly within Albert's Vanderbilt Moraines sub-region (Albert, 1995). State forest ownership is fairly concentrated.
- The historic cover types of mixed red, jack and white pines with some areas of upland hardwoods.
- The current predominant cover types include primarily aspen, oak and upland hardwoods. Approximately 9% of the area is relatively inaccessible lowland cover types.
- The dominant landforms consist of sandy, well-drained moraine ridges surrounded by poorly-drained outwash channels and plains.
- Due to the proximity of this management area to the communities of Atlanta, Fairview, Mio and Lewiston, the forest resources contribute social and economic values to the area.
- This management area contains one or more of the northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.
- The Department of Natural Resources (DNR) Hunt Creek Fish Laboratory, Greasy Creek Grouse management area and Sage Lake Flooding are located in this management area.
- This area has extensive Antrim and Niagaran gas development.
- DNR recreation facilities in this management area include Avery Lake, Big Oaks and Little Wolf Lake rustic campgrounds. Snowmobile and off-road vehicle trails cross the area. Resource damage from illegal off-road vehicle use is prevalent.
- The topography of this management area is some of the steepest in Lower Michigan, though the hills are relatively short.
- This management area contains one of the Northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production and ruffed grouse habitat. The boundary will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager.

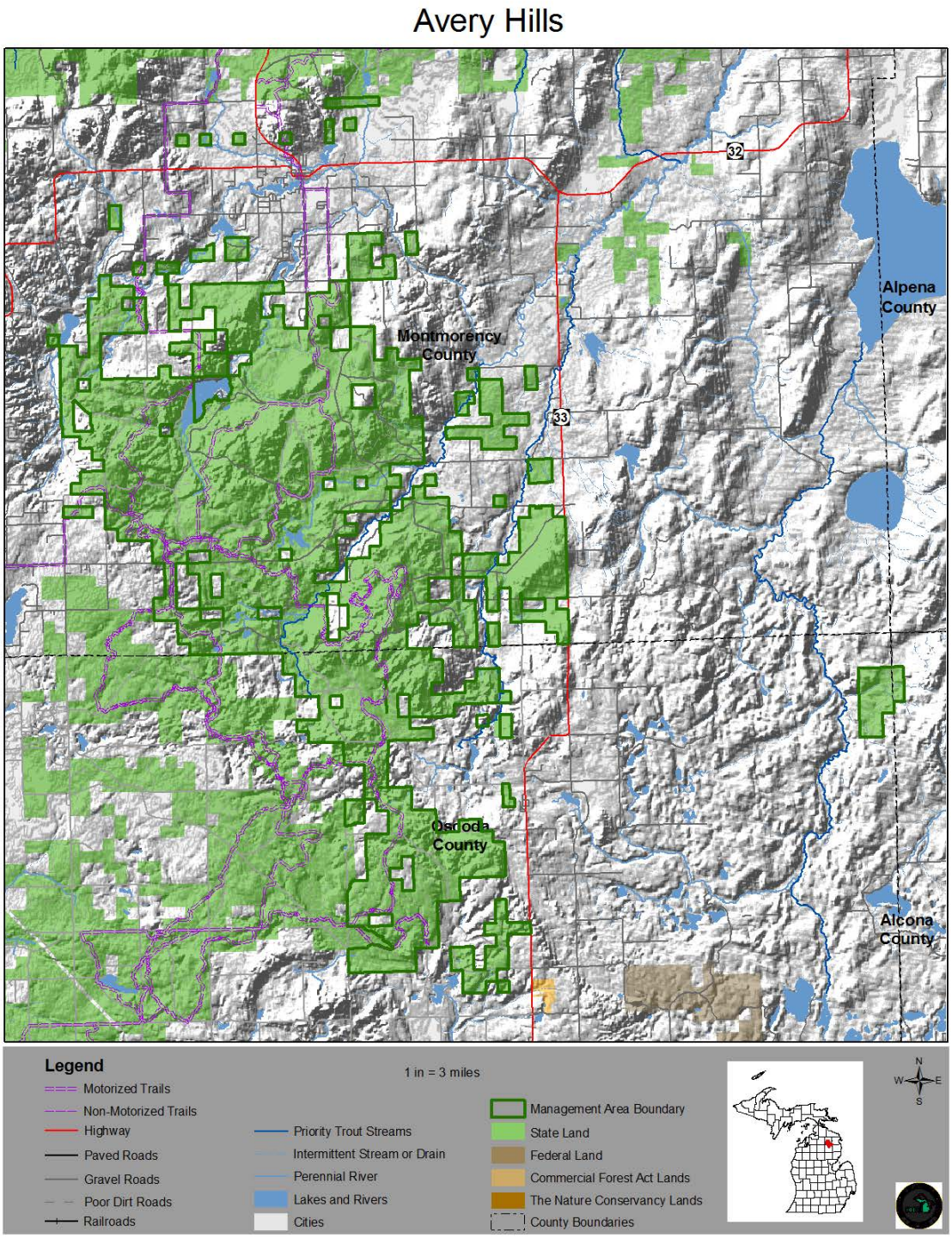

Figure 4.16.1. A map of the Avery Hills management area (dark green boundary) in relation to surrounding state forest and other lands in Montmorency and Oscoda counties, Michigan.

Table 4.16.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Avery Hills management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	45%	20,418	521	19,897	4,332		20,418	2,842	
Oak	17%	7,706	3,244	4462	338	1,556	7,706	279	1,756
Northern Hardwood	12%	5,620	654	4966		1,858	5,620		2,193
Cedar	5%	2,068	2,068				2,068		
Red Pine	3%	1,203	344	859	348	265	1,203	95	473
Jack Pine	3%	1,137	9	1128	353		1,137	161	
Lowland Conifers	2%	1,105	897	208	25		1,105	25	
Mixed Upland Deciduous	2%	999	57	942	213	69	999	135	251
Lowland Aspen/Balsam Poplar	2%	741	371	371	70		741	70	
Upland Open/Semi-Open Lands	5%	2,113		2113			2,113		
Lowland Open/Semi-Open Lands	1%	549		549			549		
Misc Other (Water, Local, Urban)	1%	522		522			522		
Others	2%	1,132	362	770	148	206	1,132	79	206
Total		45,313	8,526	36,787	5,827	3,954	45,313	3,686	4,879

4.16.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.16.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 20,418 or 45% of the management area (Table 4.16.1). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs and for a wide range of forest recreation.

Aspen occurs throughout the area. Accessible aspen has been consistently harvested over the last 50 years. There are 521 acres of aspen that have met harvest criteria (Figure 4.16.2), but have site conditions that limit harvest (hard factor limit acres). There are approximately 2,971 acres of stands that have a final harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 69 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

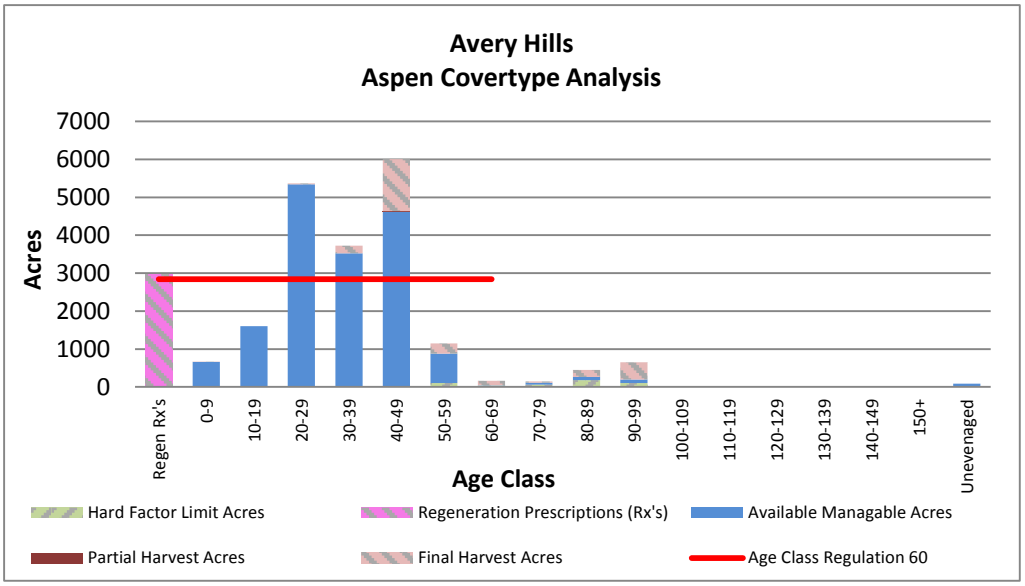

Figure 4.16.2. Age-class distribution for aspen in the Avery Hills management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct regeneration harvests on a projected 4,332 acres;
- Concentrate harvests on the oldest age classes first;
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions; and
- Aspen within the identified Grouse Enhanced Management Systems area may be managed differently than the rest of the aspen within the management area, with a shorter rotation age**,** small patch cuts and carefully considered stand adjacency.

Long-Term Management Objectives

- Continue management of aspen through regeneration harvests to balance the age-class distribution and to provide a steady flow of wood fiber, wildlife habitat and recreational opportunities; and
- A desired future harvest level is projected at 2,842 acres for final harvest per 10-year period.

4.16.1.2 Forest Cover Type Management – Oak

Current Condition

Oak acres total 7,706 or 17% of the management area (Table 4.16.1). Most (70%) of the stands are northern red oak and suitable for extending rotation age to 150 years. The balance is pin oak with moderate to well-stocked stands having a red maple component. The pin oak resource should be managed to an 80-year rotation (Figure 4.16.3). Red and white pine originally dominated the site.

Forest communities dominated primarily by oak in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, white-tailed deer, squirrels and various birds and commercially for firewood and industrial lumber. There are 3,244 acres of oak that have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 441 acres of stands that have a regeneration harvest pending and these acres are shown in the regeneration prescription class. There are 1,167 acres with a partial harvest pending and these acres are shown in their current age class. Figure 4.16.3 includes the projected number of acres converted to oak as a result of treatments that remove an overstory species resulting in the release of oak. These acres are included in the regeneration prescription class.

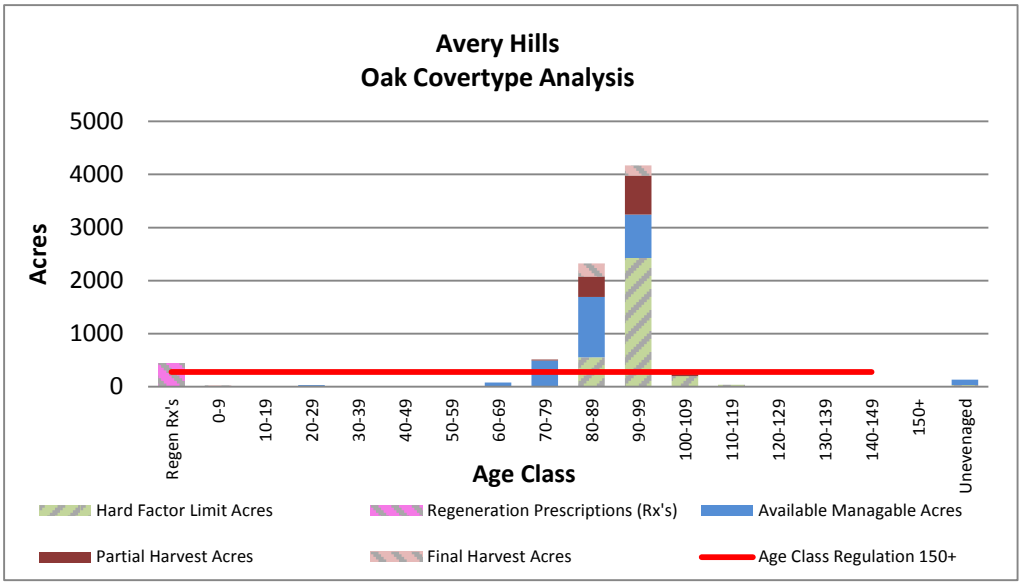

Figure 4.16.3. Age-class distribution for oak in the Avery Hills management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- The better quality northern red oak will be maintained to balance age classes between 0 and 159 years and the pin oak will be managed to for a balance between the ages of 0 and 89.

10-Year Management Objectives

- Conduct partial harvests on a projected 1,556 acres concentrating on stands that have not had any harvests or those stands that have a sufficient basal area for a partial harvest; and
- Conduct regeneration harvests on a projected 338 acres concentrating on poorer quality stands or stands that have been previously harvested and lack sufficient basal area for continued partial harvests.

Long-Term Management Objectives

- Over the next several decades, continue stand replacement harvests to balance age-class structure;
- Consider opportunities to introduce pine as a seed source or stand component to provide cover for oak regeneration and for stand diversity;
- Additional research is needed on regeneration of medium-quality oak stands;
- Consider opportunities to manage oak in mixed stands along with white pine and red maple; and
- Desired future harvest levels are projected at 279 acres for final harvest and 1,756 acres for partial harvest per 10-year period.

4.16.1.3 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 5,620 or 12% of the management area (Table 4.16.1). Northern hardwoods forest communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife including elk, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation.

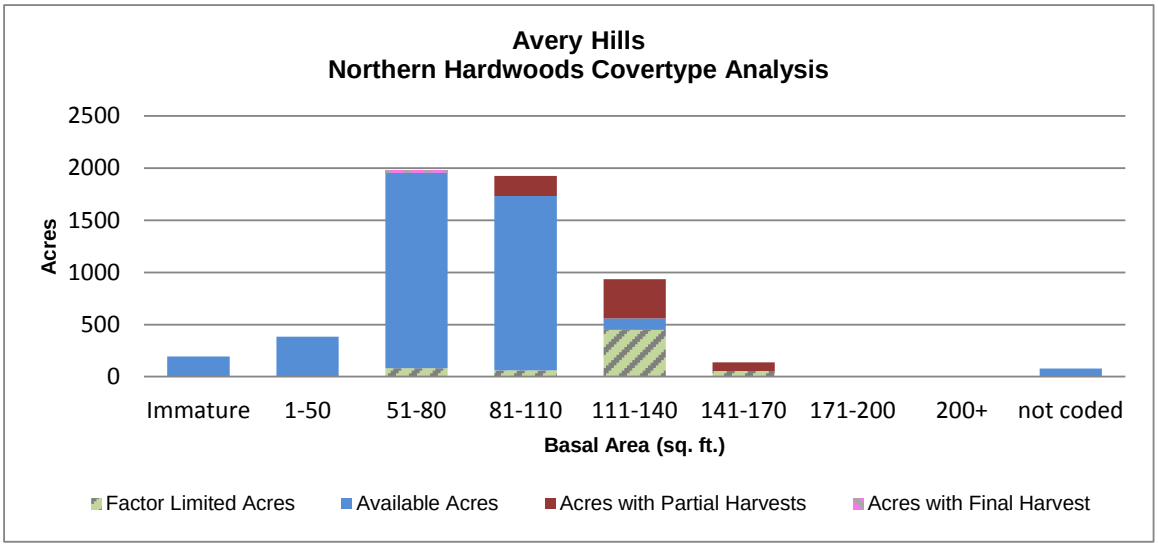

Figure 4.16.4. Basal area distribution for northern hardwood in the Avery Hills management area (2012 Department of Natural Resources inventory data).

Northern hardwoods are located throughout the management area on AFO, PArVVb/AFO and PArVHa/PArVVb habitat class sites (see Appendix E). There are 654 acres of northern hardwoods that have met harvest criteria (Figure 4.16.4), but have site conditions that limit harvest (hard factor limit acres). There are 53 acres that have a regeneration harvest pending and these acres are shown in the 0-9 year-old age class. There are 656 acres with a partial harvest pending and these acres are shown in their current age class.

Desired Future Condition

- Northern hardwoods-dominated forest communities will be maintained on operable sites through selective harvesting to achieve an uneven-aged stand structure to provide for a continuous supply of timber products, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct individual tree selection harvests, on a projected 1,858 acres of northern hardwood concentrating on those areas with a basal area above 110 square feet per acre;
- Where necessary and feasible, consider harvesting stands from lower basal area ranges to expedite the balancing of basal area distributions; and
- Consider the need to delay further selection harvesting due to resultant lower-than-normal residual basal area in post-salvage harvest stands.

Long-Term Management Objectives

- Emerald ash borer and beech bark disease will change the stand composition of the northern hardwoods in this management area;
- Consider whether to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands;
- As ash and beech decrease in the northern hardwood stands, consider introducing oak for mast in stands without oak; and
- A desired future harvest level is projected at 2,193 acres for partial harvest per 10-year period.

4.6.1.4 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 549 acres or 1% of the management area (Table 4.16.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to ensure an adequate level of wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.16.1.5 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland shrub and herbaceous open land acres total 2,113 acres (5% of the management area). These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas.

Desired Future Condition

- Upland open/semi-open lands will be maintained at or above the current level in order to provide habitat for species which use openings.

10-Year Management Objectives

- Where necessary and feasible, consider methods to maintain upland open/semi-open lands during this management cycle.

Long-Term Management Objectives

- Continue to maintain herbaceous open land and upland shrub openings at or above current levels in order to promote wildlife values and recreational opportunity;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.16.1.6 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: red pine, 1,203 acres (3% of the management area), jack pine, 1,137 acres (3%) and lowland conifers, 1,105 acres (2%). Other forest communities total 1,132 acres (2%) and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;

- The following species are projected for restarting or regeneration harvests: red pine 348 acres, jack pine 353 acres, lowland conifer 25 acres, mixed upland deciduous 213 acres, lowland aspen/balsam poplar 70 acres, lowland deciduous 7 acres, upland mixed forest 49 acres, lowland mixed forest 1 acres, planted mixed pines 20 acres and white pine 54 acres;
- Conduct partial harvests on a projected 265 acres of red pine, 69 acres of mixed upland deciduous, 45 acres of natural mixed pines, 84 acres of white pine, 48 acres of upland mixed forest and 25 acres of planted mixed pines;
- Consider methods to ensure adequate regeneration of lowland types; and
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry.

Long-Term Management Objectives

- Continue management to balance age classes to provide a steady flow of forest products, wildlife habitat and recreational opportunities;
- Continue management to regenerate lowland types; and
- Desired future harvest levels are projected at 129 acres cedar, 92 acres lowland conifers and 20 acres of lowland deciduous for final harvest per 10-year period.

4.16.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management. These recommended practices will not be employed across the management area as a whole, but rather in priority compartments, stands or wetlands as defined by local Wildlife Division and Forest Resources Division field staff.

This management area will include one or more northern Lower Peninsula Grouse Enhanced Management System areas. The boundaries will be delineated during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager. Aspen stands that fall within the Grouse Enhanced Management System area boundary may be managed on a shortened rotation with multiple age classes and smaller stand sizes to enhance hunting opportunities for ruffed grouse, woodcock, deer, turkey and hare. The remainder of the management area (outside the boundary) will be managed based on the direction in the management area write up.

The following have been identified as featured species for this management area during this 10-year planning period:

- Black bear
- Pileated woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Avery Hills management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; extensive mature forest and large open grassland complexes; the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (greater than12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-shouldered Hawk

The goal for red-shouldered hawk in the northern Lower Peninsula is to maintain available habitat. Red-shouldered hawks nest in contiguous, mature, closed canopy, hardwood forests. Nesting habitat consists primarily of well-stocked pole or sawtimber stands (stocking densities 6 and 9) with a closed canopy (80-100%) and basal area of at least 98 square feet per acre. Nests are usually found in deciduous trees with a mean 23 inches in diameter at breast height. State forest management activities should focus on the maintenance of large blocks (>385 acres) of mesic northern forest with the appropriate level of large diameter trees in priority landscapes.

Wildlife Habitat Specifications:

- All suspected red-shouldered hawk nests are to be reported to local wildlife staff and confirmed nests documented in accordance with the DNR's *Approach to the Protection of Rare Species on State Forest Lands* (CI 4172) and included in Integrated Forest Monitoring, Assessment and Prescriptions Geographic Decision Support Environment when there is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan DNR's *Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands* (August 2012) will be followed.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.
- Manage the aspen cover type for smaller patch size, a shorter rotation and a more deliberate habitat configuration within the designated Grouse Enhanced Management Systems areas where appropriate.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-Year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-Year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.

    - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
    - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.16.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed eleven listed species and two natural communities of note occurring in the management area as listed in Table 4.16.2. A colony of great blue herons has also been identified. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.16.5, the Hunt Creek Fisheries Research Station is the only special conservation area (3,000 acres) that has been identified in the Avery Hills management area.

There are no high conservation value areas or ecological reference areas identified for the Avery Hills management area as illustrated in Figure 4.16.5.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.16.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Avery Hills management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Dry-mesic northern forest		S3/G4	Confirmed				White Pine	Late
Rich conifer swamp		S3/G4	Confirmed				Tamarack	Late
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Common tern	*Stema hirundo*	T/G5/S2	Confirmed	MV	Moderate	Sand & gravel beach	Upland open/semi-open	N/A
Snail								
Spike-lip crater snail	*Appalachina sayanus*	SC/G5/SU	Confirmed	HV	Low	Mesic northern forest	Northern Hardwood	Late
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Floodplain forest	Lowland mixed	Mid
Insect								
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Reptile								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Plants								
Pale Agoseris	*Agoseris glauca*	T/G5/S2	Confirmed			Pine barrens	Jack Pine	Early
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry sand prairie	Upland open/semi-open	N/A
Small round-leaved orchis	*Amerorchis rotundifolia*	E/G5/S1	Confirmed			Patterned fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Limestone oak fern	*Gymnocarpium robertianum*	T/G5/S2	Confirmed			Rich conifer swamp	Tamarack	Late
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone lakeshore cliff	Upland open/semi-open	N/A
Allegheny plum	*Prunus allighaiensis davisii*	SC/G4T3Q/S3	Confirmed			Dry sand prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

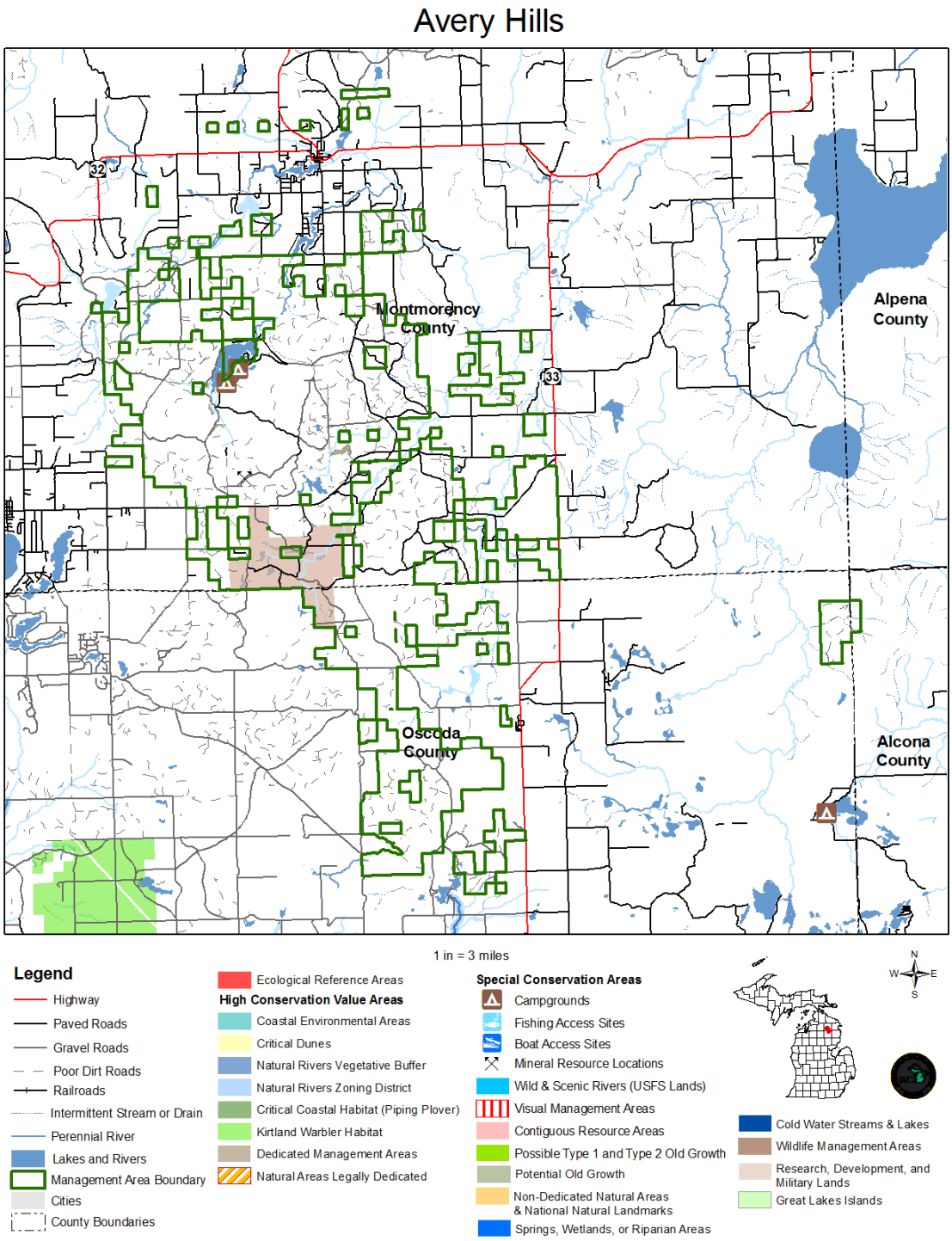

Figure 4.16.5. A map of the Avery Hills management area showing the special resource areas.

4.16.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. One of the more important forest issues in the management area includes oak wilt and oak decline and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.

- Oak wilt is prevalent in this area. Epicenters need to be identified and treated. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced.
- Other management activities that can lead to damage of residual red oak trees (oil and gas development, recreational trail improvement, etc.) should be not be conducted during this high-risk period.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.16.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.16.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Avery Hills - FMD Management Areas	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	2	2	1

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Japanese Knotweed *Fallopia japonica*	2

4.16.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.16.1 and listed in Appendix F.

4.16.6 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to reintroduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition; and
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings.

4.16.7 Public Access and Recreation

Where access is limited on state forest land, the DNR will continue to seek access across adjacent private property. In accordance with the DNR's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Specific hunting recreation improvements such as parking lots, gates, trail planting and trail establishment, as well as the preparation and dissemination of specific promotional material, may be made as a result of Grouse Enhanced Management Systems areas planning in this management area.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts. There are two state forest campgrounds adjacent to this management area as shown in Figure 4.16.5.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within-stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single-track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.16.8 Oil, Gas and Mineral Development

Surface sediments consist of coarse-textured till, glacial outwash sand and gravel and postglacial alluvium, an end moraine of medium-textured till and ice-contact outwash sand and gravel. The glacial drift thickness varies between 200 and 800 feet. Sand and gravel pits are located in this management area and there is good potential for additional pits.

The Mississippian Coldwater and Sunbury Shales and Devonian Berea Sandstone and Bedford and Antrim Shales subcrop below the glacial drift. The Antrim is quarried for cement products elsewhere in the state.

Most of this management area has been developed for gas production from the Antrim Shale. Well spacing is currently 80 acres and most of the area of Antrim potential has already been drilled. The Collingwood Formation may also have oil and gas potential in this area and probably will have a well spacing of 320-640 acres per well (or possibly larger). Only the areas drilled for the Antrim are currently leased and these areas would also be where the Collingwood could be developed, possibly using existing well sites and facilities.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and

all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire, and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.17 MA 17 – Kirtland's Warbler Management Area

Summary of Use and Management

The Kirtland's Warbler management area (MA) consists of fifteen units of land that are managed for the federally endangered Kirtland's warbler. Kirtland's warbler management is guided by two documents: Kirtland's Warbler Breeding Range Conservation Plan and Operational Plan for Kirtland's Warbler Habitat Management on Michigan State Forests. Of the 148,017 acres of state forest land that make up the Kirtland's Warbler management area, approximately 90,000 acres, most of the jack pine in the management area, have been identified as essential habitat where management is done in accordance with the Kirtland's Warbler Conservation Plan and Operational Plan. Management on the portion that is not classified as essential habitat will emphasize balancing the age classes of aspen and red pine and regenerating the aging oak resource. Management activities may be constrained or modified based on management recommendations described in the Conservation Strategy Expected trends within this 10-year planning period are introduced pests and diseases and assuring jack pine regeneration on Kirtland's warbler sites.

Introduction

This scattered management area is located in the central high plateau of the Lower Peninsula and contains 148,017 acres of state forest (Figure 4.1). The primary attributes which identify the Kirtland's Warbler management area include:

- The Kirtland's Warbler management area consists of identified areas of essential habitat large enough to manage Kirtland's warbler habitat, occurring mostly within Albert's Grayling Highplains sub-region (Albert, 1995). The Kirtland's warbler requires large tracts of young, even-aged jack pine as suitable nesting sites.
- Early observers of the Kirtland's warbler found the birds in what was then described as the "jack pine plains" of northern Lower Michigan. While jack pine is found throughout Canada and from mid-Michigan and Wisconsin to the continental tree line, Kirtland's warblers occupy only a small portion of the extreme southern range. Almost all nesting has occurred on Grayling sands.
- Historically fires were very frequent in this management area and were important in determining species composition. Jack pine, red pine, northern pin oak and barrens dominated the management area. Currently, in addition to jack pine, other mesic and dry-mesic forest types are intermixed.
- The Kirtland's Warbler management area is a popular destination for bird watchers who come from all over the world to see the rare Kirtland's warbler. This management area contributes social and economic values to the area including providing timber resources that result from warbler habitat management and from eco-tourism.
- Department of Natural Resources (DNR) recreation facilities in or near this management area include nearby Clear Lake State Park and several state forest campgrounds.
- The Crawford/Dyer Red Pine Natural Area, which has its own management plan to guide specific management of old growth red pine, is in the management area.
- Various snowmobile trails and the North Country Trail cross the area
- Much of the topography in this management area was sculpted by melting glaciers that left outwash plains of deep well-drained sand.

Kirtlands Warbler

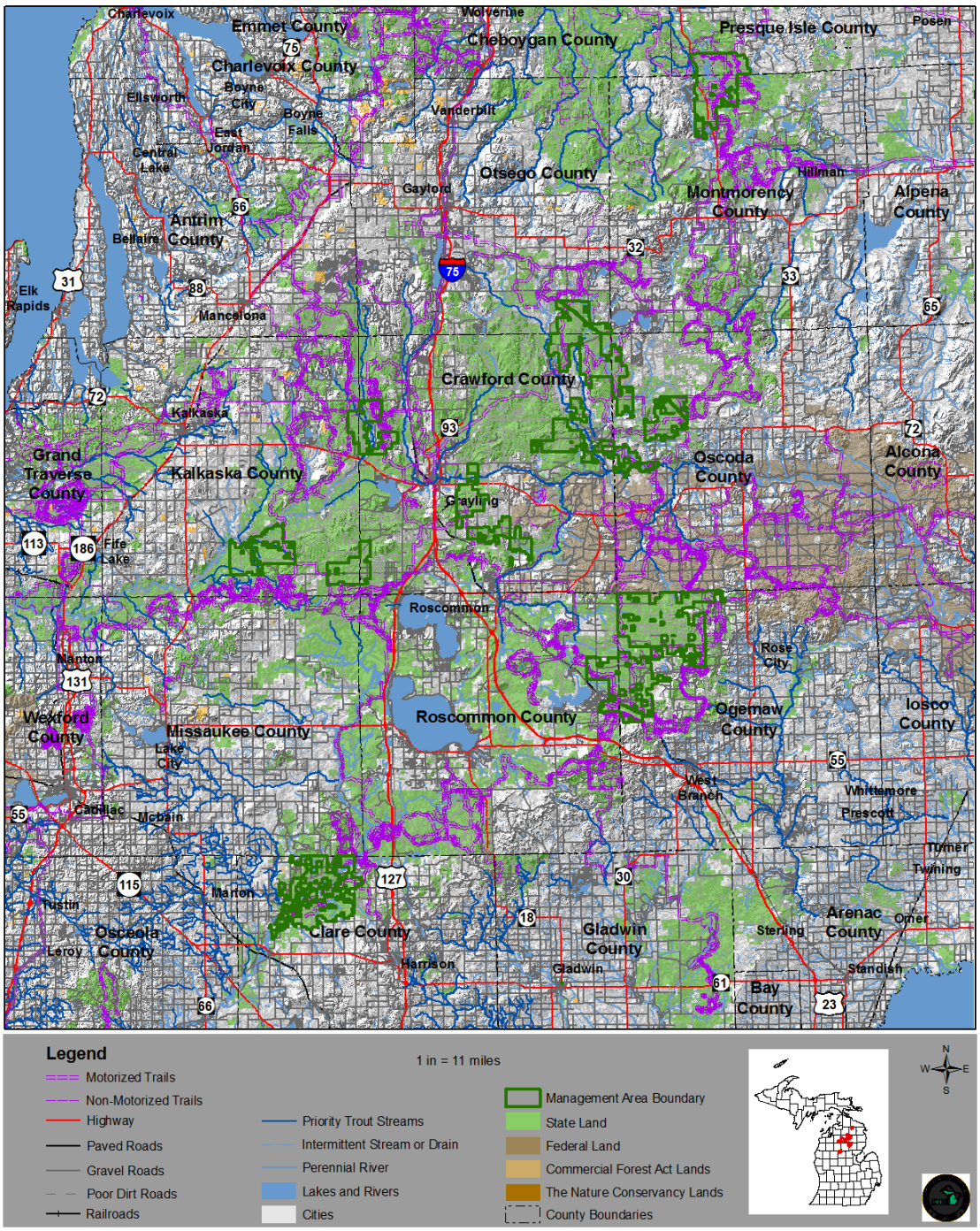

Figure 4.17.1. A map of the Kirtland's Warbler management area (dark green boundary) located in the central high plateau of the Lower Peninsula.

Table 4.17.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Kirtland's Warbler management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Jack Pine	58%	86,172	2,194	83,978	15,600		86,172	13,997	
Aspen	9%	13,524	589	12935	2,690		13,524	2,156	
Red Pine	6%	9,485	586	8899	2,191	2,391	9,485	1,000	3,883
Oak	6%	9,071	2,521	6550	156	1,142	9,071	819	1,181
Mixed Upland Deciduous	2%	3,143	20	3123	105	501	3,143	446	501
Lowland Conifers	2%	2,968	2,370	598	67		2,968	67	
Lowland Deciduous	2%	2,700	1,942	758	89		2,700	89	
Upland Open/Semi-Open Lands	3%	4,535		4535			4,535		
Lowland Open/Semi-Open Lands	3%	4,730		4730			4,730		
Misc Other (Water, Local, Urban)	1%	1,786	14	1772			1,786		
Others	7%	9,903	3,499	6404	831	1,631	9,903	629	1,794
Total		148,017	13,736	134,281	21,729	5,665	148,017	19,203	7,359

4.17.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, they are classified by the predominant species.

4.17.1.1 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 86,172 or 58% of the management area (Table 4.17.1) and the majority of this is "essential habitat" for the Kirtland's warbler. While many stands are of fire-origin, the majority of younger stands are plantation origin. However, large fires have created jack pine regeneration throughout the management area. Through the 1970s and 80s, planted stands were managed as near monocultures, where post-harvest oak and red pine removal was a common practice. In recent years, managers have incorporated more retention.

The current age-class structure may change based on the cutting schedule outlined in the Operational Plan for Kirtland's Warbler Habitat Management on Michigan State Forests. There are 8,193 acres that have final harvest pending and these acres are included in the regeneration prescription class. Figure 4.17.2 includes the projected number of acres converted to jack pine as a result of treatments that remove an overstory and planting with jack pine. These acres are included in the regeneration prescription class.

Desired Future Condition

According to the Operational Plan for Kirtland's Warbler Habitat Management, essential habitat in Kirtland's Warbler management area is regulated for sustained yield of warbler nesting habitat and for commercial timber production. Where possible, 15-25 percent of each management block is developed into nesting habitat every decade on a 50-year rotation. Rotations may vary due to the variety of stand conditions within each area because of site productivity, previous habitat development and wildfire. Some essential habitat may be managed on a shorter rotation. Efforts will continue to replicate natural disturbance and to create unfragmented interior habitat.

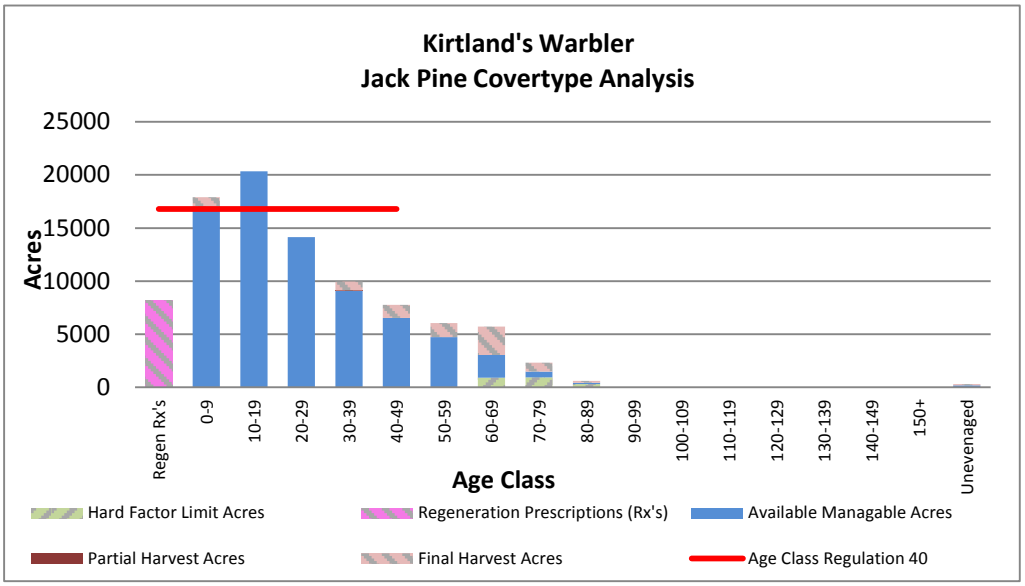

Figure 4.17.2. Age-class distribution for jack pine in the Kirtland's Warbler management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct stand replacement harvests on a projected 15,600 acres of stands currently age 50-70;
- Where necessary and feasible, consider harvesting stands below the rotation age to ensure the necessary amount of habitat for the Kirtland's warbler; and
- Desired future harvest levels will be determined by habitat needed for the Kirtland's warbler.

Long-Term Management Objectives

- Seek opportunities to enhance the visual appeal of large area treatments; and
- Consider long-term strategies to use leave strips that replicate horizontal roll vortices, retaining super-canopy red pine, barrens areas and sustaining an oak and red pine component in these areas.

4.17.1.2 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 13,524 acres or 9% of the management area (Table 4.17.1). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation.

Aspen occurs throughout the area, often on ridges along outwash plains. There are 589 acres of aspen that have met harvest criteria (Figure 4.17.3), but have site conditions that limit harvest (hard factor limited acres). There are 1,602 acres that have a final harvest pending and these acres are included in the regeneration prescription class. There are 54 acres with a partial harvest pending and these acres are included in their current age class.

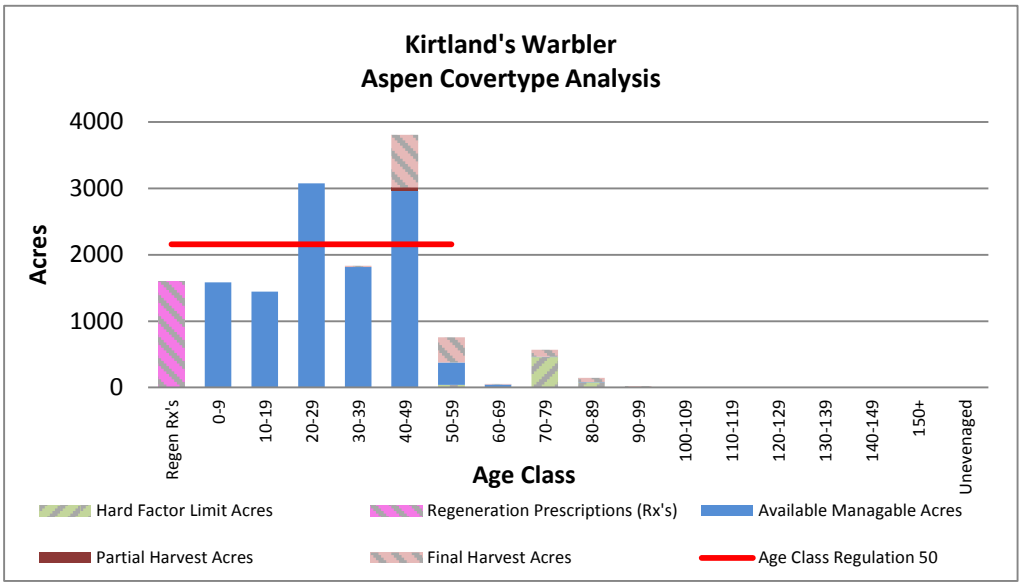

Figure 4.17.3. Age-class distribution for aspen in the Kirtland's Warbler management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 59 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 2,690 acres;
- Concentrate harvests on the oldest age-classes first; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue management through regeneration harvests to balance the age-class distribution; and
- Desired future harvest levels are projected at 2,156 acres for final harvest per 10-year period.

4.17.1.3 Forest Cover Type Management – Oak

Current Condition

Oak acres total 9,071 acres or 6% of the management area (Table 4.17.1). Approximately one half of the oak stands are moderate to well-stocked stands of almost pure oak, though trending toward mixed communities. The distribution of oak in the younger age classes (Figure 4.17.4) reflects aggressive stand replacement management of the past 40 years.

Oak is desirable as it provides valuable habitat for many wildlife species, including ruffed grouse, white-tailed deer and wild turkey, which are featured species in this management area. Oak also provides valuable timber products. Areas with poor regeneration may be inter-planted with red pine. There are 2,521 acres of oak that have met harvest criteria (Figure 4.17.4), but have site conditions that limit harvest (hard factor limit acres). There are 834 acres that have a final harvest pending and these acres are included in the regeneration prescription class. There are 335 acres with a partial harvest pending and these acres are included in their current age-class. Figure 4.17.4 includes the projected number of acres converted to oak as a result of treatments that remove an overstory species resulting in release of oak. These acres are included in the regeneration prescription class.

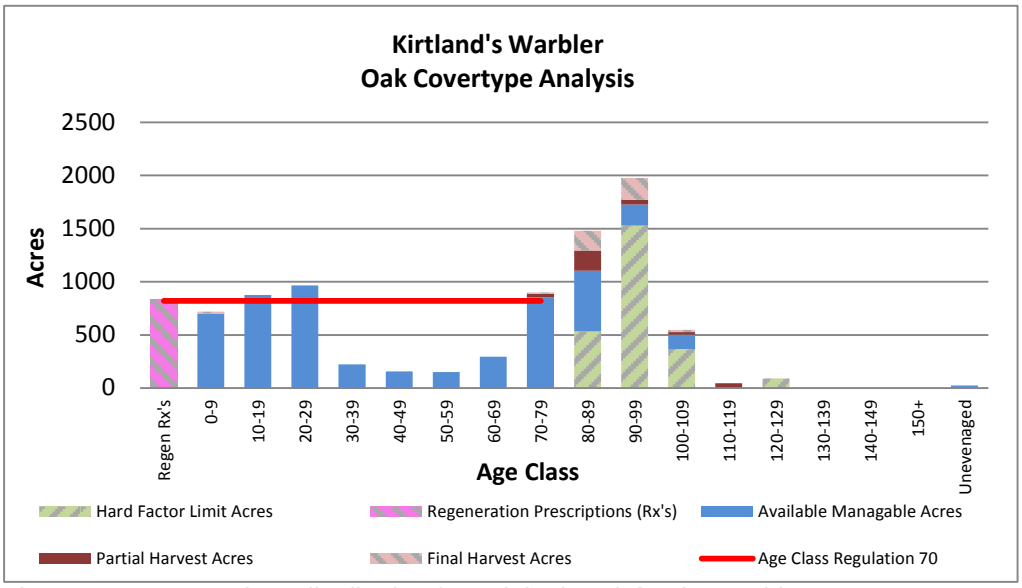

Figure 4.17.4. Age-class distribution for oak in the Kirtland's Warbler management area (2012 Department of Natural Resources inventory data).

Conditions that existed around the turn of the last century that created the extensive oak stands (large clearcuts that minimized frost pockets, intense fires that minimized competition and a smaller deer population) cannot be replicated. Although there has been successful regeneration of oak in this management area there are still a considerable number of acres in the older age classes (Figure 4.17.4). The oak in the 90+ age classes is approaching the end of the normal lifespan on outwash plains and is becoming increasingly susceptible to insects and diseases such as oak wilt and oak decline. Older oak also does not sprout as vigorously from stump sprouts.

Due to the advanced age of the oak and the challenges to regenerating oak, management should concentrate on maintaining oak in mixed stands. Where oak is in the understory, such as under jack pine or other pine types, treatments to reduce the pine overstory will release oak. Considerations should also be given to planting pine in oak stands, which can help to shelter young oak from late spring freezes. Oak can be a component of other cover types, but will require management techniques to ensure regeneration.

Desired Future Condition

- Oak will be maintained as a mixed cover type and as a component in stands throughout the management area through management to provide for timber products, wildlife habitat and recreational opportunities; and
- Some oak sites will be allowed to become mixed stands with other species.

10-Year Management Objectives

- Conduct partial harvests on a projected 1,142 acres;
- Conduct final harvests on a projected 156 acres; and
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types.

Long-Term Management Objectives

- Continue work towards maintaining oak on the landscape in mixed stands and as a component in other cover types;
- Continue management for mixed oak/pine stands through partial harvests to release understory species into the overstory or planting pine in young oak stands;
- Future management decisions will need to take into consideration the impact of oak wilt and oak decline as the cumulative impacts will likely increase over time; and
- Desired future harvest levels are projected at 819 acres for final harvest and 1,181 for partial harvest per 10-year period.

4.17.1.4 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 9,485 or 6% of the management area (Table 4.17.1), with most being 40-79 years old. Nearly all of the pine is of planted origin. The acreage of red pine on very dry sites may decrease because of conversion to jack pine. Red pine in this management area is commercially valued for pulp, saw logs and utility poles. Various regeneration techniques have been prescribed in this landscape. There are 586 acres of red pine that have met harvest criteria (Figure 4.17.5), but have site conditions that limit harvest (hard factor limit acres).

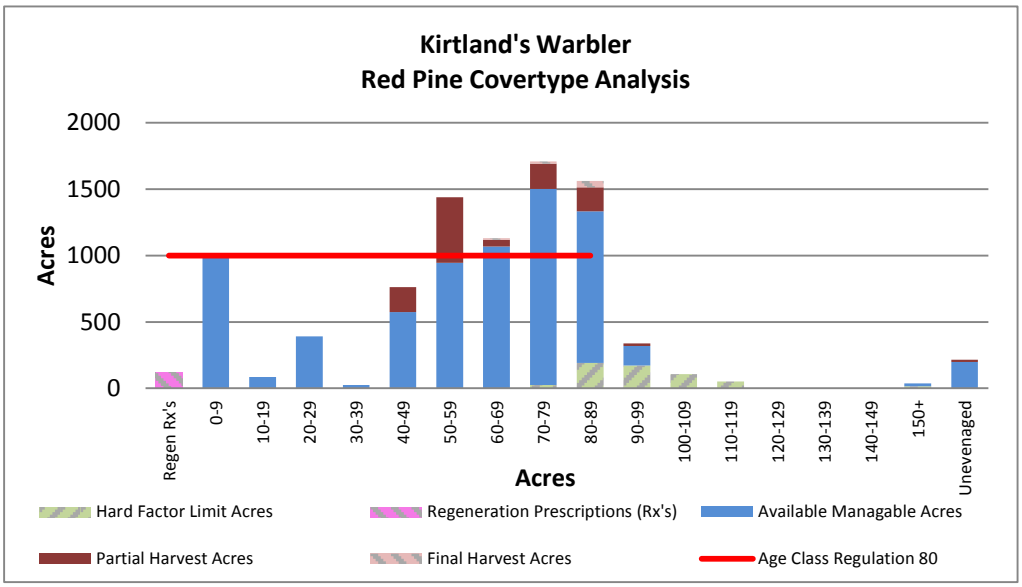

Figure 4.17.5. Age-class distribution for red pine in the Kirtland's Warbler management area (2012 Department of Natural Resources inventory data).

There are 120 acres that have a final harvest pending. However, these acres are being converted to another cover type, most likely jack pine. The acres that will remain in red pine are shown on Figure 4.17.5 as regeneration prescription acres. There are 1,141 acres with a partial harvest pending and these acres are included in their current age class. Figure 4.17.5 includes the projected number of acres converted to red pine as a result of treatments that remove an overstory and replanting with red pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Where red pine does not conflict with critical habitat for Kirtland's warbler, maintain red pine on dry-mesic sites with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0 and 89 years of age to provide for continual harvest, wildlife habitat and recreational opportunity; and
- Where red pine is located on Kirtland's warbler critical habitat site, conduct thinning operations until stand replacement harvest and replant to jack pine.

10-Year Management Objectives

- Conduct partial harvests on a projected 2,391 acres, concentrating on stands of better-quality red pine that has the potential for a higher product value in larger size classes; and
- Conduct regeneration harvests on a projected 2,191 acres of red pine beginning with the oldest age classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- In identified special conservation areas, especially those with natural red pine on dry-mesic sites, consider management of red pine to a biological rotation of 200+ years;
- Continue management through regeneration harvests to balance the age-class distribution;
- It is acceptable that some acreage may convert to jack pine on dry sites; and

- Desired future harvest levels are projected at 1,000 acres for final harvest and 3,883 acres for partial harvest per 10-year period.

4.19.1.7 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open lands acres total 4,730 or 3% of the management area (Table 4.17.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.19.1.8 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 4,535 acres or 3% of the management area (Table 4.17.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings and to serve as fuel breaks.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands;
- Protect stands from illegal off-road vehicle use; and
- If necessary and feasible, consider control of invasive non-native species.

4.17.1.9 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: mixed upland deciduous, 3,143 acres (2% of the management area), lowland conifers, 2,968 acres (2%) and lowland deciduous, 2,700 acres (2%). Other forest and non-forested acres total 9,903 acres (7%) and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These communities will be managed on operable sites, contributing to the compositional diversity of the landscape while providing for continual harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- The following species are projected for restarting or regeneration harvests: 105 acres of mixed upland deciduous, 328 acres of natural mixed pines, 277 acres of white pine, 21 acres of planted mixed pines, 15 acres of lowland spruce/fir, 43 acres of lowland aspen/balsam poplar, 49 acres of upland spruce/fir and 97 acres of upland conifers;
- Conduct regeneration harvests on a projected 89 acres of lowland deciduous and 67 acres of lowland conifer;
- Consider methods to ensure adequate lowland conifer regeneration;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry; and
- Partial harvests are projected for 780 acres of natural mixed pines, 501 acres of mixed upland deciduous, 297 acres of white pine, 258 acres of upland mixed forest, 297 acres of white pine, 189 acres of planted mixed pines and 107 acres of northern hardwood.

Long-Term Management Objectives

- Continue management of these types to provide forest products, wildlife habitat and recreational opportunities; and
- Desired future harvest levels for final harvest are; lowland deciduous 89 acres and lowland conifer 67 acres per 10-year period.

4.17.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management are during this 10-year planning period:

- Kirtland's warbler
- Mallard (Beaver Creek State Game Area)
- Pileated woodpecker
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Kirtland's Warbler management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; large open grassland complexes and marsh/grassland complexes; the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast and mesic conifer components.

Additional detail on the featured species approach can be found in Section 3.

Kirtland's Warbler

The goal for Kirtland’s warbler is to maintain a population of at least 1000 breeding pairs as observed in the annual spring census. Kirtland’s warbler breeding habitat is most closely associated with dense stands (>1450 stems per acre) of 5-15-foot tall jack pine (5-18 years old) growing on well-drained sandy soils, interspersed with small openings and ground cover of low-growing shrubs and grass. Blocks >300 acres provide the best Kirtland’s warbler habitat because they offer the

best chance for colonization, are occupied for longer periods and support denser Kirtland's warbler colonies. State forest management should focus on maintaining breeding habitat on dedicated lands at planned levels in accordance with the Conservation Strategy for Kirtland's Warbler Breeding Habitat.

Wildlife Habitat Specifications

- Maintain 38,000 acres of 5-18 year-old jack pine for 10-year duration by a 40-year age rotation on 190,000 acres of dedicated DNR, U.S. Forest Service and U.S. Fish and Wildlife Service lands.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting and brood rearing. Mallard pair-bonding wetlands are typically 0.25-20 acres in size and brood rearing wetlands are typically 1.2-30 acres in size. Optimal hemi-marsh sites are >2.5 acres with open water portions having extensive portions less than three feet deep and 4:1 area of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within about 200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition with 50/50 open water to emergent marsh for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plans for Dingman Marsh, French Farm Flooding, and O'Neil Lake state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.

- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.17.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed eighteen listed species as well as five natural communities of note occurring in the management area as listed in Table 4.17.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

Table 4.17.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Kirtland's Warbler management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Bog		S4/G3G5	Confirmed				Lowland open/semi-open	N/A
Dry northern forest		S3/G3?	Confirmed				Jack Pine, Red Pine	Late
Dry sand prairie		S2/G3	Confirmed				Upland open/semi-open	N/A
Oak-Pine barrens		S2/G3	Confirmed				Oak	Mid
Pine barrens		S2/G3	Confirmed				Jack Pine	Early
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Prairie warbler	*Dendroica discolor*	E/G5/S1	Confirmed	IL	Very High	Open dunes	Upland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Oak-pine barrens	Oak	Mid
						Great Lakes barrens	Upland open/semi-open	N/A
Kirtland's warbler	*Dendroica kirtlandii*	LE/E/G1/S1	Confirmed	PS	Very High	Pine barrens	Jack Pine	Early
						Dry northern forest	Jack Pine, Red Pine	Early
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Butterfly								
Dusted skipper	*Atrytonopsis hianna*	Sc/G4G5/S2S3	Confirmed	MV	Low	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Henry's elfin	*Callophrys henrici*	T/G4/S1S2	Confirmed	PS	Moderate	Oak-pine barrens	Oak	Mid
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
Grizzled skipper	*Pyrgus Wyandot*	SC/G1G2Q/S1S2	Confirmed	?	?	Oak-pine barrens	Oak	Mid
						Alvar	Upland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
Insect								
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Mullusk								
Round pigtoe	*Pleurobema sintoxia*	SC/G4G5/S2S3	Confirmed	HV	Low	Mainstem streams	Aquatic	N/A
						Rivers	Aquatic	N/A
Reptile								
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

Table 4.17.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Kirtland's Warbler management area (Continued).

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Plants								
Pale Agoseris	*Agoseris glauca*	T/G5/S2	Confirmed			Pine barrens	Jack Pine	Early
						Dry northern forest	Jack Pine, Red Pine	Late
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Rough fescue	*Festuca scabrella*	T/G5/S2S3	Confirmed			Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Fragile prickly pear	*Opuntia fragilis*	E/G4G5/S1	Confirmed			Granite bedrock glade	Upland open/semi-open	N/A
Ginseng	*Panax quinquefolius*	T/G3G4/S2S3	Confirmed			Southern hardwood swamp	Upland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Mesic southern forest	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Allegheny plum	*Prunus allighaiensis davisii*	SC/G4T3Q/S3	Confirmed			Dry sand prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

As shown in Figure 4.17.6, there are three special conservation areas. There is one non-dedicated natural area that is shared with the AuSable Outwash management area. There is also one potential Type 1 old growth area that is also at the Crawford/Dyer Red Pine site and consists of 19 acres of the dry northern forest natural community type (Figure 4.17.6). This entire management area also forms part of a contiguous resource area special conservation areas with adjacent land belonging to the U.S. Forest Service (Huron-Manistee National Forest) and the U.S. Fish and Wildlife Service.

Also shown in Figure 4.17.6 is the Roscommon Natural Area, a 159 acre high conservation value area.

There are also three ecological reference areas (Figure 4.17.3) that are partially or mostly on state land. The ecological reference areas represent the following natural communities: dry sand prairie (62.53 acres), dry northern forest (8.86 acres) and bog (25.53 acres). These ecological reference areas will be managed to enhance and protect their natural vegetative and associated wildlife communities as directed by an ecological reference area-specific management plan. These individual management plans will be developed over the life of this planning period.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

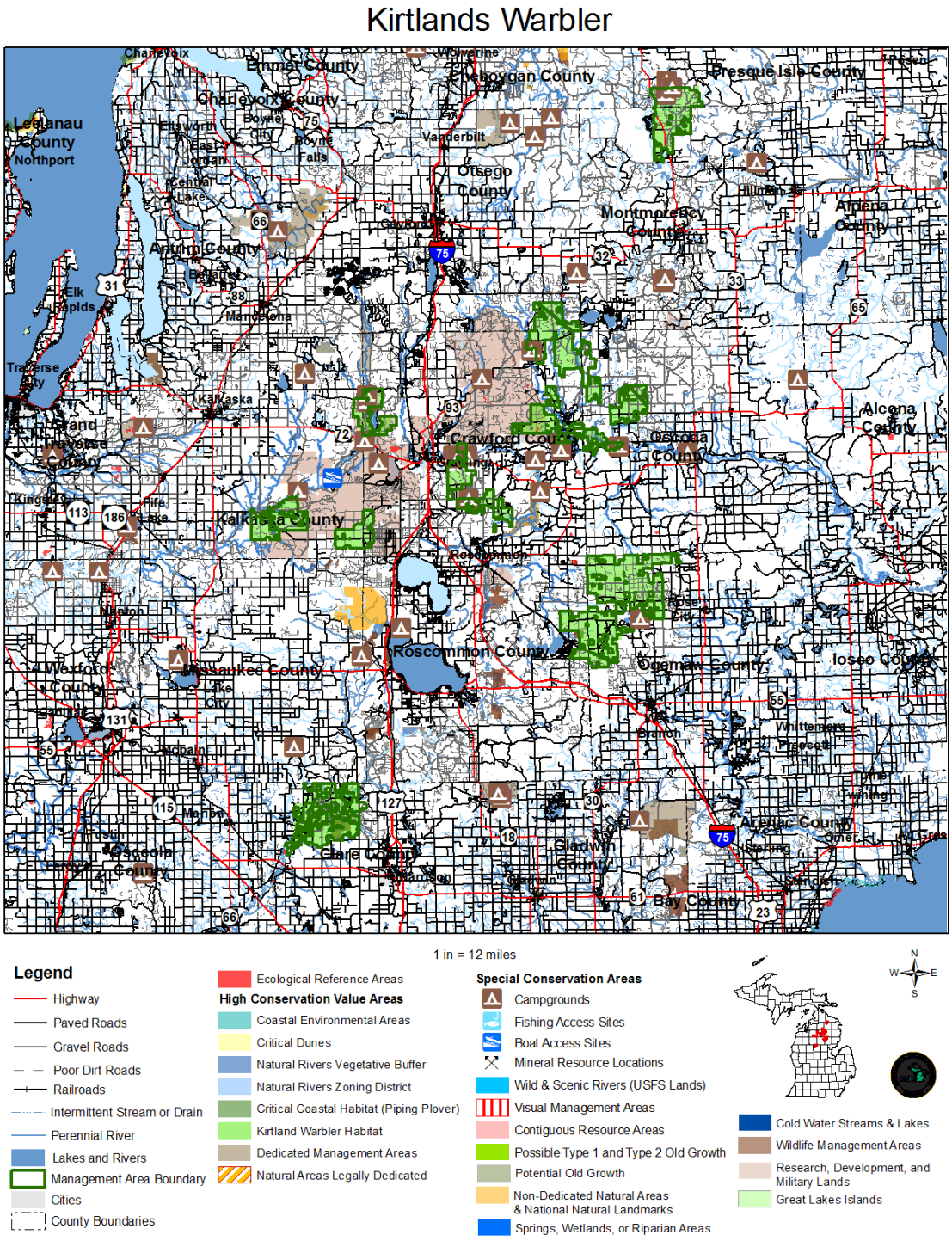

Figure 4.17.6. A map of the Kirtland's Warbler management area showing the special resource areas.

4.17.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area may include branch mortality of seedling and sapling white pine and management should be adapted as follows:

- Monitor for branch mortality of seedling and sapling white pine along and adjacent to river corridors. Causal agent(s) responsible for this problem may include pine spittlebug feeding and various fungal pathogens.
- Until management guidelines can be developed, continue reporting incidence of this problem to the forest health specialist (Form 4029-3).

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.17.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.17.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Kirtland's Warbler - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	1	1	1

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Common Buckthorn *Rhamnus cathartica*	1

4.17.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.17.1 and listed in Appendix F.

4.17.6 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of pine, oak and natural oak/pine types and small inclusions of aspen or grass/upland brush types. Efforts are currently being made to combine fuel-break maintenance with efforts to establish barrens that serve as fuel breaks and are beneficial to wildlife.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns.

The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- When feasible, re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- When feasible, incorporate fire as a tool to restore or maintain managed openings; and
- Consider creation of fire breaks to mitigate fire hazards.

4.17.7 Public Access and Recreation

Where access is limited on state forest land, the department will continue to seek access across adjacent private property. Occupied habitat will continue to be closed to public entry during the breeding and nesting season, except through guided tours. Areas with high and increasing concentrations of singing males will be closed from May 1 through September 10. Areas with low and declining concentrations will be closed from May 1 through August 15. Closure areas are posted along roads at 0.1-mile intervals. Generally, two-track roads not on the county road system will be closed permanently or at least during the posted closure period.

Recreational opportunities that co-exist with the primary objective of managing for the federally protected Kirtland's warbler are available within this management area. Goose Creek trail camp provides a vital resting site for equestrian users travelling the Shore-to-Shore Trail (Figure 4.17.1). Similarly, the Upper Manistee River State Forest Campground (Figure 4.17.3) provides recreational watercraft users with a safe overnight camping experience before paddling downstream on the Manistee River. Off-road vehicle trails (Figure 4.17.1) are common, providing marked designated riding opportunities which reduce unwanted cross-country riding within this critical habitat. Recreation activities can co-exist; however, any future recreational facilities will necessitate forethought and planning to insure adherence to the Kirtland's Warbler Recovery Plan. Existing recreational facilities within this management area are listed below:

- Guided tours attract bird watchers who come from all over the world to see the rare Kirtland's warbler.
- Trails, parking lots and campgrounds for off-road vehicle users, horseback riders or hikers will not be constructed in Kirtland's warbler essential habitat.
- Snowmobile trails are permitted in essential habitat. Snowmobile trails in essential habitat should be gated during the closure period if the habitat is inhabitable by the Kirtland's warbler.
- Snowmobile parking lots should not be constructed in essential habitat.
- Consideration will be given to relocating or buffering off-road vehicle, equestrian and hiking trails to prevent adverse effects to breeding Kirtland's warblers by trail users. Trails in existing and proposed additional essential habitat will be relocated to areas outside of essential habitat where possible. New trails will not be constructed in Kirtland's warbler essential habitat. Existing designated trails will remain in essential habitat only if they cannot be relocated outside of essential habitat without loss of recreational opportunity or experience. Kirtland's warbler nesting habitat will not be developed within 100 feet of trails that cannot be relocated. The Kirtland's Warbler Recovery Plan provides guidance on trails, parking lots, campgrounds and special events.

Campgrounds (Figure 4.17.6)

- Goose Creek Trail Camp
- Upper Manistee River State Forest Campground
- Tomahawk Creek Flooding State Forest Campground

Boating Access Sites (BASs) (Figure 4.17.6)

- Goose Creek Trail Camp BAS
- Upper Manistee River BAS
- Three Mile Bend BAS
- 612 BAS

Off Road Vehicle Trails (Figure 4.17.1)

- St. Helen to Geels Missaukee & Michigan Cycle Conservation Club Trail
- Ambrose Lake to Rose City Missaukee and Michigan Cycle Conservation Club Trail
- Rose City Trail
- Kalkaska Trail and Route
- Frederic Trail and Route
- Atlanta Trail and Route
- Red Bridge to Atlanta Missaukee & Michigan Cycle Conservation Club Trail

Snowmobile Trails (Figure 4.17.1)

- Various

Non-Motorized Trails (Figure 4.17.1)

- Shore-to-Shore Trail
- High Country Pathway
- Midland to Mackinaw Hiking Trail

4.17.8 Oil, Gas and Mineral Development

The Kirtland's Warbler management area has a relatively high density of gas and oil development with a total of 418 wells. For all essential habitats where the state of Michigan owns the mineral rights, leasing of these rights for oil and gas shall be for non-development only. Extraction of all other minerals, including sand and gravel, shall not be allowed in essential habitat.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire, and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.18 MA 18 – Benzie Moraines Management Area

Summary of Use and Management

Vegetative management in the Benzie Moraines management area (MA) will produce various forest products; maintain or enhance biodiversity conservation and wildlife habitat; protect areas of unique character and threatened, endangered and special concern species; provide for forest-based recreational uses; and Native American non-commercial use of forest products. Timber management for this 10-year planning period includes improving the age-class structure of aspen and red pine and continued selection harvesting in high-quality northern hardwoods to achieve an all-age structure. Wildlife management objectives include increasing the structural complexity of northern hardwood communities for interior forest species and perpetuating early-successional communities for species adapted to young forests. Expected trends within this 10-year planning period are forest pest issues, particularly beech bark disease and emerald ash borer and an increase in recreational trail use.

Introduction

This management area is located just east of Frankfort, Michigan and west of Traverse City in Benzie, Leelanau, Grand Traverse and Wexford counties and contains 25,118 acres of state forest (Figure 4.18.1). The primary attributes which identify the Benzie Moraines management area include:

- The moraines, moraine ridges or till landforms which account for 53% of the management area.
- Historic forest communities of northern hardwoods on the well-drained loamy sand to sandy loam soils and one extensive area of hemlock on richer soils.
- Current cover types which are dominated by northern hardwoods, aspen and red pine.
- The management area positioning on the Manistee and Newaygo Outwash Plain sub-regions of the northern Lower Peninsula.
- The proximity of this management area to the population centers, the forest resources contribute social and economic values to the area.
- Dispersed recreation in the form of hunting and mushroom picking as well as concentrated recreation on the Shore-to-Shore Riding/Hiking trail and the Platte River and Maple City snowmobile trails.
- There has been limited development of oil/gas resources.
- Surveys have confirmed the presence of threatened, endangered or special concern species red-shouldered hawk, Michigan monkey flower and ginseng.
- A history of white tailed deer, ruffed grouse, woodcock and other game species harvest.

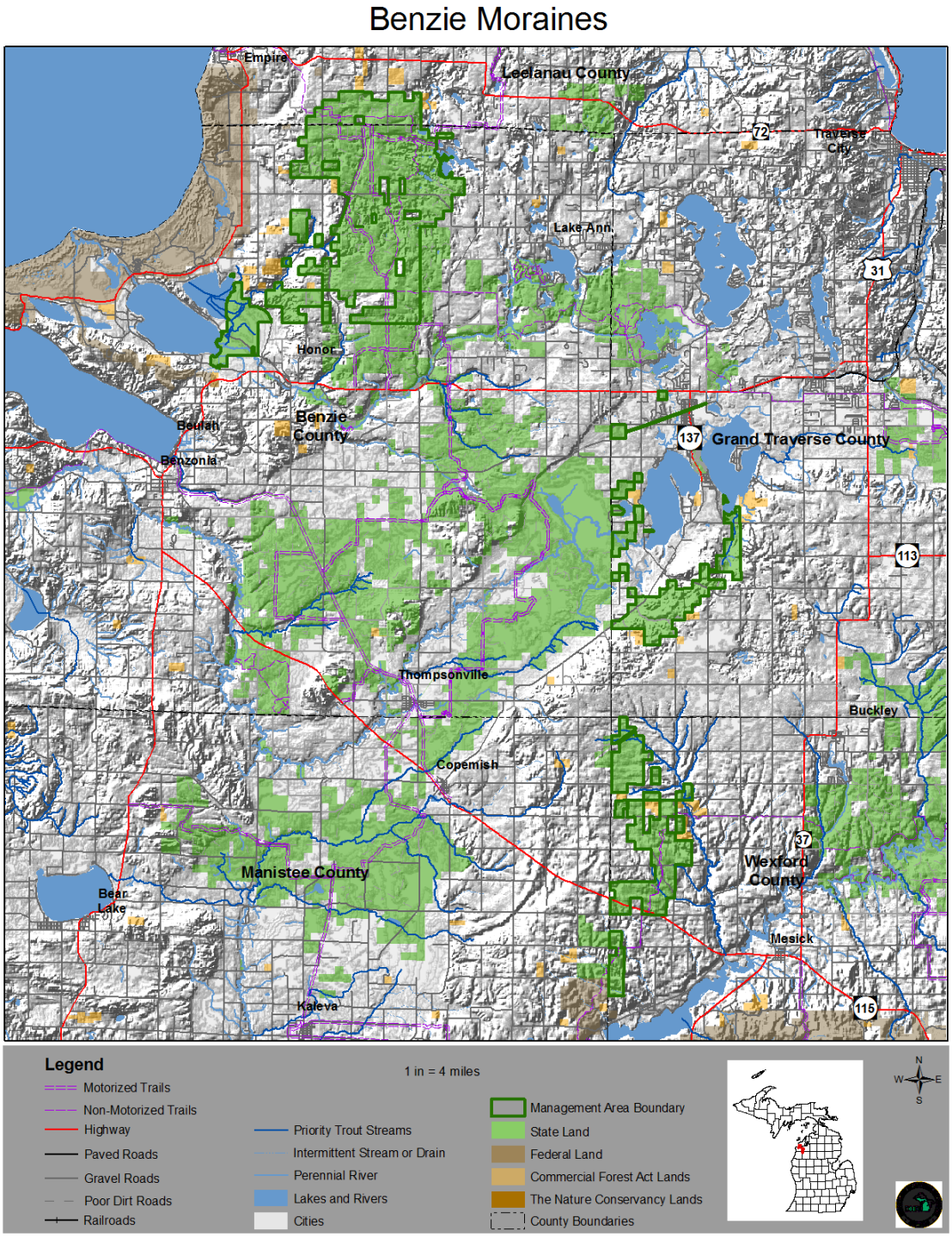

Figure 4.18.1. A map of the Benzie Moraines management area (dark green boundary) in relation to surrounding state forest and other lands in Benzie, Leelanau, Grand Traverse and Wexford counties, Michigan.

Table 4.18.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Benzie Moraines management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Net Change (Acres)	Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest			Final Harvest	Partial Harvest
Northern Hardwood	40%	10,130	1,412	8,718	1,300	2,730		10,130		4,030
Aspen	18%	4,434	300	4134	1,165			4,434	689	
Red Pine	13%	3,186	57	3129	912	1,744	113	3,299	360	1,872
White Pine	3%	844	54	790	225	376		844	72	376
Mixed Upland Deciduous	3%	841	102	739	330	271		841	106	328
Lowland Conifers	3%	721	577	144	16			721	16	
Oak	2%	563	284	279	85	134		563	25	134
Tamarack	2%	538	430	108	15			538	15	
Jack Pine	1%	211		211			-113	98	14	
Upland Open/Semi-Open Lands	6%	1,532		1532				1,532		
Lowland Open/Semi-Open Lands	2%	424		424				424		
Misc Other (Water, Local, Urban)	1%	172		172				172		
Others	6%	1,522	838	684	147	146		1,522	76	146
Total		25,118	4,054	21,064	4,195	5,401		25,118	1,373	6,886

4.18.1 Forest Cover Type Management

Management areas consist of stands that are defined by their predominant vegetative cover type. While most stands have a variety of trees species and other vegetation, they are classified by the predominant species. The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives.

4.18.1.1 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 10,130 acres (40%) of the management area (Table 4.18.1) on moraine ridges, moraines or till areas Since hardwood stands have trees of varying ages, stand density (described as basal area) is a more appropriate measure of stand condition for northern hardwood stands. The majority of the acres are in stands of moderate density represented by a basal area between 81-110 square feet per acre. Past treatments have had a variety of outcomes depending on soil type, topography and amount of aspen in the species mix, degree of canopy opening and potential for beech regeneration. Future harvest prescriptions need to consider these factors to favor desirable outcomes. There are 1,412 acres of northern hardwoods have met harvest criteria (Figure 4.18.2), but have site conditions that limit harvest (hard factor limit acres).

There are 2,034 acres with a partial harvest pending and these acres are included in their current basal area range.

Desired Future Condition

- Northern hardwood stands will be maintained and managed through selection harvests on better quality hardwood sites and through regeneration harvests on poorer quality hardwood sites to provide a sustainable timber supply, wildlife habitat and recreational opportunity; and
- A significant portion of this cover type will be managed on an even-aged basis, including some stands with a significant aspen component which will be reclassified as aspen types after regeneration harvests.

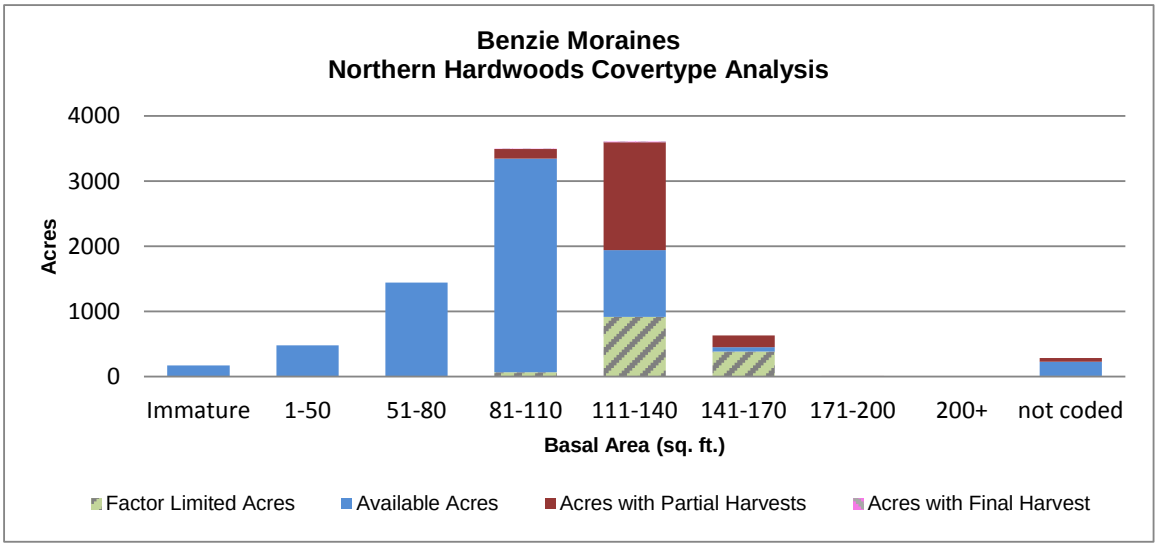

Figure 4.18.2. Basal area distribution for northern hardwood in the Benzie Moraines management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct partial harvests on a projected 2,730 acres concentrating on better quality AFO and AFOCa habitat class sites (see Appendix E) and stands with high basal area while attempting good spatial distribution of harvests over time to minimize wildlife impacts;
- Conduct final harvests to restart northern hardwood stands on a projected 1,300 acres with a concentration on stands located on excessively drained soil types;
- Consider opportunities to spatially separate harvests to minimize wildlife impacts;
- Consider opportunities to harvest stands in lower basal area ranges to expedite balancing of basal area ranges;
- Where present, retain hemlock and white pine for within-stand diversity; and
- Additional areas may be nominated to inclusion in special conservation areas, which could reduce the overall acres of this type available for active management.

Long-Term Management Objectives

- Stands with a significant aspen component will be re-classified as aspen types after regeneration harvests. These stands may also have a significant component of cherry with other hardwoods developing over time. These diverse stands will provide a variety of options for long-term timber and habitat management;
- Continue to manage high-quality hardwood sites (AFOCa and better AFO sites) through partial harvests to develop an uneven-aged structure;
- Continue to manage lower quality hardwood sites (PArVVb and poorer AFO sites) through final harvests for even-aged management. It is acceptable that stands will initially be mixed with aspen and cherry and through management will eventually become dominated by sugar maple;
- Long-term management of northern hardwoods in draws and depressions, influenced by cold air drainage and initially composed of quaking aspen, low-quality cherry and other hardwoods, will target an eventual red maple, sugar maple composition;
- Consider opportunities to promote mast producing species to mitigate the loss of ash and beech due to insect and disease infestations; and
- A desired future harvest levels is projected at 4,030 acres for per 10-year period through a mix of final and partial harvests.

4.18.1.2 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total 4,434 acres or 18% of the management area (Table 4.18.1). Aspen is distributed throughout the management area and there is a large spike of acres in the 30-39 year-old age class. Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs and for a wide range of forest recreation. In addition, aspen is often a significant component of northern hardwood stands; suitable portions of such stands may be final harvested and converted to aspen-dominated stands.

There are 300 acres of aspen have met harvest criteria (Figure 4.18.3), but have site conditions that limit harvest (hard factor limit acres).

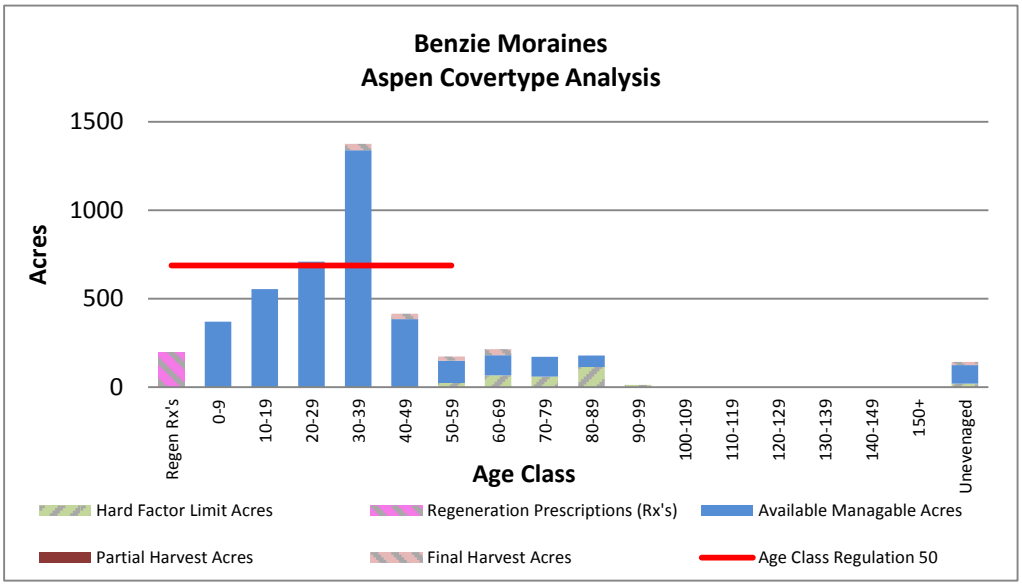

Figure 4.18.3. Age-class distribution for aspen in the Benzie Moraines management area (2012 Department of Natural Resources inventory data).

There are 1,071 acres of stands that have a regeneration harvest pending and these acres are included in the regeneration prescription class. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of aspen. These acres are included in the 0-9 year-old age class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0 and 69 years of age to provide for a sustainable harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 1,165 acres per decade; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue treatments to balance the age-class distribution. It is projected that this will take at least three 10-year inventory (or planning) cycles to complete;
- A desired future harvest level is projected at 689 acres for final harvest per 10-year period; and
- Stands converted from northern hardwoods to aspen may have a significant component of cherry, with other hardwoods developing over time. Within-stand diversity offers a variety of options for long-term timber and habitat management in these stands.

4.18.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 3,186 acres or 13% of the management area (Table 4.18.1). Red pine is located on high-quality moraines including habitat classes PArVVb and AFO. It should be noted that a habitat classification has not been completed for Manistee and Benzie Counties. Only Wexford County, which is a small percentage of the management area, has had habitat classification completed.

There are 57 acres of northern hardwoods have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres).

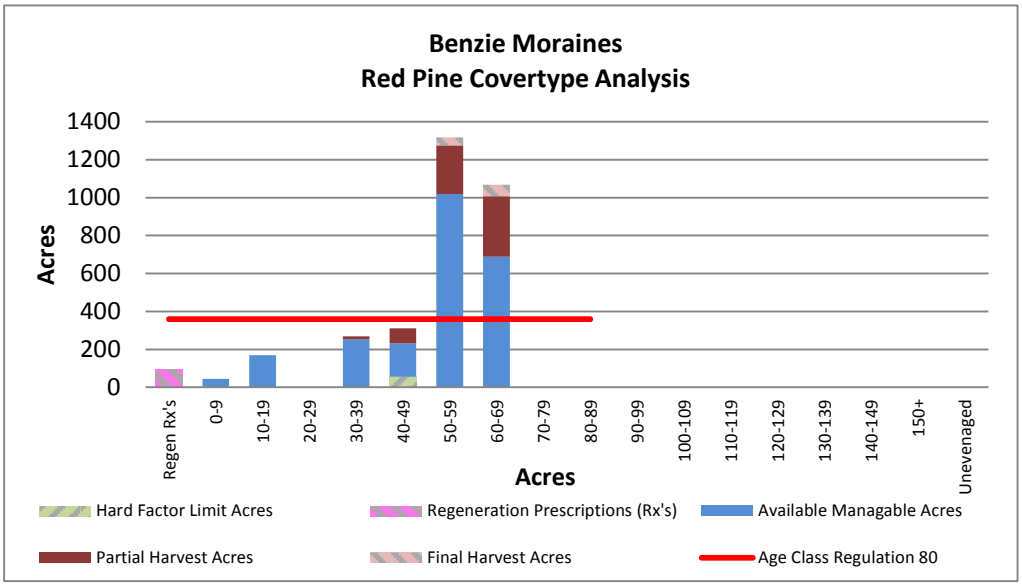

Figure 4.18.4. Age-class distribution for red pine in the Benzie Moraines management area (2012 Department of Natural Resources inventory data).

As shown in Figure 4.18.4, there is a pronounced spike in the 50-69 year-old age classes which represents an era of active planting.

There are 96 acres of stands that have a regeneration harvest pending and these acres are shown in the regeneration prescription class. There are 670 acres with a partial harvest pending and these acres are included in their current age class.

Figure 4.18.4 includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species (jack pine) and planting of red pine which is more suitable for this management area. These acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0 and 89 years of age to provide for continual harvest, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age-class distribution;
- If a well-established understory of desirable upland hardwood seedlings and saplings exists below older red pine, usually on AFO sites, use seed tree or shelterwood harvests to release the hardwoods while keeping some red pine as a component to improve stand diversity;
- Conduct partial harvests on a projected 1,744 acres, concentrating on stands of better quality red pine that has the potential for a higher product value in larger size classes; and
- Conduct regeneration harvests, on a projected 912 acres of red pine beginning with the oldest age classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- Achieve a more balanced 0-89 year-old age-class distribution for red pine over the next several decades;
- In identified special conservation areas, especially those with natural red pine, consider management of red pine to a biological rotation of 200+years; and
- A desired future harvest level is projected at 360 acres for final harvest and 1,872 acres for partial harvest per 10-year period.

4.23.1.4 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 1,532 acres or 6% of the management area (Table 4.18.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at the current level to provide habitat for species which use openings.

10-Year Management Objectives

- If necessary and feasible, consider maintaining upland open/semi-open lands through possible use of prescribed fire, woody brush removal, herbicide and planting.

Long-Term Management Objectives

- Continue to maintain upland open/semi-open lands at current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.6.1.5 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 424 acres or 2% of the management area (Table 4.18.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at current levels to ensure an adequate level of wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.18.1.6 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: white pine, 844 acres (3%), mixed upland deciduous, 841 acres (3%), lowland conifers, 721 acres (3%), oak, 563 acres (2%), tamarack, 538 acres (2%) and upland mixed forest, 421 acres (2%). Other forest communities total 1,132 acres (5%) and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape in addition to providing wood products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Consider methods to ensure lowland conifer and cedar regeneration;
- Conduct regeneration harvests on a projected 16 acres of lowland conifers;
- Consider methods to ensure adequate regeneration of lowland types;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry;
- Conduct regeneration harvests on a projected 225 acres of white pine, 85 acres of oak and 330 acres of mixed upland deciduous, 15 acres of tamarack and 101 acres of upland mixed forest;
- Conduct partial harvests on a projected 376 acres of white pine, 271 acres of mixed upland deciduous, 134 acres of oak and 107 acres of upland mixed forest;
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration in other cover types;
- White pine, which is predominantly in plantations, should be managed long-term on an even-aged basis, using partial harvests to gradually remove low-quality trees and steer these stands toward pine-hardwood mixed types.; and
- Opportunities for harvesting and regeneration of lowland types should be considered on a case-by-case basis. Much of the lowland acreage in this management area is in the Deadstream Swamp near Platte Lake, which is listed as a high-quality rich conifer swamp and should be managed passively.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible;
- Continue management of these other types to provide wood products, wildlife habitat and recreational opportunities; and
- A desired future harvest level is projected at 15 acres of tamarack, 16 acres of lowland conifer and 12 acres of lowland deciduous for final harvest per 10-year period.

4.18.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this 0-year planning period:

- American marten
- Black bear
- Black-throated blue warbler
- Pileated woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Wild turkey
- White-tailed deer
- Wood thrush

The primary focus of wildlife habitat management in the Benzie Moraines management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area the maintenance of young forest, extensive mature forest, large open grassland complexes and marsh/grassland complexes, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast, understory shrub and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Marten

The goal for American marten in the northern Lower Peninsula is to increase available habitat. American marten needs mature mixed forest stands or old conifer-dominated stands, with dead and down material for maintaining a stable and sufficient supply of small mammals as prey. American marten are rarely found outside the forest canopy. This species depends upon live-tree dens, snags and coarse woody debris for loafing (resting) and denning sites. State forest management should address the maintenance and improvement of extensive and mature forest tracts, corridors, dead wood and conifer components in priority landscapes.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore large forested tracts and forested corridors.
- In even-aged management systems, within-stand retention should focus on large diameter (greater than15 inches in diameter at breast-height) trees, known cavity trees and/or mesic conifers to maintain/increase denning and loafing sites.
- Where possible, increase both standing-dead and downed-dead wood by:
    - Applying at least the minimum level of within-stand retention to all stands in management area;
    - Writing harvest specifications to leave slash at the stump or to minimize the removal of slash; and
    - Limiting or prohibiting firewood permits at marten-occupied sites.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Black-throated Blue Warbler

The goal for black-throated blue warbler in the northern Lower Peninsula is to maintain available habitat. Black-throated blue warbler is an area-sensitive species (e.g., densities increase exponentially with increasing patch size) mainly occurring in mesic deciduous forest tracts >50 years in age and >250 acres in size, with a dense understory layer for nesting and foraging. State forest management for the species should focus on maintaining mature, large (>50 years old and >250 acres) mesic deciduous forest tracts with a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (greater than 12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-shouldered Hawk

The goal for red-shouldered hawk in the northern Lower Peninsula is to maintain available habitat. Red-shouldered hawks nest in contiguous, mature, closed canopy, hardwood forests. Nesting habitat consists primarily of well-stocked pole or sawtimber stands (stocking densities 6 and 9) with a closed canopy (80-100%) and basal area of at least 98 square feet per acre. Nests are usually found in deciduous trees with a mean 23 inches in diameter at breast height. State forest management activities should focus on the maintenance of large blocks (>385 acres) of mesic northern forest with the appropriate level of large diameter trees in priority landscapes.

Wildlife Habitat Specifications:

- All suspected red-shouldered hawk nests are to be reported to local wildlife staff and confirmed nests documented in accordance with the DNR's *Approach to the Protection of Rare Species on State Forest Lands* (CI 4172) and included in Integrated Forest Monitoring, Assessment and Prescriptions Geographic Decision Support Environment when there

is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan DNR's *Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands* (August 2012) will be followed.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and aspen/mixed hardwood cover types to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is to maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival on suitable sites.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
- Large contiguous patches of mature deciduous forest are the priority in this management area, but existing openings on old fields/orchards and semi-open habitats in frost-prone low areas provide opportunities for brood-rearing openings.
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.
Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Thrush

The goal for wood thrush in the northern Lower Peninsula is to maintain available habitat. Wood thrush occur primarily in upland, mesic deciduous and mixed forests with large trees, diverse tree communities, moderate undergrowth and a well-developed litter layer. They are highly susceptible to nest predation and brood parasitism, which increases with forest fragmentation. State forest management for the species should focus on maintaining large (>250 acres) forest tracts, minimizing edge and promoting a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

4.18.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed four listed species and no natural communities of note occurring in the management area as listed in Table 4.18.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

Table 4.18.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Benzie Moraines management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Plants								
Michigan monkey flower	*Mimulus glabratus michiganensis*	LE/E/G5T1/S1	Confirmed			Rich conifer swamp	Tamarack	Late
Ginseng	*Panax quinquefolius*	T/G3G4/S2S3	Confirmed			Floodplain forest	Lowland mixed	Mid
						Mesic northern forest	Northern Hardwood	Late

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

There are no high conservation value areas or ecological reference areas identified for the Benzie Moraines management area as illustrated in Figure 4.18.5.

There are two goals and three objectives related to rare species and special resource areas.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Future development and recreational pressure associated with expected population growth in the vicinity of this management area will be the primary challenge to successful management for special resource areas.

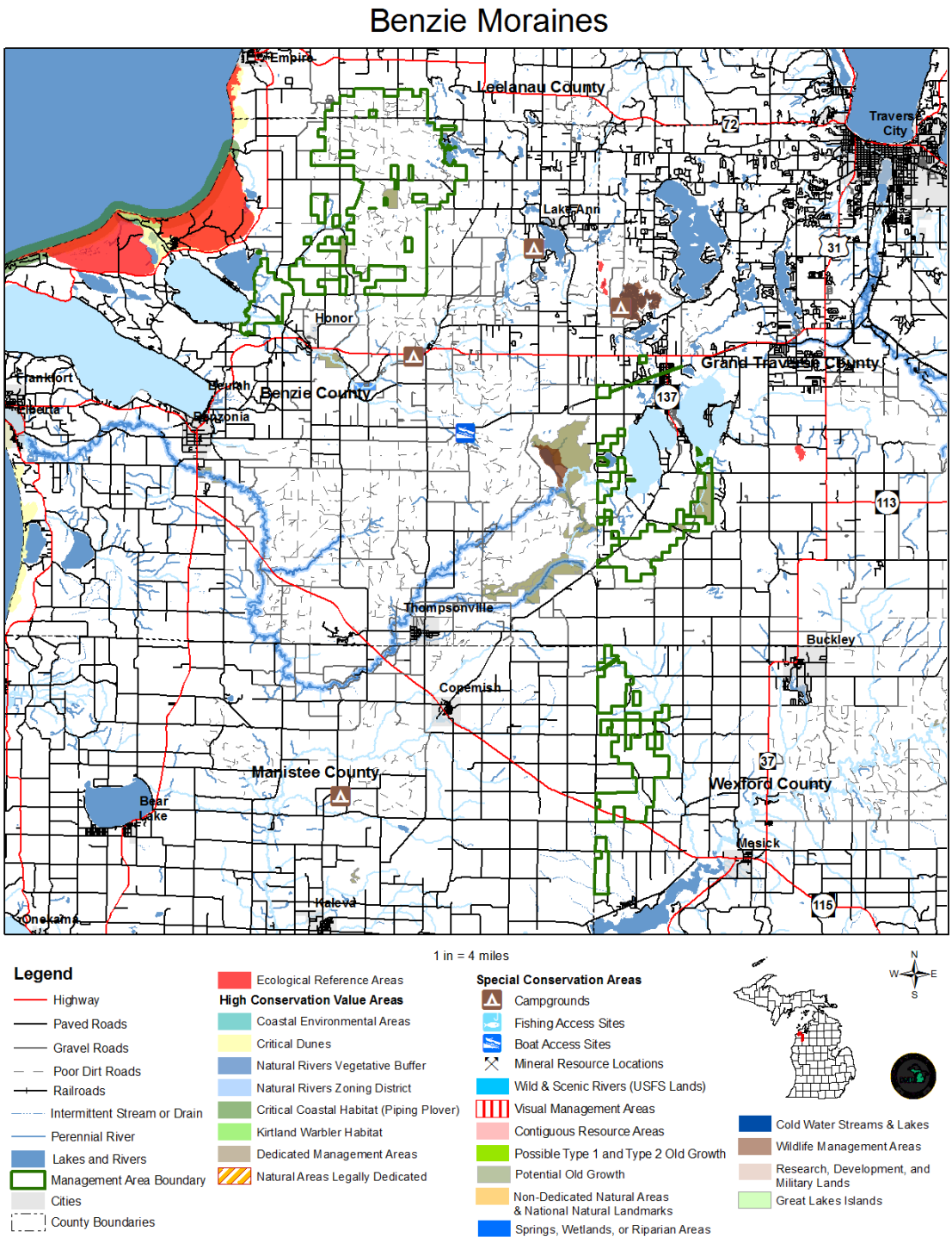

Figure 4.18.5. A map of the Benzie Moraines management area showing the special resource areas.

4.18.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health issues in this management area may include emerald ash borer and beech bark disease and management should be adapted as follows:

- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important;
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow; and
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.18.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. Local staff has noted the presence of garlic mustard and *Phragmites* on the edges of lakes and wetlands within this management area. In the management area and some areas have been treated, infestations may be small enough in many cases to have confidence in the efficacy of further treatments. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.18.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Benzie Moraines - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	4	10	14	2

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
Glossy Buckthorn *Rhamnus frangula*	4	Glossy Buckthorn *Rhamnus frangula*	9
-	-	Japanese Barberry *Berberis thunbergii*	1

4.18.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.18.1 and listed in Appendix F.

4.18.6 Fire Management

Northern hardwoods which have historically been a major component of this management area are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance of small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.18.7 Public Access and Recreation

Access for management and/or recreation is generally very good throughout this management area as there is very little lowland and a well-developed road/trail system which includes the Platte River and Maple City snowmobile trails. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Recreational opportunities within this management area include the popular Garey Lake Trail camp, which provides a critical resting spot along the equestrian-oriented Shore-to-Shore Trail. A vital north/south snowmobile trail dissects this management area and the nationally recognized non-motorized North Country Trail is found in the southern portion of this management area. Trails are shown in Figure 4.18.1. Due to the proximity of this management area to heavily populated Traverse City area, coupled with favorable upland soils, future expansion of recreational amenities may occur. There are no state forest campgrounds within the management area, but one is nearby as shown in Figure 4.18.5. Listed below are the recreational facilities within this management area:

Campgrounds
- Garey Lake Trail Camp

Boating Access Sites (BSAs)
- Garey Lake BAS

Off-Road Vehicle Trails---N/A

Snowmobile Trails
- Various

Non-Motorized Trails
- Shore-To-Shore Trail
- North Country Trail

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.18.8 Oil, Gas and Mineral Development

Surface sediments consist of an end moraine of coarse-textured till, coarse-textured till, glacial outwash sand and gravel and postglacial alluvium and lacustrine (lake) sand and gravel. The glacial drift thickness varies between 200 and 1,100 feet. Sand and gravel pits are located in this management area and there is very good potential for additional pits.

The Mississippian Coldwater and Sunbury Shales and Devonian Bedford and Antrim Shales and Traverse Formation subcrop below the glacial drift. The Antrim is quarried for cement products and the Traverse for limestone elsewhere in the state.

Part of the Grand Traverse and Wexord county lands in this management area have been developed for oil and gas production from the Guelph (former Niagaran) reefs. Well spacing is currently 80 acres and most of the area of Guelph production is still under lease. The Collingwood Formation does not appear to have potential in this management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.19 MA 19 – Williamsburg Moraine Management Area

Summary of Use and Management

Vegetation management in the Williamsburg Moraine management area (MA) (Figure 4.19.1) will provide various forest products; maintain or enhance wildlife habitat; protect areas of unique character and threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management objectives for this management area for this 10-year planning period include improving the age-class structure of aspen, regenerating oak and the continuation of management through selection or restarting harvests of red pine and upland hardwood communities. Wildlife habitat management objectives include increasing the structural complexity of upland hardwood communities for forest interior species; perpetuating early-successional communities for young-forest-dependent species, hunting and other wildlife-related recreation opportunities; maintaining soft and hard mast sources including oak; and preserving the biodiversity value of the Skegemog high conservation value area. Expected trends within this 10-year planning period are: increased recreational pressure, especially on established trails; increased oil and gas development; introduced pests and diseases, especially beech bark disease and emerald ash borer; an increased need to regenerate oak and red pine; and the decreased dominance of pure oak types to mixed oak/pine types.

The current predominant cover types, acreages and projected harvest acres in the management area are shown in Table 4.19.1.

Introduction

This management area is located just east of Traverse City near Williamsburg and Kalkaska in Grand Traverse and Kalkaska counties and contains 19,015 acres of state forest (Figure 4.19.1). The primary attributes which identify the Williamsburg Moraines management area include:

- The historic forest communities dominated by mesic northern forests and dry-mesic northern forests.
- The current forest communities dominated by northern hardwoods, aspen and planted red pine.
- Landforms of steep, broken moraine ridges.
- Alignment with Albert's Williamsburg sub-region, the smallest sub-region in northern Lower Michigan (Albert, 1995).
- Proximity to population centers leading to an emphasis on social and economic values.
- Inclusion of the Skegemog Lake Wildlife Area (a high conservation value area).
- A history of white-tailed deer, ruffed grouse, woodcock, river otter, black bear and bobcat harvest.
- Individuals and populations of threatened, endangered or special concern species including eastern massasauga rattlesnake, bald eagle, osprey, northern goshawk, spotted turtle and red-legged spittlebug, primarily in the portion of the management area near Lake Skegemog.
- Portions of the Vasa cross country ski trail, single-track bike trail and North Country Trail.
- A history of oil and gas exploration associated with the Niagaran and Antrim shale formations.

Landforms in the management area are dominated by rich moraines bordering a broad outwash plain to the south. The western portion of the management area includes areas of transition between moraines and outwash and is dominated by excessively drained mesic to dry-mesic sandy soils where much of the aspen and red pine occurs. Aspen density and distribution expanded significantly following the initial harvest of the forest around the turn of the last century and has been perpetuated in this landscape through even-aged management. Much of the red pine found its origin in department's efforts to reforest "barren" lands during the 1950s and 60s and is now beginning to reach economic maturity.

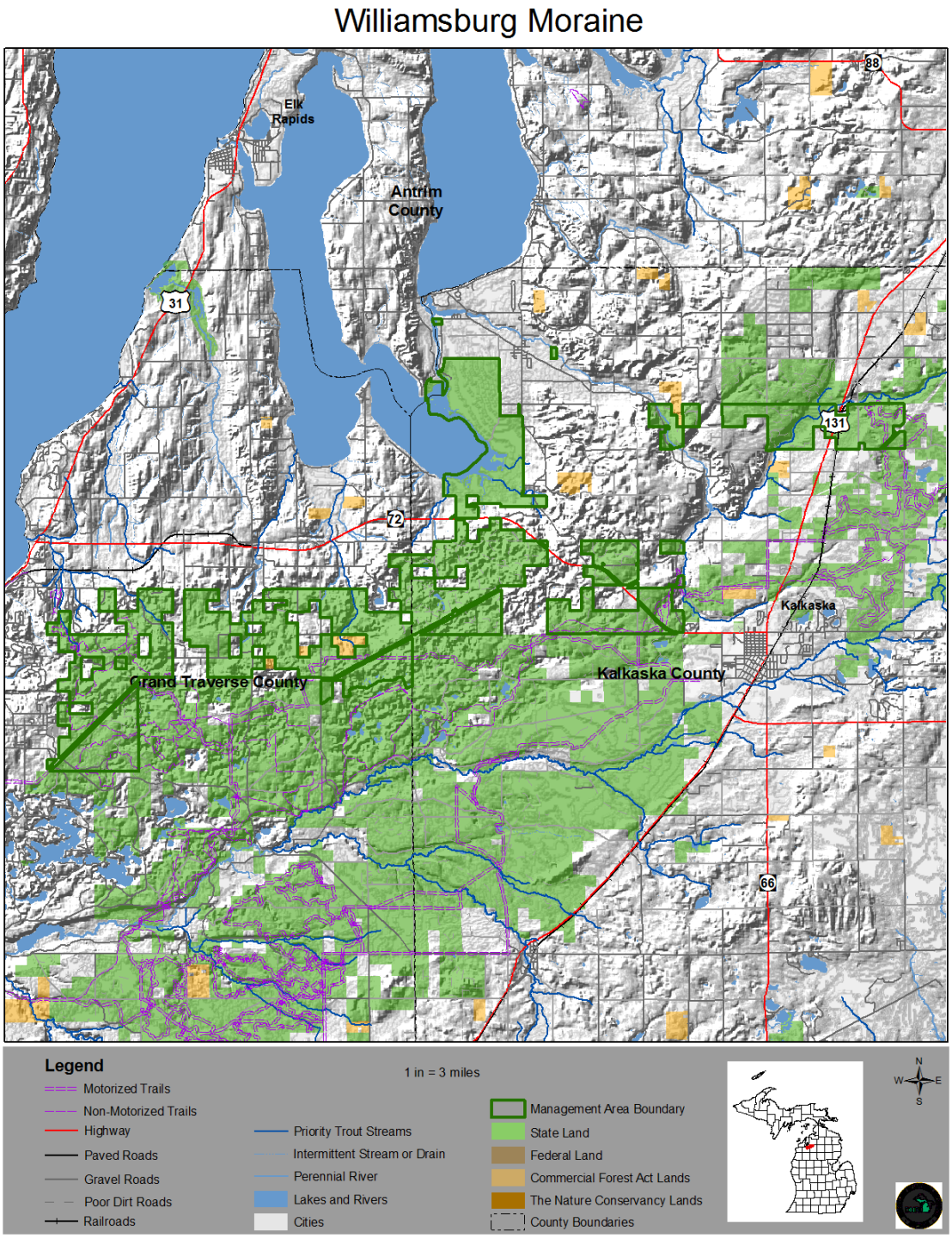

Figure 4.19.1. Location of the Williamsburg Moraine management area (dark green boundary) in relation to surrounding state forest and other lands in Grand Traverse and Kalkaska counties, Michigan.

The eastern portion of the management area (with the exception of the Skegemog Swamp) has a prevalence of well drained loamy sand and sandy loam soils and is dominated by upland (northern) hardwoods. Hardwoods in the management area are significantly different from their pre-logging condition where white pine and hemlock were dominant components and stands were primarily uneven aged and contained a high proportion of dead wood. Presently, stands are even aged and conifer is a minor component. In addition, hardwood stands contain fewer snags, large trees and downed woody material.

Table 4.19.1. Current cover types, acreages, projected harvests and projected acreages at this ten-year planning end of the period for the Williamsburg Moraines management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Northern Hardwood	22%	4,133	65	4,068		1,940	4,133		1,940
Aspen	14%	2,674	161	2513	791		2,674	359	
Red Pine	12%	2,242	40	2202	582	1,224	2,242	245	1,224
Mixed Upland Deciduous	8%	1,592	423	1169	474	479	1,592	167	479
Oak	7%	1,262	601	661	141	229	1,262	60	258
White Pine	6%	1,068	10	1058	197	447	1,068	96	447
Cedar	5%	961	961				961		
Lowland Conifers	4%	747	598	149	17		747	17	
Natural Mixed Pines	3%	659	162	497	29	90	659	45	90
Upland Open/Semi-Open Lands	8%	1,478		1478			1,478		
Lowland Open/Semi-Open Lands	1%	284		284			284		
Misc Other (Water, Local, Urban)	3%	611		611			611		
Others	7%	1,301	422	879	102	28	1,301	112	68
Total		19,012	3,443	15,569	2,332	4,437	19,012	1,101	4,506

4.19.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.19.1.1 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 4,133 acres or 22% of the management area on habitat class PArVVb, AFO and AFOCa sites (Table 4.19.1) (see Appendix E). Forest communities dominated by northern hardwoods in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds, commercially for pulp and saw logs and for a wide range of forest recreation. Current data show that 65 acres of northern hardwood have met harvest criteria (Figure 4.19.2), but have site conditions that limit harvest (hard factor limited acres). There are 33 acres that have a final (regeneration) harvest pending and these acres are included in the 0-9 year-old age class. There are 631 acres with a partial harvest pending and these acres are included in their current age class.

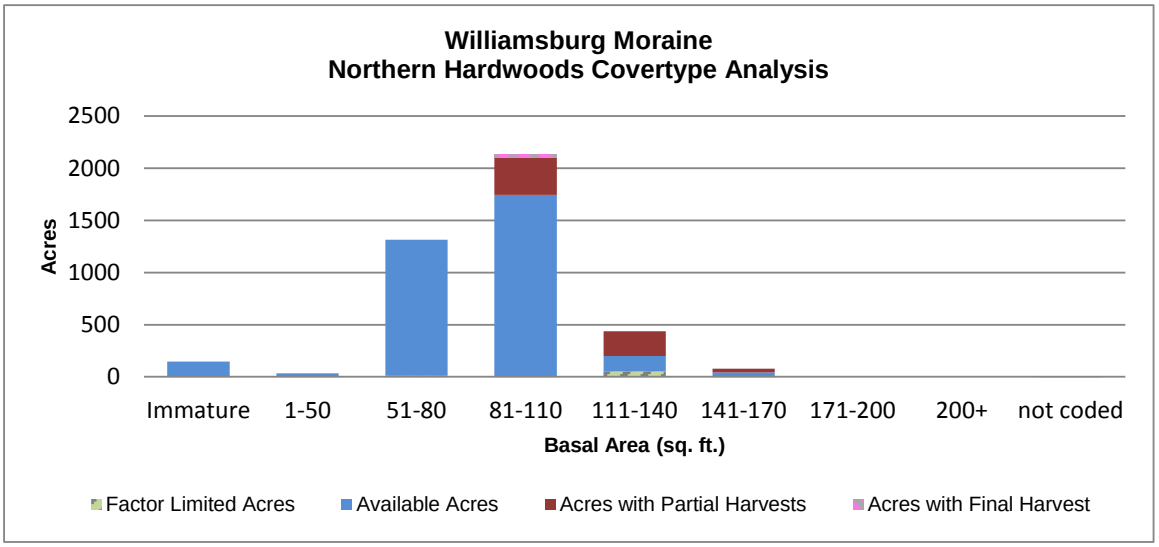

Figure 4.19.2. Basal area distribution for northern hardwoods in the Williamsburg Moraines management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Northern hardwood stands will continue to transition to an uneven-aged condition through selection harvests. The conifer component and coarse woody debris will be increased over current levels.

10-Year Management Objectives

- A projected 1,940 acres will be harvested through selection harvests to continue the transition to uneven-aged stands.

Long-Term Management Objectives

- Continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer, using Beech Bark Disease Guidelines and Emerald Ash Borer Guidelines;
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands; and
- Desired future harvest levels for partial harvest are projected at 1,940 acres per 10-year period to continue the transition to uneven-aged stands.

4.19.1.2 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 2,674 acres or 14% of the management area (Table 4.19.1). Forest communities dominated by big-tooth and quaking aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, chestnut-sided warbler, golden-winged warbler, and white-tailed deer, commercially for pulp and saw logs and recreationally by hunters and mushroom hunters.

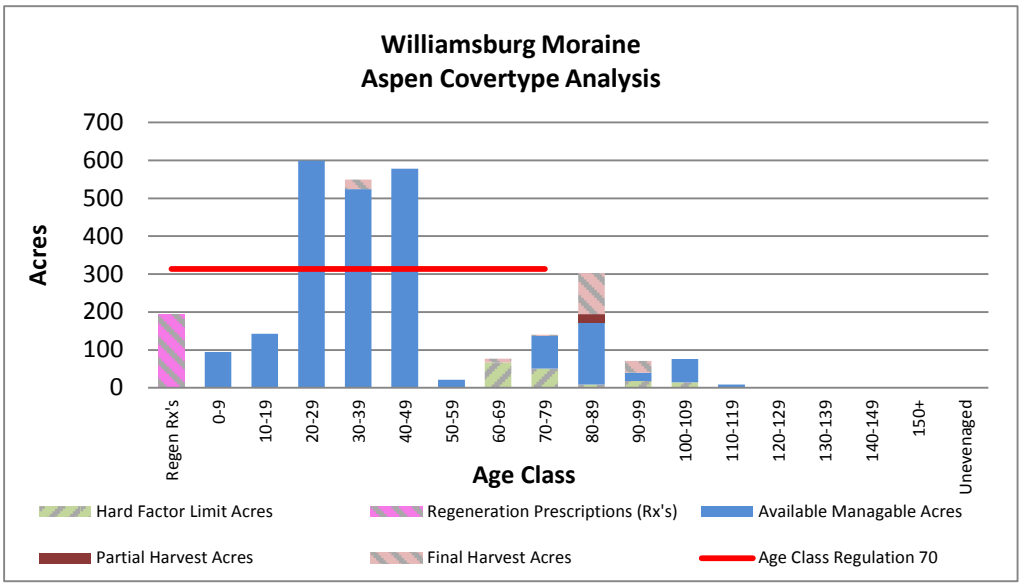

Figure 4.19.3. Age-class distribution for aspen in the Williamsburg Moraines management area (2012 Department of Natural Resources inventory data).

Although aspen occurs throughout the area, including the moraine ridges, moraines and till areas on habitat class PArVHa, PArVVb, and AFO sites, it is primarily concentrated on dry-mesic sites on the west side of the management area. Aspen has been consistently harvested over the last 60 years with the greatest harvest activity occurring 20-50 years ago. Some of the stands beyond 60 years of age may be located on steep slopes or in close proximity to recreational trails which may limit treatment options. Aspen in this landscape, especially big-tooth aspen, is of exceptional quality and vigor, providing opportunity for extending the rotational age to 70 years. Extending rotation age has multiple benefits, including providing sawlog quality timber, providing greater opportunity for snag and large woody debris formation, improving stand structure by allowing for increased understory growth and development and providing for increased site recovery and nutrient loading. There are 161 acres of aspen that have met harvest criteria (Figure 4.19.3), but have site conditions that limit harvest (hard factor limited acres). There are approximately 192 acres of stands that have a regeneration harvest pending and these acres are shown in the regeneration prescription class. There are approximately 23 acres with a partial harvest pending and these acres are shown in their current age class. Figure 4.19.3 displays the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in the release of aspen. These acres are shown in the 0-9 year-old age class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained as even-aged stands with acres balanced between 0 and 79 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct final harvests to regenerate aspen on a projected 791 acres in this 10-year planning period;
- Concentrate harvests on the oldest age classes first; and
- Where necessary and feasible, consider harvesting stands from other age classes and below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- A desired future harvest level for final harvest is projected at 359 acres per 10-year period to continue balancing the age-class structure.

4.19.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 2,242 acre or 12% of the management area, with most being 40-60 years old (Table 4.19.1). Red pine dominated communities in this management area are valued commercially for pulp, saw logs and utility poles. Nearly all of the pine is of planted origin occurring on dry-mesic (habitat class PArVVb) sites where red pine has the potential to occur naturally and on mesic or hardwood sites (habitat class AFO, AFOCa). Red pine regeneration efforts will be focused on dry-mesic sites.

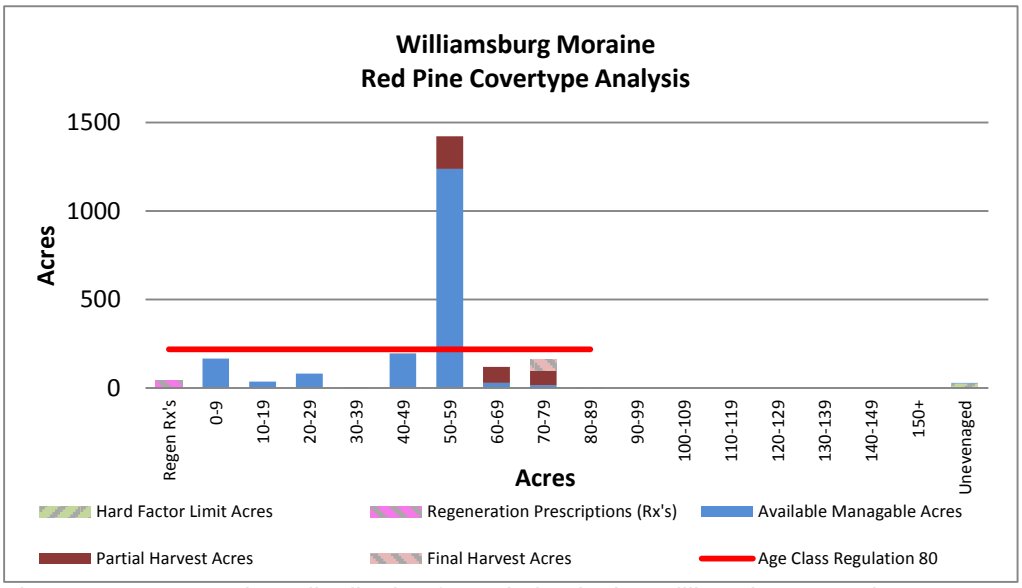

Figure 4.19.4. Age-class distribution for red pine in the Williamsburg Moraines management area (2012 Department of Natural Resources inventory data).

Planted pine responds well on these sites, though red maple is often a competitor to regeneration. There are approximately 63 acres of stands that have a regeneration harvest pending and these acres are shown in the 0-9 year-old age class (Figure 4.19.4). There are approximately 359 acres with a partial harvest pending and these acres are included in their current age class.

Desired Future Condition

- Red pine stands will be maintained and managed through thinning until stand replacement harvests at economic maturity, with acres balanced between 0-89 years of age to provide for a sustainable harvest, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age-class distribution between the ages of 0 and 89;
- Conduct partial harvests on a projected 1,224 acres on the younger age classes to improve the quality and size class; and
- Conduct regeneration harvests on a projected 582 acres in the older age classes to help balance the age-class distribution.

Long-Term Management Objectives

- A desired future harvest level for final harvest is projected at 245 acres per 10-year period to continue balancing the age-class distribution;
- A desired future harvest level for partial harvest is projected at 1,224 acres per 10-year period to improve the volume and value;
- Consider opportunities to manage red pine in mixed stands with oak or other species;
- On quality northern hardwood sites or sites where advanced northern hardwood species are present, consider whether to allow these sites to convert to northern hardwood; and
- Red pine found in riparian buffers or other sensitive sites may remain until biological maturity.

4.19.1.4 Forest Cover Type Management – Oak

Current Condition

Oak acres total 1,262 acres or 7% of the management area (Table 4.19.1) and are located on habitat classes: PArVVb, AFO and AFOCa. White and red oak (northern red, northern pin and black) dominated communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife (particularly as a source for hard mast) and commercially for pulp and saw logs. The age class-distribution (Figure 4.19.5) is dominated by stands 70-100+ years old, though tree vigor is high and mortality is much lower than in other portions of the ecoregion.

Young oak is poorly represented in these stands, though red maple and white pine frequently occupy the understory.

Oak distribution in the management area is much greater than stated here as it is an understory or minor component in many stands classified as other types. There are 601 acres of oak have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 68 acres of oak that have a partial harvest pending.

Desired Future Condition

- Oak will be represented by mixed cover types and as a component in stands throughout the management area through management to provide for timber products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Conduct partial harvests on a projected 229 acres;
- Conduct restarting harvests on a projected 141 acres; and
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types. This will be beneficial to wildlife species including, but not limited to turkey, black bear and deer (featured species in this management area).

Long-Term Management Objectives

- A desired future harvest level for final harvest is projected at 60 acres per 10-year period to regenerate oak stands;
- A desired future level for partial harvest is projected at 258 acres per 10-year period to maintain oak as a component in other cover types or in mixed stands;

- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area; and
- It is acceptable that some oak stands may become mixed stands through partial removal of an oak overstory, planting pine in oak stands or through natural regeneration of other species.

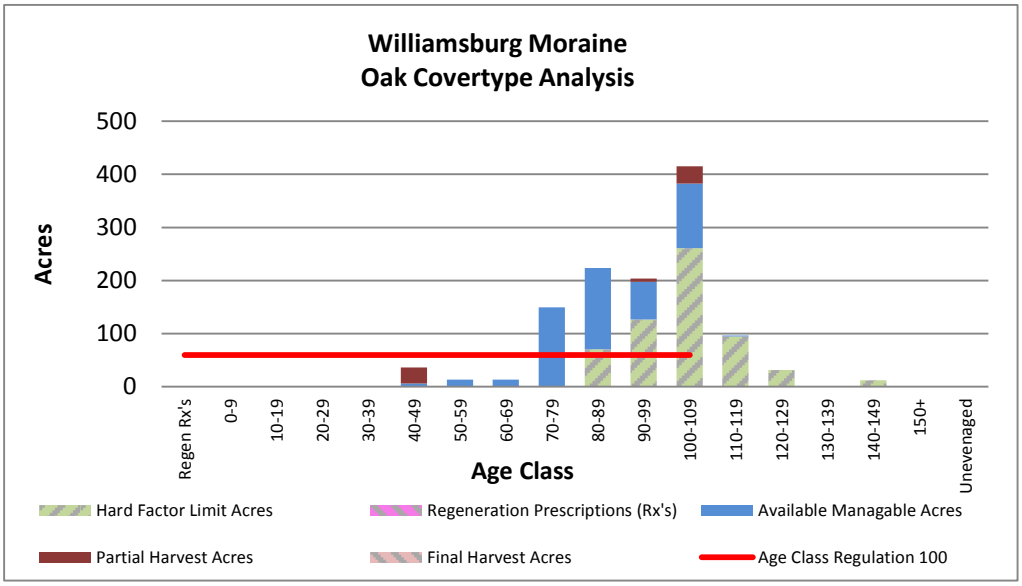

Figure 4.19.5. Age-class distribution for oak in the Williamsburg Moraines management area (2012 Department of Natural Resources inventory data).

4.19.1.5 Forest Cover Type Management – White Pine

White pine acres total 938 acres or 5% of the management area (Table 4.19.1) and are distributed throughout the management area on AFO/AFOCa habitat class sites.

The planted white pine acres are largely between the ages of 40 and 69 with the largest amount in the 50-59 year-old age class (Figure 4.19.6). White pine in this management area is valued ecologically as a source of habitat for numerous species of wildlife, particularly at young and very old stages and commercially for pulp and saw logs. Advanced white pine regeneration in association with red maple is frequently well represented in the understory of oak or other pine stands (habitat class sites PArVVb/PArVHa). There are 10 acres of white pine that have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). Figure 4.19.6 includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of understory white pine or final harvests and planting to white pine. These acres are included in the 0-9 year age class.

<u>Desired Future Condition</u>

- White pine will be a major forest component on this management area and may be in mixed stands along with red maple, oak and red pine.

<u>10-Year Management Objectives</u>

- Conduct a partial harvest on a projected 447 acres with a concentration on stand improvement for those stands which may yield a higher value product in the future;
- Conduct a regeneration harvest on a projected 197 acres with a concentration on those sites with poorer quality;
- In areas of extensive advanced regeneration of white pine and red maple understory, consider partial removal of the overstory species to release the understory. The projected acres of overstory removal may be reflected in the partial harvest acres for oak and red pine;
- Management should consider the impact of white pine weevil on young age-class stands of white pine; and
- Consider retaining a component of the overstory after harvests to increase stand diversity.

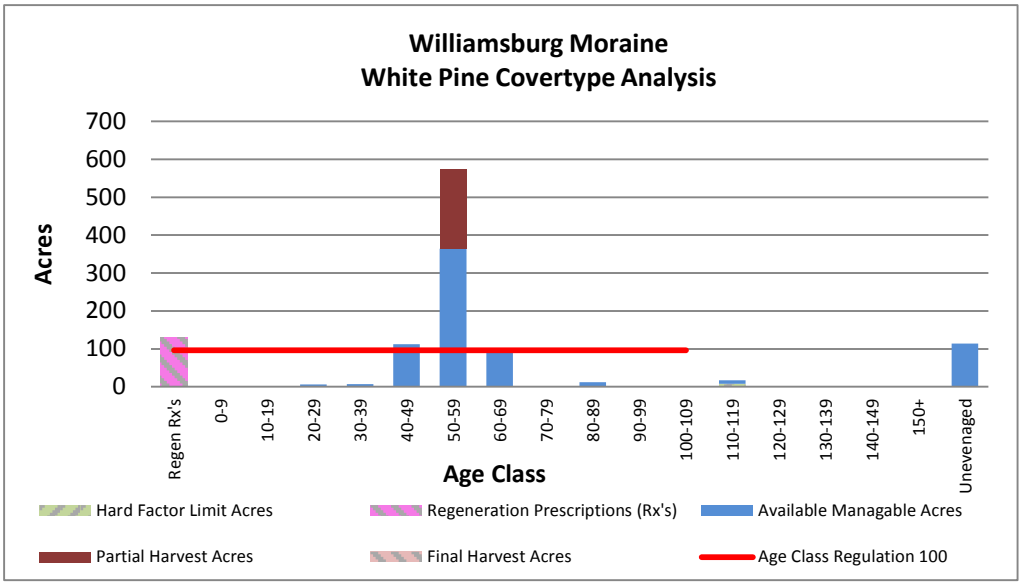

Figure 4.19.6. Age-class distribution for white pine in the Williamsburg Moraines management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue management of white pine in mixed stands through partial harvests at a projected desired future harvest level of 447 acres per 10-year period.
- Continue final harvests at a projected desired future harvest level of 96 acres per 10-year period to maintain white pine stands.

4.19.1.6 Forest Cover Type Management – Cedar and Lowland Conifer

Cedar acres total 961 or 5% of the management area (Table 4.19.1) and lowland conifers acres total 4,937 or 13% of the management area (Table 4.19.1), constituting a significant portion of the management area. There are 589 acres of lowland conifers (Figure 4.19.8) with a hard factor limit and all 961 acres of cedar are factor limited due to access and operability issues. There types may offer only limited opportunities for management.

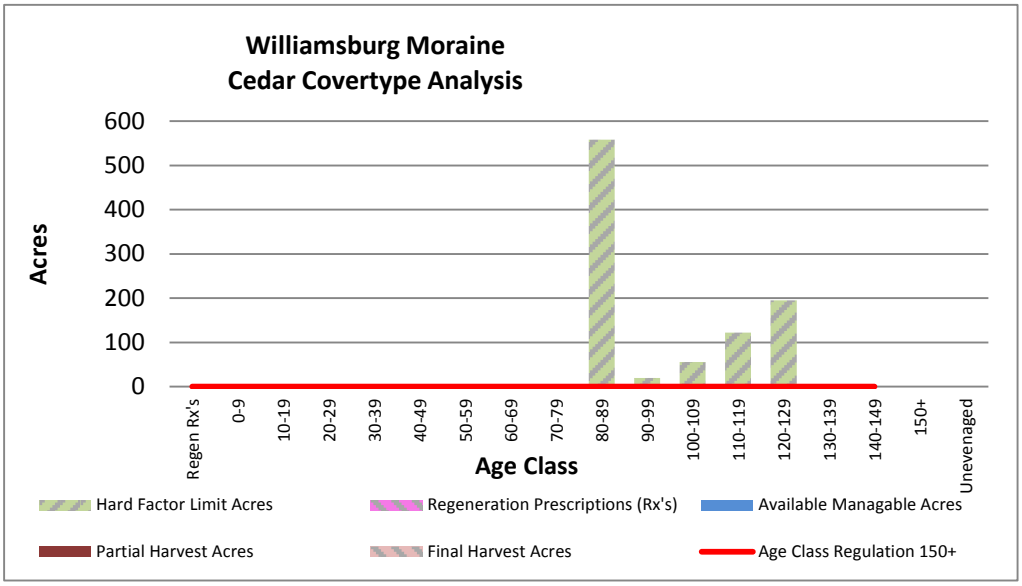

Figure 4.19.7. Age-class distribution for cedar in the Williamsburg Moraine management area (2012 Department of Natural Resources inventory data).

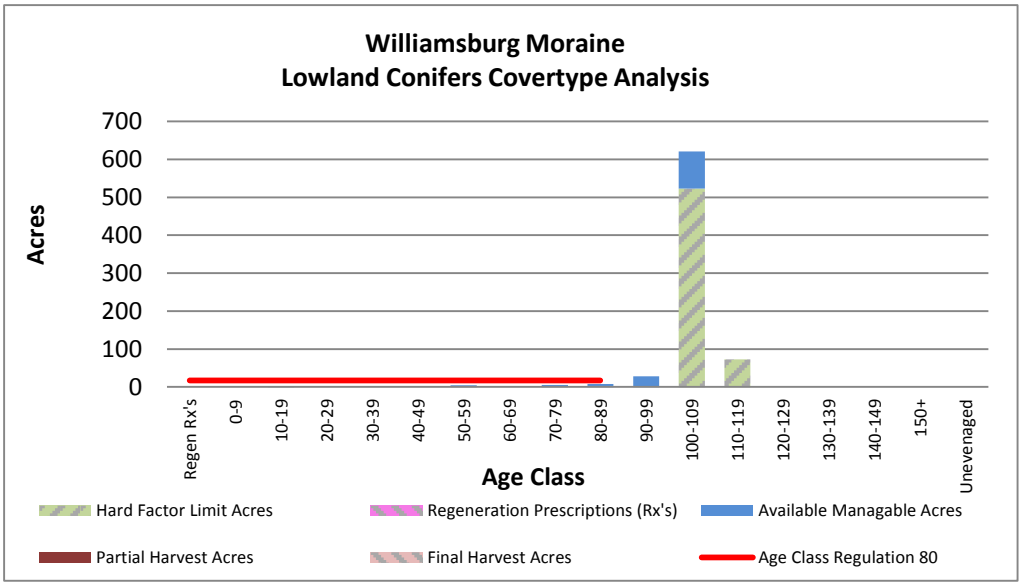

Figure 4.19.8. Age-class distribution for lowland conifers in the Williamsburg Moraine management area (2012 DNR inventory data).

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape and wildlife habitat while providing forest products.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 17 acres of lowland conifer;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years-of-entry; and
- Consider methods to ensure adequate regeneration of cedar and lowland conifer.

Long-Term Management Objectives

- Continue harvests, where feasible, at the projected desired future harvest levels of 17 acres for lowland conifer per 10-year period to maintain habitat for species such as deer (a featured species in this management area) and to produce forest products.

4.19.1.7 Forest Cover Type Management – Mixed Upland Deciduous

Current Condition

Mixed upland deciduous (primarily aspen, oak and red maple) acres total 1,592 acres or 8% of the management area (Table 4.19.1). Due to the age classes of this type (Figure 4.19.9) it would appear that these stands are primarily oak stands mixed with smaller amounts of aspen and red maple. The community is distributed throughout the management area on habitat class PArVHa sites. Forest communities classed as mixed upland deciduous in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, white-tailed deer, squirrels and various birds and commercially for firewood and industrial lumber.

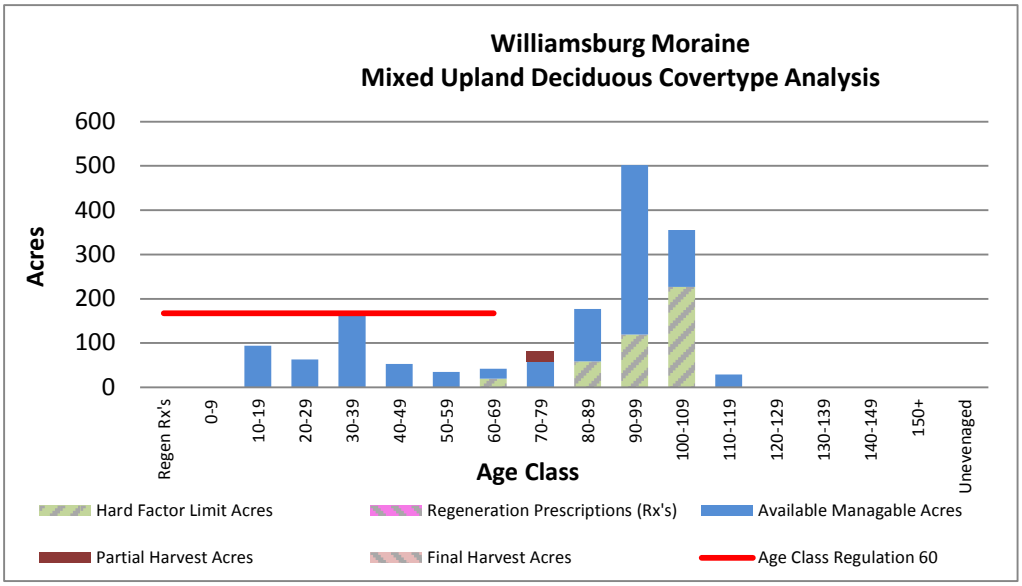

Figure 4.19.9. Age-class distribution for mixed upland deciduous in the Williamsburg Moraines management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- These communities will located on operable sites, contributing to the compositional diversity of the landscape while providing for continual harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species.

10-Year Management Objectives

- These areas will be managed primarily through selection harvests that may select an individual species for harvest;
- Conduct regeneration harvests on a projected 474 acres to regenerate those species which meet silvicultural criteria; and
- Conduct partial harvests on a projected 479 acres; primarily partial harvests on oak.

Long-Term Management Objectives

- A desired future harvest level for final harvest is projected at 167 acres per 10-year period;
- A desired future harvest level for partial harvest is projected at 479 acres per 10-year period; and
- Maintain these mixed types through continued management to provide a diverse cover type that provides habitat and forest products on a sustainable basis.

4.19.1.8 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 284 acres or 1% of the management area (Table 4.19.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.19.1.9 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 1,478 acres or 8% of the management area. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Continue using prescribed fire, woody brush removal, herbicide or grass plantings to maintain upland open/semi-open lands; and
- Protect stands from illegal off-road vehicle use and where feasible and necessary, use control methods on invasive non-native species.

Long-Term Management Objectives

- Upland open/semi-open lands will be maintained provide habitat for species that require open habitats.

4.19.1.10 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: natural mixed pines, 659 acres (3% of the management area). Other forested and non-forested communities total 1,301 acres (7%) and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape in addition to providing wood products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct partial harvests on a projected 90 acres of natural mixed pines; and
- Conduct final harvests on a projected 29 acres of natural mixed pines and 145 acres of upland mixed forest.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible.

4.19.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this cycle of state forest planning:

- American marten
- American woodcock (Skegemog Lake State Wildlife Management Area)
- Beaver (Skegemog Lake State Wildlife Management Area)
- Black bear
- Black-throated blue warbler
- Eastern massasauga (Skegemog Lake State Wildlife Management Area)
- Mallard (Skegemog Lake State Wildlife Management Area)
- Pileated woodpecker
- Wild turkey
- White-tailed deer
- Wood duck (Skegemog Lake State Wildlife Management Area)
- Wood thrush

The primary focus of wildlife habitat management in the Williamsburg Moraine management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest, extensive mature forest, large open grassland complexes and marsh/grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast, understory shrub and mesic conifer components. Additional detail on the featured species approach can be found in Section 3.

American Marten

The goal for American marten in the northern Lower Peninsula is to increase available habitat. American marten needs mature mixed forest stands or old conifer-dominated stands, with dead and down material for maintaining a stable and sufficient supply of small mammals as prey. American marten are rarely found outside the forest canopy. This species depends upon live-tree dens, snags and coarse woody debris for loafing (resting) and denning sites. State forest management should address the maintenance and improvement of extensive and mature forest tracts, corridors, dead wood and conifer components in priority landscapes.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore large forested tracts and forested corridors.
- In even-aged management systems, within-stand retention should focus on large diameter (greater than15 inches in diameter at breast-height) trees, known cavity trees and/or mesic conifers to maintain/increase denning and loafing sites.
- Where possible, increase both standing-dead and downed-dead wood by:
  - Applying at least the minimum level of within-stand retention to all stands in management area;
  - Writing harvest specifications to leave slash at the stump or to minimize the removal of slash; and
  - Limiting or prohibiting firewood permits at marten-occupied sites.

American Woodcock

The goal for woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less than 15% and other inland bodies of water.
  - Implementation of the Dingman Marsh and French Farm Flooding master plans and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Black-throated Blue Warbler

The goal for black-throated blue warbler in the northern Lower Peninsula is to maintain available habitat. Black-throated blue warbler is an area-sensitive species (e.g., densities increase exponentially with increasing patch size) mainly occurring in mesic deciduous forest tracts >50 years in age and >250 acres in size, with a dense understory layer for nesting and foraging. State forest management for the species should focus on maintaining mature, large (>50 years old and >250 acres) mesic deciduous forest tracts with a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
    - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting and brood rearing. Mallard pair-bonding wetlands are typically 0.25-20 acres in size and brood rearing wetlands are typically 1.2-30 acres in size. Optimal hemi-marsh sites are >2.5 acres with open water portions having extensive portions less than three feet deep and 4:1 area of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within about 200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
    - Implementation of the Wildlife Management Area Master Plans for Dingman Marsh, French Farm Flooding, and O'Neil Lake state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast-height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood duck are most limited by available nesting and brood rearing habitat. Wood duck nest in tree cavities near rivers, streams, swamps, beaver ponds and marshes. Nests require mature hardwood trees with 10 inches or larger in diameter at breast height. Brood-rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority state wildlife management areas with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
    - Implementation of the wildlife management area master plans for Dingman Marsh, French Farm Flooding, and O'Neil Lake state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Wood Thrush

The goal for wood thrush in the northern Lower Peninsula is to maintain available habitat. Wood thrush occur primarily in upland, mesic deciduous and mixed forests with large trees, diverse tree communities, moderate undergrowth and a well-developed litter layer. Wood thrush is highly susceptible to nest predation and brood parasitism, which increases with forest fragmentation. State forest management for the species should focus on maintaining large (>250 acres) forest tracts, minimizing edge and promoting a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

4.19.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in "DNR's *Approach to the Protection of Rare Species on State Forest Lands*" (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed twelve listed species as well as four natural communities of note occurring in the management area as listed in Table 4.9.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.19.10, the Skegemog Swamp is the only special conservation area in the Williamsburg Moraines management area.

Also shown in Figure 4.19.10 is the Skegemog Lake wildlife area, a high conservation value area.

There is also one ecological reference area (Figure 4.19.10) that is mostly on state land. The ecological reference area represents the northern fen natural community type and is 47.26 acres in area. This ecological reference area will be managed to enhance and protect the natural vegetative and associated wildlife communities as directed by an ecological reference area-specific management plan. These individual management plans will be developed over the life of this planning period.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.19.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Williamsburg Moraines management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Community								
Northern fen		S3/G3	Confirmed				Lowland open/semi-open	N/A
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Osprey	*Pandion haliaetus*	SC/G5/S2-3	Confirmed	PS	Low	Coastal fen	Lowland open/semi-open	N/A
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland Mixed	Mid
						Hardwood-conifer swamp	Lowland Mixed	Mid
Insect								
Red-legged spittlebug	*Prosapia ignipectus*	SC/G4/S2S3	Confirmed	EV	Moderate	Alvar	Upland open/semi-open	N/A
						Prairie fen	Upland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Mesic sand prairie	Upland open/semi-open	N/A
Reptile								
Spotted trutle	*Clemmys guttata*	T/G5/S2	Confirmed	HV	Low	Prairie fen	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Interdunal wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Lakeplain wet prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Inundated shrub swamp	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

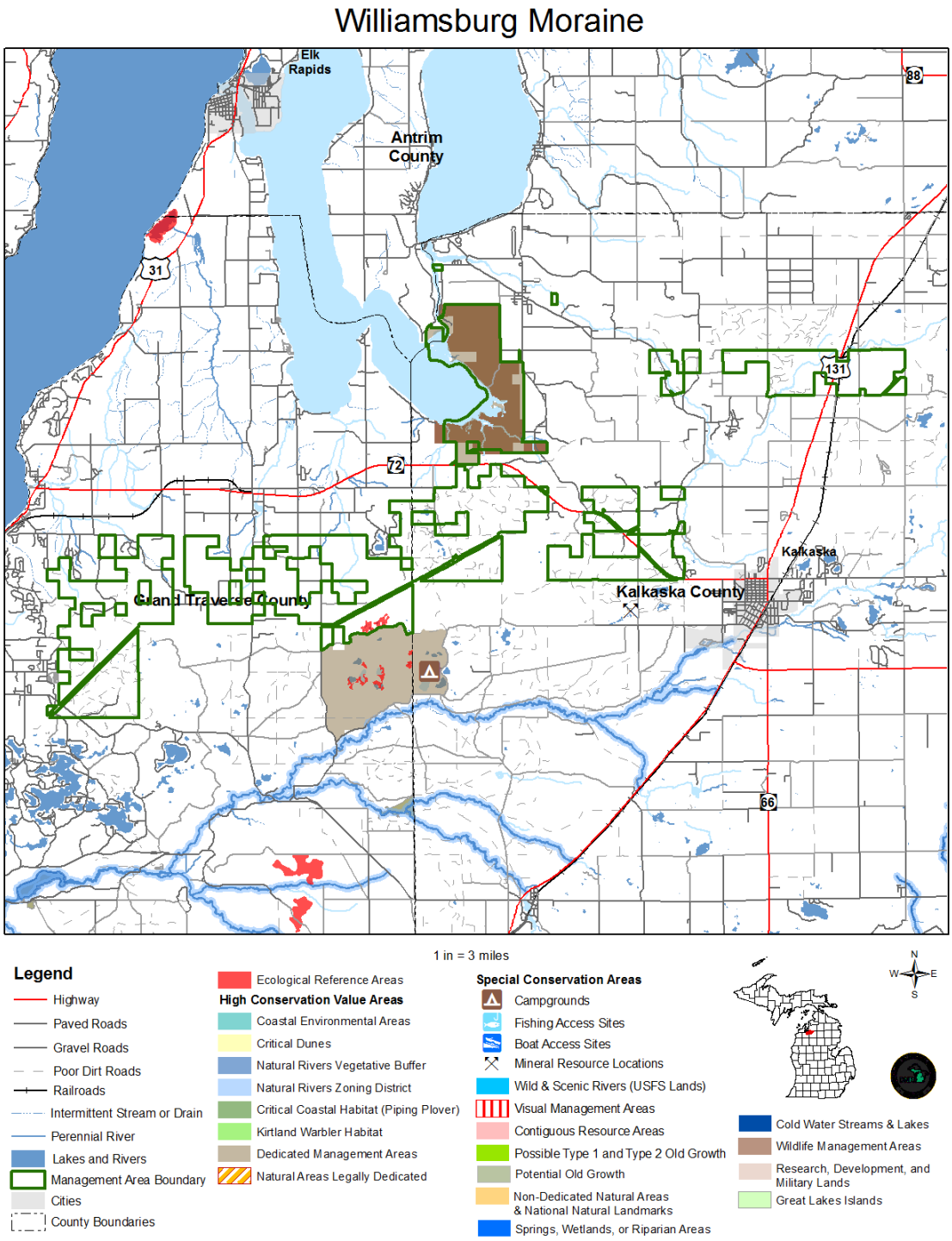

Figure 4.19.10. A map of the Williamsburg Moraines management area showing the special resource areas.

4.19.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include emerald ash borer, beech bark disease and oak decline and management should be adapted as follows:

- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important;
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow;

- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration; and
- While oak and other hardwood species growing on higher quality sites can occasionally suffer decline-associated mortality, it is primarily associated with frost-prone, well-drained soils.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.19.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.19.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Williamsburg Moraine - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	9	9	2

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Japanese Knotweed *Fallopia japonica*	1
-	-	Phragmites (Common Reed) *Phragmites australis*	8

4.19.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process, and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.19.1 and listed in Appendix F.

4.19.6 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of aspen or herbaceous openland/upland brush types. Wildfire risk and fuel loading is increased in young dense conifer plantations.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Seek opportunities to re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Seek opportunities to use fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.19.7 Public Access and Recreation

Where access is limited on state forest land, the department will continue to seek access across adjacent private property. In accordance with the department's *Sustainable Soil and Water Quality Practices of Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Existing recreational opportunities within this management area include off-road vehicle trails, snowmobile trails and non-motorized trails as shown in Figure 4.19.1. The popular Vasa cross country ski trail, which recently held the prestigious National Masters Championship race with participants from all over the country is in this management area. A section of the North Country Trail, which is America's longest national scenic trail, transects this management area and a critical portion of the equestrian Shore-to-Shore Trail, which runs from Lake Huron to Lake Michigan dissects this management area. Motorized recreational enthusiasts can enjoy scenic trails through northern Michigan forests dominated by white pine. Due to its proximity to populated areas coupled with favorable soil conditions, current and projected future recreation opportunities will continue to be an important aspect of this management area. Recreation facilities within this management area are shown below:

Campgrounds—N/A

Boating Access Sites—N/A

Off-Road Vehicle Trails
- Grand Traverse to Leetsville North Missaukee and Michigan Cycle Conservation Club Trail
- Leetsville Trail

Snowmobile Trails
- Various

Non-Motorized Trails
- Vasa Trail
- North Country Trail
- Shore-to-Shore Trail

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division, and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.19.8 Oil and Gas Development

Surface sediments consist of an end moraine of coarse-textured till, coarse-textured till, glacial outwash sand and gravel and postglacial alluvium and lacustrine (lake) sand and gravel. The glacial drift thickness varies between 200 and 800 feet. Sand and gravel pits are located in this management area and there is very good potential.

The Mississippian Coldwater and Sunbury Shales and Devonian Berea Sandstone, and Bedford and Antrim Shales subcrop below the glacial drift. The Antrim is quarried for cement products elsewhere in the state.

Most of this management area has been developed for oil and gas production from Antrim Shale or the Guelph (former Niagaran) reefs. Well spacing for both formations is currently 80 acres and most of the area of production is still under lease. Some additional state lands in the management area have been lease recently, most likely for the Collingwood Formation. The Collingwood Formation probably will have a well spacing of 320-640 acres per well (or possibly larger). The areas drilled for the Antrim and Guelph are also where the Collingwood could be developed, possibly using existing well sites and facilities.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.20 MA 20 Benzie Outwash Management Area

Summary of Use and Management

Vegetation management in the Benzie Outwash management area (MA) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique character, including the Betsie River which is a designated natural river; and threatened, endangered and special concern species and provide for forest-based recreational uses and Native American non-commercial uses of forest products. Timber management for the next 10 years includes improving the age-class distribution of aspen and red pine. Northern hardwoods management includes continued selective or regeneration harvesting of northern hardwoods to achieve an uneven age-class structure or improve timber quality. Wildlife management objectives include increasing the structural complexity of northern hardwood communities for interior forest species and perpetuating early-successional communities for species adapted to young forests. Expected trends in this 10-year planning period are increased recreational pressure on recreational trails and introduced insect and disease concerns, especially emerald ash borer and beech bark disease.

Introduction

This management area is located just east of Frankfort, Michigan and west of Traverse City in Leelanau, Benzie and Grand Traverse counties and contains 43,089 acres of state forest (Figure 4.20.1). The primary attributes which identify the Benzie Outwash management area include:

- Outwash plains landform which accounts for 96% of the management area.
- Current cover types which are dominated by aspen, upland (northern) hardwoods and red pine.
- Due to the proximity of this management area to Traverse City and other population areas, the forest resources contribute social and economic values to the area.
- This management area is almost entirely within the Newaygo Outwash Plain sub-region of the northern Lower Peninsula.
- Dispersed recreation in the form of hunting and mushroom picking as well as concentrated recreation on snowmobile trails, the Lake Ann Pathway and at the Lake Ann Campground and Lake Dubonnet Trail Camp.
- The Betsie River, a designated natural river, which crosses part of the management area.
- There has been limited development of oil/gas resources.
- Surveys have located the threatened, endangered or special concern species red-shouldered hawk, bald eagle, wood turtle, Blanding's turtle, osprey, common loon and ebony boghaunter.
- A history of white-tailed deer, ruffed grouse, woodcock and other game species harvest.
- This management area contains one or more of the northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.

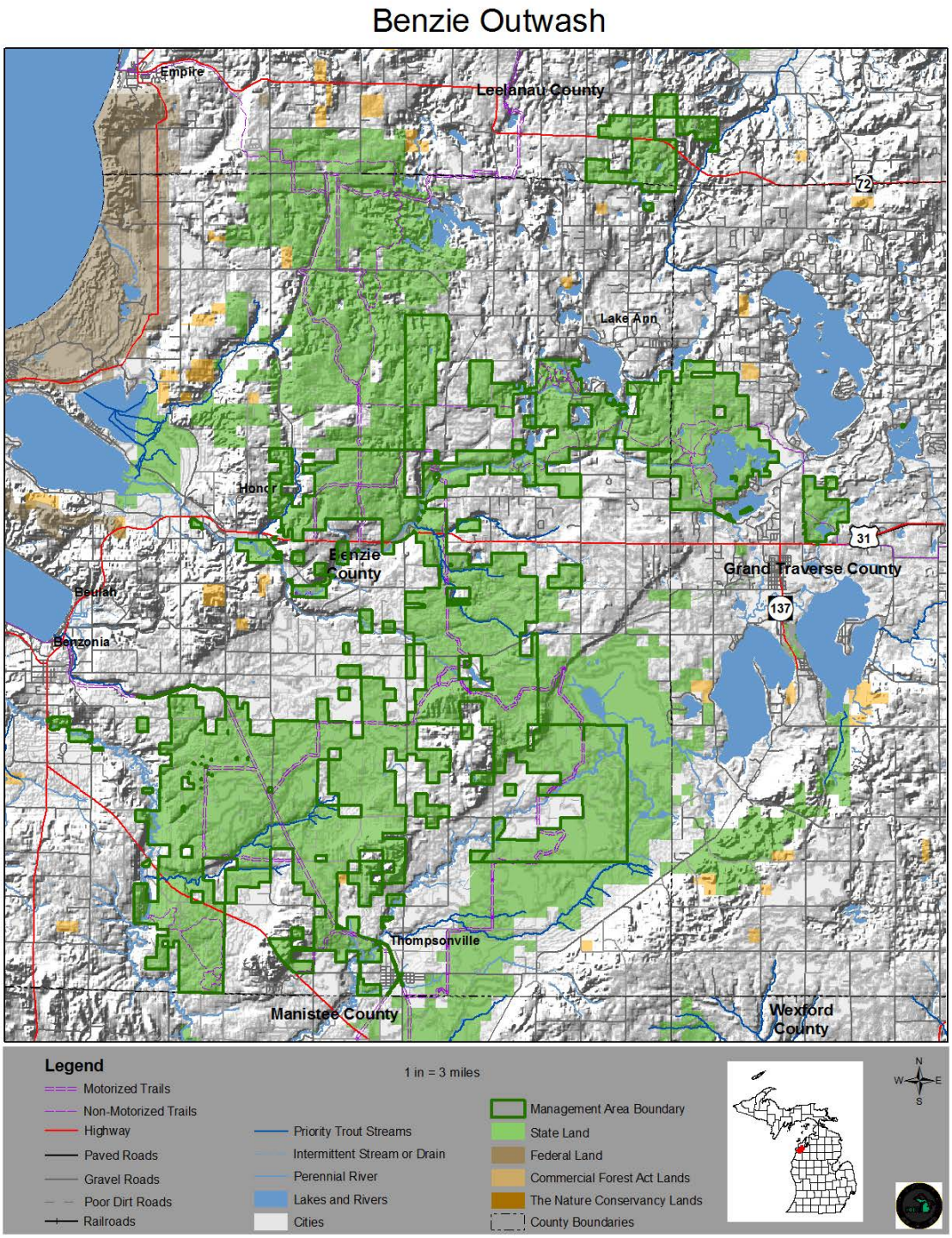

Figure 4.20.1. A map of the Benzie Outwash management area (dark green boundary) in relation to surrounding state forest and other lands in Leelanau, Benzie and Grand Traverse counties, Michigan.

Table 4.20.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Benzie Outwash management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	29%	12,584	1,001	11,583	3,660		12,584	1,931	
Northern Hardwood	26%	11,358	511	10847		4,864	11,358		4,864
Red Pine	10%	4,233	30	4203	872	1,980	4,233	467	2,196
Lowland Deciduous	3%	1,399	984	416	46		1,399	46	
Mixed Upland Deciduous	3%	1,301	8	1293	629	467	1,301	185	613
White Pine	3%	1,272	4	1268	291	376	1,272	115	433
Oak	2%	1,001	385	616	190	210	1,001	56	252
Lowland Aspen/Balsam Poplar	2%	777	398	379	64		777	64	
Natural Mixed Pines	2%	699	8	691	192	294	699	63	294
Upland Open/Semi-Open Lands	8%	3,333		3333			3,333		
Lowland Open/Semi-Open Lands	2%	1,012		1012			1,012		
Misc Other (Water, Local, Urban)	2%	1,048		1048			1,048		
Others	7%	3,072	1,295	1777	393	253	3,072	229	257
Total		43,089	4,623	38,466	6,338	8,444	43,089	3,156	8,909

4.20.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.20.1.1 Forest Cover Type – Aspen

Current Condition

Aspen acres total 12,584 acres or 29% of the management area (Table 4.20.1). The habitat classification is unavailable for Benzie County which comprises the majority of the management area. Forest communities dominated aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, chestnut-sided warbler, golden- winged warbler and white tail deer; commercially for pulp and saw logs; and recreationally by hunters and mushroom hunters.

The age classes of aspen are unbalanced, with a spike in the 20-49 year-old age classes (Figure 4.20.2). There are 1,001 acres of aspen that have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 1,071 acres that have a final harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen will be located on suitable sites with acres balanced in the 0-59 year age class rotation. Aspen acres will be maintained on currently operable sites to provide early successional habitat for species viability, recreation opportunities and a sustainable level of wood fiber.

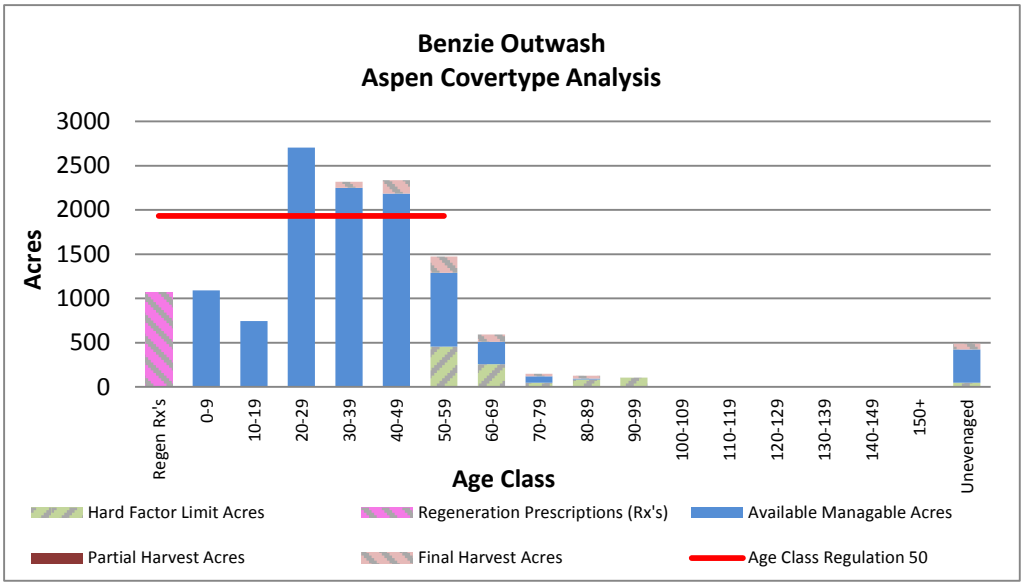

Figure 4.20.2. Age-class distribution for aspen in the Benzie Outwash management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 3,660 acres per decade;
- Concentrate harvests on the oldest age classes first;
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions; and
- Aspen within the identified Grouse Enhanced Management Systems areas may be managed differently than the rest of the aspen within the management area, with a shorter rotation age**,** small patch cuts and carefully considered stand adjacency.

Long-Term Management Objectives

- As the aspen in the younger age classes reach maturity, implement treatments to balance the age-class distribution; and
- A desired future harvest level is projected at 1,931 acres for final harvest per 10-year period.

4.20.1.2 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 11,358 acres or 26% of the management area (Table 4.20.1). Since northern hardwood stands have trees of varying ages, stand density, described as basal area, is a more appropriate measure of stand condition for upland hardwood areas. As shown in Figure 4.20.3, nearly half of the northern hardwood acres are in stands with a basal area between 81-110 square feet per acre. There are 511 acres of northern hardwoods have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres).

There are 1,045 acres with a partial harvest pending and these acres are included in their current age-class.

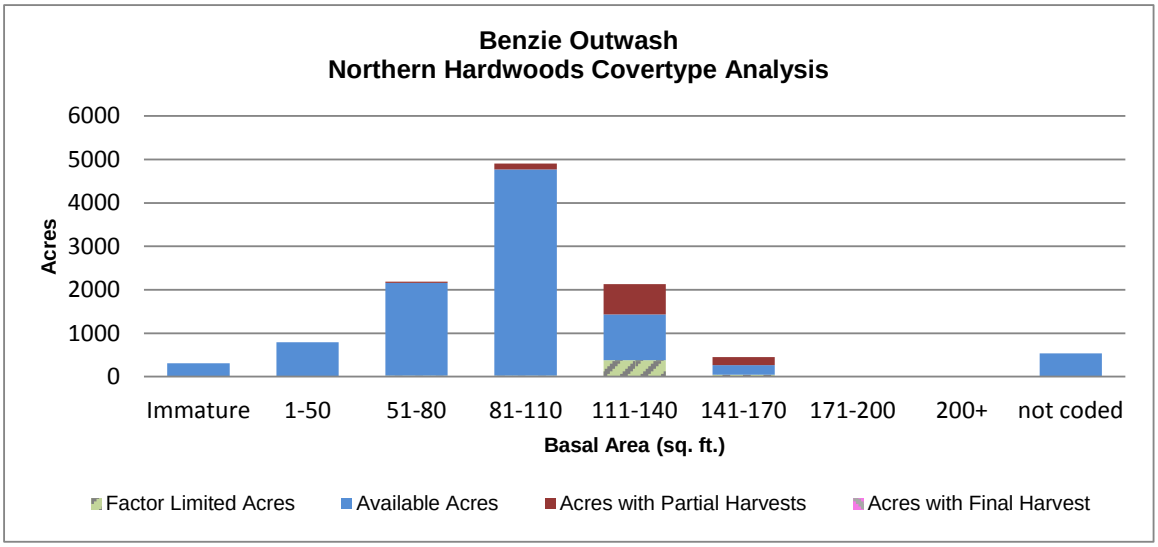

Figure 4.20.3. Basal area distribution for northern hardwood in the Benzie Outwash management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Northern hardwoods will be located on suitable sites and will produce a sustainable yield of forest products along with wildlife habitat and recreational opportunities; and
- Where feasible, stands will be in relatively large contiguous patches of all-aged, compositionally diverse forest which contain coarse woody debris, scattered large trees and scattered snags.

10-Year Management Objectives

- Conduct partial harvests on a projected 4,864 acres;
- Where present, retain hemlock and white pine for within-stand diversity; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of basal area distributions.

Long-Term Management Objectives

- Continue management through individual tree selection harvests to develop an all-aged stand structure;
- Continue to conduct salvage harvests of beech and ash where present in northern hardwood stands and affected by affected by beech bark disease and emerald ash borer, using Beech Bark Disease Management Guidelines and Emerald Ash Borer Guidelines. If needed, delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands.
- A desired future harvest level is projected at 4,864 acres for partial harvest per 10-year period.

4.20.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 4,233 acres or 10% of the management area (Table 4.20.1). Currently, there is a large spike of red pine in the age classes from 40-59 years of age (Figure 4.20.4) which will be suitable for thinning. There are 268 acres that have a final harvest pending and these acres are shown in the regeneration prescription class. There are 728 acres with a partial harvest pending and these acres are included in their current age class. Figure 4.20.4 includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory and planting of red pine. These acres are included in the regeneration prescription class.

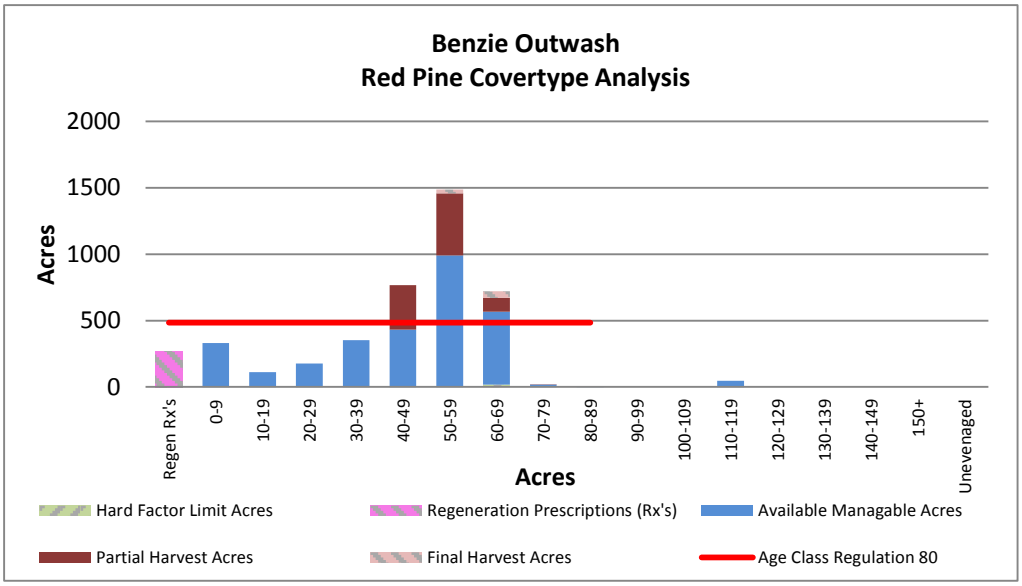

Figure 4.20.4. Age-class distribution for red pine in the Benzie Outwash management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Red pine stands will be maintained and managed through thinning until stand replacement harvests at economic maturity, with acres balanced between 0 and 89 years of age to provide for a sustainable harvest, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age-class distribution;
- Conduct partial harvests on a projected 1,937 acres on the younger age classes to improve the quality and size class; and
- Conduct regeneration harvests on a projected 930 acres in the older age classes to help balance the age-class distribution.

Long-Term Management Objectives

- Continue work towards balancing the age-class distribution between the ages of 0 and 89 years through final harvests and replanting;
- Seek opportunities to move red pine to suitable sites which may include managing red pine in mixed stands with oak or other species;
- On quality northern hardwood sites or sites where advanced northern hardwood species are present, consider whether to allow these sites to convert to northern hardwood; and
- A desired future harvest level is projected at 467 acres for final harvest and 2,196 acres for partial harvest per 10-year period.

4.20.1.4 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open lands acres total 1,012 or 2% of the management area (Table 4.20.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.20.1.5 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open lands in the management area valued ecologically as sources of habitat for numerous species of wildlife and recreationally for hunting, wildlife viewing and camping. These open lands acres total 3,333 acres (8%) of the management area. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub and low-density trees. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with past management practices to maintain these areas.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use: and
- Where feasible and necessary, use control methods on invasive non-native species.

4.19.1.6 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: lowland deciduous, 1,399 acres (3% of the management area), mixed upland deciduous, 1,302 acres (3%), white pine, 1,272 acres (3%), oak, 1,001 acres (2%), lowland aspen/balsam poplar, 777 acres (2%) and natural mixed pines, 699 acres (2%). Other forested and non-forested cover types total 3,072 acres (7%) and is spread throughout the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape in addition to providing wood products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct final (regeneration) harvests on a projected 46 acres of lowland deciduous.
- Consider methods to ensure adequate regeneration of lowland conifers;

- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years of entry;
- Conduct final harvests on a projected 629 acres of mixed upland deciduous, 291 acres of white pine, 190 acres of oak, 64 acres of lowland aspen/balsam poplar, 192 acres of natural mixed pines, 156 acres of upland mixed forest, 210 acres of upland spruce/fir and 27 acres of planted mixed pines; and
- Conduct partial harvests on a projected 467 acres of mixed upland deciduous, 376 acres of white pine, 210 acres of oak, 294 acres of natural mixed pines, 191 acres of upland mixed forest and 62 acres of planted mixed pines.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- A desired future harvest level for final harvest is projected at 46 acres for lowland deciduous and 13 acres for lowland conifers per 10-year period.

4.20.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this 10-year planning period:

- American marten
- American woodcock (Grass Lake Flooding State Wildlife Management Area)
- Black bear
- Black-throated blue warbler
- Golden-winged warbler
- Mallard (Grass Lake Flooding State Wildlife Management Area)
- Pileated woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Wild turkey
- White-tailed deer
- Wood duck (Grass Lake Flooding State Wildlife Management Area)
- Wood thrush

The primary focus of wildlife habitat management in the Benzie Outwash management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; extensive mature forest; large open grassland complexes and marsh/grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast, understory shrub and mesic conifer components.

This management area will include one or more northern Lower Peninsula Grouse Enhanced Management System areas. The boundaries will be delineated during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager. Aspen stands that fall within the Grouse Enhanced Management System area boundary may be managed on a shortened rotation with multiple age classes and smaller stand sizes to enhance hunting opportunities for ruffed grouse, woodcock, deer, turkey and hare. The remainder of the management area (outside the boundary) will be managed based on the direction in the management area write up.

A more detailed overview of featured species is included in Section 3.

American Marten

The goal for American marten in the northern Lower Peninsula is to increase available habitat. American marten needs mature mixed forest stands or old conifer-dominated stands, with dead and down material for maintaining a stable and sufficient supply of small mammals as prey. American marten are rarely found outside the forest canopy. This species depends upon live-tree dens, snags and coarse woody debris for loafing (resting) and denning sites. State forest management should address the maintenance and improvement of extensive and mature forest tracts, corridors, dead wood and conifer components in priority landscapes.
Wildlife Habitat Specifications:

- Identify, maintain, develop or restore large forested tracts and forested corridors.
- In even-aged management systems, within-stand retention should focus on large diameter (>15 inches in diameter at breast-height) trees, known cavity trees and/or mesic conifers to maintain/increase denning and loafing sites.
- Where possible, increase both standing-dead and downed-dead wood by:
  - Applying at least the minimum level of within-stand retention to all stands in management area;
  - Writing harvest specifications to leave slash at the stump or to minimize the removal of slash; and
  - Limiting or prohibiting firewood permits at marten-occupied sites.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this American woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Black-throated Blue Warbler

The goal for black-throated blue warbler in the northern Lower Peninsula is to maintain available habitat. Black-throated blue warbler is an area-sensitive species (e.g., densities increase exponentially with increasing patch size) mainly occurring in mesic deciduous forest tracts >50 years in age and >250 acres in size, with a dense understory layer for nesting and foraging. State forest management for the species should focus on maintaining mature, large (>50 years old and >250 acres) mesic deciduous forest tracts with a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting and brood rearing. Mallard pair-bonding wetlands are typically 0.25 to 20 acres in size and brood rearing wetlands are typically 1.2 to 30 acres in size. Optimal hemi-marsh sites are >2.5 acres with open water portions having extensive portions less than three feet deep and 4:1 area of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within about 200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master Plans for Dingman Marsh, French Farm Flooding, and O'Neil Lake state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches DBH.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-shouldered Hawk

The goal for red-shouldered hawk in the northern Lower Peninsula is to maintain available habitat. Red-shouldered hawks nest in contiguous, mature, closed canopy, hardwood forests. Nesting habitat consists primarily of well-stocked pole or sawtimber stands (stocking densities 6 and 9) with a closed canopy (80-100%) and basal area of at least 98 square feet per acre. Nests are usually found in deciduous trees with a mean 23 inches in diameter at breast height. State forest management activities should focus on the maintenance of large blocks (>385 acres) of mesic northern forest with the appropriate level of large diameter trees in priority landscapes.

Wildlife Habitat Specifications:

- All suspected red-shouldered hawk nests are to be reported to local wildlife staff and confirmed nests documented in accordance with the DNR's *Approach to the Protection of Rare Species on State Forest Lands* (CI 4172) and included in Integrated Forest Monitoring, Assessment and Prescriptions Geographic Decision Support Environment when there is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan DNR's *Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands* (August 2012) will be followed.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.
- Manage the aspen cover type for smaller patch size, a shorter rotation and a more deliberate habitat configuration within the designated Grouse Enhanced Management Systems areas where appropriate.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.

- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annually manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage, and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood duck are most limited by available nesting and brood rearing habitat. Wood duck nest in tree cavities near rivers, streams, swamps, beaver ponds and marshes. Nests require mature hardwood trees with 10 inches or larger in diameter at breast height. Brood-rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority state wildlife management areas with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plans for Dingman Marsh, French Farm Flooding and O'Neil Lake state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Wood Thrush

The goal for wood thrush in the northern Lower Peninsula is to maintain available habitat. Wood thrush occur primarily in upland, mesic deciduous and mixed forests with large trees, diverse tree communities, moderate undergrowth and a well-developed litter layer. Wood thrush is highly susceptible to nest predation and brood parasitism, which increases with forest fragmentation. State forest management for the species should focus on maintaining large (>250 acres) forest tracts, minimizing edge and promoting a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

4.20.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest* Lands (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Future development and recreational pressure associated with expected population growth in the vicinity of this management area will be the primary challenge to successful management for rare fish, wildlife and plants.

Past surveys have noted and confirmed eight listed species and one natural community of note occurring in the management area as listed in Table 4.20.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

The Betsie River and its tributaries have been identified as a natural river and along with its corridor are also designated as a high conservation value area as shown in Figure 4.20.5.

There are two ecological reference areas identified for the Benzie Moraines management area as shown if Figure 4.20.5. The two ecological reference areas represent the bog natural community type and are 26.05 acres and 36.97 acres in size. These ecological reference areas will be managed to enhance and protect their natural vegetative and associated wildlife communities as directed by an ecological reference area-specific management plan. These individual management plans will be developed over the life of this planning period.

Table 4.20.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Benzie Outwash management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Community								
Bog		S4/G3G5	Confirmed				Lowland open/semi-open	N/A
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Reptile								
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Eastern box turtle	*Terrapene carolina carolina*	SC/S2S3/G5T5	Confirmed	HV	Moderate	Northern hardwood swamp	Black Ash	Late
						Great Lakes marsh	Lowland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Inundated shrub swamp	Lowland open/semi-open	N/A
						Northern shrub thicket	Upland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Prairie fen	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Coastal fen	Lowland open/semi-open	N/A
Plant								
Ginseng	*Panax quinquefolius*	T/G3G4/S2S3	Confirmed			Floodplain forest	Lowland mixed	Mid
						Mesic northern forest	Northern Hardwood	Late

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

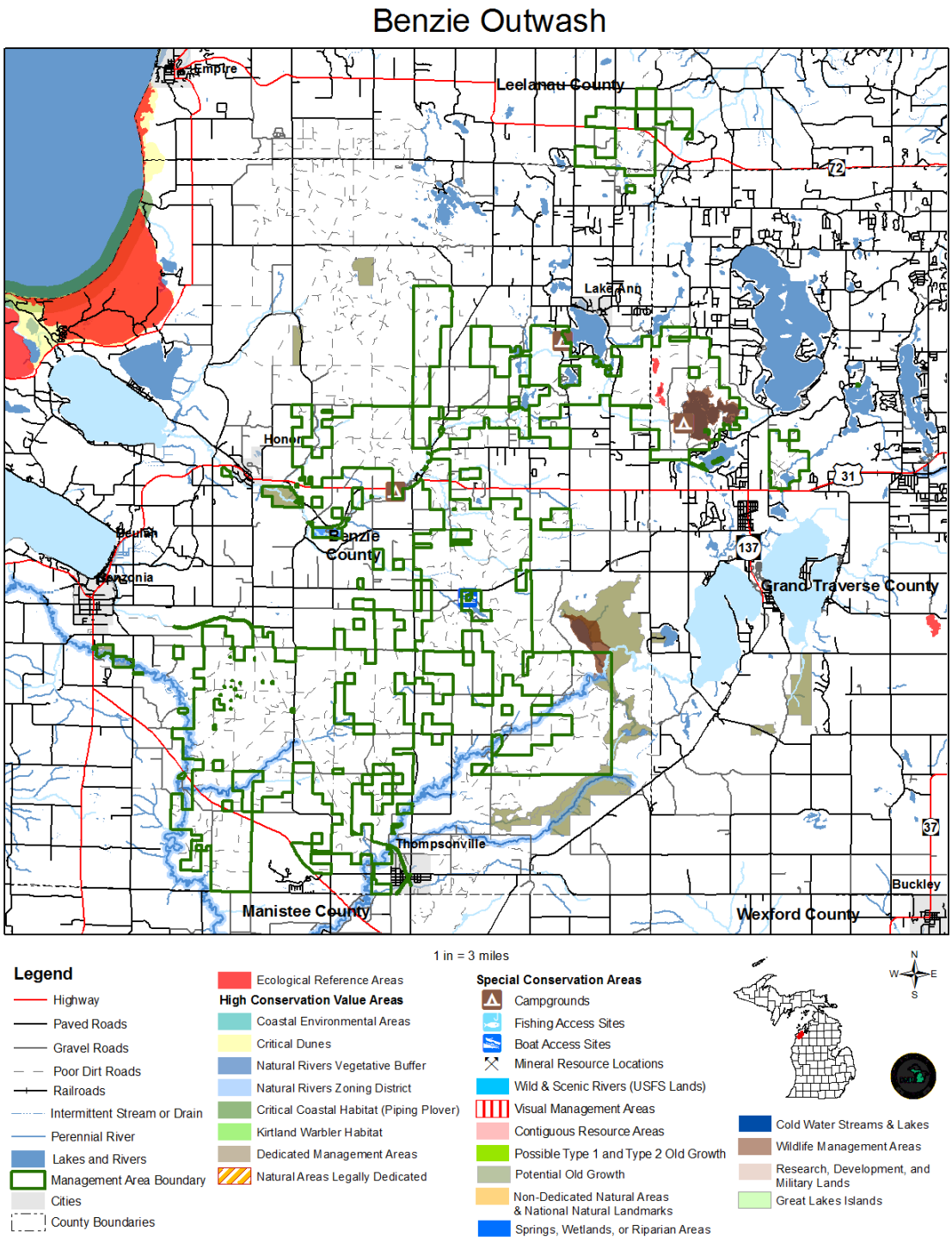

Figure 4.20.5. A map of the Benzie Outwash management area showing the special resource areas.

4.20.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include emerald ash borer and beech bark disease and management should be adapted as follows:

- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important;
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow; and
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in Table 4.20.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.20.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Benzie Outwash - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	2	13	15	3

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
Glossy Buckthorn *Rhamnus frangula*	2	Japanese Knotweed *Fallopia japonica*	1
-	-	Glossy Buckthorn *Rhamnus frangula*	11
-	-	Phragmites (Common Reed) *Phragmites australis*	1

4.20.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.20.1 and listed in Appendix F.

4.20.6 Fire Management

Northern hardwoods which have historically been a major component of this management area are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may

not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.
The following fire management concepts should be considered in the management area:

- Where feasible, seek opportunities to use fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Where feasible, seek opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.20.7 Public Access and Recreation

Access for management and/or recreation is generally very good throughout this management area as there is very little lowland and a well-developed road/trail system which includes snowmobile and other recreational trails. In accordance with the department's *Sustainable Soil and Water Quality Practices of Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Specific hunting recreation improvements such as parking lots, gates, trail planting and trail establishment, as well as the preparation and dissemination of specific promotional material, may be made as a result of Grouse Enhanced Management Systems areas planning in this management area.

This management area is located within close proximity to Traverse City area, which is known for its affinity to promote and participate in an active outdoor lifestyle. Recreational opportunities in this management area vary greatly to accommodate the public's thirst for enjoying state lands. Rustic camping opportunities, along with boating access sites can be found at Lake Ann, Lake Dubonnet, Veteran's Memorial, Platte River and Grass Lake state forest campgrounds (Figure 4.20.5). Equestrian-based users can use Lake Dubonnet trail camp before journeying onward via the Shore-to-Shore Trail (Figure 4.20.1). Water sport enthusiasts can use numerous boating access sites that provide both inland lake and river access. Snowmobiling opportunities are numerous, winding through various forest cover types within the management area (Figure 4.20.1). For the non-motorized users, trails are numerous including the Lake Ann, Lost Lake and Platte Springs pathways (Figure 4.20.1). A portion of the heavily used Betsie Valley rail trail dissects this management area offering a unique opportunity to hike, bike and in the winter snowmobile through northern Michigan forests. Current and projected future recreation opportunities will continue to be an important component of this management area. Recreation facilities within this management area are shown below:

Campgrounds
- Lake Ann State Forest Campground
- Lake Dubonnet Trail Camp
- Lake Dubonnet State Forest Campground
- Veteran's Memorial State Forest Campground
- Platte River State Forest Campground
- Grass Lake State Forest Campground

Boating Access Sites (BSAs)
- Lake Ann BAS
- Lake Dubonnet BAS
- Veteran's Memorial BAS
- Platte River BAS
- Grass Lake BAS
- Turtle Lake BAS
- Ellis Lake BAS

Off-Road Vehicle Trails—N/A

Snowmobile Trails
- Various

Non-Motorized Trails

- Shore-To-Shore Trail
- Lake Ann Pathway
- Lost Lake Pathway
- Betsie Valley Trail
- Platte Springs Pathway
- Betsie River Trail

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and Guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40 5.2.41 and 5.2.42, and the Department of Natural Resources Within Stand Retention Guidance.

4.20.8 Oil, Gas and Mineral Development

Surface sediments consist of an end moraine of coarse-textured till, coarse-textured till, glacial outwash sand and gravel and postglacial alluvium, and lacustrine (lake) sand and gravel. The glacial drift thickness varies between 400 and 800 feet. Sand and gravel pits are located in this management area and there is potential for additional pits.

The Devonian Ellsworth and Antrim Shales sub-crop below the glacial drift. The Antrim is quarried for cement products elsewhere in the state.

The southern part of Benzie County lands has been developed for gas from the Antrim Shale and oil and gas production from the Guelph (former Niagaran) reefs. Well spacing for both formations is currently 80 acres and most of the area of Antrim and Guelph production is still under lease. Some of the Grand Traverse County lands are leased, probably for the Antrim Shale. The Collingwood Formation does not appear to have potential in this management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.21 MA 21 – Boardman Plains Management Area

Summary of Use and Management

Vegetation management in the Boardman Plains management area (MA) (Figure 4.1) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique character including the Boardman River (a designated natural river) and the Sand Lakes Quiet area (a designated high conservation value area), threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management objectives for this 10-year planning period include improving the age-class structure of aspen; increasing regeneration of oak; working toward balancing the red pine age-class structure; continuing emphasis on managing the northern hardwood resource for stand quality, age, and species diversity; wildlife values; and continued production of wood products. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation opportunity. Expected trends within this 10-year planning period are: increased recreational pressure, especially on the Muncie Lakes pathway, North Country and other established trails; increased oil and gas development; an increased wildland/urban interface; a need to restore oak/pine barrens communities; invasive plant control; and the conversion of poor oaks sites to mixed pine/oak sites.

Introduction

This management area is located just east of Traverse City, Michigan in Grand Traverse and Kalkaska Counties and contains 71,296 acres of state forest (Figure 4.21.1). The primary attributes which identify the Boardman Plains management area include:

- The glacial outwash plain landform (96% of the management area).
- A history of large fires which resulted in the cover types of oak, red pine, jack pine with pockets of aspen and upland hardwoods.
- Proximity of this management area to Traverse City, Kalkaska and other population areas and contribution of forest resources to the social and economic values to the area.
- Location within the Grayling Outwash Plain sub-region of the northern Lower Peninsula.
- Location of the approximately 3,000 acre Sand Lakes Quiet Area in the management area, which is a dedicated management area and high conservation value area.
- Location of the Boardman River and its tributaries in the management area, which is a designated natural river.
- Location of portions of the North Country Trail, Vasa cross country ski trail and single track bike trail, Muncie Lakes Pathway, Michigan Coast-to-Coast Cycle Trail, snowmobile trails and Shore-to-Shore Horse Trail in the management area.
- Location of two northern fen environmental reference areas (Root Lake and Sand Lake) and two oak pine barren ecological reference areas (North and South Carpenter Creek) in the management area.
- Numerous active and abandoned oil or gas wells associated with the Niagaran and Antrim Shale formations and future oil/gas storage facilities which may be located here.
- Survey presence of the following threatened, endangered or special concern species: Kirtland’s warbler, Hill’s thistle, bald eagle, wood turtle, red-shouldered hawk and osprey.

The current predominant cover types and acreages in the management area are shown in Table 4.21.1.

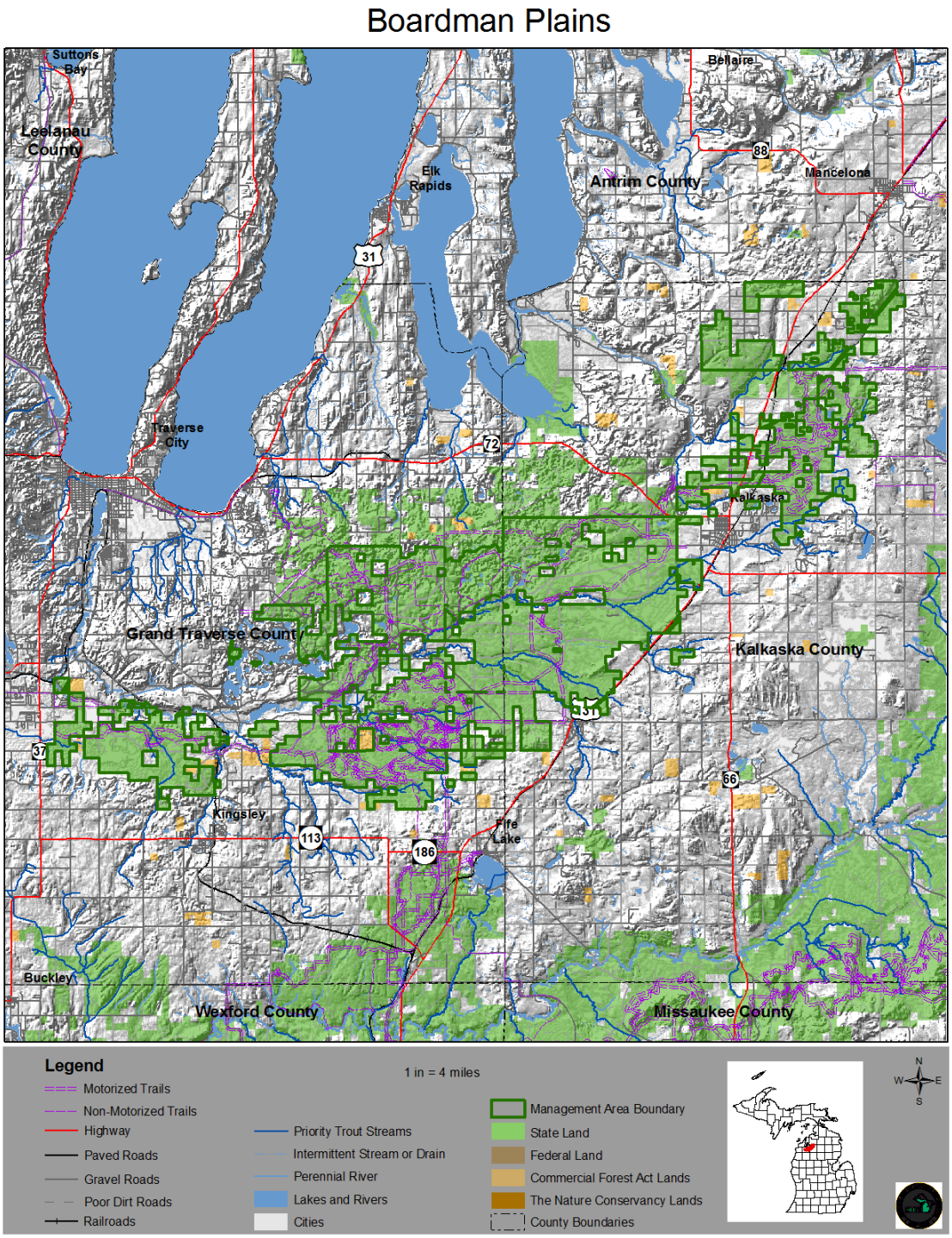

Figure 4.21.1. A map of the Boardman Plains management area (dark green boundary) in relation to surrounding state forest and other lands in Grand Traverse and Kalkaska counties, Michigan.

Table 4.21.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Boardman Plains management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	17%	11,984	666	11,318	2,539		11,984	1,886	
Oak	14%	10,062	2,984	7078	1,474	2,235	10,062	787	2,235
Red Pine	13%	9,438	276	9162	829	3,570	9,438	833	3,685
Northern Hardwood	10%	7,242	180	7062	300	3,270	7,242		2,862
Jack Pine	8%	5,722	223	5499	745		5,722	786	
Natural Mixed Pines	5%	3,349	228	3121		880	3,349	284	880
Mixed Upland Deciduous	5%	3,248	532	2716	1,094	625	3,248	388	1,045
Upland Mixed Forest	4%	2,977	468	2509	627	628	2,977	279	628
White Pine	4%	2,884	8	2876	535	1,100	2,884	262	1,100
Upland Open/Semi-Open Lands	6%	4,614		4614			4,614		
Lowland Open/Semi-Open Lands	3%	2,016		2016			2,016		
Misc Other (Water, Local, Urban)	1%	878		878			878		
Others	10%	6,882	4,366	2516	631	420	6,882	289	420
Total		71,296	9,933	61,363	8,774	12,728	71,296	5,794	12,855

4.21.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives for each of the major and some of the minor cover types within the management area. This information applies to those portions of the forest where active management (e.g., timber harvest, prescribed fire, planting or mowing) will be conducted. While most stands have a variety of trees species and other vegetation, cover types are classified by the species with the dominant canopy coverage. In unmanaged portions of the state forest the natural processes of succession and disturbances will create forest areas that will provide ecological benefits such as habitat, carbon sequestration, oxygen production, improvement of water quality, reduced water runoff, aesthetic qualities and a host of other benefits.

4.21.1.1 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total 11,984 or 17% of the management area (Table 4.21.1). Aspen is distributed throughout the management area including the moraine ridges, moraines and till areas on habitat class PArVHa, PArVVb, and AFO sites (see Appendix E). The age-classes of aspen are fairly well-balanced with a slight trough in the 0-9 and 10-19 year-old age classes (Figure 4.21.2). Data show that 666 acres of aspen have met harvest criteria, but have site conditions that preclude harvest (hard factor limited acres).

There are 1,184 acres of stands that have a regeneration harvest pending and these acres are included in the regeneration prescription class. Aspen is generally managed on a 50-year rotation in this management area to produce pulpwood and occasional sawlogs. The exceptions to this management are priority areas for ruffed grouse habitat (a featured species for this management area) where the emphasis may be placed on shorter rotations which provides more acres in the younger age classes. In some areas, aspen may be of merchantable size at less than 50 years and this may provide an opportunity to harvest stands “early” to restart additional acres which may help to balance the age-class distributions.

Desired Future Condition

- Aspen will be located on suitable sites with acres balanced within the 0-59 year-old age classes; and
- Aspen acres will be maintained on currently operable sites to provide early successional habitat for species viability which will provide recreational opportunities, while also providing a sustainable level of wood fiber.

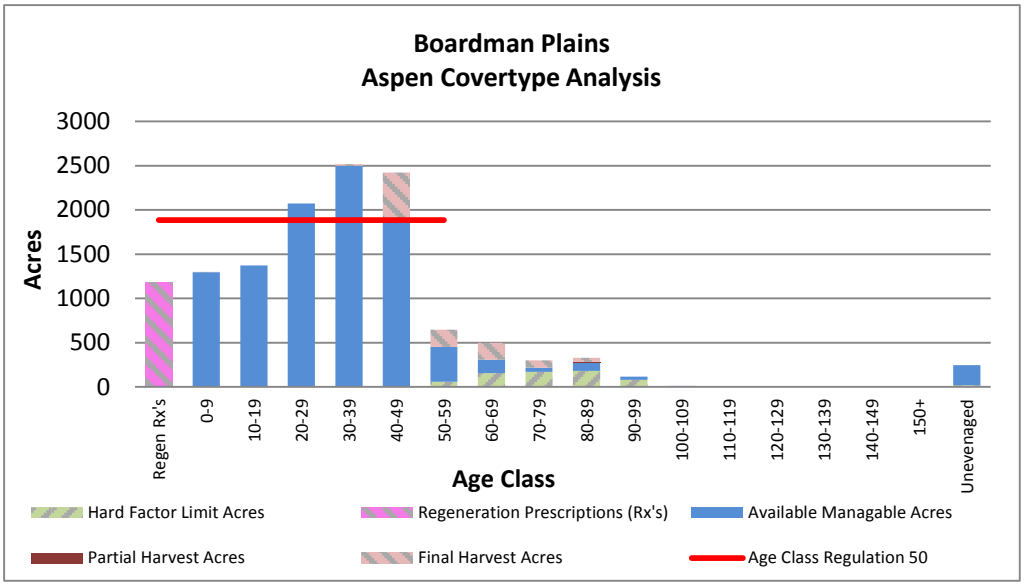

Figure 4.21.2. Age-class distribution for aspen in the Boardman Plains management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected desired future harvest level of 2,539 acres. This level is above the age class regulation level; and
- Where necessary and feasible, consider harvesting stands from other age classes and below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- A desired future harvest level for final harvest is projected at 1,886 acres per 10-year period to balance the aspen age-class distribution.

4.21.1.2 Forest Cover Type Management – Oak

Current Condition

Oak acres total 10,062 or 14% of the management area (Table 4.21.1). The age-class distribution is dominated by stands between the ages of 70-100+ years old (Figure 4.21.3). Oak is located on habitat class PArVVb, AFO and AFOCa sites. Data show that 2,984 acres of oak have met harvest criteria, but have site conditions that preclude harvest (hard factor limited acres). There are 556 acres of stands that have a regeneration harvest pending and these acres are shown in the regeneration prescription class (restart harvest acres). Data show 420 acres with a partial harvest pending and these acres are shown in their current age class.

The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of oak. These acres are included in the regeneration prescription class.

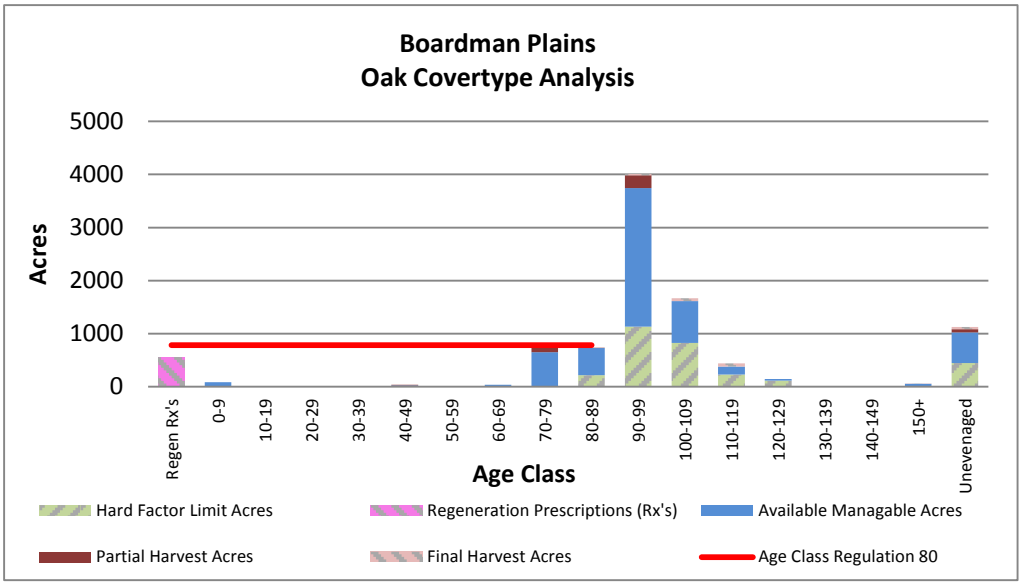

Figure 4.21.3. Age-class distribution for oak in the Boardman Plains management area (2012 Department of Natural Resources inventory data).

Oak is desirable as it provides valuable habitat for many wildlife species, including ruffed grouse, white-tailed deer, black bear and wild turkey, which are featured species in this management area. Oak also provides valuable timber products.

Conditions that existed around the turn of the last century that created the extensive oak stands (large clearcuts that minimized frost pockets, intense fires that minimized competition and a smaller deer population) cannot be replicated. Therefore, the oak resource in this management area is extremely skewed towards the older age classes due to a minimal amount of regeneration for the last 70 years (Figure 4.21.3). The oak in the 90+ age classes is approaching the end of the normal lifespan on outwash plains and is becoming increasingly susceptible to insects and diseases such as oak wilt and oak decline. Older oak also does not sprout as vigorously from stump sprouts.

Due to the advanced age of the oak and the challenges to regenerating oak, management should concentrate on maintaining oak in mixed stands. The current understory of white pine and red maple below oak will be released through partial oak harvests. Where oak is in the understory, such as under jack pine or other pine types, treatments to reduce the pine overstory will release oak. Considerations should also be given to planting pine in oak stands, which can help to shelter young oak from late spring freezes. Oak can be a component of other cover types, but will require management techniques to ensure regeneration.

Desired Future Condition

- Oak will be represented by mixed cover types and as a component in stands throughout the management area through management to provide for timber products, wildlife habitat and recreational opportunities; and
- Some oak sites will be mixed with white pine or red maple.

10-Year Management Objectives

- Conduct final harvests on a projected 1,474 acres;
- Conduct partial harvests on a projected 2,235 acres;
- Consider competition control through methods such as prescribed burning or herbicide use to improve the chances for successful natural regeneration;
- Maintain or expand oak as a component in stands throughout the management area through retention and management to promote natural regeneration in other cover types;
- Consider opportunities to re-establish and maintain oak/pine barrens on poorer quality sites (primarily low-end PArVVb and PVCd). This will provide habitat for species, including wild turkey (a featured species in this management area), that prefer openings; and
- Where site conditions allow, consider introduction of red pine in young oak stands to shelter oak from late spring freezes.

Long-Term Management Objectives

- Continue work towards maintaining oak on the landscape in mixed stands and as a component in other cover types through final harvests at a projected desired future harvest level of 787 acres and 2,235 acres for partial harvests per 10-year period;
- Continue management for mixed oak/pine stands through partial harvests to release understory species into the overstory or planting pine in young oak stands; and
- Future management decisions will need to take into consideration the impact of oak wilt and oak decline as the cumulative impacts will likely increase over time.

4.21.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 9,438 or 13% of the management area (Table 4.21.1) on high-quality moraines on habitat class PArVBB and AFO sites. Red pine timber is a high-value forest commodity which drives continued management of the red pine resource.

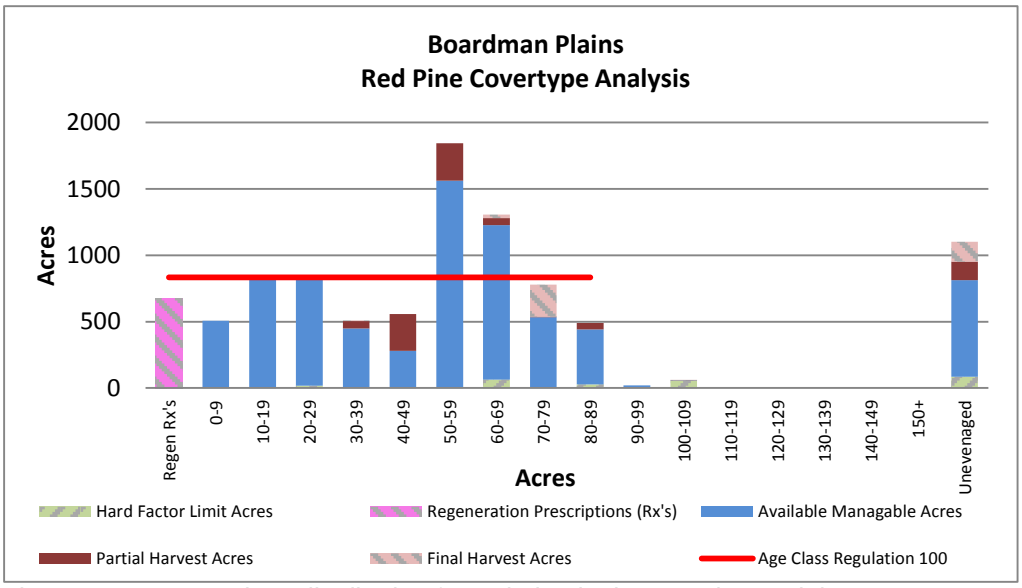

Figure 4.21.4. Age-class distribution for red pine in the Boardman Plains management area (2012 Department of Natural Resources inventory data).

Data show that 276 acres of red pine have met harvest criteria, but have site conditions that preclude harvest (hard factor limited acres). Data show that 679 acres have a regeneration harvest pending and these acres are included in the regeneration prescription class.

There are 867 acres with a partial harvest pending and these acres are included in their current age-class. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of red pine or final harvests and then planting red pine. These acres are included in the 0-9 year-old age class.

Due to the active era of red pine planting during the 1950s and 1960s there are spikes of acres above the rotation regulation in the 50-59 and 60-69 year-old age classes and less than the age-class regulation level in the 0-9, 30-39 and 40-49 year age classes. Most operable acres are currently being thinned to increase the volume and value for future harvests.

Desired Future Condition

- Red pine of either natural origin or in planted stands will be located on suitable sites with acres balanced between 0 and 109 years of age to provide a sustainable harvest of forest products.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and managing toward a balanced age-class distribution;
- Consider site suitability when deciding where to plant red pine;
- Conduct partial harvests (thinning) on a projected 3,570 acres, concentrating on stands of better-quality red pine that have the potential for a higher product value in larger size classes; and
- Conduct final harvests on a projected 829 acres of red pine beginning with the oldest age-classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objective

- In identified special conservation areas, especially those with natural red pine on dry-mesic sites, consider management of red pine to a biological rotation of 200+ years;
- Continue management of red pine through partial harvests of the younger age classes at a projected desired future harvest level of 833 acres per 10-year period and final harvests at a projected desired future harvest level of 3,685 acres per 10-year period; and
- Where necessary and feasible, future planning may need to consider harvesting additional acres to expedite the balancing of age-class distributions.

4.21.1.4 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwoods total 7,242 acres or 10% of the management area (Table 4.21.1) on habitat class PArVVb, AFO and AFOCa sites. Since northern hardwood stands have trees of varying ages and stand density, basal area is a more appropriate measure of stand condition. It should be noted that red oak is a frequent and valuable component of northern hardwood stands in this management area and has good growth potential. Data show that 180 acres of northern hardwoods (Figure 4.21.5) have met harvest criteria, but have site conditions that preclude harvest (hard factor limited acres). Data show 1,799 acres with a partial harvest pending and these acres are included in their current age class.

Northern hardwoods in the management area may vary from higher quality sites capable of producing quality hardwood sawlogs to poor quality sites that contain a mix of less valuable timber species. Poorer sites are estimated by field staff to be approximately 30% of the overall treatable acres and the form and quality of the trees may result in lower quality products due to multiple stems or poorer quality stems that are not capable of producing quality sawlogs. This will dictate whether stands are treated through selective or partial harvests to produce quality sawlogs or through final harvests to improve the future stem quality. Final harvests may occasionally release aspen which may out-compete the hardwoods resulting in a conversion to aspen.

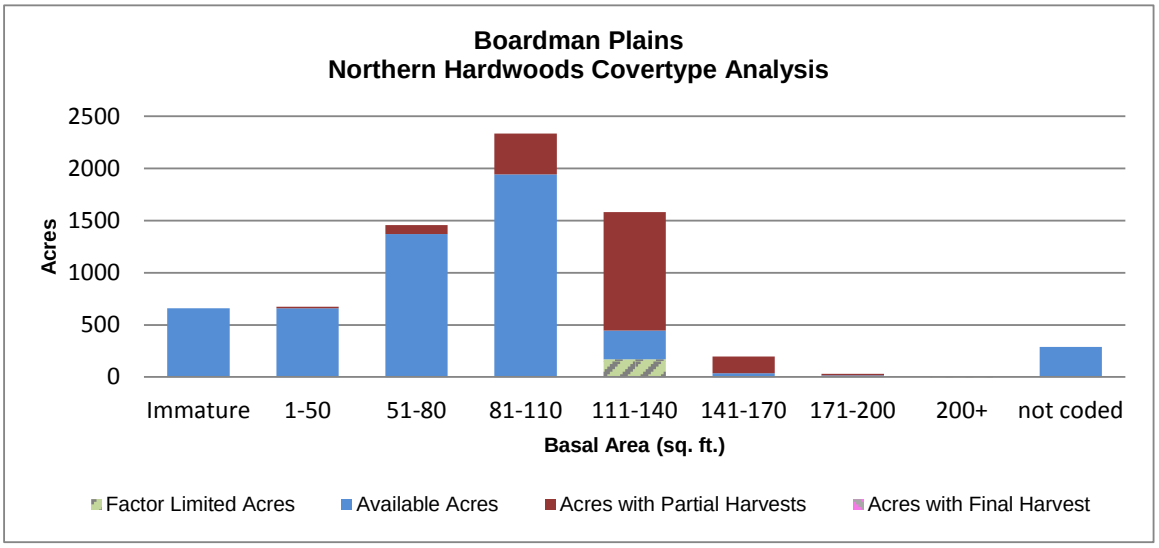

Figure 4.21.5. Basal area distribution for northern hardwoods in the Boardman Plains management area (2012 Department of Natural Resources inventory data).

The ash and American beech components of northern hardwoods are susceptible to emerald ash borer and beech bark disease and as such, it may be desirable to salvage these species to capture the timber value. This salvage may result in lower than normal residual basal area in some northern hardwood stands.

Desired Future Condition

- Northern hardwoods will be located on suitable sites and will produce a sustainable yield of forest products along with wildlife habitat which will provide recreational opportunities; and
- Where feasible, stands will be in relatively large contiguous patches of all–aged, compositionally diverse forest which contain coarse woody debris, scattered large trees and scattered snags. These stand conditions will be of benefit to numerous wildlife species including pileated woodpecker, a featured species for this management area.

10-Year Management Objectives

- Conduct partial harvests on a projected 2,544 acres of northern hardwood with a basal area of 111 square feet per acre or greater;
- Conduct final harvests on a projected 300 acres of poorer quality northern hardwood;
- Where necessary (especially for ash and beech salvage) and feasible, consider harvesting stands from lower basal area stands to expedite the balancing of basal area distributions;
- Where present, retain healthy oak for mast production and white pine and hemlock for within stand diversity and thermal cover for wildlife;
- Continue to conduct salvage harvests of beech and ash affected by beech bark disease and emerald ash borer using the appropriate management guidelines; and
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands.

Long-Term Management Objectives

- Management of northern hardwoods will continue with individual tree selection harvests (partial harvests) at a projected desired future harvest level of 2,862 acres per 10-year period. This will help to develop an uneven-aged stand structure;
- Consider the need to delay further selection harvesting due to resultant lower-than-normal residual basal area in post-salvage harvest stands;
- Consider the need to continue final harvests on poor or low quality sites to improve future timber quality; and
- It is acceptable that a small number of lower quality hardwood acres may convert to aspen due to harvest activities.

4.21.1.5 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 5,722 or 8% of the management area (Table 4.21.1) on habitat class PArVHa sites. Age classes are well distributed in the 0-69 age-classes, with a slight spike in the 0-9 year-old age class (Figure 4.21.6). Data shows that 223 acres of jack pine have met harvest criteria, but, have site conditions that preclude harvest (hard factor limited acres). There are 431 acres of stands that have a regeneration harvest pending and these acres are included in the 0-9 year-old age class. Data show that 139 acres have a regeneration harvest pending and these acres are included in the regeneration prescription class. Some jack pine-dominated stands may provide incidental habitat for the Kirtland's warbler through natural jack pine reproduction.

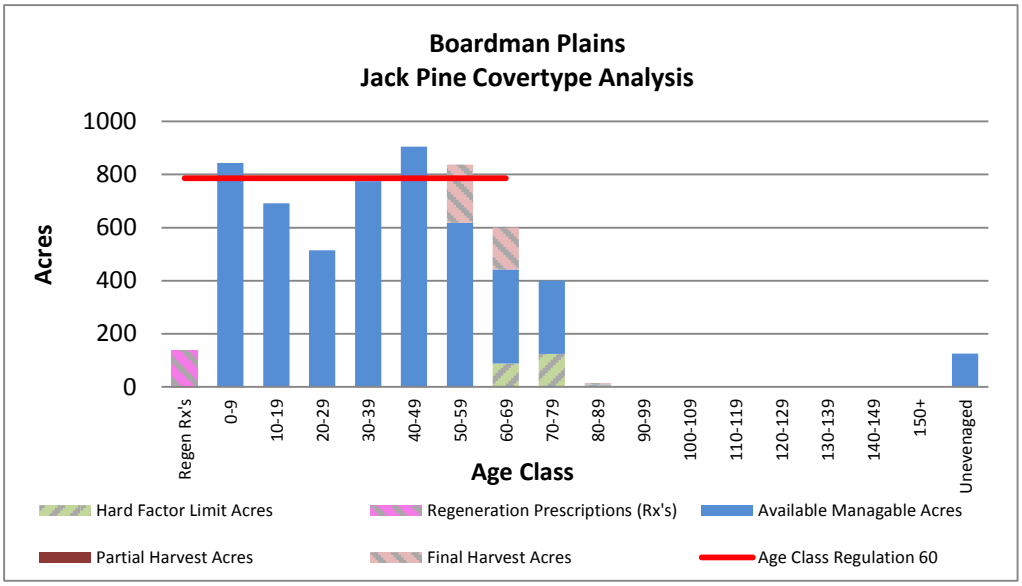

Figure 4.21.6. Age-class distribution for jack pine in the Boardman Plains management area (2012 Department of Natural Resources inventory data).

However, jack pine areas in this management area are not part of essential habitat for Kirtland's warbler. Jack pine is managed for timber products with the objective of balancing the age-class distribution and managing jack pine on suitable sites. Jack pine budworm outbreaks may result in increased mortality in older age classes and work continues to reduce the number of acres in the older age classes.

Desired Future Condition

- Jack pine will have balanced age classes between 0 and 69 years of age to provide a sustainable timber production and wildlife habitat which will provide recreational opportunities.

10-Year Management Objectives

- Conduct final harvests on a projected 745 acres concentrating on stands older than 60 years to reduce the risk of jack pine budworm in older age classes.

Long-Term Management Objectives

- Continue to manage jack pine for a balanced age-class distribution at a projected desired future harvest level of 786 acres per 10-year period to produce a sustainable timber supply and wildlife habitat which will provide recreational opportunities;
- Where necessary and feasible, future planning may need to consider harvesting additional acres above the rotation regulation level from younger age classes to expedite the balancing of age-class distributions;
- Some jack pine dominated stands have a component of red pine that is much better quality and form than the jack pine. These stands may be converted to a mixed stand with a red pine component (through planting) and natural oak/red maple/aspen; and
- Some deteriorating jack pine stands have a considerable oak understory which may be promoted as managerially desirable.

4.21.1.6 Forest Cover Type Management – White Pine

Current Condition

White pine acres total 2,884 or 4% of the management area (Table 4.21.1). Age classes are well distributed in the 0-69 age-classes, with a slight spike in the 0-9 year-old age class (Figure 4.21.6). Data shows that 8 acres of white pine have met harvest criteria, but, have site conditions that preclude harvest (hard factor limited acres).

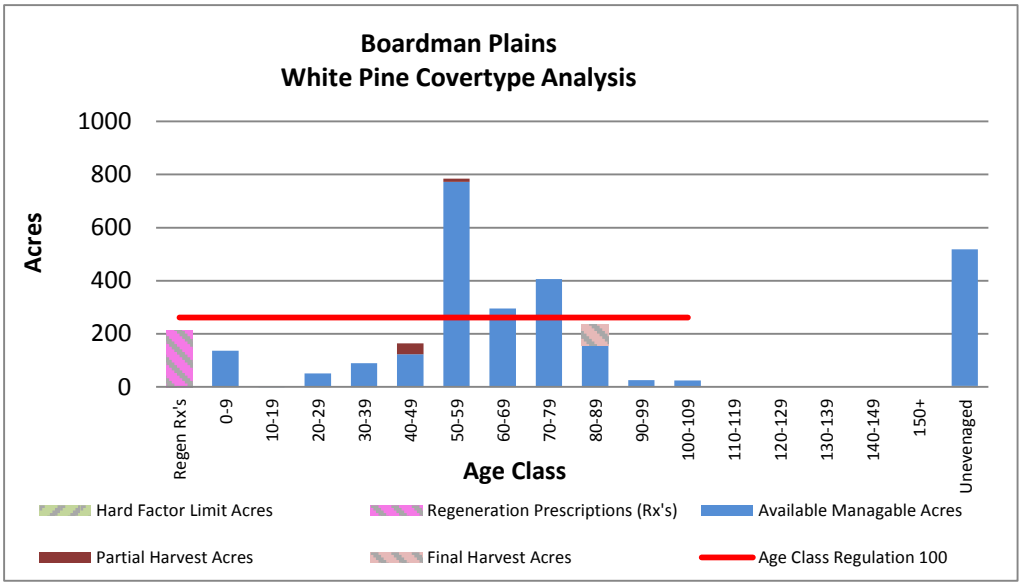

Figure 4.21.7. Age-class distribution for white pine in the Boardman Plains management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- White pine will have balanced age classes between 0 and 109 years of age to provide a sustainable timber production and wildlife habitat which will provide recreational opportunities.

10-Year Management Objectives

- Conduct final harvests on a projected 535 acres concentrating on older stands; and
- Conduct partial harvests on a projected 1,100 acres.

Long-Term Management Objectives

- Continue to manage white pine for a balanced age-class distribution at a projected desired future final harvest level of 262 acres and partial harvest of 1,100 acres over 10 years to produce a sustainable timber supply and wildlife habitat which will provide recreational opportunities; and
- Where necessary and feasible, future planning may need to consider harvesting additional acres above the rotation regulation level from younger age classes to expedite the balancing of age-class distributions.

4.21.1.7 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 4,614 acres or 5% of the management area (Table 4.21.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural fire, frost or other disturbances which created openings in the forest canopy and intentional opening maintenance through prescribed fire or removal of trees that have encroached in openings. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife including wild turkey, a featured species for this management area.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Where feasible and necessary, conduct management to maintain upland open/semi-open lands;
- Conduct management activities that favor mast-producing shrubs (such as blueberry, juneberry, cherry, and hawthorn) for black bear, turkey and ruffed grouse; and
- Manage for warm season bunch grasses, row crops and drill planted forages were possible for wild turkey brood rearing habitat.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Where feasible and necessary, use control methods on invasive non-native species; and
- Consider opportunities to manage historic barrens/savannah areas through use of prescribed fire and timber harvests.

4.21.1.8 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 2,016 acres or 3% of the management area (Table 4.21.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.21.1.9 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: natural mixed pines, 3,339 acres (5% of the management area), mixed upland deciduous 3,248 acres (5%) and upland mixed forest, 2,977 acres (4%) (see Table 4.21.1). Also included but not shown in Table 4.21.1 are even smaller acreages of other cover types including non-forested types, 6,882 acres (10%), lowland conifer, 1,570 acres (2%), planted mixed pines, 1,282 acres (2%), lowland deciduous, 1,201 acres (2%), lowland mixed forest, 482 acres (1%), lowland aspen/balsam poplar, 363 acres (1%) and other scattered acres of upland conifers, upland spruce/fir, tamarack, hemlock, lowland spruce/fir and paper birch. All of these timbered and non-timbered cover types have important ecological values and are important habitat for numerous species. Some of these types are managed through partial or final harvests to provide forest products.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape while providing forest products and habitat for wildlife.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct final harvests on a projected 35 acres of lowland conifer and 40 acres of lowland deciduous stands. Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry;
- Consider methods to ensure adequate regeneration of lowland types;
- Conduct final harvests on a projected 1,094 acres of mixed upland deciduous, 627 acres of upland mixed forest, 431 acres of planted mixed pines, 28 acres of lowland aspen/balsam poplar 38 acres of upland conifers and 59 acres of upland spruce/fir; and
- Conduct partial harvests on a projected 880 acres of natural mixed pines, 625 acres of mixed upland deciduous, 368 acres of planted mixed pines, 47 acres of upland conifers and 628 acres of upland mixed forest.

Long-Term Management Objectives

- Continue management to regenerate lowland types; and
- Continue management of lowland types at a projected desired harvest level of 35 acres of lowland conifer and 40 acres of lowland deciduous stands per 10-year period to provide a sustainable yield of forest products and wildlife habitat.

4.21.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest management.

The following have been identified as featured species for this management area during this 10-year planning cycle:

- Black bear
- Pileated woodpecker
- Ruffed grouse
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Boardman Plains management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest and large open grassland complexes, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year-old), even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every 10 years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak, and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.

- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.21.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed seven listed species and four natural communities of note occurring in the management area as listed in Table 4.21.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

The Boardman River and its tributaries have been identified as a natural river and along with its corridor are also designated as a high conservation value area as shown in Figure 4.21.7. Another high conservation value area is the Sand Lake Quiet Area, a 2775 acre area set aside as a non-motorized recreation area (Figure 4.21.7).

There are three ecological reference areas identified for the Boardman Plains management area as shown if Figure 4.21.7. Two ecological reference areas represent the northern fen natural community type and are 0.07 acres (only partially on state forest land) and 47.05 acres in size. The third ecological reference area represents the oak-pine barrens natural community type and is 306.63 acres. These ecological reference areas will be managed to enhance and protect their natural vegetative and associated wildlife communities as directed by an ecological reference area-specific management plan. These individual management plans will be developed over the life of this planning period.

Table 4.21.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Boardman Plains management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Dry-mesic northern forest		S3/G4	Confirmed				White Pine	Late
Northern fen		S3/G3	Confirmed				Lowland open/semi-open	N/A
Oak-Pine barrens		S2/G3	Confirmed				Oak	Mid
Rich conifer swamp		S3/G4	Confirmed				Tamarack	Late
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Kirtland's warbler	*Dendroica kirtlandii*	LE/E/G1/S1	Confirmed	PS	Very High	Pine barrens	Jack Pine	Early
						Dry northern forest	Jack Pine, Red Pine	Early
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Osprey	*Pandion haliaetus*	SC/G5/S2-3	Confirmed	PS	Low	Coastal fen	Lowland open/semi-open	N/A
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland Mixed	Mid
						Hardwood-conifer swamp	Lowland Mixed	Mid
Butterfly								
Dusted skipper	*Atrytonopsis hianna*	Sc/G4G5/S2S3	Confirmed	MV	Low	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Plant								
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

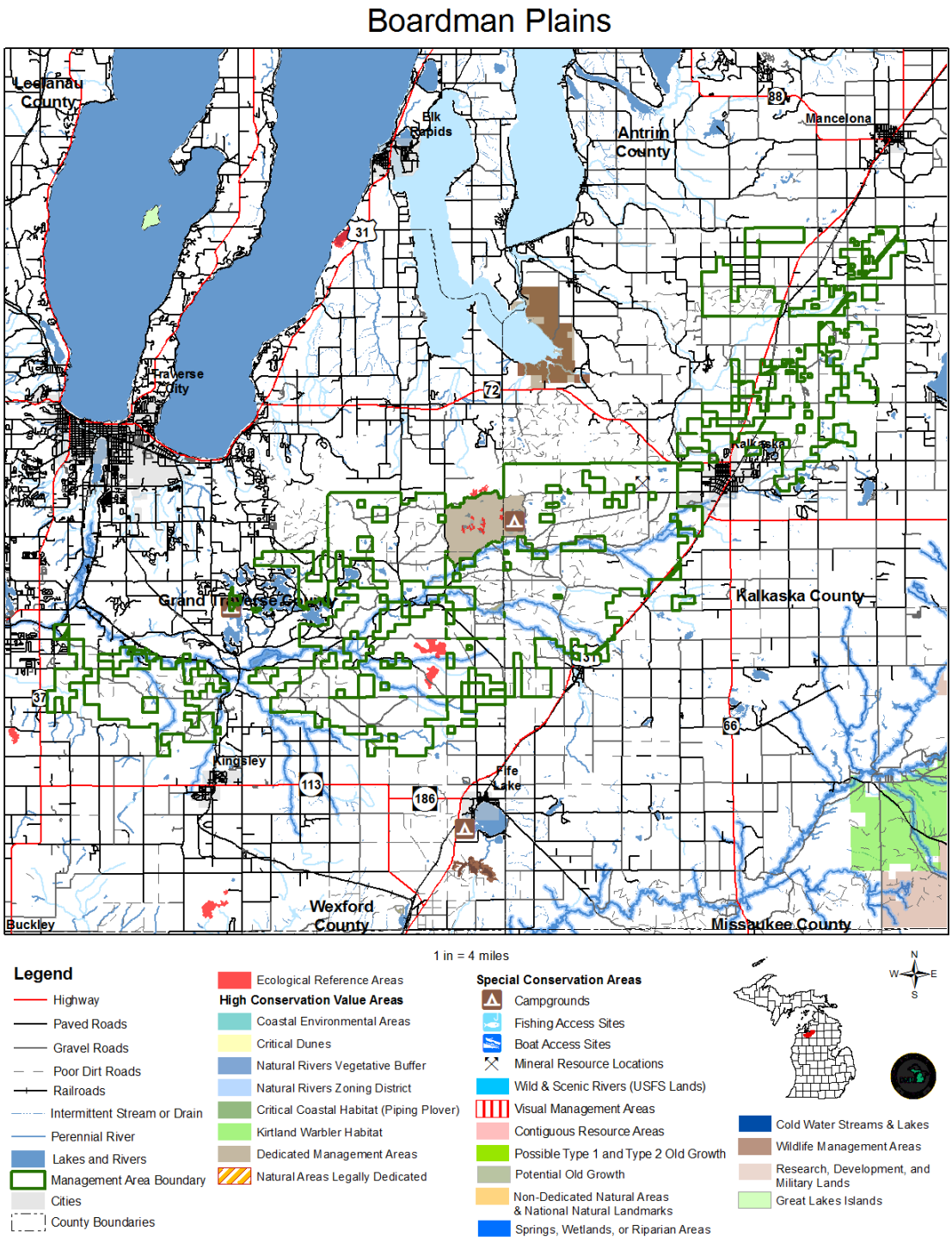

Figure 4.21.7 A map of the Boardman Plains management area showing the special resource areas.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

4.21.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Oak wilt and oak decline are both important forest health issues in this management area and management should be adapted as follows:

- Oak wilt is prevalent in this area. Epicenters need to be identified and treated. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced;
- Other management activities that can lead to damage of residual red oak trees (oil and gas development, recreational trail improvement, etc.) should be not be conducted during this high-risk period; and
- Oak decline is most prevalent on frost- prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce the risk of decline.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.21.3. This information was compiled from the Midwest Invasive Species Information Network database, but, it should not be considered complete. This information and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.21.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Boardman Plains - FRD MA	Cases within FRD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	1	10	11	2

Invasive Species within FRD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
Phragmites (Common Reed) *Phragmites australis*	1	Japanese Knotweed *Fallopia japonica*	1
-	-	Phragmites (Common Reed) *Phragmites australis*	9

4.21. 5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.21.1 and listed in Appendix F.

4.21.6 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen and grass/upland brush types. Wildfire risk and fuel loading is increased in young dense conifer plantations and mature jack pine affected by jack pine budworm.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts will be applied in the management area:

- Consider opportunities to re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Consider opportunities to incorporate fire as a tool to achieve silvicultural objectives and to restore or maintain managed openings and oak/pine barrens; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression and prescribed fire implementation.

4.21.7 Public Access and Recreation

Access for management and/or recreation is generally very good throughout this management area as there is very little lowland and a well-developed road/trail system which includes the Vasa single-track and Vasa ski trails. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

The Boardman Plains management area located between Traverse City (the most populated city in the northern Lower Peninsula) and Kalkaska is heavily used by residents and visitors due to the abundance of outdoor recreational opportunities. Camping opportunities along with boating access sites can be found at Guernsey Lake and Scheck's Place campgrounds (Figure 4.20.7). There are two trail camps for equestrians at Scheck's Place Trail Camp and Rapid River Trail Camp which link to the Shore-to-Shore equestrian trail (Figure 4.20.1). The Forks access site located on the Boardman River provide access on this natural river. Off-road vehicle users have numerous opportunities to ride trails designed for all types of off-road vehicles from single track motorcycles to full size jeep-type vehicles (Figure 4.20.1). These trails include the Grand Traverse Cycle Trail, Grand Traverse to Leetsville Michigan Cycle Conservation Club Trail, Leetsville Trail and the Leetsville to Kalkaska Michigan Cycle Conservation Club Trail. Snowmobiling opportunities are numerous, winding through the forests in this management area (Figure 4.20.1). For those users that prefer a quiet hiking and skiing experience, the Sand Lakes Quiet Area trail system provides a unique 3,000-acre tract of state land void of engine noise (Figures 4.20.1 and 4.20.7). The popular Vasa cross country ski trail, which recently held the prestigious National Masters Championship race, (with participants from all over the country) can be found in this management area. A section of the North Country Trail, which is America's longest national scenic trail, transects this management area and additional hiking experiences include the Muncie Lakes Pathway and the Shore-to-Shore Trail.

The opportunity to participate in these recreational activities on the nearby state forest land is one of the reasons that the population in areas near the management area is expected to continue to increase. This will result in an increased demand for outdoor recreation opportunities. Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the

public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.21.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium and minor end moraine of coarse-textured till. The glacial drift thickness varies between 200 and 600 feet. Sand and gravel pits are located in this management area and there is potential for additional pits.

The Mississippian Coldwater and Sunbury Shales and Devonian Berea Sandstone, and Bedford, Ellsworth and Antrim Shales sub-crop below the glacial drift. The Antrim is quarried for cement products elsewhere in the state.

Most of these lands have been developed for oil and gas production from the Guelph (former Niagaran) reefs. Well spacing is currently 80 acres and most of the area of production is still under lease. The Collingwood Formation has potential in this management area and some lands have been leased for that exploration. Well spacing will probably be either 320-640 acres or possibly larger units. If exploration is successful for the Collingwood Formation, additional lands will be leased and drilling could expand, potentially using existing well pads and facilities.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615 of 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended), habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance, unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. Areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Forest operations (including harvest and planting trees, prescribed fire and wildfire response) in the management area may require modification to accommodate the presence of pre-existing oil and gas pipelines located at or near the ground surface. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.22 MA 22 – Manistee Plains Management Area

Summary of Use and Management

Vegetation management in the Manistee Plains management area (MA) (Figure 4.22.1) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique character including the Betsie River (a designated natural river), Bear Creek and the Grass Lake Flooding State Wildlife Management Area; threatened, endangered and special concern species; and provide for forest-based recreational uses. The primary attributes and associated uses that influence and drive management in the Manistee Plains management area are wood fiber production, wildlife habitat for existing species and recreational uses. Management activities will emphasize the age, size and species distribution within cover types. Expected trends within this 10-year planning period are increased recreation pressure and continued management to balance cover type age-class distributions for timber and wildlife habitat.

This management area is located in the northeast portion of Manistee County and the southeast portion of Benzie County northeast of Manistee, Michigan and contains 31,847 acres of state forest (Figure 4.22.1).

Introduction

This management area is located in the northeast portion of Manistee County and southeast corner of Benzie County and contains 31,847 acres of state forest (Figure 4.22.1). The primary attributes which identify the Manistee Plains management area include:

- The lake plain landform (49%) and outwash plain (24%).
- Cover types which are dominated by lowland deciduous, aspen, northern hardwoods and red pine. This management area is almost entirely within the Newaygo Outwash Plain sub-region of the northern Lower Peninsula.
- Dispersed recreation in the form of hunting as well as concentrated recreation on snowmobile trails and at the Healy Lake Campground and Grass Lake Campground are popular in this management area.
- There has been extensive development of oil/gas resources.
- The Betsie River which is a natural river (high conservation value area) and the Little Betsie River run through the management area.
- Bear Creek by agreement is managed as if it were an officially designated natural river.
- A snowmobile trail crosses the management area. Surveys have located the threatened, endangered or special concern species red-shouldered hawk, bald eagle, wood turtle, woodland vole and a several great blue heron colonies.
- The Selma Swamp, a northern hardwood swamp is also located in the management area.

The current predominant cover types, acreages and projected harvest acres in the management area are shown in Table 4.22.1.

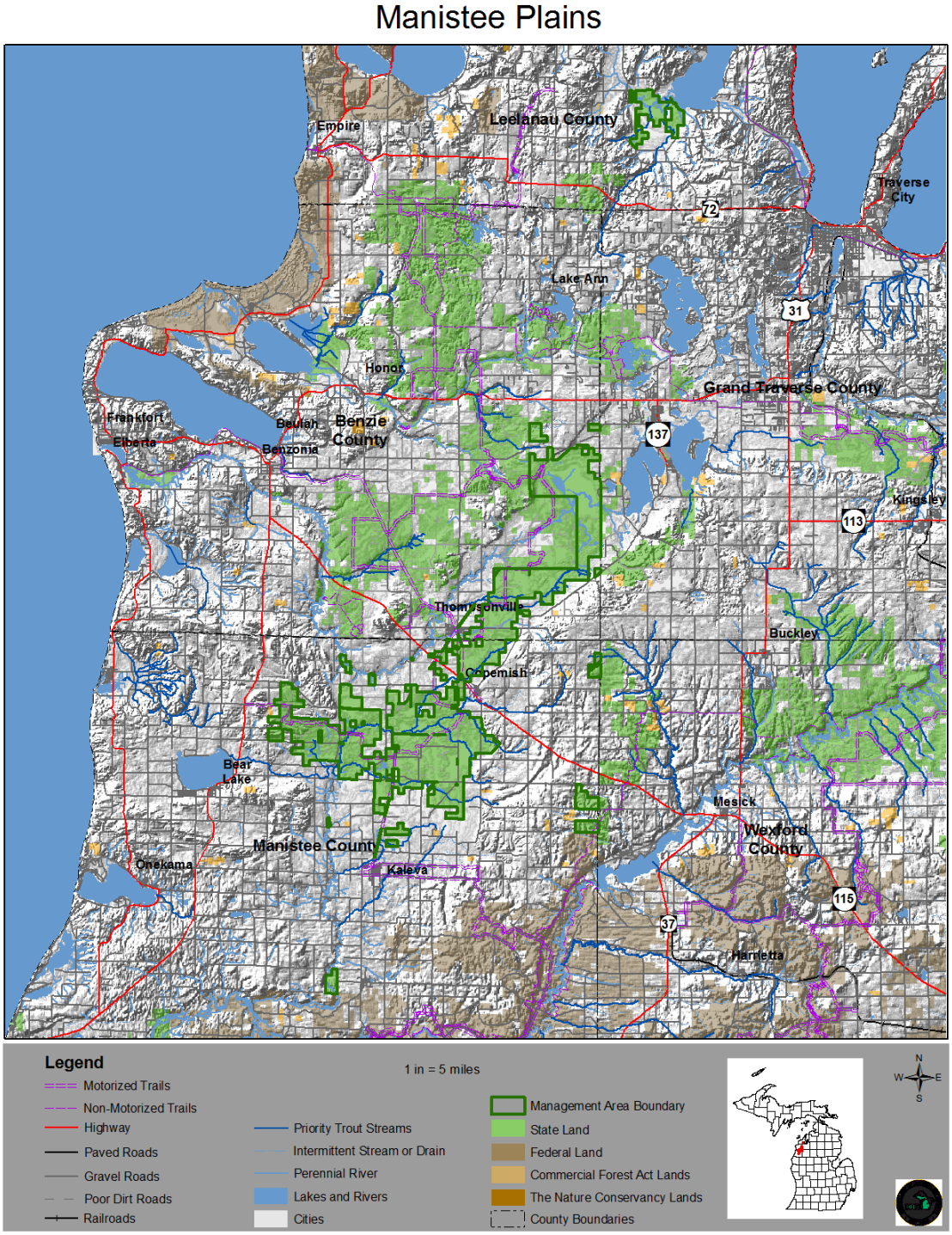

Figure 4.22.1. A map of the Manistee Plains management area (dark green boundary) in relation to surrounding state forest and other lands in Manistee and Benzie Counties, Michigan.

Table 4.22.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Manistee Plains management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Lowland Deciduous	25%	8,059	4,350	3,709	412		8,059	412	
Aspen	20%	6,469	294	6175	1,277		6,469	1,029	
Northern Hardwood	9%	2,753	155	2598	150	1,134	2,753		1,134
Red Pine	8%	2,698	71	2627	544	1,372	2,698	292	1,399
Cedar	6%	1,761	53	1708	107		1,761	107	
Lowland Aspen/Balsam Poplar	5%	1,530	289	1241	640		1,530	207	
White Pine	3%	907	52	855	265	399	907	78	399
Lowland Conifers	3%	851	373	478	53		851	53	
Upland Open/Semi-Open Lands	6%	1,803		1803			1,803		
Lowland Open/Semi-Open Lands	7%	2,365		2365			2,365		
Misc Other (Water, Local, Urban)	2%	648	0	648			648		
Others	6%	2,003	39	1964	490	333	2,003	235	399
Total		31,847	5,676	26,171	3,937	3,238	31,847	2,413	3,331

4.22.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.22.1.1 Forest Cover Type Management – Lowland Deciduous

Current Condition

Lowland deciduous acres total 8,059 or 25% of the management area (Table 4.22.1) and are located on wetland sites. As shown in Figure 4.22.2, most of the acres are in the age-classes above the age of 60. Lowland deciduous stands may be managed as even-aged stands on drier sites. On wetter sites, uneven-aged management is preferred. The residual trees keep the sites from becoming even wetter, resulting in a conversion to marsh.

Tip-overs and windthrow may also be an issue in stands that have been reduced below a residual basal area of 80 square feet per acre. Black ash, red maple and aspen are frequent components of swamp hardwoods (lowland hardwoods) and treatments on more mesic sites may convert lowland deciduous stands to aspen or red maple. It is expected that much of the ash will be affected by emerald ash borer. There are currently over 4,350 acres factor limited that are not available for harvest (hard factor limit acres), often because the sites are too wet or due to other site factors.

Desired Future Condition

- Lowland deciduous stands will be located on suitable sites in a compositionally diverse forest which contains coarse woody debris, scattered large trees and scattered snags; and
- These lowland types will provide a sustainable level of forest products along with wildlife habitat and recreational opportunity.

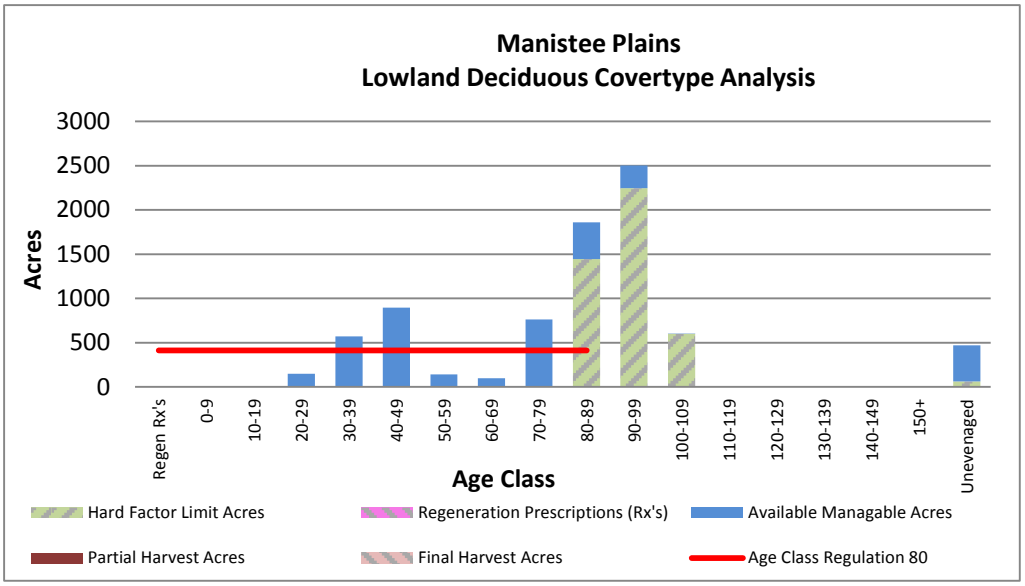

Figure 4.22.2.Age-class distribution for lowland deciduous in the Manistee Plains management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct final harvests on a projected 412 acres.

Long-Term Management Objectives

- Continue to manage lowland deciduous stands for timber products, wildlife habitat and recreational opportunities;
- Lowland deciduous stands will continue to be managed with individual tree selection, group selection or final harvest to produce a sustainable level of forest products and wildlife habitat;
- Consider the impact of emerald ash borer on ash in lowland deciduous stands in management decisions; and
- A desired future harvest level is projected at 412 acres for final harvest per 10-year period.

4.22.1.2 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 6,469 or 20% of the management area (Table 4.22.1). Aspen (most commonly quaking aspen) is distributed throughout the management area. The age-classes of aspen are somewhat imbalanced, with spikes in the 0-9 and 30-39 year-old age classes (Figure 4.22.3). There are 294 acres of aspen that have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 766 acres that have a final harvest pending and these acres are included in the regeneration prescription class.

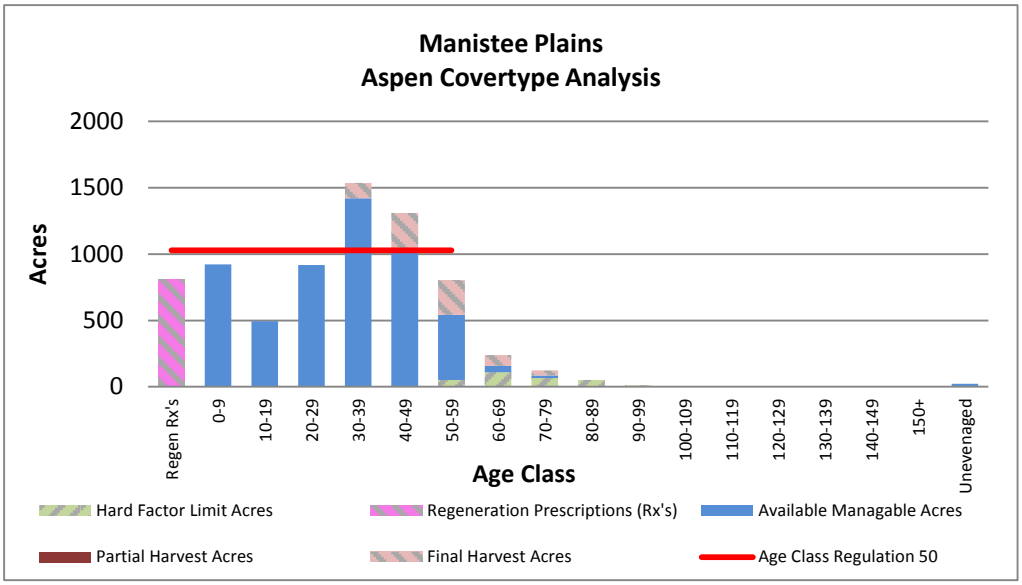

Figure 4.22.3. Age-class distribution for aspen in the Manistee Plains management area (2012 Department of Natural Resources inventory data).

The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of aspen. These acres are included in the 0-9 year-old age-class.

Aspen is generally managed on a 50-year rotation in this management area to produce pole quality timber and occasional sawlogs. The exceptions to this management are priority areas for ruffed grouse and American woodcock habitat (featured species for this management area) where the emphasis may be placed on shorter rotations which provide more acres in the younger age-classes. In some areas, aspen may be of merchantable size at less than 50 years and this may provide an opportunity to harvest stands "early" to restart additional acres which may help to balance the age-class distributions.

Desired Future Condition

- Aspen will be located on suitable sites with acres balanced between 0-59 years of age; and
- Aspen acres will be maintained on currently operable sites to provide early successional habitat for species viability, while also providing a sustainable level of wood fiber.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 1,277 acres.

Long-Term Management Objectives

- Continue management through regeneration harvests at the desired future harvest level of 1,029 acres for final harvest per 10-year period to continue work toward balancing the age-class distribution; and
- Where necessary and feasible, future planning may need to consider harvesting additional acres above the rotation regulation level by harvesting from younger age-classes to expedite the balancing of age-class distributions.

4.22.1.3 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 2,753 acres or 9% of the management area (Table 4.22.1). Since hardwood stands have trees of varying ages, stand density, described as basal area, is a more appropriate measure of stand condition for northern hardwood stands. Nearly half of the northern hardwood acres are in stands with a basal area between 81-110 square feet per acre. There are 155 acres of northern hardwoods have met harvest criteria (Figure 4.22.4) but have site conditions that limit harvest (hard factor limit acres). There are 104 acres with a partial harvest pending and these acres are included in their current basal area range.

Northern hardwoods in the management area may vary from higher quality sites capable of producing quality hardwood sawlogs to poor-quality sites that contain a mix of less valuable timber species.

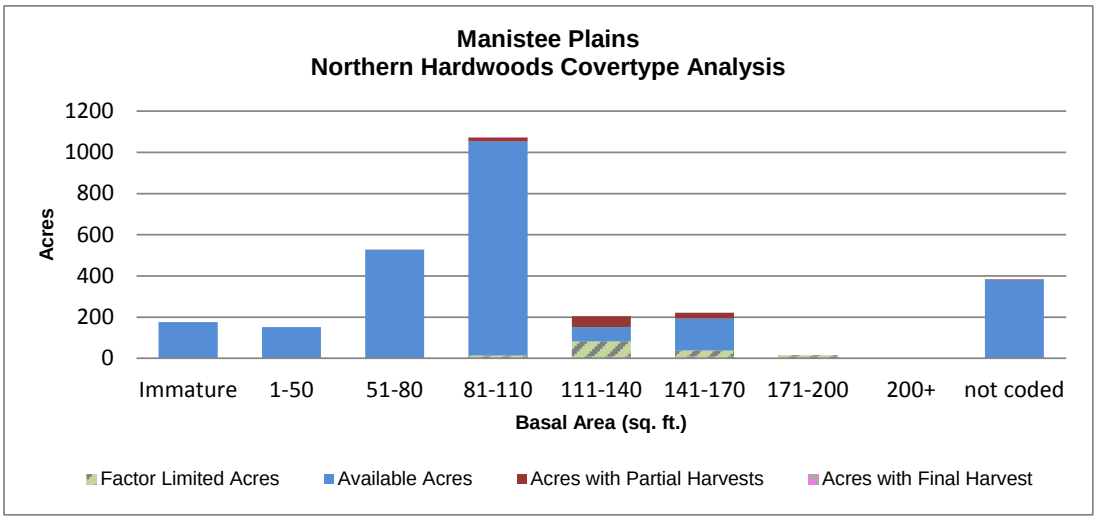

Figure 4.22.4. Basal area distribution for northern hardwoods in the Manistee Plains management area (2012 Department of Natural Resources inventory data).

On the poor-quality sites, the form and quality of the trees may result in lower value products due to multiple stems or poorer quality stems that are not capable of producing quality sawlogs. This will dictate whether stands are treated through selective or partial harvests to produce quality sawlogs or through restarting harvests to improve the future stem quality. Restarting harvests may occasionally release aspen which may out-compete the hardwoods resulting in a conversion to aspen.

Desired Future Condition

- Northern hardwood stands will be maintained and managed through selection harvests on better quality hardwood sites and through regeneration harvests on poorer quality hardwood sites to provide a sustainable timber supply, wildlife habitat and recreational opportunity; and
- Where feasible, stands will be in relatively large contiguous patches of uneven-aged, compositionally diverse forest which contain coarse woody debris, scattered large trees and scattered snags. This will be of benefit to a wide range of wildlife species, including pileated woodpecker, a featured species in this management area.

10-Year Management Objectives

- On better quality hardwood sites a projected 1,134 acres will be harvested through selection harvests to produce uneven-aged stands;
- Where necessary and feasible, consider harvesting stands from the lower basal area range to expedite the balancing of basal area distributions; and
- Where present, favor red oak for mast and hemlock and white pine for within-stand diversity.

Long-Term Management Objectives

- Where present, continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer, in northern hardwood stands, using Beech Bark Disease Guidelines and Emerald Ash Borer Guidelines;
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands;
- Continue to manage for stands with an uneven-age class on better quality hardwood sites at a projected desired future harvest level of 1,134 acres for partial harvest per 10-year period; and
- Consider continued management of poorer quality sites through regeneration harvests.

4.22.1.4 Forest Cover Type Management – Red Pine

Current Condition

Red pine is mostly planted, of generally high-quality and consists of a total of 2,698 acres (8%) on high quality moraines (Table 4.22.1). Red pine timber is a high-value forest commodity which drives continued management of the red pine resource. There is a pronounced spike in the 50-59 year-old age classes (Figure 4.22.5) which represents an era of active planting. There are 88 acres that have a final harvest pending and these acres are included in the regeneration prescription class.

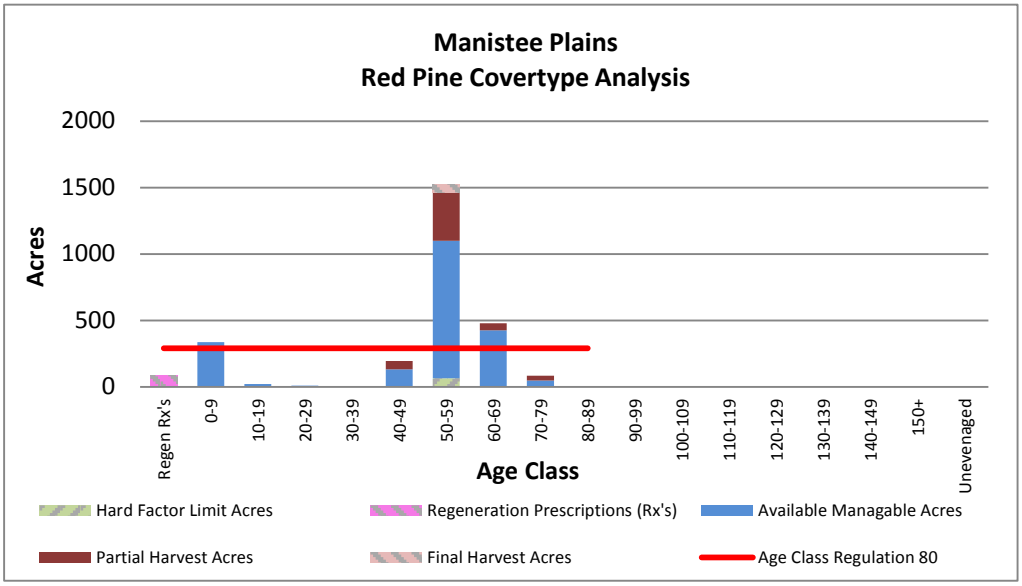

Figure 4.22.5. Age-class distribution for red pine in the Manistee Plains management area (2012 Department of Natural Resources inventory data).

There are approximately 507 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to the cover type as a result of final harvests and planting of red pine. These acres are included in the 0-9 year-old age class.

The acres in the 50-59 year-old age class are being thinned to increase growth on the remaining trees to achieve a more valuable product. There is a slight surplus of acres in the 0-9 year-old age class and harvests may need to be adjusted down in the 10-year planning period to offset this surplus.

Desired Future Condition

- Red pine will be located on suitable sites with acres balanced between the ages of 0-89; and
- Red pine will be managed for a sustainable yield of forest products and recreational opportunities.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age-class distribution;
- If a well-established understory of desirable northern hardwood seedlings and saplings exists below older red pine, consider using seed tree or shelterwood harvests to release the hardwoods while keeping red pine as a component to improve stand diversity;
- Conduct final (regeneration) harvests on a projected 544 acres, beginning with the oldest age-classes and with a concentration on stands with less potential for a higher product value; and
- Conduct partial harvests on a projected 1,372 acres, concentrating on stands of better quality red pine that have the potential for a higher product value in larger size classes.

Long-Term Management Objectives

- Continue to thin younger stands until the stands are replaced by seed tree harvests or final harvests at economic maturity (80 years);
- Future planning may need to consider adjustments to harvest levels to continue work toward balancing age-class distributions. Due to the extremely unbalanced age-class distribution of red pine, balancing the age-class distribution will take many decades; and
- A desired future harvest level is projected at 292 acres for final harvest and 1,399 acres for partial harvest per 10-year period.

4.22.1.5 Forest Cover Type Management – Cedar

Current Condition

Cedar acres total 1,761 acres or 6% of the management area (Table 4.22.1). Cedar is primarily located on lowlands throughout the management area.

Forest cover types dominated primarily by cedar in this management area is valued ecologically as sources of habitat for numerous species of wildlife including bear and white-tailed deer (featured species in this management area), hare and various song birds; and commercially for pulp. The age-class distribution for cedar is heavily skewed toward the older age classes (70 and above) (Figure 4.22.6) and there has been virtually no regeneration in the last 80 years.

Desired Future Condition

- Cedar forest cover types will be maintained on operable sites through even-aged management with acres balanced between 0-159 for cedar to provide for regulated harvest;
- To contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species; and
- By storing high levels of sequestered carbon and serving as carbon sinks, cedar swamps will play an important role in global geochemical cycles.

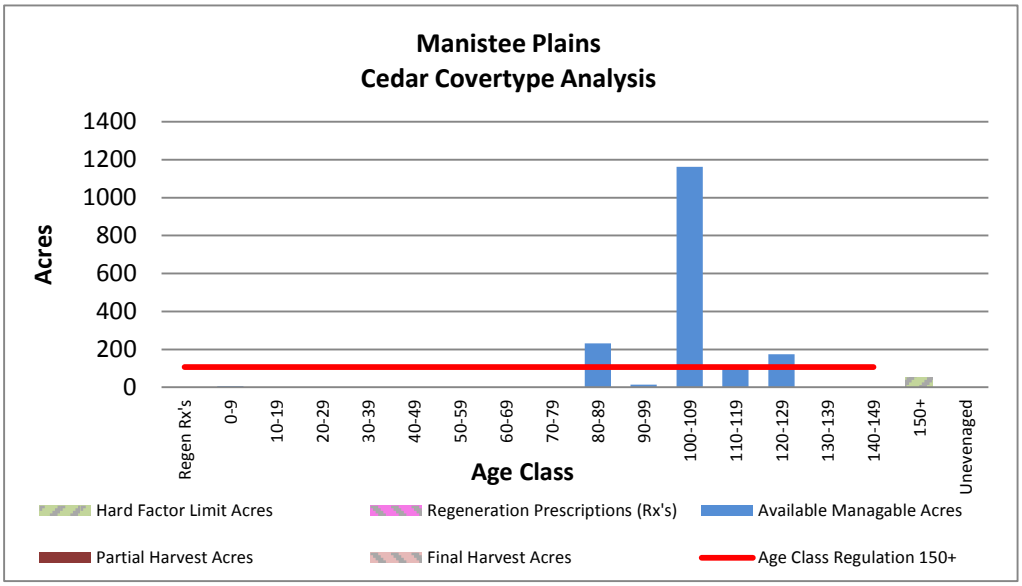

Figure 4.22.6. Age-class distribution for cedar in the Manistee Plains management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct regeneration harvests on a projected 107 acres of cedar;
- Consider methods to ensure adequate regeneration of cedar; and
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years of entry.

Long-Term Management Objectives

- It is acceptable that over the next several decades, the older cedar stands, much of it inaccessible for harvest, will continue to experience natural processes (fire, wind throw, insect defoliation and beaver flooding) resulting in the formation of a range of successional stages;
- Continue to manage cedar where accessible for a sustainable yield of forest products, habitat and recreational opportunities; and
- A desired future harvest level is projected at 107 acres for final harvest per 10-year period.

4.22.1.6 Forest Cover Type Management – Lowland Aspen/Balsam Poplar

Current Condition

Lowland aspen/balsam poplar (primarily balsam poplar, swamp aspen and swamp white birch) acres total 1,530 or 5% of the management area (Table 4.22.1). Forest communities dominated primarily by lowland poplar in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear and white-tailed deer (featured species in this management area); various song birds; and commercially for pulp. Lowland aspen/balsam poplar is primarily concentrated in wet areas or areas without easement limiting treatment options. There are 289 acres in this management area is considered inaccessible (Figure 4.22.7) or otherwise unavailable for harvest unless it can be done in a manner that will not adversely impact wetland soils (hard factor limit acres).

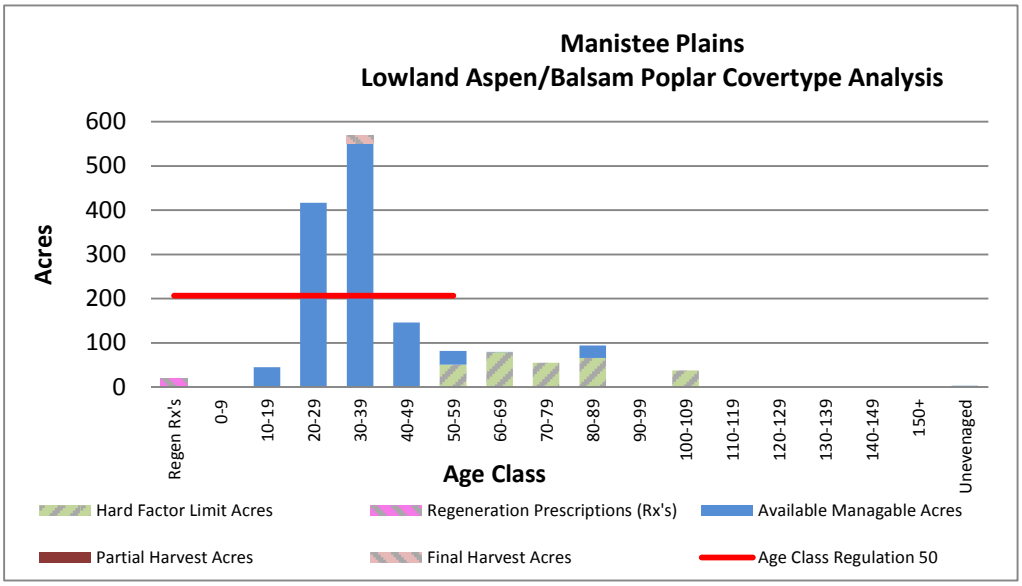

Figure 4.22.7. Age-class distribution for lowland aspen/balsam poplar in the Manistee Plains management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland aspen/balsam poplar-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0-59 years of age to provide for a sustainable harvest, wildlife habitat and to contribute to the preservation of regional biodiversity.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 640 acres in accessible stands that will attain age 50 during the next decade; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- It is acceptable that the older lowland poplar, much of it inaccessible to human management, will continue to experience natural processes (wind throw, flooding and senescence) resulting in changes in species composition;

- Future planning decisions may need to take into consideration the impact of emerald ash borer on ash in lowland sites; and
- A desired future harvest level is projected at 207 acres for final harvest per 10-year period.

4.22.1.7 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland shrub and herbaceous open land acres total 1,803 acres or 6% of the management area (Table 4.22.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas.

Desired Future Condition

- Upland open/semi-open lands will be maintained at or above the current level in order to provide habitat for species which use openings.

10-Year Management Objectives

- Where necessary and feasible, consider methods to maintain upland open/semi-open lands during this management cycle. This will be of benefit to wildlife species that use non-forested openings, including wild turkey, a featured species in this management area.

Long-Term Management Objectives

- Continue to maintain herbaceous open land and upland shrub openings at or above current levels in order to promote wildlife values and recreational opportunity; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.22.1.8 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: white pine 844 acres or 3%, mixed upland deciduous 841 (3%), lowland conifers 721 acres (3%), oak 563 acres (2%), tamarack 538 (2%) and upland mixed forest 421 acres (2%). Other forest and non-forested acres total 2,003 acres or 6% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- The following species are projected for restarting or regeneration harvests: 265 acres of white pine, 53 acres of lowland conifers, 175 acres of lowland mixed forest, 82 acres of upland mixed forest, 105 acres of mixed upland deciduous, 59 acres of natural mixed pines and 68 acres of oak; and
- Partial harvests are projected for 399 acres of white pine, 127 acres of upland mixed forest, 52 acres of mixed upland deciduous, 77 acres of natural mixed pines and 77 acres of oak.

Long-Term Management Objectives

- A desired future harvest level is projected at 53 acres of lowland conifers for final harvest per 10-year period.

4.22.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management. These recommended practices will not be employed across the management area as a whole, but rather in priority compartments, stands or wetlands as defined by local Wildlife Division and Forest Resources Division field staff.

The following have been identified as featured species for this management area during this cycle of state forest planning:

- American woodcock
- Beaver
- Black bear
- Mallard (Grass Lake Flooding State Wildlife Management Area)
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Wild turkey
- White-tailed deer
- Wood duck (Grass Lake Flooding State Wildlife Management Area)

The primary focus of wildlife habitat management in the Manistee Plains management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest, large open grassland complexes, and marsh/grassland complexes; the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
  - Implementation of the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting and brood rearing. Mallard pair-bonding wetlands are typically 0.25 to 20 acres in size and brood rearing wetlands are typically 1.2 to 30 acres in size. Optimal hemi-marsh sites are > 2.5 acres with open water portions having extensive portions < 3 feet deep and 4:1 area of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within ~ 200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plan for Grass Lake Flooding State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than

5 acres in size with a savannah-like dispersion of large trees (< 50% canopy cover) with open under story and include tall trees or snags of large (> 12 inches) diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease, and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than 12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres, and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old); even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age-classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every ten years in 10-40 acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry, and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak, and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting, and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood ducks are most limited by available nesting and brood rearing habitat. Wood duck nest in tree cavities near rivers, streams, swamps, beaver ponds and marshes. Nests require mature hardwood trees with 10 inches or larger in diameter at breast height. Brood rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority wildlife management areas with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plan for Grass Lake Flooding State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification.
- Maintain stable water levels at managed floodings from April through August.

4.22.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed five listed species and no natural community of note occurring in the management area as listed in Table 4.22.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.
The Betsie River and its tributaries have been identified as a natural river and along with its corridor are also designated as a high conservation value area as shown in Figure 4.22.8.

There is no ecological reference areas identified for the Manistee Plains management area.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.22.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Manistee Plains management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Mammal								
Woodland vole	*Microtus pinetorum*	SC/G5/S3S4	Confirmed	PS	Very High	Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
						Floodplain forest	Lowland mixed	Mid
						Oak-pine barrens	Oak	Mid
						Bur oak plains	Upland open/semi-open	N/A
Reptile								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic southern forest		
						Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

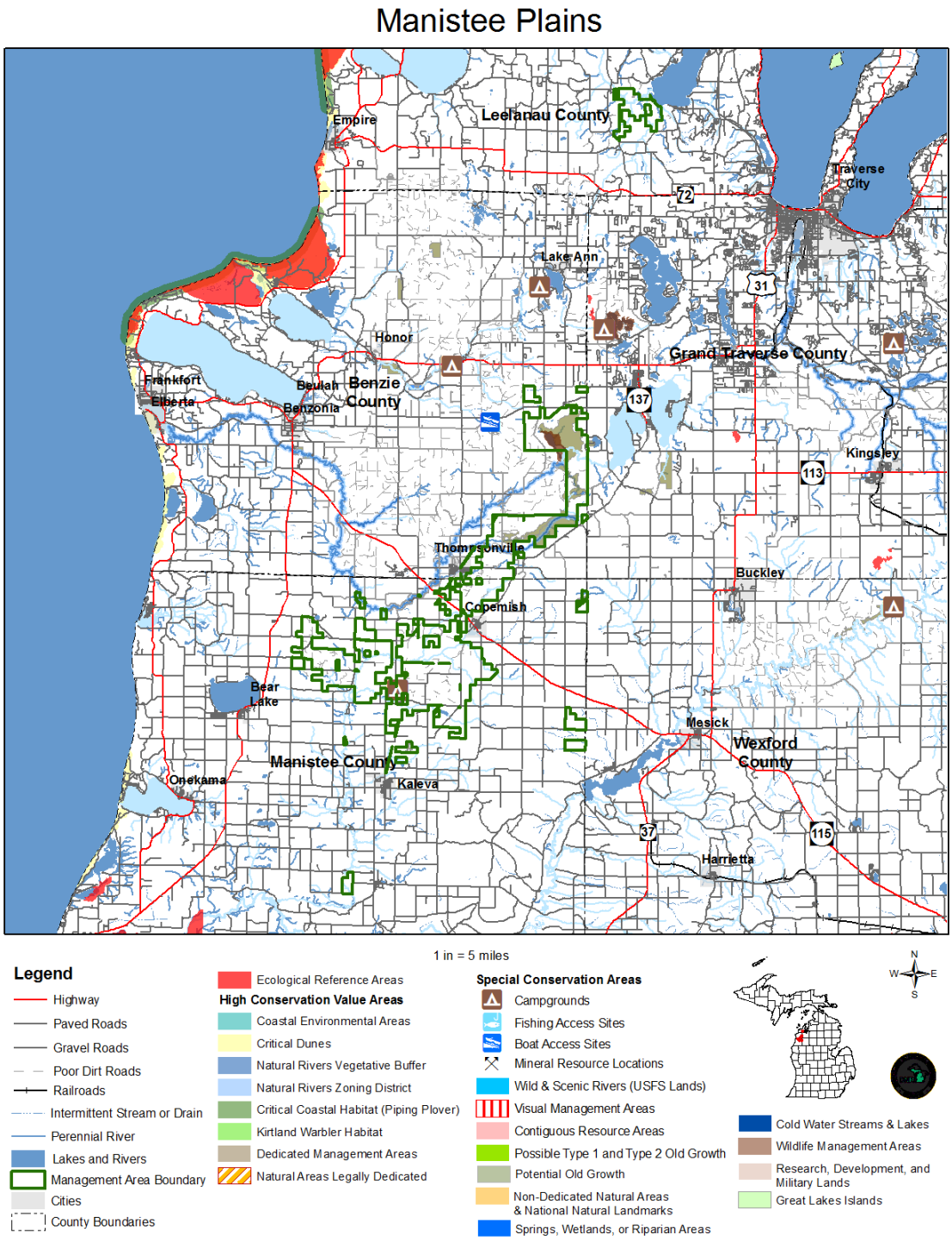

Figure 4.21.8. A map of the Manistee Plains management area showing the special resource areas.

4.22.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this

management area include oak wilt, beech bark disease and emerald ash borer impacts on black ash in lowland types and management should be adapted as follows:

- Where high quality ash and/or beech are present, full site use (e.g. stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important;
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow; and
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.22.3. This information was compiled from the Midwest Invasive Species Information Network Ddatabase, but it should not be considered complete. Local staff has noted the presence of garlic mustard and *Phragmites* in the management area. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.22.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Manistee Plains - FRD Management Areas	Cases within FRD Areas	Cases within 5 Mile Buffer	Total number of cases	Total number of different Invasive Species
	4	12	16	4

Invasive Species within FRD Areas	Occurrences	Invasive Species within 5 Mile Buffer	Occurrences
Glossy Buckthorn *Rhamnus frangula*	4	Glossy Buckthorn *Rhamnus frangula*	9
-	-	Japanese Knotweed *Fallopia japonica*	1
-	-	Purple Loosestrife *Lythrum salicaria*	1
-	-	Tatarian Honeysuckle *Lonicera tatarica*	1

4.22.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.22.1 and listed in Appendix F.

4.22.6 Fire Management

Northern hardwoods which have historically been a major component of this management area are rarely impacted by natural fire regimes.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed

burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings;
- Consider opportunities to use fire as a tool for site preparation and to reduce slash or competing vegetation; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.22.7 Public Access and Recreation

Access for management and/or recreation is generally good throughout this management area as there is a well-developed road/trail system. The department will continue to seek access across adjacent private property. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Recreation opportunities within this management area include the Healy Lake State Forest Campground (Figure 4.22.8) and boating access site, which are both managed by Springdale Township. The Betsie Valley Trail, which is a converted railroad line, offers non-motorized users with a gentle, smooth trail tread in non-winter months and then during the winter, provides snowmobilers with a critical snowmobile trail link to local communities (Figure 4.22.1). Other recreational opportunities such as dispersed camping, mushroom and berry picking are prevalent in this management area. Future growth of recreational amenities is likely in this management area based upon population shifts, and compatible soil types. Recreation facilities within this management area are shown below:

Campgrounds
- Healy Lake State Forest Campground

Boating Access Sites
- Healy Lake Boating Access Site

Snowmobile Trails
- Various

Non-Motorized Trails
- Betsie Valley Trail

The opportunity to participate in these recreational activities on the nearby state forest land is one of the reasons that the population in areas near the management area is expected to continue to increase. This will result in an increased demand for outdoor recreation opportunities. Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails. Additionally, considerations may be made for harvest timing around snowmobile trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.22.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium and lacustrine (lake) sand and gravel. The glacial drift thickness varies between 400 and 800 feet. Sand and gravel pits are located in this management area and there is potential.

The Mississippian Coldwater and Sunbury Shales and Devonian Ellsworth and Antrim Shales sub-crop below the glacial drift. The Antrim is quarried for cement products elsewhere in the state.

Most of these lands have been developed for gas production from the Antrim Shale and oil and gas production from the Guelph (former Niagaran) reefs. Well spacing for both formations is currently 80 acres and most of the producing area is still under lease. Additional development for both formations is likely. The Collingwood Formation does not appear to have potential in this management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and that all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.21 MA 23 – Manistee River Valley Management Area

Summary of Use and Management

Vegetation management in the Manistee River Valley management area (MA) (Figure 4.23.1) will provide timber products; maintain or enhance wildlife habitat; protect areas of unique character including the Manistee River and its tributaries, a designated natural river; threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management for this 10-year planning period includes continuing aspen management to maintain early successional habitat for hunting and other wildlife-related recreational opportunities; increasing regeneration of oak; focusing on balancing the red pine age class structure through final harvests and re-planting; and on improving red pine quality through partial harvests. Expected trends within this 10-year planning period are increased recreational pressure, especially on the established trails and along the Manistee River and its tributaries; an increased wildland/urban interface and a need to restore barrens communities through prescribed fire; and invasive plant control.

Introduction

This management area is located between Traverse City and Cadillac in Grand Traverse, Wexford, Kalkaska and Missaukee counties and contains 114,592 acres of state forest (Figure 4.23.1). The primary attributes which identify the Manistee River Valley management area include:

- The glacial outwash plain landform (75% of the management area).
- A history of intensive management which has resulted in the cover types of aspen, red pine, oak, upland hardwoods and white pine.
- Due to the proximity of this management area to Traverse City and Cadillac and other population areas, the forest resources contribute significant social and economic values to the area.
- This management area is evenly split between two forest management units (Traverse City and Cadillac forest management units), which will require cooperative management.
- The management area falls within the Grayling Outwash Plain sub-region of the northern Lower Peninsula.
- The Manistee River and its tributaries, a designated natural river, cross the management area and are heavily used for canoeing, kayaking and fishing. A portion of the Manistee River in Wexford County is being managed as a natural river although it is not designated as such.
- Portions of the North Country Trail, Grand Traverse to Supply Road Missaukee and Michigan Cycle Conservation Club Trail (MCCCT), North Missaukee Off-Road Vehicle (ORV) Route, North Missaukee ORV Trail, US – 131 to North Missaukee Trail, MCCCT to US 131 Motorcycle Trail, Missaukee – Kalkaska Snowmobile Trail and the 20 Road to Grand Traverse MCCCT cross portions of the management area.
- The Baxter Bridge and Spring Lake Campgrounds are located in the management area.
- Surveys have located the threatened, endangered or special concern species Hill's thistle, bald eagle, wood turtle, northern goshawk, great blue heron heronry, ginseng, eastern Massasauga, red-shouldered hawk and the common loon. In addition, listed communities include Upper Midwest type wet meadows and Upper Midwest type pine barrens are located in the management area.

The current predominant cover types, acreages and projected harvest acres in the management area are shown in Table 4.23.1.

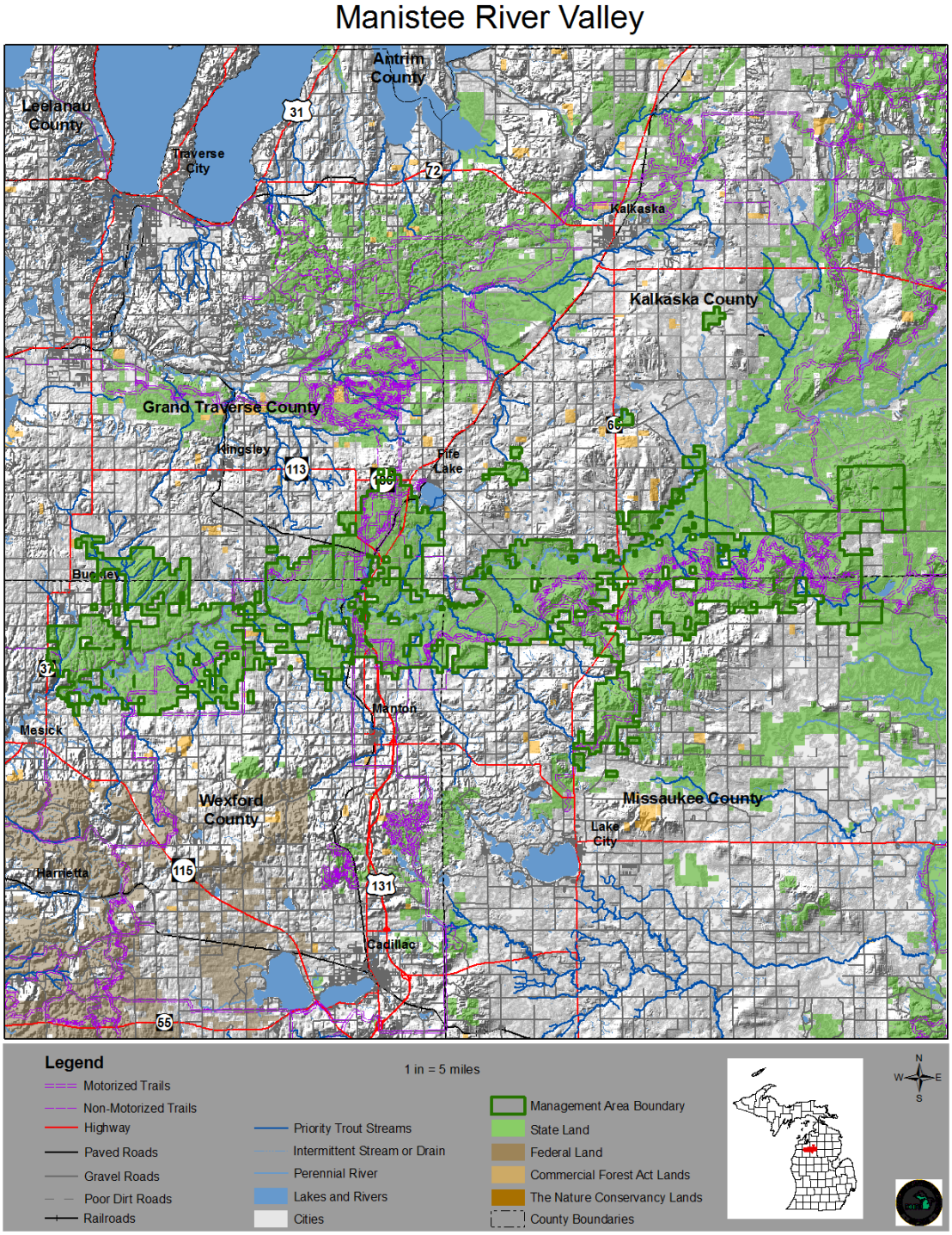

Figure 4.23.1. A map of the Manistee River Valley management area (dark green boundary) in relation to surrounding state forest and other lands in Grand Traverse, Wexford, Kalkaska and Missaukee counties, MI.

Table 4.23.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Manistee River Valley management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	29%	33,036	911	32,125	6,570		33,036	5,354	
Red Pine	15%	17,411	903	16508	3,487	6,692	17,411	1,651	8,425
Oak	11%	12,636	3,050	9586	2,027	803	12,636	1,065	2,650
Northern Hardwood	9%	10,147	416	9731	200	3,800	10,147		4,259
Jack Pine	5%	6,247	42	6205	264		6,247	886	
Lowland Conifers	5%	5,186	1,797	3389	376		5,186	376	
White Pine	3%	3,658	86	3572	1,007	1,427	3,658	325	1,492
Natural Mixed Pines	3%	3,625	268	3357	599	1,020	3,625	305	1,138
Mixed Upland Deciduous	3%	3,292	273	3019	775	497	3,292	435	831
Upland Open/Semi-Open Lands	5%	6,300		6300			6,300		
Lowland Open/Semi-Open Lands	2%	1,782		1782			1,782		
Misc Other (Water, Local, Urban)	0%	123	0	123			123		
Others	10%	11,149	1,673	9476	1,653	726	11,149	984	834
Total		114,592	9,419	105,173	16,958	14,965	114,592	11,381	19,629

4.23.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.23.1.1 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total 33,036 or 29% of the management area (Table 4.23.1). Aspen is distributed throughout the management area on till areas on very dry to dry/poor nutrient sites (habitat classes: PArVHa and PArVVb). The age-classes of aspen are fairly well balanced. There are 911 acres of aspen are coded with a harvest criterion (Figure 4.23.2) but have site conditions that limit harvest (hard factor limit acres). There are 3,334 acres that have a final harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen acres will be maintained on currently operable sites to provide early successional habitat for species viability, with acres balanced within the 0-59 year age-class rotation to provide a sustainable level of wood fiber.

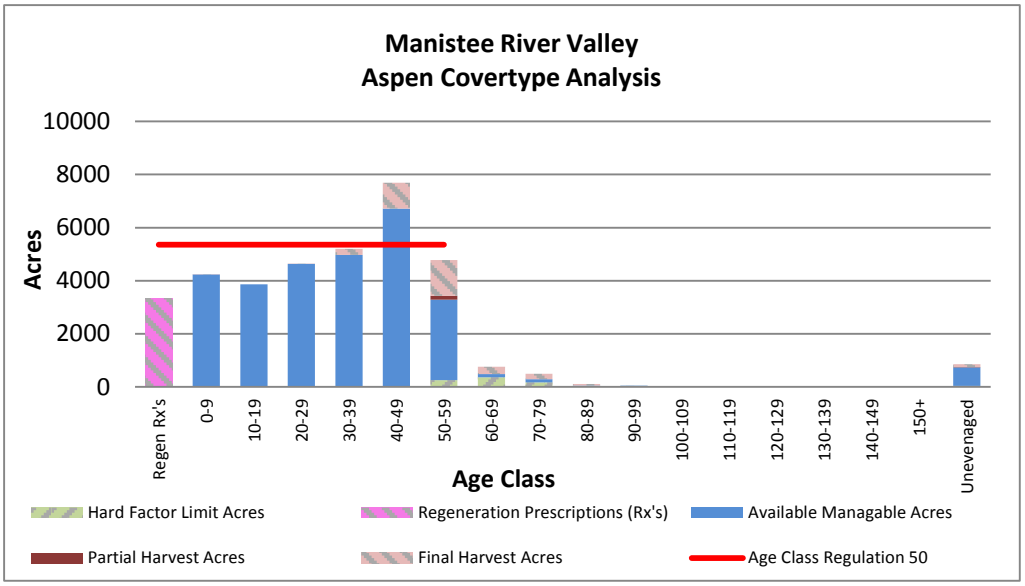

Figure 4.23.2. Age-class distribution for aspen in the Manistee River Valley management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct final (regeneration) harvests on a projected 6,570 acres; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue regeneration harvests to balance age-class distributions which should be completed within the next 50-year rotation; and
- A desired future harvest level is projected at 5,354 acres for final harvest per 10-year period.

4.23.1.2 Forest Cover Type Management – Red Pine

Current Condition

Natural and planted red pine acres total 17,411 or 15% of the management area (Table 4.23.1) on habitat class PArVVb and PArVHa sites. Approximately 2,000 acres of red pine along the Manistee River is under a timber lease with the Consumers Power Corporation. There is a pronounced spike of red pine in age classes from 40-59 (Figue 4.23.3) which coincides with an era of active planting during the 1950s and 1960s. Also, there has been very little re-planting or regeneration of red pine in the last 40 years. Many of the planted red pine areas are in the pole to small sawlog size (8-12 inches in diameter at breast height) in relatively dense stands (above 110 square feet per acre of basal area).

These are frequently thinned to concentrate growth on the remaining stems to increase value through growth into larger sizes and more valuable product classes. Some of the older pine stands are natural red pine that may be mixed with oak or white pine. There are 903 acres of red pine have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 1,301 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class. There are 3,141 acres with a partial harvest pending and these acres are included in their current age class. The graph displays the projected number of acres converted to the cover type as a result of treatments and planting to red pine. These acres are included in the regeneration prescription class.

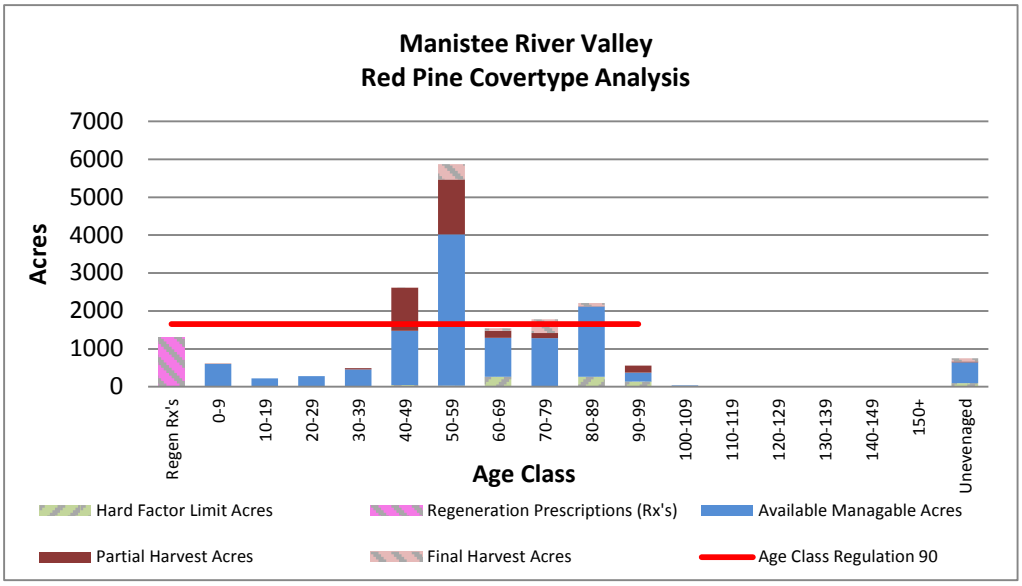

Figure 4.23.3. Age-class distribution for red pine in the Manistee River Valley management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Red pine of either natural origin or in planted stands will be located on suitable sites with acres balanced between 0-99 years of age.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distribution;
- Conduct partial harvests on a projected 6,692 acres on the younger age-classes to improve quality and size class; and
- Conduct final (regeneration) harvests on a projected 3,487 acres in the older age-classes to help balance the age-class distribution.

Long-Term Management Objectives

- Continue work towards balancing the age-class distribution between the ages of 0-99 years through regeneration harvests;
- Seek opportunities to move red pine to suitable sites which may include managing red pine in mixed stands with oak or other species;
- On quality northern hardwood sites or sites where advanced northern hardwood species are present, consider whether to allow these sites to convert to northern hardwood while retaining a component of red pine for within stand diversity;
- On poorer quality red pine sites (PVCd habitat class) consider whether to restore to oak/pine barrens;
- In identified special conservation areas, especially those with natural red pine on dry-mesic sites, consider management of red pine to a biological rotation of 200+ years; and
- A desired future harvest level is projected at 1,651 acres for final harvest and 8,425 acres for partial harvest per 10-year period.

4.23.1.3 Forest Cover Type Management – Oak

Current Condition

Oak which is predominantly northern red, white and black oak acres total 12,636 acres or 11% of the management area (Table 4.23.1) on the till areas of very dry to dry/poor nutrient (habitat classes: PArVHa, PArVVb) sites. The origin of the oak resource was the aftermath of the logging era in the late 1800s and early 1900s when most of the red and white pine was removed. This cutting combined with frequent wildfires resulted in a period of oak regeneration during the late 1800s

and early 1900s. Some oak, due to the lack of fire, is found on poor quality PVCd sites that were historically oak/pine barrens. There are 3,050 acres of oak have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 718 acres of stands that have a final harvest pending and these acres are shown in the regeneration prescription class (Figure 4.23.4). There are 1,940 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in the release of oak. These acres are included in the current age-class.

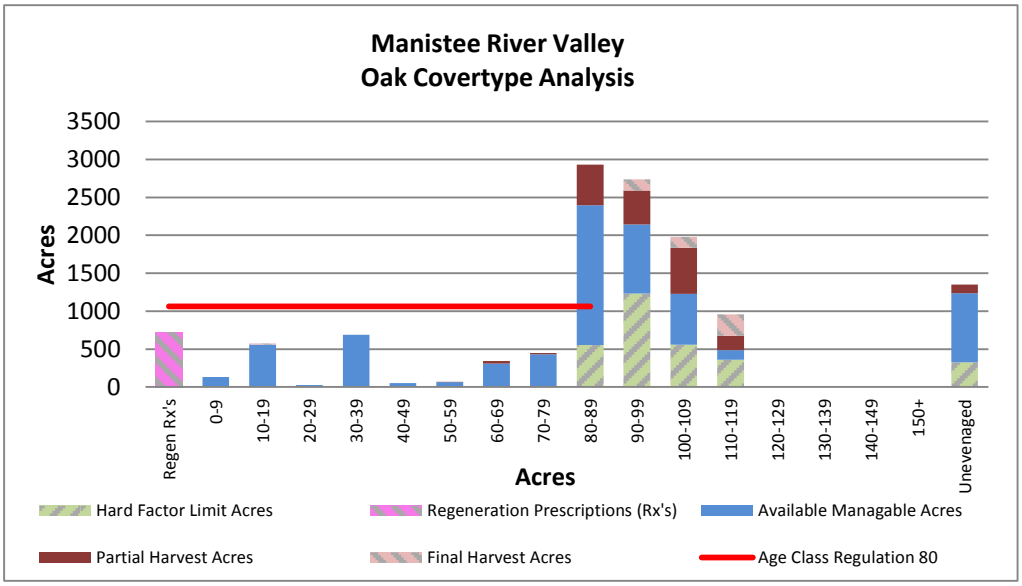

Figure 4.23.4. Age-class distribution for oak in the Manistee River Valley management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management to provide for timber products, wildlife habitat and recreational opportunities; and
- Oak will become more valuable as a mast source as a result of beech bark disease which will cause a decline in the amount of beech.

10-Year Management Objectives

- Conduct partial harvests on a projected 803 acres to prepare stands for eventual regeneration harvests;
- Conduct final harvests on a projected 2,027 acres;
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types; and
- Seek opportunities to manage existing oak for wildlife values and a sustainable yield of wood products in pine and low quality hardwoods.

Long-Term Management Objectives

- Continue work towards maintaining oak as the predominant species in selected stands through restarting harvests;
- It is acceptable that some oak stands may become mixed stands through partial removal of an oak over story, planting pine in oak stands or through natural regeneration of other species;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area;
- On poorer quality oak sites (PVCd habitat class) consider whether to restore to pine/oak barrens; and
- A desired future harvest level is 1,065 acres for final harvest and 2,650 acres for partial harvest per 10-year period.

4.23.1.4 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 10,147 acres or 9% of the management area (Table 4.23.1) on habitat class PArVVb, AFOCa and AFO sites. High-quality red oak is a valuable component of northern hardwood stands in this management area. Northern hardwood forest communities in this management area are valued ecologically as sources of habitat for numerous plants (i.e., spring ephemeral herbs, ferns and shrubs) and wildlife species including black bear, red shouldered hawk, wood thrush and red-backed salamander; commercially for firewood, high value sawlogs and veneer; and recreationally for hiking, biking, hunting and mushrooming. There are 416 acres of northern hardwood have met harvest criteria (Figure 4.23.5), but have site conditions that limit harvest (hard factor limit acres). There are 1,770 acres with a partial harvest pending and these acres are included in their current basal area range.

Desired Future Condition

- Northern hardwood stands will be maintained and managed through selection harvests on better quality hardwood sites and through regeneration harvests on poor-quality hardwood sites to provide a sustainable timber supply, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Conduct partial harvests on a projected 3,806 acres to produce uneven-aged stands;
- On poor-quality hardwood sites a projected 200 acres will be harvested through restarting harvests;
- Where present, retain oak for mast and hemlock and white pine for within-stand diversity; and
- Where necessary and feasible, consider harvesting stands from lower basal area ranges to expedite the balancing of basal area distributions.

Long-Term Management Objectives

- Continue to conduct salvage harvests of beech affected by beech bard disease and ash where present and affected by emerald ash borer, in northern hardwood stands, using Beech Bark Disease Guidelines and Emerald Ash Borer Guidelines;
- Consider whether to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands;
- Continue to manage northern hardwoods for stand quality, age and species diversity, wildlife values and a sustainable yield of wood products;
- Continue to manage for stands with an uneven age-class on better quality hardwood sites; and
- A desired future harvest level is projected at 4,259 acres for partial harvest per 10-year period.

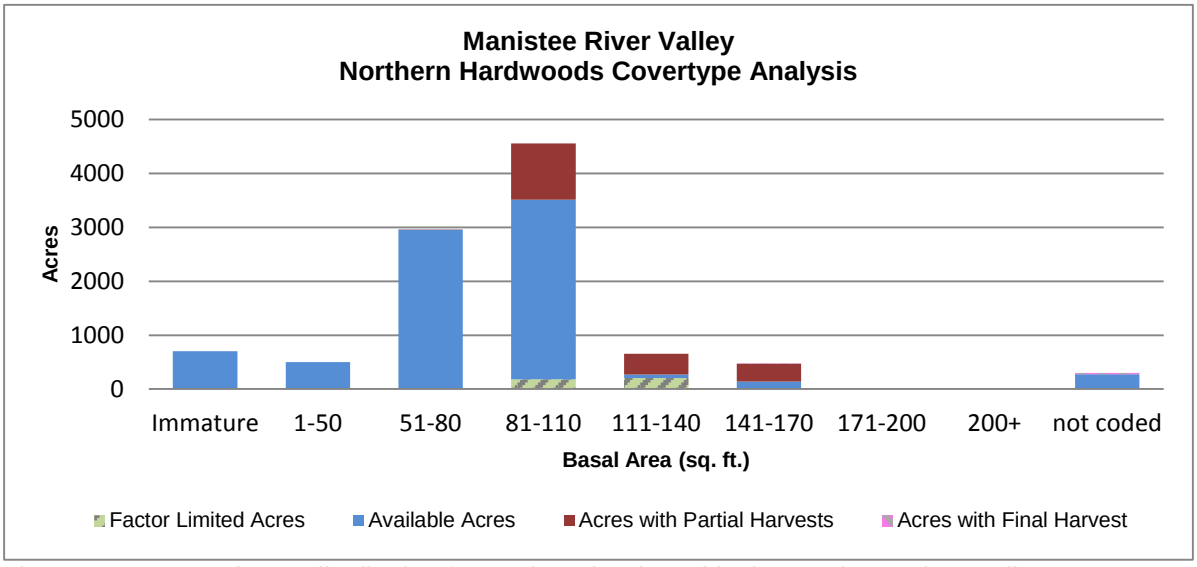

Figure 4.23.5. Basal area distribution for northern hardwood in the Manistee River Valley management area (2012 Department of Natural Resources inventory data).

4.23.1.5 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 6,247 or 5% of the management area (Table 4.23.1) on habitat class PArVHa sites. Age classes are uniformly below the age-class regulation level with the exception of the regeneration prescription class. Data show that 1,797 acres of jack pine have met harvest criteria, but have site conditions that preclude harvest (hard factor limited acres). There are 3,849 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class. Jack pine budworm outbreaks may result in increased mortality in older age classes and work continues to reduce the number of acres in the older age classes. Harvests will come from the older age-classes including the 60-69 and 80-89 year age-classes.

Desired Future Condition

- Jack pine will have balanced age classes between 0 and 69 years of age to provide a sustainable timber production and wildlife habitat which will provide recreational opportunities.

10-Year Management Objectives

- Conduct final harvests on a projected 264 acres concentrating on stands older than 60 years to reduce the risk of jack pine budworm and other forest health issues in older age-classes.

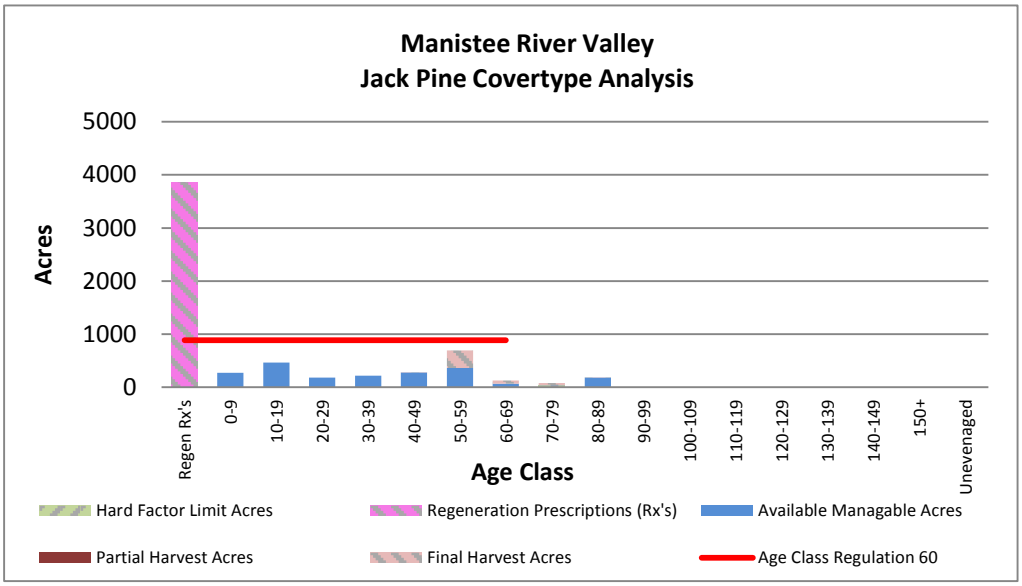

Figure 4.23.6. Age-class distribution for jack pine in the Manistee River Valley management area (2012 DNR inventory data).

Long-Term Management Objectives

- Continue to manage jack pine for a balanced age-class distribution at a projected regulation level of 886 acres over 10 years to produce a sustainable timber supply and wildlife habitat which will provide recreational opportunities;
- Where necessary and feasible, future planning may need to consider harvesting additional acres above the rotation regulation level from younger age classes to expedite the balancing of age class distributions;
- Some jack pine dominated stands have a component of red pine that is much better quality and form than the jack pine. These stands may be converted to a mixed stand with a red pine component (through planting) and natural oak/red maple/aspen. Some deteriorating jack pine stands have a considerable oak understory which may be promoted as managerially desirable; and
- A desired future harvest level is projected at 886 acres for final harvest per 10-year period.

4.23.1.6 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 6,300 acres or 5% of the management area (Table 4.23.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- If necessary and feasible, consider maintaining upland open/semi-open lands through possible use of prescribed fire, woody brush removal, herbicide and planting.

Long-Term Management Objectives

- Continue to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.6.1.7 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 1,782 acres or 2% of the management area (Table 4.23.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.23.1.8 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: jack pine 6,247 or 5% of the management area, lowland conifers 5,186 acres (5%), white pine 3,658 acres (3%), natural mixed pines 3,625 acres (3%), mixed upland deciduous 3,292 acres (3%), lowland deciduous 2,662 acres (2%), cedar 2,418 acres (2%) and upland mixed forest 2,027 acres (2%). Other forested and non-forested communities total 11,149 acres or 10% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.
Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct final harvests on a projected 150 acres of cedar, 376 acres of lowland conifers, 1,007 acres of white pine, 599 acres of natural mixed pines, 775 acres of mixed upland deciduous, 239 acres of lowland deciduous, 204 acres of upland mixed forest, 41 acres of lowland aspen/balsam poplar, 286 acres of lowland mixed forest, 171 acres of planted mixed pines, 120 acres of upland spruce/fir, 126 acres of lowland spruce/fir, 287 acres of upland conifers and 28 acres of tamarack;
- Consider methods to ensure regeneration of cedar and lowland conifers;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry;
- The following species are projected for regeneration harvests: lowland conifers; and
- Partial harvests are projected for 1,427 acres of white pine, 1,020 acres of natural mixed pines, 497 acres of mixed upland deciduous, 471 acres of upland mixed forest and 255 acres of planted mixed pines.

Long-Term Management Objectives

- Continue to manage other types to provide forest products, wildlife habitat and recreational opportunities; and
- Desired future harvest levels for final harvest are projected at 376 acres for lowland conifers, 239 acres for lowland deciduous and 150 acres per 10-year period.

4.23.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this cycle of state forest planning:

- American bittern (Cannon Creek Floodings State Wildlife Management Area)
- American woodcock (Headquarters Lake Flooding State Wildlife Management Area)
- Beaver (Cannon Creek Floodings State Wildlife Management Area)
- Black bear
- Eastern massasauga rattlesnake (Cannon Creek Floodings State Wildlife Management Area)
- Golden-winged warbler
- Mallard (Cannon Creek Floodings and Headquarters Lake Flooding state wildlife management areas)
- Pileated woodpecker
- Ruffed grouse
- Snowshoe hare
- White-tailed deer
- Wood duck (Cannon Creek Floodings and Headquarters Lake Flooding state wildlife management areas)

The primary focus of wildlife habitat management in the Manistee River Valley management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest, large open grassland complexes and marsh/grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Bittern

The goal for American bittern in the northern Lower Peninsula is maintain or increase available habitat. American bittern prefer large (>10 acres), shallow (average depth four inches) wetlands with open water in the center, a band of emergent vegetation around periphery and idle grassland in the adjacent uplands (4:1 grassland to wetland ratio). State forest management should focus on priority wildlife management areas with suitable shallow water marsh (hemi-marsh).

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat. Ideal wetland/upland complexes are > 50 acres.
    - Implementation of the wildlife management area master plan for Cannon Creek Flooding State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain water levels from the April through August breeding season.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specification:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
    - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
    - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
    - Implementation of the Cannon Creek Floodings State Wildlife Management Area Master Plan and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
  - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting, and brood rearing. Mallard pair-bonding wetlands are typically 0.25 to 20 acres in size and brood rearing wetlands are typically 1.2-30 acres in size. Optimal hemi-marsh sites are greater than 2.5 acres with open water portions having extensive portions less than three feet deep and 4:1 area of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within ~ 200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plans for Cannon Creek Floodings and Headquarters Lake Flooding state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old); even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age-classes allows for different life history requirements to be met within a small area, and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry, and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood ducks are most limited by available nesting and brood rearing habitat. Wood duck nest in tree cavities near rivers, streams, swamps, beaver ponds and marshes. Nests require mature hardwood trees with 10 inches or larger in diameter at breast height. Brood rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority wildlife management area with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plans for Cannon Creek Floodings and Headquarters Lake Flooding state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification.
- Maintain stable water levels at managed floodings from April through August.

4.23.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed eight listed species and one natural communities of note occurring in the management area as listed in Table 4.23.2. A colony of great blue herons has also been identified. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

Future development and recreational pressure associated with expected population growth in the vicinity of this management area will be the primary challenge to successful management for rare fish, wildlife, plants and listed communities.

Table 4.23.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Manistee River Valley management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Northern wet meadow		S4/G4	Confirmed				Lowland open/semi-open	N/A
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common tern	*Stema hirundo*	T/G5/S2	Confirmed	MV	Moderate	Sand & gravel beach	Upland open/semi-open	N/A
Reptile								
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Plants								
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Ginseng	*Panax quinquefolius*	T/G3G4/S2S3	Confirmed			Floodplain forest	Lowland mixed	Mid
						Mesic northern forest	Northern Hardwood	Late

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

The Upper Manistee River and its tributaries have been identified as a natural river and along with its corridor are also designated as a high conservation value area as shown in Figure 4.23.7.

There are no ecological reference areas identified for the Manistee River Valley management area as illustrated in Figure 4.23.7.

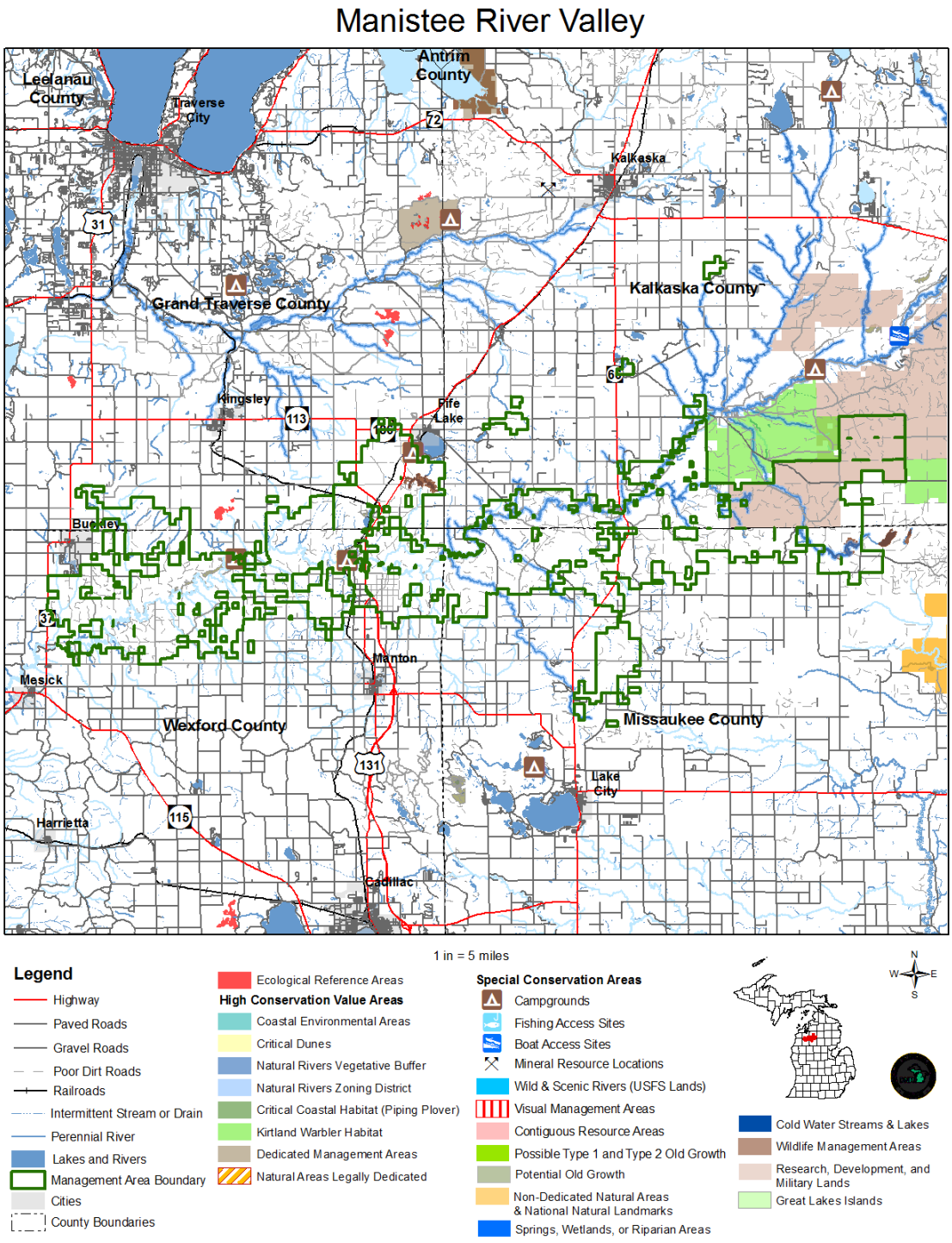

Figure 4.23.7. A map of the Manistee River Valley management area showing the special resource areas.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

4.23.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include oak decline, beech bark disease and emerald ash borer and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline;
- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important;
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow; and
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.23.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. Local staff has identified garlic mustard in this management area. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.23.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Manistee River Valley - FMD Management Areas	Cases within FMD Areas	Cases within 5 Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	1	1	1

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5 Mile Buffer	Occurrences
-	-	Japanese Knotweed *Fallopia japonica*	1

4.23.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.23.1 and listed in Appendix F.

4.23.6 Fire Management

This management area which is largely a glacial outwash area has had a history of wildfire which has played an important role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen or grass/upland brush types. Current wildfire risk and fuel loading is increased in young dense conifer plantations and mature jack pine affected by jack pine budworm.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife

game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings and natural pine/oak barrens; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.23.7 Public Access and Recreation

Access for management and/or recreation is generally very good throughout this management area as there is very little lowland and a well-developed road/trail system which includes the Missaukee off-road vehicle route and the North Missaukee Off-Road Vehicle Trail. In accordance with the DNR's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Dominated by the Manistee River, this management area provides unique recreational experiences influenced by one of Michigan's most pristine rivers. Both Baxter Bridge and Old US-131 state forest campgrounds (Figure 4.23.7) are located on the banks of the Manistee River, providing weary river users a place to camp. Along with riverside camping opportunities, there are numerous independent boating access sites offering access to the Manistee River. Hopkins Creek and Spring Lake campgrounds provide rustic camping experience and the Hopkins Creek Equestrian campground is strategically located along the Shore-to-Shore horse trail (Figure 4.23.1). Off-road vehicle trails, and snowmobile trails (Figure 4.23.1) are prevalent on upland sites and the nationally recognized North Country (hiking) Trail is another recreation amenity within this management area. Current and future recreation expansion, especially by those using the Manistee River will continue to be an important feature in this management area. The recreation features provided in this management area are listed below.

Campgrounds
- Hopkins Creek State Forest Campground
- Hopkins Creek Equestrian Campground
- Old US-131 State Forest Campground
- Baxter Bridge State Forest Campground
- Spring Lake State Forest Campground

Boating Access Sites (BASs)
- Old US-131 BAS
- Baxter Bridge BAS
- Spring Lake BAS
- Lucas Road BAS
- Harvey Bridge BAS
- Rainbow Jim's BAS
- Smithville Landing BAS
- Sand Banks BAS

Off-Road Vehicle Trails
- Grand Traverse to Supply Road Missaukee and Michigan Cycle Conservation Club Trail
- North Missaukee Trail and Route
- Grand Traverse Trail and Route
- Kalkaska Route

Snowmobile Trails

- Various

Non-Motorized Trails

- North Country Trail
- Shore-To-Shore Trail

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.23.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium, an end moraine of coarse-textured till, coarse-textured till and ice-contact outwash sand and gravel. The glacial drift thickness varies between 200 and 800 feet. Sand and gravel pits are located in this management area and there is good potential.

The Pennsylvanian Saginaw Formation and Mississippian Michigan Formation, Marshall Sandstone and Coldwater Shale sub-crop below the glacial drift. The Mississippian Michigan Formation is quarried for gypsum elsewhere in the state.

Only a small part of these lands has been developed for oil and gas from the Devonian Richfield, the Guelph (former Niagaran) reefs and Ordovician Prairie du Chien. Well spacing for the Devonian is 40 acres and the Guelph is 80 acres and the Prairie du Chien 320-640 acres. Additional development for these formations is likely. The Collingwood Formation's first well was drilled for gas in this management area and additional wells have been permitted. Spacing will most likely be 640 acres or larger. If drilling is successful, additional leasing and drilling will continue in this management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and that all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.24 MA 24 – Houghton Lake Wetlands Management Area

Summary of Use and Management

Vegetation management in the Houghton Lake Wetlands management area (MA) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management for this 10-year planning period will focus on balancing the aspen age-class distribution. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation opportunity. Expected trends within the next decade are the need to continue to balance aspen age-class distributions, an expected increase in recreation pressure and invasive species encroachment.

Introduction

There are 69,470 acres of state forest land in the Houghton Lake Wetlands management area located in Roscommon and Missaukee counties near the towns of Houghton Lake, Grayling, Lake City, Roscommon and West Branch. The primary attributes which identify the Houghton Lake Wetlands management area include:

- The dominant landform consists of poorly drained outwash channels and plains which accounts for over 94% of the management area.
- The management area falls within Grayling Outwash Plain sub-region as classified by Albert (1995).
- This area is popular for hunting, off-road vehicle riding on the West Higgins Off-Road Vehicle trail, snowmobiling on a snow trail and other activities for the nearby communities of Grayling Houghton Lake, Roscommon, Lake City and West Branch.
- The Houghton Lake State Forest Campground located on the north side of Houghton Lake is included in the management area.
- These recreational uses, combined with the quantity and availability of wood fiber contributes significant social and economic values to the area.
- Oil and gas development is not significant.
- A significant portion of the management area includes the Dead Stream Swamp which is a National Natural Landmark and special conservation area. The Houghton Lake State Wildlife Research Area, the Reedsburg Dam and Bear Creek Flooding State Wildlife Management Areas are special conservation areas and are also included within the management area.
- The management area contains the Wraco Flooding and the Houghton Lake Flats (north and south units).
- The management area contains the headwaters of the Muskegon River.
- Threatened, endangered or species of special concern located by Michigan Natural Features Inventory surveys include spotted turtle, great blue heron colony, yellow rail, osprey, boreal *brachionyncha* moth, bald eagle, rainbow mussel, slippershell mussel, Blanding's turtle, black tern, least bittern, red-shouldered hawk, common moorhen and river redhorse and bigmouth shiner.

Most of the management area was covered by wetlands including lowland deciduous, lowland conifers, and lowland open/semi-open lands interspersed with jack pine, cedar and aspen (Table 4.24.1).

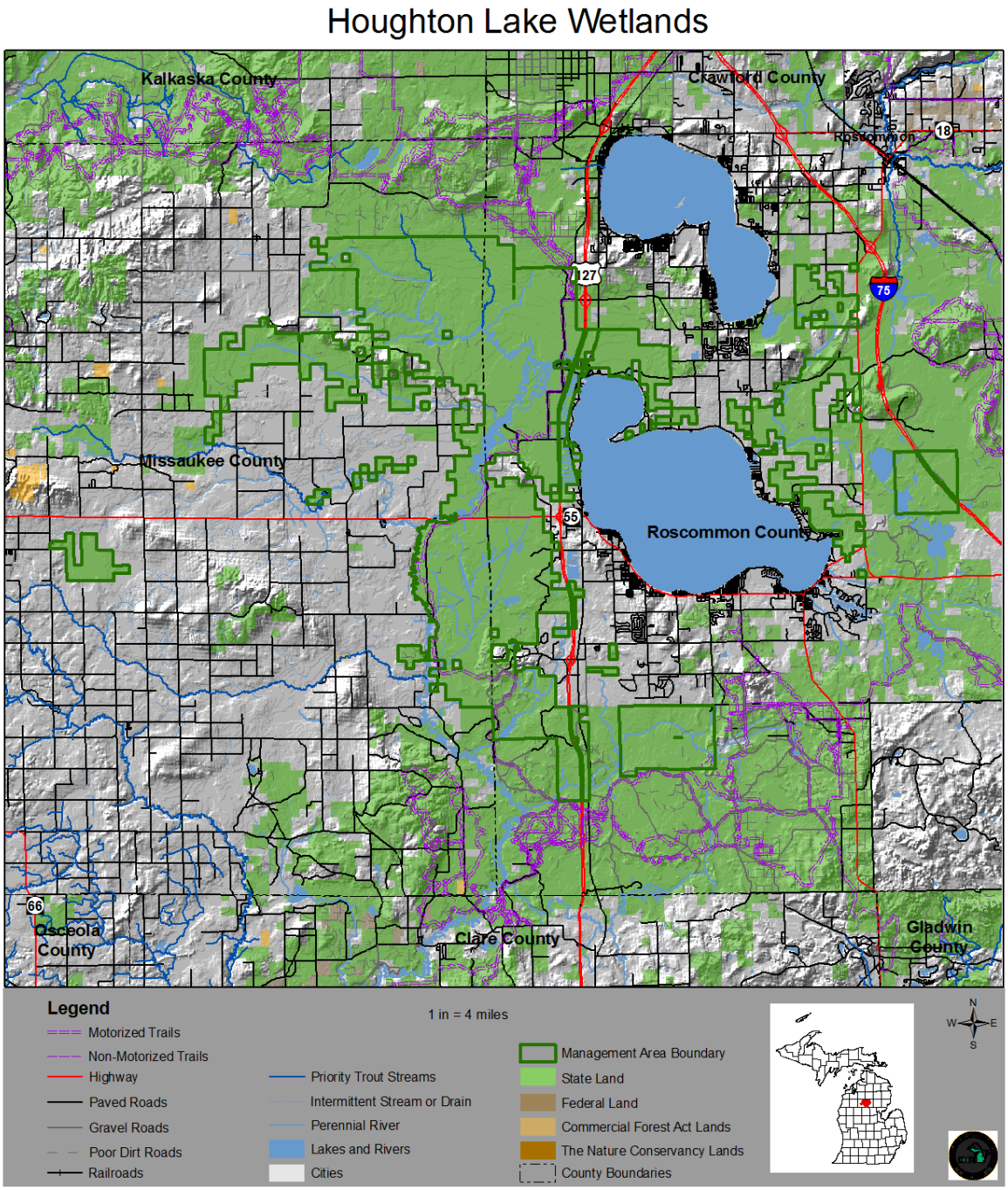

Figure 4.24.1. A map of the Houghton Lake Wetlands management area (dark green boundary) in relation to surrounding state forest and other lands in Roscommon and Missaukee counties, Michigan.

Table 4.24.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Houghton Lake Wetlands management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	18%	12,726	777	11,949	993		12,726	1,707	
Lowland Conifers	11%	7,432	5,946	1486	165		7,432	165	
Cedar	10%	6,722	6,722				6,722		
Lowland Deciduous	8%	5,417	3,821	1596	177		5,417	177	
Jack Pine	6%	3,900	271	3629	67		3,900	518	
Oak	3%	1,753	1,050	703	89	96	1,753	78	153
Red Pine	2%	1,236	201	1035	403	366	1,236	115	502
White Pine	2%	1,124	223	901	276	320	1,124	82	360
Upland Open/Semi-Open Lands	2%	1,310		1310			1,310		
Lowland Open/Semi-Open Lands	30%	20,854		20854			20,854		
Misc Other (Water, Local, Urban)	3%	2,279		2279			2,279		
Others	7%	4,717	1,762	2955	311	659	4,717	299	666
Total		69,470	20,772	48,698	2,481	1,441	69,470	3,141	1,681

4.24.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.24.1.1 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open acres total 20,854 or 30% of the management area (Table 4.24.1). Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife, including wood duck, mallard and eastern massasauga rattlesnake which are featured species in this management area.

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at current levels to ensure an adequate level of wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics. This will benefit numerous wildlife species, including the featured species for this management area.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.24.1.2 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total 12,726 acres or 18% of the management area (Table 4.24.1). Aspen is distributed throughout the management area including outwash sands with a high water table and pitted outwash with high-quality big-tooth aspen (habitat classes: primarily PArVHa with some PArVVb).

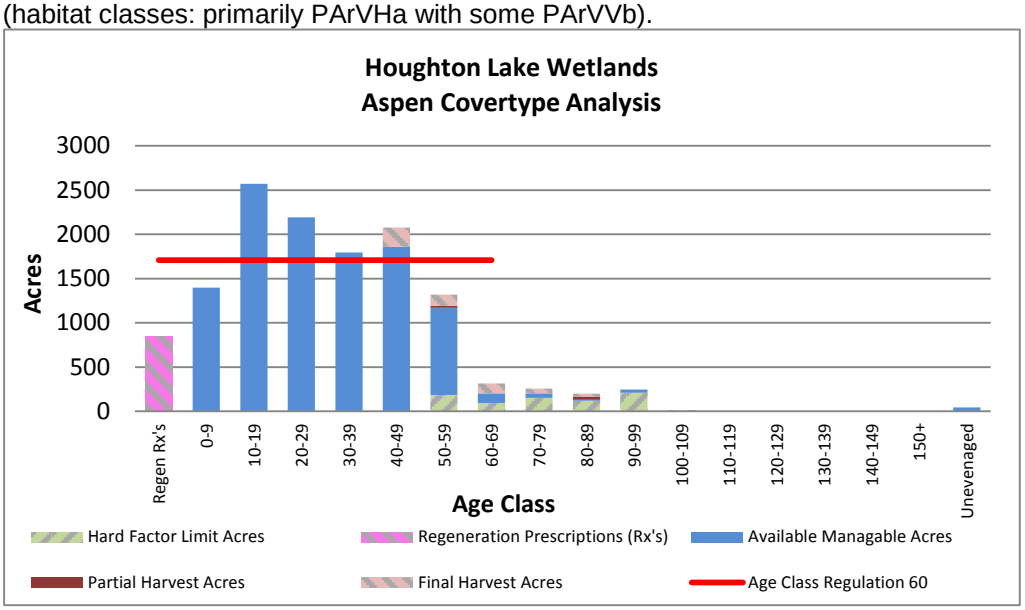

Figure 4.24.2. Age-class distribution for aspen in the Houghton Lake Wetlands management area (2012 Department of Natural Resources inventory data).

The age classes of aspen are fairly well balanced, with small spikes in the 10-19, 20-29 and 40-49 year-old age classes (Figure 4.24.2). There are 777 acres of aspen have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 843 acres of stands that have a final harvest pending and these acres are included in the regeneration prescription class.

Aspen is generally managed on a 60-year rotation in this management area to produce pole quality timber and occasional sawlogs. The exceptions to this management are priority areas for American woodcock, white-tailed deer and ruffed grouse habitat (featured species for this management area) where the emphasis may be placed on shorter rotations which provide more acres in the younger age-classes. In other priority areas, maintaining young aspen as well as alder, birch, maple or willow along streams will provide habitat for beaver, a featured species in this management area.

In some areas, aspen may be of merchantable size at less than 60 years and this may provide an opportunity to harvest stands “early” to restart additional acres which may help to balance the age-class distributions.

Desired Future Condition

- Aspen will be managed on suitable sites with acres balanced between 0-69 years of age; and
- Aspen acres will be maintained on currently operable sites to provide early successional habitat for species viability, while also providing a sustainable level of wood fiber.

10-Year Management Objectives

- Conduct final harvests on a projected 993 acres.

Long-Term Management Objectives

- As aspen stands reach the rotation age, harvest stands as needed to facilitate balancing the age-class distribution;
- Where necessary and feasible, future planning may need to consider harvesting additional acres above the rotation regulation level by harvesting from younger age classes to expedite the balancing of age-class distributions; and
- A desired future harvest level is projected at 1,707 acres for final harvest per 10-year period.

4.24.1.3 Forest Cover Type Management – Lowland Deciduous

Lowland deciduous acres total 5,417 acres or 8% of the management area (Table 4.24.1) and are located on wetland sites. Most of the acres are in the age classes above the age of 60 years (Figure 4.24.3). Lowland deciduous stands may be managed as even-aged stands on drier sites. On wetter sites, uneven-aged management is preferred. The residual trees keep the sites from becoming even wetter, resulting in a conversion to marsh.

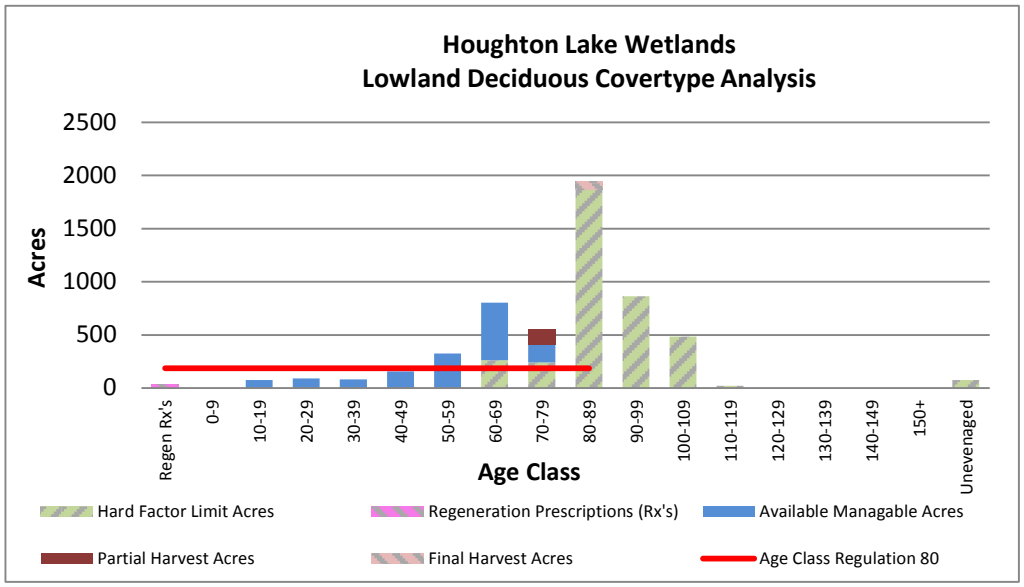

Figure 4.24.3. Age-class distribution for lowland deciduous in the Houghton Lake Wetlands management area (2012 Department of Natural Resources inventory data).

Tip overs and windthrow may also be an issue in stands that have been reduced below a residual basal area of 80 square feet per acre. Green ash, black ash, red maple and aspen are frequent components of swamp hardwoods (lowland hardwoods) and treatments on more mesic sites may convert lowland deciduous stands to aspen or red maple. It is expected that much of the ash will be affected by emerald ash borer. There are currently 3,821 acres factor limited that are not available for harvest (hard factor limit acres), often because the sites are too wet or due to other site factors.

Desired Future Condition

- Lowland deciduous stands will be located on suitable sites in a compositionally diverse forest which contains coarse woody debris, scattered large trees and scattered snags. This condition will benefit numerous wildlife species including red-headed and pileated woodpecker, featured species in this management area; and
- These lowland types will provide a sustainable level of forest products along with wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Conduct final harvests on a projected 177 acres.

Long-Term Management Objectives

- Management decisions should consider impact of the emerald ash borer on the ash with the expectation that ash will not be available;
- Continue efforts to regenerate lowland types where feasible; and
- A desired future harvest level is projected at 177 acres for final harvest per 10-year period.

4.24.1.4 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine on outwash sands with a high water table acres total 3,900 acres or 6% of the management area (Table 4.24.1). Jack pine is found on habitat class PVCd, PArVHa and PArVCo sites. There are 271 acres that have met harvest

criteria (Figure 4.24.4), but have site conditions that limit harvest (hard factor limit acres). There are 285 acres that have a final harvest pending and these acres are included in the regeneration prescription class.

Jack pine is managed on a 60-year rotation to provide pulpwood products and occasional sawlogs with the objective of balancing the age-class distribution and managing jack pine on suitable sites. Jack pine also provides habitat for many wildlife species, including snowshoe hare, a featured species in this management area, which prefers young dense conifer stands. There is a lack of acres in the 20-29 and 30-39 year-old age-classes which will affect future management decisions.

Desired Future Condition

- Jack pine of either natural origin or in planted stands will be managed on suitable sites with acres balanced in the 0-69 year old age-classes to provide a continuous flow of forest products and wildlife habitat for recreational activities.

10-Year Management Objectives

- Conduct final harvests on a projected 67 acres primarily from the 70-79 and 80-89 year age classes.

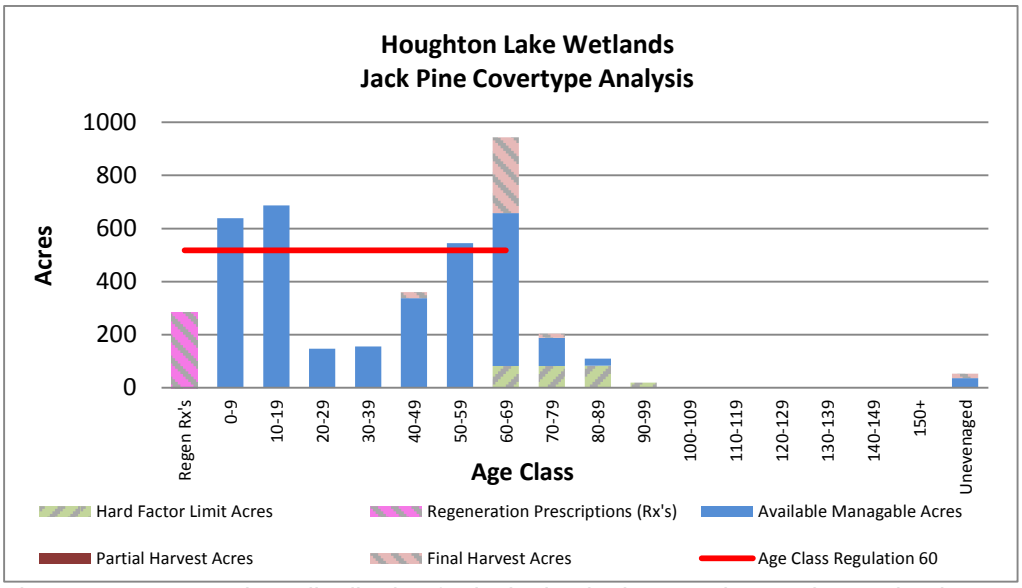

Figure 4.24.4. Age-class distribution for jack pine in the Houghton Lake Wetlands management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Consider converting jack pine to red pine on sites where red pine is better suited;
- Consider maintaining jack pine for habitat and forest products;
- Future planning may need to consider delaying harvest of jack pine until future periods to help offset the lack of jack pine acres in the 20-29 and 30-39 year-old age classes; and
- A desired future harvest level is projected at 518 acres for final harvest per 10-year period.

4.24.1.5 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 1,236 acres or 2% of the management area (Table 4.24.1). There are 201 acres that have met harvest criteria (Figure 4.24.4) but have site conditions that limit harvest (hard factor limit acres). There are 22 acres that have a partial harvest pending and these acres are included in their current age-classes (60-69 and 70-79).

There is a pronounced spike of red pine in the 40-89 year age-classes and these acres are being thinned to increase growth on the remaining trees to achieve a more valuable product. There are very few acres in the 0-39 year age classes and this will result in a significant reduction in future red pine harvests.

Desired Future Condition

- Red pine will be located on suitable sites with acres balanced between 0 and 89 years of age to provide a sustainable harvest of forest products.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and managing toward a balanced age-class distribution;
- Consider site suitability when deciding where to plant red pine;
- Conduct partial harvests (thinning) on a projected 366 acres, concentrating on stands of better quality red pine that have the potential for a higher product value in larger size classes; and
- Conduct final harvests on a projected 403 acres of red pine beginning with the oldest age-classes and with a concentration on stands with less potential for a higher product value.

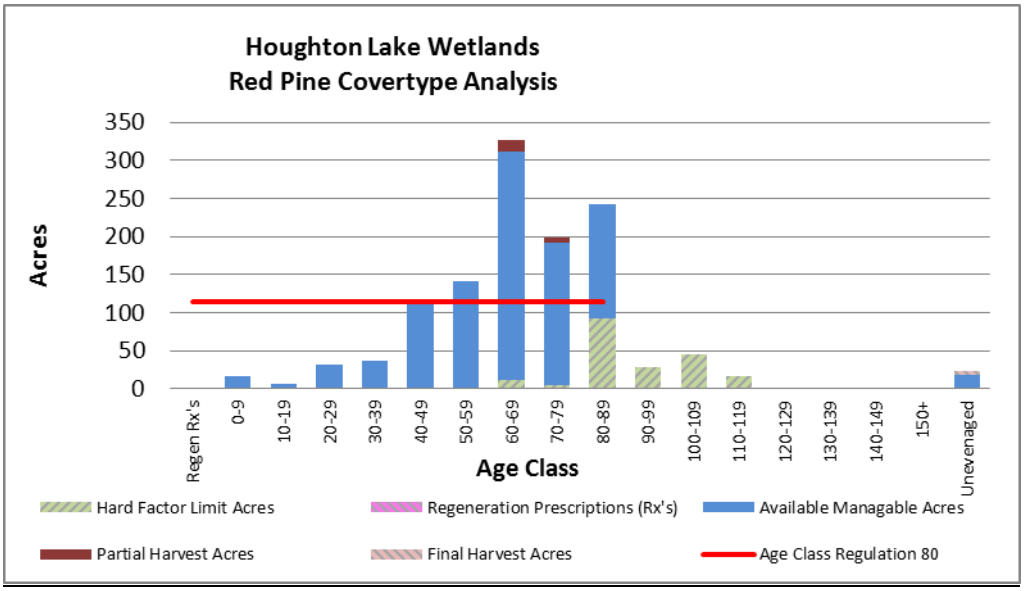

Figure 4.24.5. Age-class distribution for red pine in the Houghton Lake Wetlands management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue management of red pine through partial harvests of the younger age classes and regeneration harvests as stands reach the silvicultural rotation age (80 years).
- Consider opportunities to re-establish red pine through planting;
- Where necessary and feasible, future planning may need to consider the implications of the lack of red pine in the 0-39 year age-classes;
- Balancing the age-class distribution of red pine will require one complete rotation (80 years or more); and
- A desired future harvest level is projected at 115 acres for final harvest and 502 acres for partial harvest per 10-year period.

4.24.1.6 Forest Cover Type Management – White Pine

Current Condition

White pine acres total 1,124 acres or 2% of the management area (Table 4.24.1). There are 223 acres that have met harvest criteria (Figure 4.24.4), but have site conditions that limit harvest (hard factor limit acres). There are 127 acres that have a partial harvest pending and these acres are included in their current age classes (40-49, 50-59 and 60-69).

All acres of white pine are over the age of 30 with a spike in the 50-59 year age class. Although white pine can be managed on a rotation to 109 years, the lack of acres in the younger age classes 0-29 will result in a reduction of white pine available for harvest in the future.

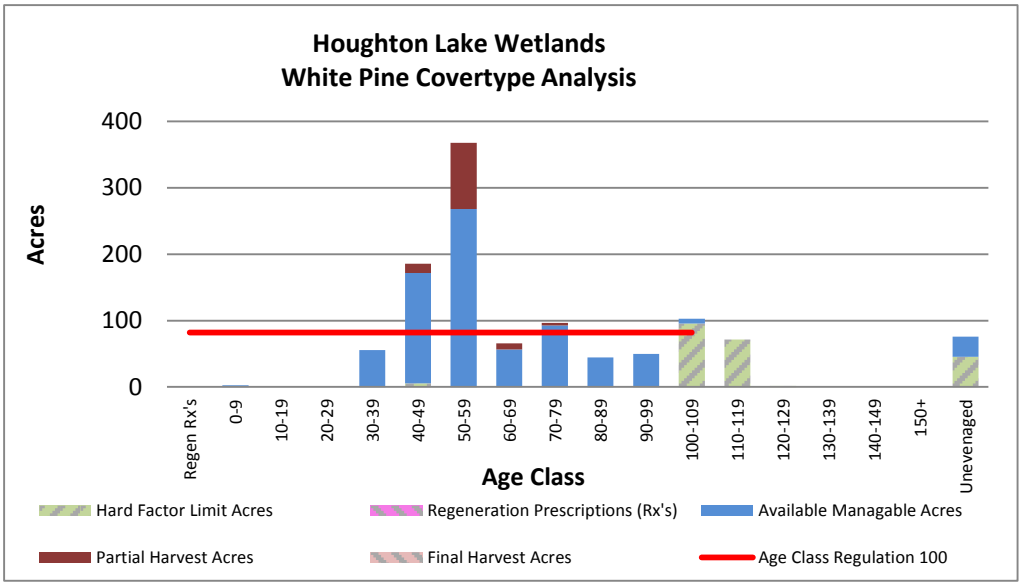

Figure 4.24.6. Age-class distribution for white pine in the Houghton Lake Wetlands management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- White pine will be balanced between the 0-109 year age classes to provide sustainable harvests of wood products and wildlife habitat for recreational activities.

10-Year Management Objectives

- Conduct partial harvests (thinning) on a projected 276 acres; and
- Conduct final harvests on a projected 320 acres of white pine.

Long-Term Management Objectives

- Continue management to balance the age class distribution;
- Future planning will need to consider the impact of the current lack of white pine in the youngest age classes; and
- A desired future harvest level is projected at 82 acres for final harvest and 360 acres of partial harvest per 10-year period.

Section 4.24.1.6 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: oak 1,753 acres or 3%. Other forest communities total 3,693 acres or 5% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct final harvests on a projected 165 acres of lowland conifer, 89 acres of oak, 84 acres of lowland aspen/balsam poplar, 67 acre of mixed upland deciduous, 85 upland spruce/fir, 9 acres of lowland mixed forest, 30 acres of upland mixed forest and 44 acres of upland conifer;
- Consider methods to ensure adequate regeneration of lowland types;

- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years-of-entry; and
- Conduct partial harvests on a projected 96 acres of oak, 170 acres of mixed upland deciduous, 172 acres of northern hardwood, 131 acres of upland mixed forest, 82 acres of natural mixed pines, 37 acres of hemlock and 60 acres of upland conifers.

Long-Term Management Objectives

- Continue management of these other types to produce forest products, wildlife habitat and recreational opportunities; and
- Desired future harvest levels for final harvests are projected at 165 acres for lowland conifers.

4.24.1.7 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open lands acres total 1,310 or 2% of the management area (Table 4.24.1). This category is a combination of the following non-forested land cover types: herbaceous open land; upland shrub, low density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.24.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this 10-year planning period:

- American woodcock
- Beaver
- Black bear
- Eastern massasauga rattlesnake
- Golden-winged warbler
- Mallard (Backus Creek State Game Area and Bear Creek Flooding and Houghton Lake Flats state wildlife management areas)
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- White-tailed deer
- Wood duck (Backus Creek State Game Area and Bear Creek Flooding and Houghton Lake Flats state wildlife management areas)

The primary focus of wildlife habitat management in the Houghton Lake Wetlands management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest, large open grassland complexes and marsh/grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
  - Implementation of the 10-year management direction for aspen, lowland aspen, and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
    - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
    - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting and brood rearing. Mallard pair-bonding wetlands are typically 0.25 to 20 acres in size and brood rearing wetlands are typically 1.2-30 acres in size. Optimal hemi-marsh sites are greater than 2.5 acres with open water portions having extensive portions less than 3 feet deep and 4:1 area of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within ~ 200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
    - Implementation of the wildlife management area master plans for Backus Creek State Game Area and the Bear Creek Flooding and Houghton Lake Flats state wildlife management areas; and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than 5 acres in size with a savannah-like dispersion of large trees (< 50% canopy cover) with open under story and include tall trees or snags of large (> 12 inches) diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres, and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old) even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorne, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen, and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood ducks are most limited by available nesting and brood rearing habitat. Wood duck nest in tree cavities near rivers, streams, swamps, beaver ponds and marshes. Nests require mature hardwood trees with 10 inches in diameter at breast height or larger. Brood rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority wildlife management areas with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat;
- Implementation of the wildlife management area master plans for Backus Creek State Game Area and the Bear Creek Flooding and Houghton Lake Flats state wildlife management areas; and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification; and
- Maintain stable water levels at managed floodings from April through August.

4.24.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed six listed species and no natural communities of note occurring in the management area as listed in Table 4.24.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.24.7, the Houghton Lake Wildlife Research Area (shared with the AuSable Outwash management area) is a special conservation area (12,000 acres) as is the Dead Stream Swamp (11,663 acres) (also a national natural landmark) which is shared with the Upper Muskegon management area. There are no high conservation value areas or ecological reference areas identified for the Houghton Lake Wetlands management area as illustrated in Figure 4.24.7.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.24.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Houghton Lake Wetlands management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Bird								
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Insect								
Red-legged spittlebug	*Prosapia ignipectus*	SC/G4/S2S3	Confirmed	EV	Moderate	Alvar	Upland open/semi-open	N/A
						Prairie fen	Upland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Mesic sand prairie	Upland open/semi-open	N/A
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Plants								
Pale Agoseris	*Agoseris glauca*	T/G5/S2	Confirmed			Pine barrens	Jack Pine	Early
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry sand prairie	Upland open/semi-open	N/A
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Rough fescue	*Festuca scabrella*	T/G5/S2S3	Confirmed			Oak-pine barrens	Oak	Mid

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

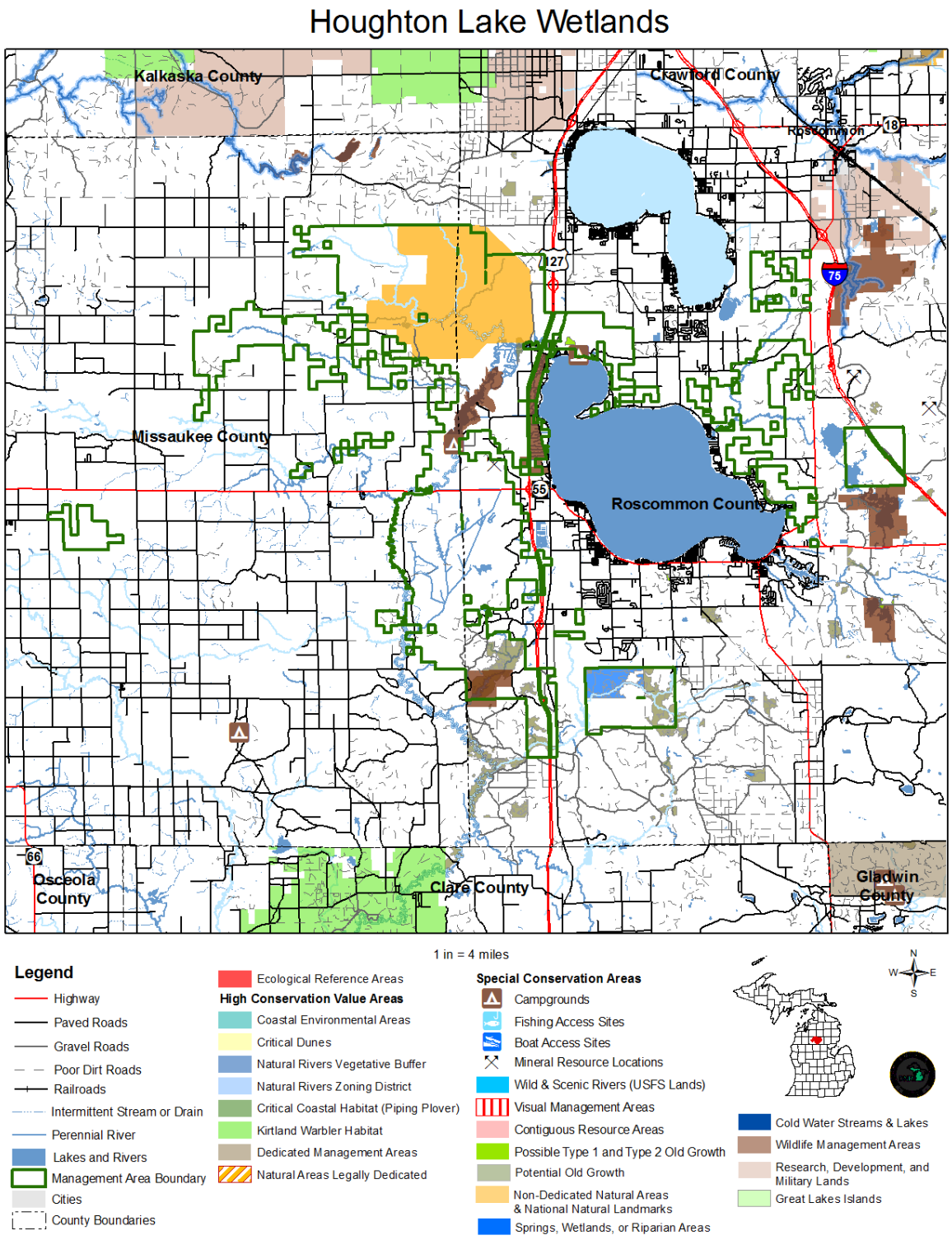

Figure 4.24.7. A map of the Houghton Lake Wetland management area showing the special resource areas.

4.24.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. One of the more important forest health issues in this management area includes oak decline and management should be adapted as follows:

- Oak decline which is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.24.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.24.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Houghton lake Wetlands - FRD Management Areas	Cases within FRD Areas	Cases within 5 Mile Buffer	Total number of cases	Total number of different Invasive Species
	1	2	3	3

Invasive Species within FRD Areas	Occurrences	Invasive Species within 5 Mile Buffer	Occurrences
Japanese Knotweed *Fallopia japonica*	1	Garlic Mustard *Alliaria petiolata*	1
-	-	Reed Canary Grass *Phalaris arundinacea*	1

4.24.5 Fire Management

Historically, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen or grass/upland brush types. Wildfire risk and fuel loading is increased in young dense conifer plantations and mature jack pine affected by jack pine budworm.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition particularly from red maple;
- Incorporate fire as a tool to restore or maintain managed openings;
- Reduce fuel loading and therefore the risk of wildfire in jack pine stands by harvesting at maturity; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.24.6 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process, and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.24.1 and listed in Appendix F.

4.24.7 Public Access and Recreation

Access for management and/or recreation is generally very poor throughout this management area due to the extent of the lowland areas. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

With a high water table and fragile ecosystems, this management area offers limited recreational opportunities; however, the facilities provided have unique qualities. Situated on the north shore of Houghton Lake, the Houghton Lake State Forest Campground (Figure 4.24.7) routinely ranks as one of the top five busiest state forest campgrounds in the state. Houghton Lake State Forest Campground has a "modern" toilet facility, natural flowing drinking water wells and portable docks for boat enthusiasts, which all sustain its heavy use. Reedsburg Dam state forest campground (Figure 4.24.7) offers typical camp sites, along with smaller "hike-in" sites for those looking for a tenting camping experience. Off-road vehicle enthusiasts can ride the 50-inch West Higgins Trail and snowmobiling is an important economic boost to the area in the winter months (Figure 4.24.1). Current recreation opportunities are heavily used, but future additional recreation amenities are limited by the fragile terrain associated with wetland ecosystems. The recreation features provided in this management area are listed below.

Campgrounds
- Reedsburg Dam State Forest Campground
- Houghton Lake State Forest Campground

Boating Access Sites (BASs)
- Reedsburg Dam BAS
- Deadstream Flooding BAS

Off-Road Vehicle Trails
- West Higgins Trail

Snowmobile Trails
- Various

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as retaining trees along single track off-road vehicles trails to maintain the integrity of narrow trails. Additionally, considerations may be made for harvest timing around snowmobile trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.24.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium, fine-textured till, coarse-textured till, ice-contact outwash sand and gravel and peat and muck. The glacial drift thickness varies between 200 and 800 feet. Sand and gravel pits are located in this management area and there is good potential for additional pits.

The Jurassic Red Beds, Pennsylvanian Saginaw Formation and Mississippian Bayport Limestone and Michigan Formation subcrop below the glacial drift. The Bayport is quarried for limestone elsewhere in the state.

Very little of these lands have been developed for oil and gas from the Devonian Richfield and Ordovician Prairie du Chien. Well spacing for the Devonian is 40 acres and the Prairie du Chien 320 to 640 acres. There is potential for additional development for these formations in this management area. The Collingwood Formation's first well was drilled for gas in Missaukee county and additional wells have been permited. Spacing will most likely be 640 acres or larger.

Most of the management area is currently leased, most likely for Collingwood Formation development and if drilling is successful, additional leasing and drilling will continue in this management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and that all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.25 MA 25 – AuSable Outwash Management Area Plan

Summary of Use and Management

Vegetation management in the AuSable Outwash management area (MA) (Figure 4.25.1) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique character including several state wildlife area floodings, the Roscommon Forest Fire Experiment Station, threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management for this 10-year planning period will focus on improving the age-class structure of aspen, harvesting older jack pine and regeneration of red pine and oak to help balance age-classes. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation opportunity and management of the state wildlife management areas. Expected trends within this 10-year planning period are an increase in non-native exotic plants, especially *Phragmites* in the wetland areas and increased recreational pressure.

Introduction

This management area is located in Otsego, Montmorency, Kalkaska, Crawford, Oscoda, Roscommon and Ogemaw counties and contains 160,801 acres of state forest land (Figure 4.25.1). The primary attributes which identify the AuSable Outwash management area include:

- The management area falls within Albert's (1995) Grayling Outwash Plain sub-region.
- This management area is characterized by a high outwash plain with several large ridges of excessively drained sand intermixed with wetlands.
- The AuSable River and its tributaries are designated as a natural river.
- The Rifle River, a designated natural river, crosses the portion of the management area in Ogemaw County.
- A portion of the management area is adjacent to the Rifle River Recreation Area.
- This area is popular for hunting and mushroom hunting and other activities for the nearby communities of Harrison, Houghton Lake, Grayling and Roscommon.
- This use combined with the quantity and availability of wood fiber contributes significant social and economic values to the area.
- This management area contains one or more of the northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.
- The management area contains the Robinson Creek, Conners Marsh Flooding and Beaver Lake Wildlife Area Floodings and well as the Houghton Lake State Wildlife Area.
- The management area contains the Mason Tract, a designated natural area with its own management plan.
- The Roscommon Forest Fire Research Area is located in this management area.
- With the exception of the Mason Tract where mineral leasing is restricted, there has been extensive development of oil/gas resources.
- The Geels Off-Road Vehicle Trail and snowmobile trails are located in the management area.
- The Mason Tract Pathway, Canoe Harbor state forest campgrounds and Chase and Smith bridges access sites are located in the management area.
- Threatened, endangered or species of special concern located by Michigan Natural Features Inventory surveys include: Hill's thistle, rough fescue, Allegheny or sloe plum, secretive locust, prairie or pale *agoseris*, Kirtland's warbler and prairie warbler.

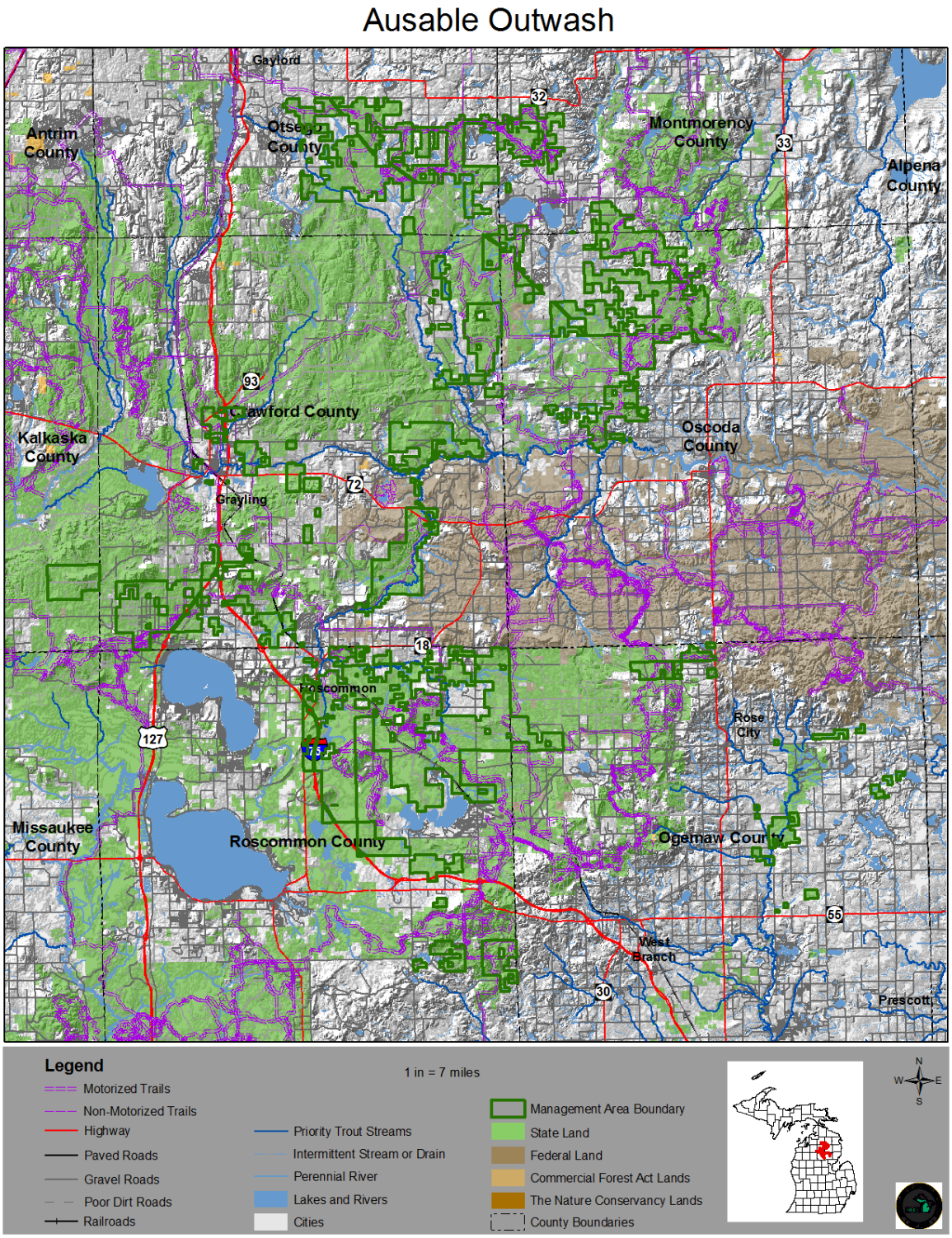

Figure 4.25.1. A map of the AuSable Outwash management area (dark green boundary) in relation to surrounding state forest and other lands in Otsego, Montmorency, Oscoda, Crawford, Roscommon, Kalkaska and Ogemaw counties, Michigan.

Table 4.25.1. Current cover types, acreages, projected harvests and projected acreages at the end of the period for this ten-year planning AuSable Outwash management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	26%	41,690	1,702	39,988	8,177		41,690	6,665	
Jack Pine	16%	25,685	1,656	24029	4,210		25,685	4,005	
Oak	13%	20,318	6,032	14286	151	2,159	20,318	1,785	2,309
Red Pine	11%	17,492	2,148	15344	2,834	5,697	17,492	1,540	7,060
Lowland Conifers	5%	8,693	6,967	1726	192		8,693	192	
Cedar	3%	4,379	4,379				4,379		
White Pine	2%	3,330	504	2826	733	1,104	3,330	257	1,125
Mixed Upland Deciduous	2%	2,553	21	2532		351	2,553	362	351
Upland Open/Semi-Open Lands	6%	10,077		10077			10,077		
Lowland Open/Semi-Open Lands	8%	12,235		12235			12,235		
Misc Other (Water, Local, Urban)	1%	1,812		1812			1,812		
Others	8%	12,537	4,828	7709	880	1,668	12,537	649	1,724
Total		160,801	28,237	132,564	17,177	10,979	160,801	15,455	12,569

4.25.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, passive management resulting in natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

Section 4.25.1.1 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total 41,690 acres or 26% of the management area (Table 4.25.1). Aspen is found on PArVVb, PArVHa, PArVHa/PArVVb, PVCd and PVCd/PArVHa habitat sites.

Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation.

There are 1,702 acres of aspen have met harvest (Figure 4.25.2) criteria, but have site conditions that limit harvest (hard factor limit acres). There are 3,132 acres that have a final harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0-59 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

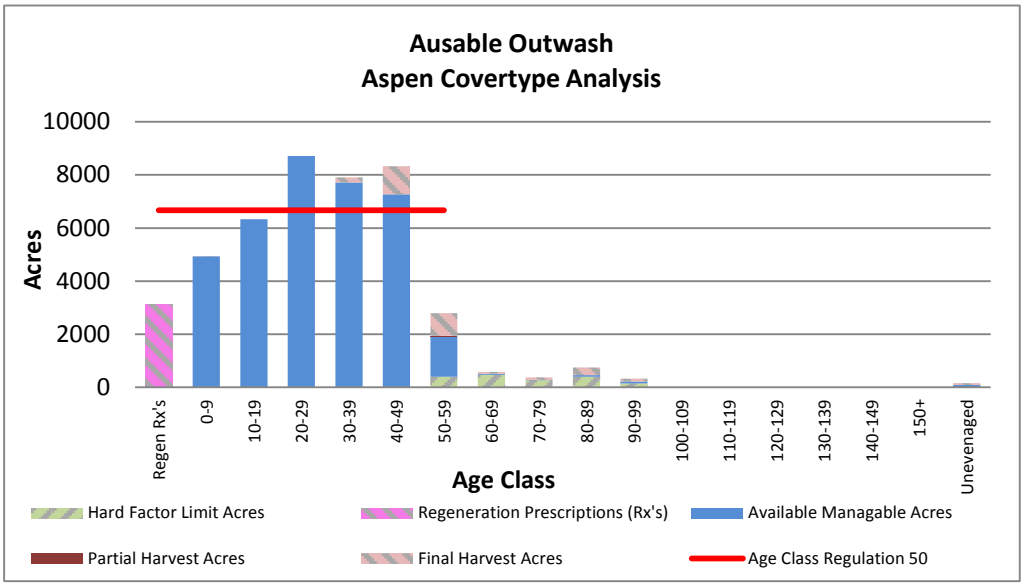

Figure 4.25.2. Age-class distribution for aspen in the AuSable Outwash management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 8,177 acres per decade; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue to manage aspen for a balanced distribution of acres between 0-59 years;
- A desired future harvest level is projected at 6,665 acres for final harvest per 10-year period; and
- Aspen within the identified Grouse Enhanced Management Systems area may be managed differently than the rest of the aspen within the management area, with a shorter rotation age**,** small patch cuts and carefully considered stand adjacency.

Section 4.25.1.2 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 25,685 or 16% of the management area (Table 4.25.1). Jack Pine is found on PArVHa/PArVVb, PArVHa, PVCd/PArVHa and PVCd habitat class sites. Forest communities dominated primarily by jack pine in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation.

There are 1,656 acres of jack pine have met harvest criteria (Figure 4.25.3), but have site conditions that limit harvest (hard factor limit acres). There are 1,016 acres that have a regeneration harvest pending and these acres are included in the regeneration prescription class. There are 111 acres with a partial harvest pending and these acres are included in their current age-class. The graph includes the projected number of acres converted to jack pine as a result of treatments that remove an overstory and planting jack pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Jack pine dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0-59 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

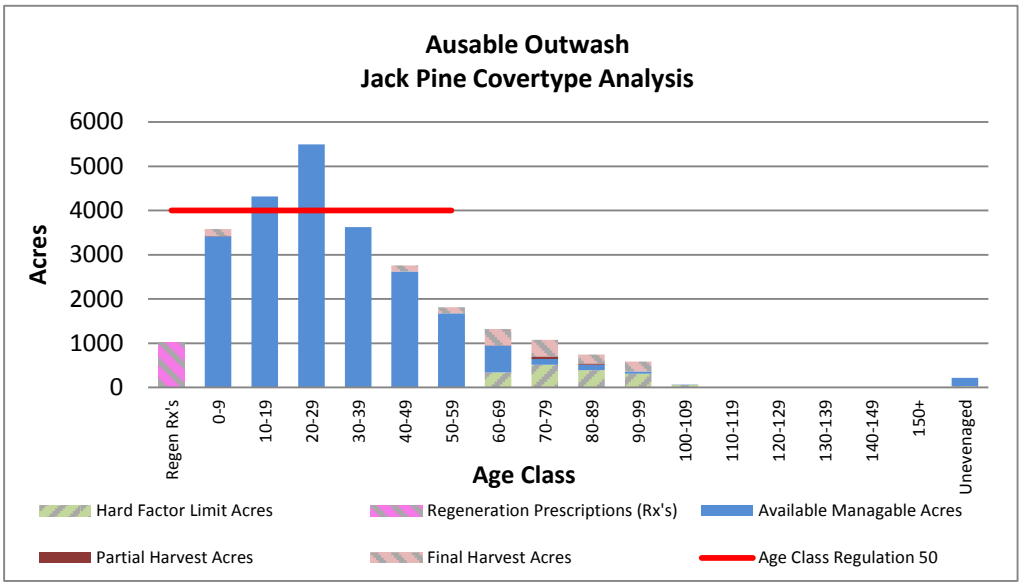

Figure 4.25.3. Age-class distribution for jack pine in the AuSable Outwash management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct final (regeneration) harvests on a projected 4,210 acres; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue management of jack pine on appropriate sites with an emphasis on reducing over mature stands to minimize losses from jack pine budworm and associated risks due to increased fuel loads; and
- A desired future harvest level is projected at 4,005 acres for final harvest per 10-year period.

Section 4.25.1.3 Forest Cover Type Management – Oak

Current Condition

Oak acres dominated primarily by a mixture of pin oak and black oak total 20,318 or 13% of the management area (Table 4.25.1). Oak stands occur on dry, poor nutrient sites (habitat classes: ArVHa/PArVVb, PArVHa and PVCd). Recent management has been partial harvests in areas with natural pine understory. The oak type in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, white-tailed deer, squirrels and various birds and commercially for firewood and industrial lumber.

The older oak (age 90+) is declining rapidly. There are 6,032 acres of oak have met harvest criteria (Figure 4.25.4), but have site conditions that limit harvest (hard factor limit acres). There are 2,544 acres that have a regeneration harvest pending and these acres are shown in regeneration prescription class. There are approximately 1,259 acres with a partial harvest pending and these acres are included in their current age-class. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release oak. These acres are included in the regeneration prescription class.

Oak is desirable as it provides valuable habitat for many wildlife species, including ruffed grouse, white-tailed deer, black bear and wild turkey, which are featured species in this management area. Oak also provides valuable timber products.

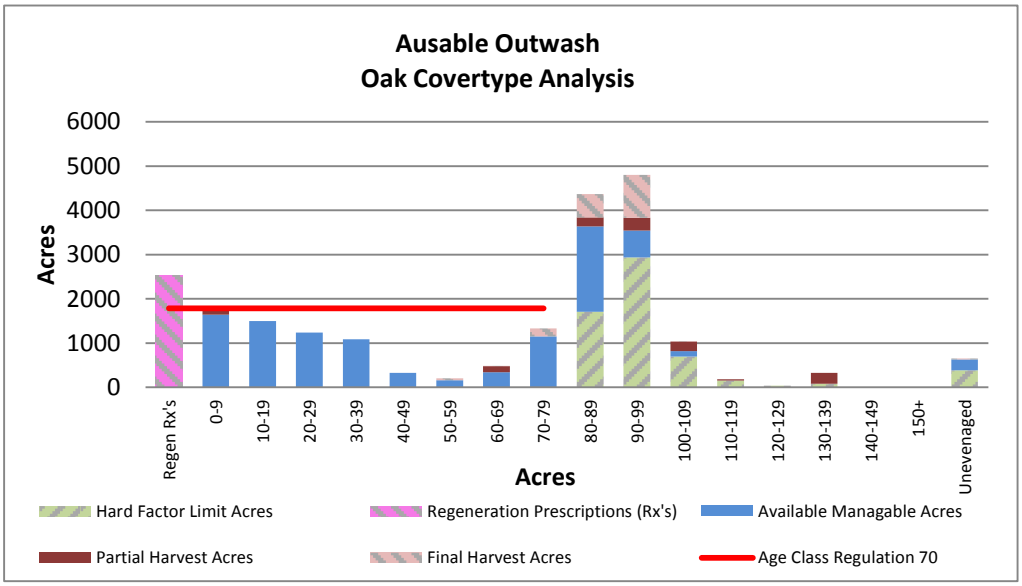

Figure 4.25.4. Age-class distribution for oak in the AuSable Outwash management area (2012 Department of Natural Resources inventory data).

Conditions that existed around the turn of the last century that created the extensive oak stands (large clearcuts that minimized frost pockets, intense fires that minimized competition and a smaller deer population) cannot be replicated. Therefore, the oak resource in this management area is extremely skewed towards the older age classes due to a minimal amount of regeneration for the last 70 years (Figure 4.21.3). The oak in the 90+ age classes is approaching the end of the normal lifespan on outwash plains and is becoming increasingly susceptible to insects and diseases such as oak wilt and oak decline. Older oak also does not sprout as vigorously from stump sprouts.

Due to the advanced age of the oak and the challenges to regenerating oak, management should concentrate on maintaining oak in mixed stands. The current understory of white pine and red maple below oak will be released through partial oak harvests. Where oak is in the understory, such as under jack pine or other pine types, treatments to reduce the pine overstory will release oak. Considerations should also be given to planting pine in oak stands, which can help to shelter young oak from late spring freezes. Oak can be a component of other cover types, but will require management techniques to ensure regeneration.

Desired Future Condition

- Oak will be maintained as a mixed cover type and as a component in stands throughout the management area through management to provide for timber products, wildlife habitat and recreational opportunities; and
- Some oak sites will be allowed to become mixed with white pine or red maple.

10-Year Management Objectives

- Conduct final harvests on a projected 2,159 acres;
- Conduct partial harvests on a projected 151 acres;
- Consider competition control through methods such as prescribed burning or herbicide use to improve the chances for successful natural regeneration;
- Maintain or expand oak as a component in stands throughout the management area through retention and management to promote natural regeneration in other cover types;
- Consider opportunities to re-establish and maintain oak/pine barrens on poor-quality sites (primarily low-end PArVVb and PVCd). This will provide habitat for species, including wild turkey, that prefer openings; and
- Where site conditions allow, consider introduction of red pine in young oak stands to shelter oak from late spring freezes.

Long-Term Management Objectives

- Continue work towards maintaining oak on the landscape in mixed stands and as a component in other cover types;

- Continue management for mixed oak/pine stands through partial harvests to release understory species into the overstory or planting pine in young oak stands;
- Future management decisions will need to take into consideration the impact of oak wilt and oak decline as the cumulative impacts will likely increase over time; and
- A desired future harvest level is projected at 1,785 acres for final harvest and 2,309 acres for partial harvest per 10-year period.

Section 4.25.1.4 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres of varying quality total 17,492 or 11% of the management area (Table 4.25.1) on dry to dry-mesic sites (habitat classes: PArVVb, PArVHa/PArVVb, PArVHa and PVCd/PArVHa). Forest communities dominated primarily red pine in this management area is valued commercially for pulp, poles and sawtimber.

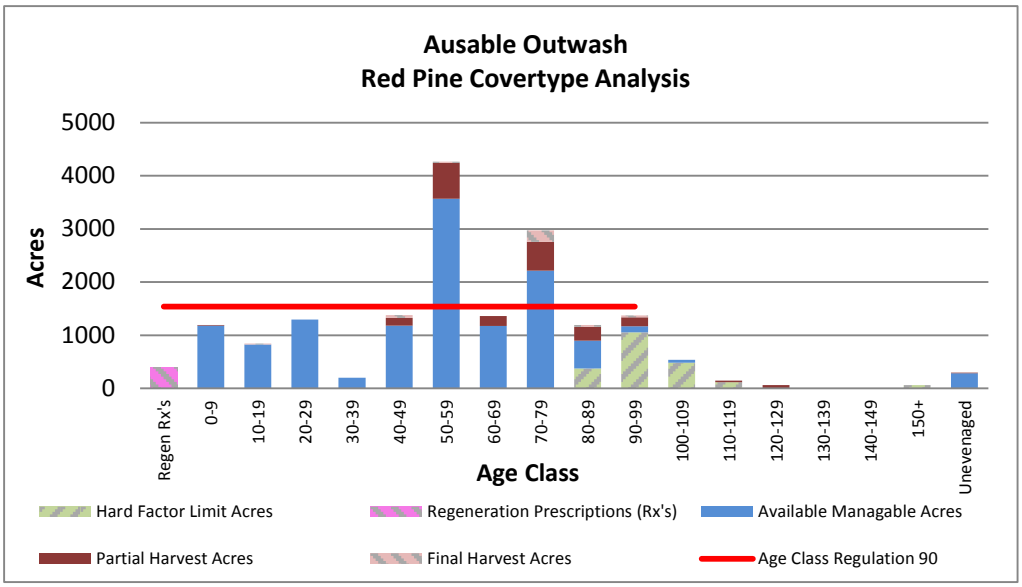

Figure 4.25.5. Age-class distribution for red pine in the AuSable Outwash management area (2012 Department of Natural Resources inventory data).

There are 385 acres of stands that have a regeneration harvest pending and these acres are included in regeneration prescription class (Figure 4.25.5). There are 2,072 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to red pine as a result of treatments that remove an overstory and planting to red pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine on dry-mesic sites (PArVVb and PArVHa/PArVVb) will be maintained and managed with a thinning regime until stand replacement harvest at economic maturity with acres balanced between 0-99 years of age to provide for continual harvest, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age-class distribution;
- Conduct restarting harvests on a projected 2,834 acres; and
- Conduct partial harvests, based on a projected 5,697 acres of red pine.

Long-Term Management Objectives

- In identified special conservation areas, especially those with natural red pine on dry-mesic sites, consider management of red pine to a biological rotation of 200+ years; and

- A desired future harvest level is projected at 1,540 acres for final harvest and 7,060 acres for partial harvest per 10-year period.

Section 4.25.1.5 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open acres total 12,235 acres or 8% of the management area (Table 4.25.1). Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife.

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Protect stands from illegal off-road vehicle use; and
- Where necessary and feasible, use control methods on invasive non-native species.

Section 4.25.1.6 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 10,077 or 6% of the management area (Table 4.25.1). Included in this type are herbaceous open land; bare/sparsely vegetated, low density trees and upland shrub. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Management to maintain upland open/semi-open lands may include prescribed fire, woody brush removal, application of herbicide and planting.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where necessary and feasible, consider control methods on invasive non-native species.

Section 4.25.1.7 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: lowland conifers 8,693 acres or 5% of the management area, cedar 4,379 acres (3%), white pine 3,330 acres (2%) and mixed upland deciduous 2,553 acres (2%). Other forested and non-forested communities total 1,812 acres or 1% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape in addition to providing wood products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct final (regeneration) harvests on a projected 192 acres of lowland conifer, 733 acres of white pine, 65 acres of lowland deciduous, 142 acres of upland mixed forest, 286 acres of natural mixed pines, 34 acres of lowland aspen/balsam poplar, 28 acres of lowland spruce/fir, 22 acres of lowland mixed forest, 143 acres of upland spruce/fir, 69 acres of upland conifers and 31 acres of paper birch;
- Consider methods to ensure adequate regeneration of lowland types;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years-of-entry; and
- Conduct partial harvests on a projected 1,104 acres of white pine, 351 acres of mixed upland deciduous, 603 acres of northern hardwood, 361 acres of upland mixed forest, 480 acres of natural mixed pines, 130 acres of planted mixed pines and 82 acres of upland conifers.

Long Term Management Objectives

- Continue efforts to regenerate lowland types where feasible. Desired future harvest levels for final harvest are projected at 192 acres of lowland conifer and 65 acres of lowland deciduous per 10-year period.

4.25.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

This management area will include one or more northern Lower Peninsula Grouse Enhanced Management System areas. The boundaries will be delineated during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager. Aspen stands that fall within the Grouse Enhanced Management System area boundary may be managed on a shortened rotation with multiple age classes and smaller stand sizes to enhance hunting opportunities for ruffed grouse, woodcock, deer, turkey and hare. The remainder of the management area (outside the boundary) will be managed based on the direction in the management area write up.

The following have been identified as featured species for this management area during this 10-year planning period:

- American bittern (Robinson Creek Flooding State Wildlife Management Area)
- American woodcock
- Beaver
- Black bear
- Eastern massasauga rattlesnake
- Golden-winged warbler
- Mallard (Beaver Creek Flooding State Wildlife Management Area)
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer
- Wood duck (Beaver Creek Flooding and Robinson Creek Flooding state wildlife management areas)

The primary focus of wildlife habitat management in the AuSable Outwash management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; large open

grassland complexes and marsh/grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Bittern

The goal for American bittern in the northern Lower Peninsula is maintain or increase available habitat. American bittern prefer large (>10 acre), shallow (average depth four inches) wetlands with open water in the center, a band of emergent vegetation around periphery and idle grassland in the adjacent uplands (4:1 grassland to wetland ratio). State forest management should focus on priority wildlife management areas with suitable shallow water marsh (hemi-marsh).

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat. Ideal wetland/upland complexes are > 50 acres.
    - Implementation of the wildlife management area master plans for Robinson Creek State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain water levels from the April through August breeding season.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specification:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
    - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
    - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
    - Implementation of the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve

adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
  - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age-class.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting and brood rearing. Mallard pair-bonding wetlands are typically 0.25-20 acres in

size and brood rearing wetlands are typically 1.2-30 acres in size. Optimal hemi-marsh sites are greater than 2.5 acres with open water portions having extensive portions less than three feet deep and 4:1 area of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within ~200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plan for Beaver Creek Flooding State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than 5 acres in size with a savannah-like dispersion of large trees (< 50% canopy cover) with open under story and include tall trees or snags of large (> 12 inches in diameter at breast height). State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease, and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than 12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old) even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry, and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.
- Manage the aspen cover type for smaller patch size, a shorter rotation and a more deliberate habitat configuration within the designated Grouse Enhanced Management Systems areas where appropriate.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting, and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood ducks are most limited by available nesting and brood rearing habitat. Wood duck nest in tree cavities near rivers, streams, swamps, beaver ponds and marshes. Nests require mature hardwood trees with 10 inches in diameter at breast height or larger. Brood rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority wildlife management areas with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plans for Beaver Creek Flooding State Wildlife Management Area and Robinson Creek Flooding State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification.
- Maintain stable water levels at managed floodings from April through August.

4.25.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed sixteen listed species and five natural communities of note occurring in the management area as listed in Table 4.25.2. A colony of great blue herons has also been identified. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.25.6, the Houghton Lake Wildlife Research Area is a special conservation area (12,000 acres) as is the Roscommon Forest Fire Experiment Station (5,487 acres). As shown in Figure 4.25.6, there are two non-dedicated natural areas. The South Branch of the AuSable River is 3,182 acres and is wholly within the management area and the Crawford/Dyer Red Pine site (120 acres) is shared with the Kirtland's Warbler management area. There is also one potential Type 1 old growth area that is referred to as the Roscommon Red Pine site and consists of 42 acres of the dry northern forest natural community type (Figure 4.25.6).

The Rifle and AuSable rivers and their tributaries have been identified as natural rivers and along with their corridors are also designated as high conservation value areas as shown in Figure 4.25.6. Another high conservation value area is the Mason Tract, also shown in Figure 4.21.3.

There are four ecological reference areas identified for the AuSable Outwash management area as shown if Figure 4.25.6. Two ecological reference areas represent the dry northern forest natural community type and are 9.94 acres and 42.2 acres in size. A third ecological reference area represents the pine barrens natural community type and is 41.71 acres and the fourth represents the northern fen natural community type and is 31.38 acres. These ecological reference areas will be managed to enhance and protect their natural vegetative and associated wildlife communities as directed by an ecological reference area-specific management plan. These individual management plans will be developed over the life of this planning period.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.25.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the AuSable Outwash management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Dry northern forest		S3/G3?					Jack Pine, Red Pine	Late
Northern fen		S3/G3	Confirmed				Lowland open/semi-open	N/A
Northern shrub thicket		S5/G4	Confirmed				Upland open/semi-open	N/A
Pine barrens		S2/G3	Confirmed				Jack Pine	Early
Rich conifer swamp		S3/G4	Confirmed				Tamarack	Late
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Kirtland's warbler	*Dendroica kirtlandii*	LE/E/G1/S1	Confirmed	PS	Very High	Pine barrens	Jack Pine	Early
						Dry northern forest	Jack Pine, Red Pine	Early
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common tern	*Stema hirundo*	T/G5/S2	Confirmed	MV	Moderate	Sand & gravel beach	Upland open/semi-open	N/A
Insect								
Red-legged spittlebug	*Prosapia ignipectus*	SC/G4/S2S3	Confirmed	EV	Moderate	Alvar	Upland open/semi-open	N/A
						Prairie fen	Upland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Mesic sand prairie	Upland open/semi-open	N/A
Butterfly								
Dusted skipper	*Atrytonopsis hianna*	Sc/G4G5/S2S3	Confirmed	MV	Low	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Moth								
Doll's merolonche	*Merolonche dolli*	SC/G3G4/S1S2	Confirmed	MV	Moderate	Pine barrens	Jack Pine	Early
						Oak-pine barrens	Oak	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Mesic northern forest	Northern Hardwood	Late
						Bog	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Rich conifer swamp	Tamarack	Late
Insect								
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Mussel								
Slippershell mussel	*Alasmidonta viridis*	T/G4G5/S2S3	Confirmed	EV	Very High	Headwater Stream	Aquatic	N/A
						Mainstem streams	Aquatic	N/A
						Inland lake	Aquatic	N/A
Reptiles								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

Table 4.25.3. Occurrence information for special concern, rare, threatened and endangered communities and species for the AuSable Outwash management area (Continued).

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Reptiles (Cont'd)								
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Plants								
Pale Agoseris	*Agoseris glauca*	T/G5/S2	Confirmed			Pine barrens	Jack Pine	Early
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry sand prairie	Upland open/semi-open	N/A
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Rough fescue	*Festuca scabrella*	T/G5/S2S3	Confirmed			Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Allegheny plum	*Prunus allighaiensis davisii*	SC/G4T3Q/S3	Confirmed			Dry sand prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

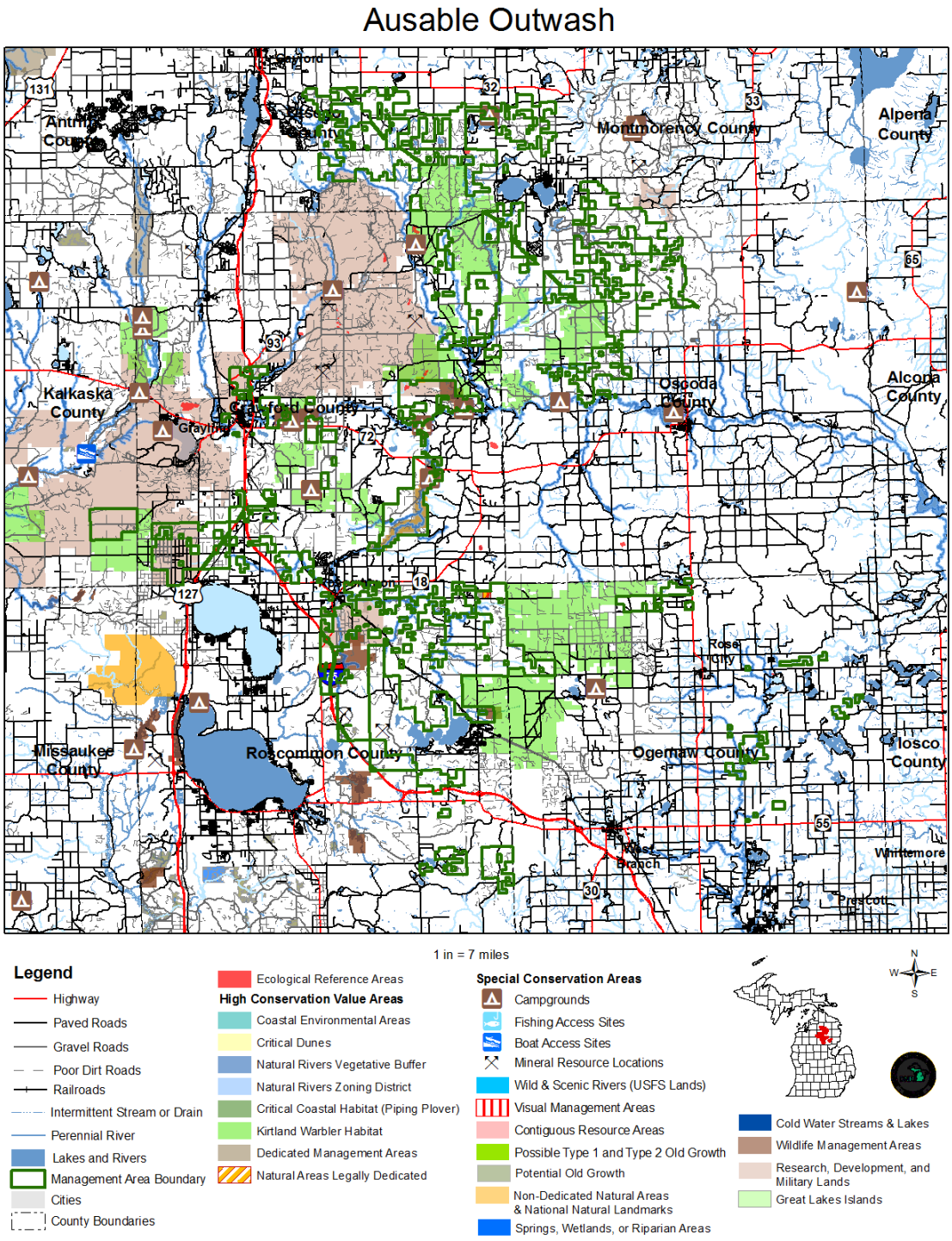

Figure 4.25.6. A map of the AuSable Outwash management area showing the special resource areas.

4.25.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include oak wilt, oak decline, *Diplodia* shoot blight and branch mortality of seedling and sapling white pine and management should be adapted as follows:

- Oak wilt is found in this area. Epicenters need to be identified and treated. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced. Other management activities that can lead to damage of residual red oak trees (oil and gas development, recreational trail improvement, etc.) should be not be conducted during this high-risk period;
- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce the risk of decline;
- Will need to monitor sites for *Diplodia* shoot blight (shoot flagging and mortality) if natural regeneration of red pine is prescribed;
- Monitor for branch mortality of seedling and sapling white pine along and adjacent to river corridors; and
- Causal agent(s) responsible for this problem may include pine spittlebug feeding and various fungal pathogens. Until management guidelines can be developed, continue reporting incidence of this problem to the forest health specialist (Form 4029-3).

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.25.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. Local staff has noted the presence of purple loosestrife (*Lythrum salicaria*) and Japanese barberry (*Berberis thunbergii)*. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.25.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Ausable Outwash - FMD Management Areas	Cases within FMD Areas	Cases within 5 Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	7	7	4

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5 Mile Buffer	Occurrences
-	-	Common Buckthorn *Rhamnus cathartica*	1
-	-	Garlic Mustard *Alliaria petiolata*	1
-	-	Japanese Knotweed *Fallopia japonica*	4
-	-	Phragmites (Common Reed) *Phragmites australis*	1

4.25.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.25.1 and listed in Appendix F.

4.25.6 Fire Management

Disturbance through fire has historically played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider reintroduction of fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition; and
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings.

4.25.7 Public Access and Recreation

Where access is limited on state forest land, the department will continue to seek access across adjacent private property. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

The following recreation trails and facilities are found in the management area:

Campgrounds in or adjacent to the management area (Figure 4.25.6)

- Canoe Harbor State Forest Campground
- White Pine Canoe Camp State Forest Campground
- Au Sable River Canoe Camp State Forest Campground
- Rainbow Bend State Forest Campground
- Keystone Landing State Forest Campground

Boating Access Sites (BSAs)

- Rainbow Bend BAS
- Canoe Harbor BAS
- White Pine Canoe Camp BAS
- AuSable River Canoe Camp BAS
- Chase Bridge BAS
- Smith Bridge BAS
- Connor's Flats BAS
- Keystone Landing BAS
- Sheep Pasture BAS

Off-Road Vehicle Trails (Figure 4.25.1)

- Geels Trail and Route
- St. Helen to Geels Michigan Cycle Conservation Club Trail
- Beaver Creek Michigan Cycle Conservation Club Trail
- Rose City Trail
- St Helen Route
- M-30 to St. Helen Michigan Cycle Conservation Club Trail

Snowmobile Trails (Figure 4.25.1)

- Various

Non-Motorized Trails (Figure 4.25.1)

- Tisdale Triangle Pathway
- Mason Tract Pathway
- Shore-To-Shore Trail
- Midland to Mackinaw Hiking Trail

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Specific hunting recreation improvements such as parking lots, gates, trail planting and trail establishment, as well as the preparation and dissemination of specific promotional material, may be made as a result of Grouse Enhanced Management Systems areas planning in this management area.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.25.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium, an end moraine of medium-textured till, ice-contact outwash sand and gravel and lacustrine (lake) sand and gravel. The glacial drift thickness varies between 50 and 1,000 feet. Sand and gravel pits are located in this management area and there is potential for additional pits.

The Mississippian Michigan Formation, Marshall Sandstone and Coldwater Shale sub-crop below the glacial drift. The Michigan is quarried for gypsum elsewhere in the state.

Most of these lands have been developed for oil and gas from the Devonian Antrim Shale and Richfield Formation, the Silurian Guelpf (former Niagaran) reefs and Ordovician Prairie du Chien. Well spacing for the Antrim and Guelph is 80 acres, the Richfield is 40 acres and the Prairie de Chien is 320 to 640 acres. There is potential for additional development for these formations in this management area. The Collingwood Formation's first well was drilled for gas in Missaukee County and additional wells have been permited. Spacing will most likely be 640 acres or larger. Most of the management area is currently leased, most for the known producing formations and other areas most likely for Collingwood Formation development. If drilling is successful for the Collingwood, additional leasing and drilling will continue in this management area. Surface development for minerals is prohibited in the Mason Tract.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the

survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and that all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.26 – MA 26: Wurtsmith Management Area Plan

Summary of Use and Management

Vegetation management in the Wurtsmith management area (MA) (Figure 4.26.1) will provide timber products; maintain or enhance wildlife habitat; protect areas of unique threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management for this 10-year planning period will focus on harvesting older jack pine and balancing age-class distributions of oak and aspen. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation opportunity. Expected trends within this 10-year planning period are increased off-road vehicle pressure, both legal and illegal and an increased need to aggressively regenerate an aging oak resource.

Introduction

This management area is located in Alcona and Iosco counties and contains 20,962 acres of state forest land (Figure 4.26.1). The primary attributes which identify the Wurtsmith management area include:

- The portion of the management area in Alcona County is dune and swale complex.
- A significant portion of this management area is relatively inaccessible due to wet conditions.
- The management area straddles the Standish and Onaway sub-regions of the northern Lower Peninsula ecoregion as classified by Albert (1995).
- The lower part of the AuSable River flows along the south side of the management area.
- The Wurtsmith management area is a popular destination for game hunting, hiking, mushroom hunting and other activities for the town of Oscoda and the nearby community near the airport.
- Due to the proximity of this management area to these communities, the forest resources contribute significant social and economic values to the area.
- There is minimal oil and gas activity.
- The Old State House Off-Road Vehicle trail is located in the management area. Van Etten Lake State Forest Campground is near this management area. The Highbanks Access site and a snowmobile trail are also located in the management area.
- This management area borders federal land – the Huron-Manistee National Forest and the former Wurtsmith Air Force Base and bombing range.
- The management area contains approximately 2,500 acres within what the Department of Defense has defined as the Wurtsmith Bombing and Gunnery Range Formerly Used Defense Site Boundary. The Land Use Orders of the Director were amended in 2009 to close state land within the Formerly Used Defense Site area to all entry, except to operate motorized vehicles on existing open roads or with a written permit issued by the department.
- Threatened, endangered or species of special concern located by Michigan Natural Features Inventory surveys include: Hill's thistle, eastern massasauga rattlesnake and secretive locust. The Kirtland's warbler also uses some of the jack pine in this area.

The current predominant cover types, acreages and projected harvest acres in the management area are shown in Table 4.26.1.

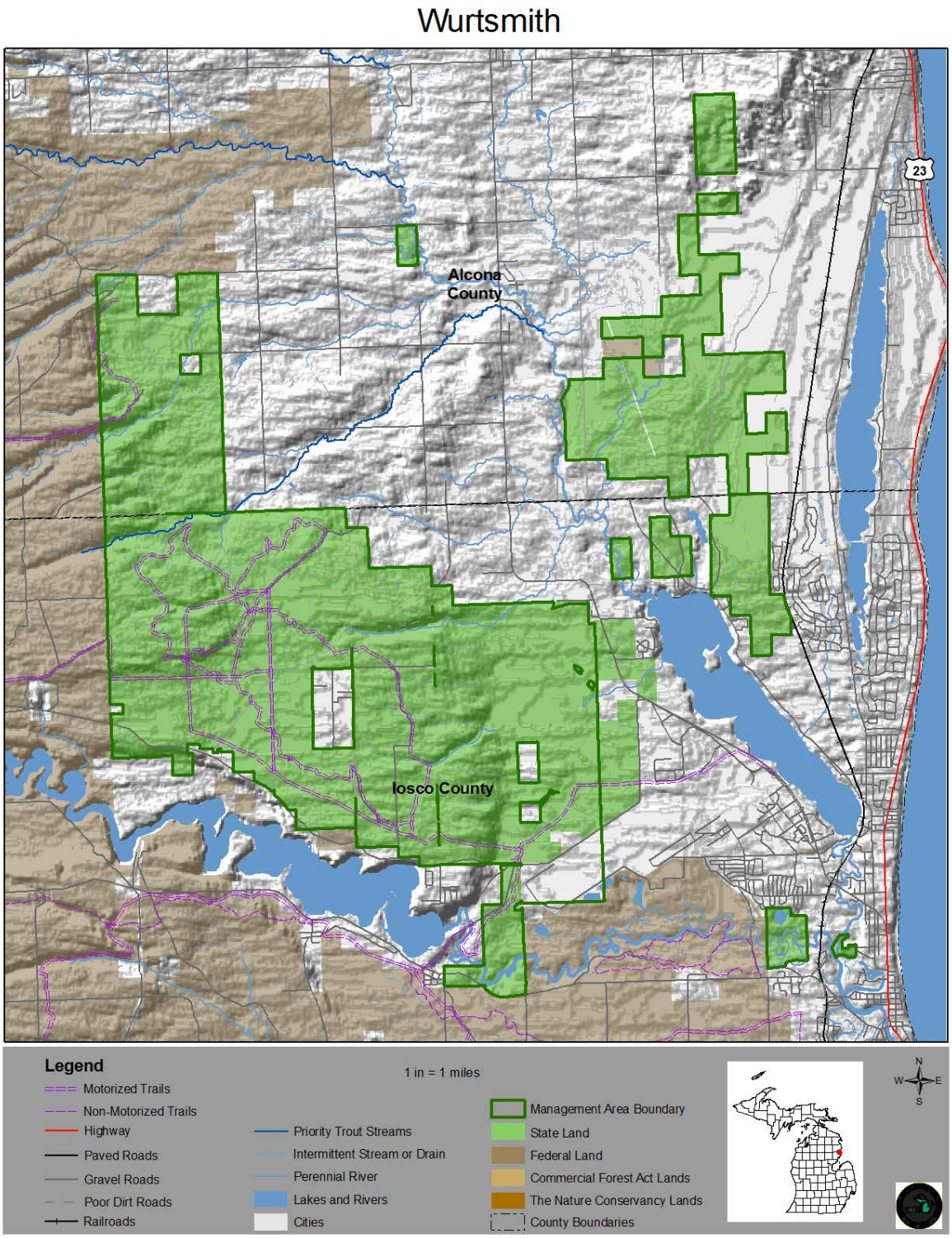

Figure 4.26.1. A map of the Wurtsmith management area (dark green boundary) in Alcona and Iosco counties.

Table 4.26.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Wurtsmith management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Oak	34%	7,154	1,883	5,271	533	843	7,154	586	843
Jack Pine	17%	3,613	316	3297	414		3,613	550	
Aspen	12%	2,613	169	2444	283		2,613	349	
Cedar	12%	2,433	2,433				2,433		
Lowland Deciduous	6%	1,242	869	373	41		1,242	41	
White Pine	4%	837	59	778		104	837	71	104
Red Pine	3%	566	201	365	49	49	566	41	95
Lowland Conifers	2%	337	270	67	0		337	7	
Upland Open/Semi-Open Lands	1%	285		285			285		
Lowland Open/Semi-Open Lands	3%	701		701			701		
Misc Other (Water, Local, Urban)	1%	169		169			169		
Others	5%	1,020	349	671	105	85	1,020	53	196
Total		20,970	6,549	14,421	1,425	1,081	20,970	1,698	1,238

4.26.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

Section 4.26.1.1 Forest Cover Type Management – Oak

Current Condition

Oak acres total 7,154 acres or 34% of the management area (Table 4.26.1) and occur on dry, poor nutrient sites (habitat classes: PArVCo, PArVHa/PArVVb, PArVHa and PVCd). More than 1,000 acres have a basal area of less than 50 square feet per acre (Figure 4.26.2), but may have an understory of oak, aspen and red maple.

Forest communities dominated primarily by oak type, generally a mixture of pin oak, black oak and jack pine, in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, white-tailed deer, squirrels and various birds and commercially for firewood and industrial lumber.

The older oak (age 90+years) is declining rapidly. There are 1,883 acres of oak that have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 207 acres of stands that have a final harvest pending and these acres are included in the regeneration prescription class. The graph includes the projected number of acres converted to oak as a result of treatments that remove an overstory species resulting in the release of oak. These acres are included in the regeneration prescription class.

The management emphasis will be on aggressively regenerating an aging oak resource in this 10-year planning period.

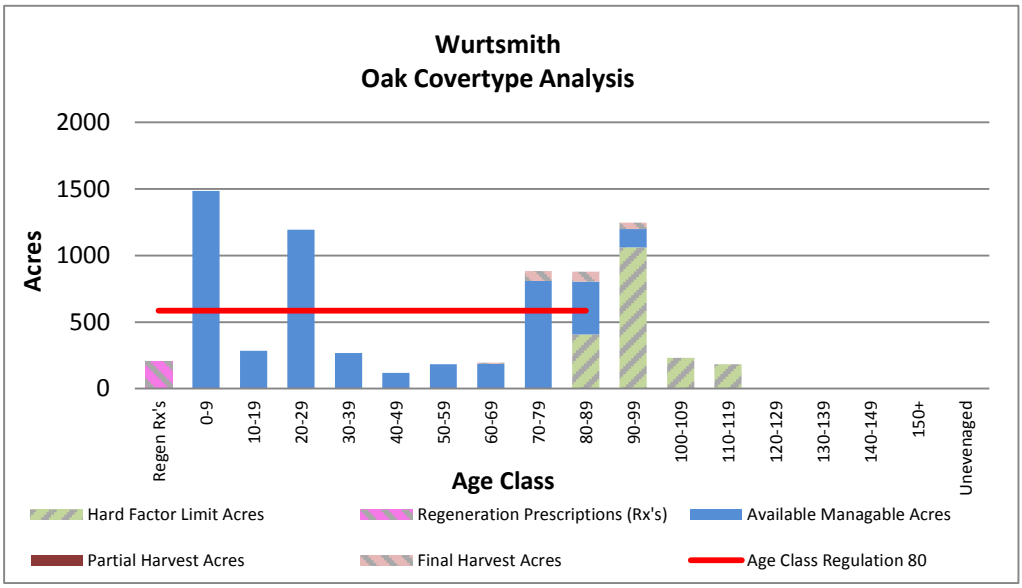

Figure 4.26.2. Age-class distribution for oak in the Wurtsmith management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management to provide for timber products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Conduct restarting harvests on a projected 533 acres with a concentration on acres in the oldest age groups;
- Conduct partial harvests on a projected 843 acres with a concentration on acres with a higher basal area that have not been previously harvested; and
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration in other cover types.

Long-Term Management Objectives

- Continue to seek opportunities to aggressively regenerate an aging oak resource;
- It is acceptable that the oak community will become more mixed over time to include more jack pine; and
- A desired future harvest level is projected at 586 acres for final harvest and 843 acres for partial harvest per 10-year period.

Section 4.26.1.2 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 3,613 acres or 17% of the management area (Table 4.26.1) in the dry and dry-mesic outwash areas of the management area (habitat classes: PVCd, PArVHA) where it is often mixed with oak. The jack pine is generally limbic with poor form. Approximately two thirds of the jack pine is age 30 or less (Figure 4.26.3) reflecting robust management over the past three decades.

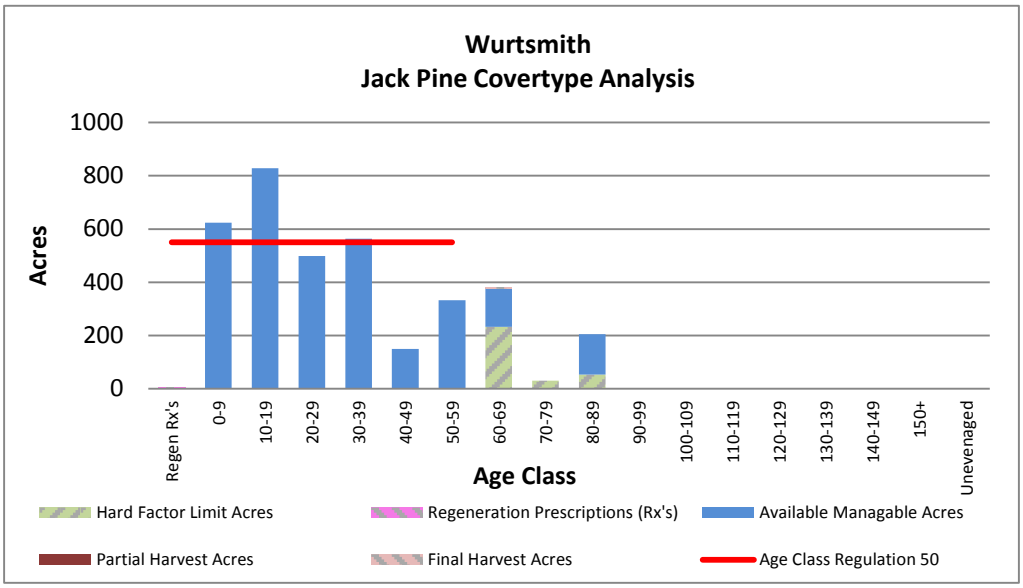

Figure 4.26.3. Age-class distribution for jack pine in the Wurtsmith management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Jack pine will be evenly distributed in age classes between 0-59 years on suitable sites to provide a steady supply of forest products, wildlife habitat and recreational opportunities;
- Management of the jack pine resource will minimize mortality due to jack pine budworm; and
- Wildfire risks will be minimized through reduction of fuel loads associated with older age classes of jack pine.

10-Year Management Objectives

- Conduct stand replacement harvests on a projected 414 acres of stands currently age 50 and older; and
- Overall jack pine acres may increase due to inter-planting on sites where oak was removed and oak regeneration was sparse.

Long-Term Management Objectives

- Continue management of jack pine on appropriate sites with an emphasis on reducing over mature stands to minimize losses from jack pine budworm and associated risks due to increased fuel loads; and
- A desired future harvest level is projected at 550 acres for final harvest per 10-year period.

Section 4.26.1.3 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 2,613 acres or 12% of the management area (Table 4.26.1). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs and for a wide range of forest recreation.

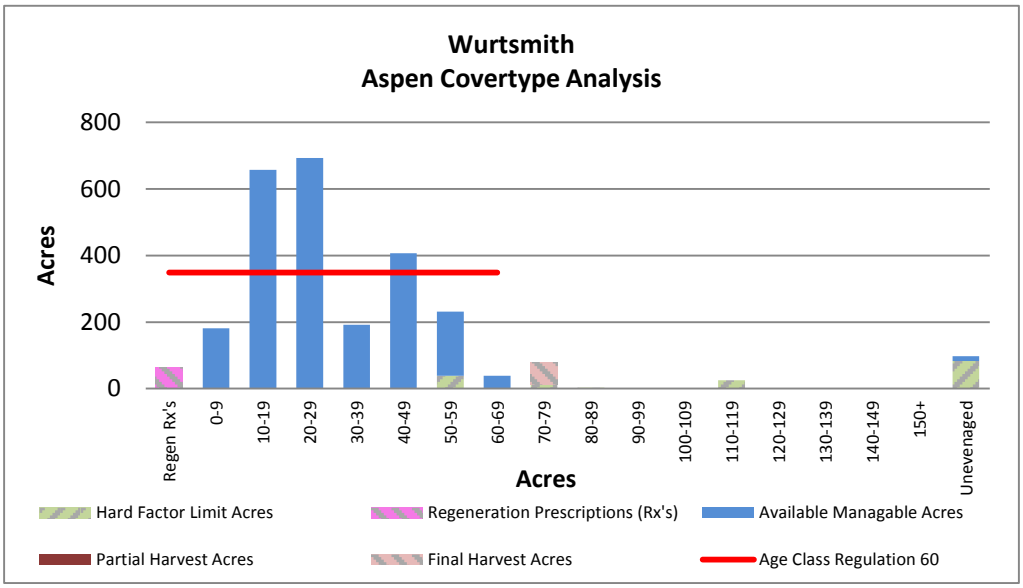

Figure 4.26.4.Age-class distribution for aspen in the Wurtsmith management area (2012 Department of Natural Resources inventory data).

Aspen occurs throughout the area on PArVHa, PArVHa/PArVVb and PArVVb sites. Accessible aspen has been consistently harvested over the last 40 years. There are 180 acres of aspen located in areas that are hard factor limited (Figure 4.26.4) making these areas unavailable for management (hard factor limit acres). There are 64 acres that have already been assigned a final harvest and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen-dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0-59 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 283 acres in this 10-year planning period.

Long-Term Management Objectives

- Continue management to balance age-class distribution to produce a sustainable yield of forest products and wildlife habitat; and
- A desired future harvest level is projected at 349 acres for final harvest per 10-year period.

Section 4.26.1.4 Forest Cover Type Management – Lowland Deciduous

Current Condition

Lowland deciduous acres total 1,242 acres or 6% of the management area (Table 4.26.1) in predominantly older age classes above 70 years. Lowland deciduous forests are characterized by areas that show evidence of flooding in the past five years or support lowland indicators plants. The lowland type is typically a mixture of ash, red maple, birch, lowland aspen/balsam poplar, oak and other minor species. There has also been very little regeneration in the last 20 years. There are 869 acres which are hard factor limited, most frequently due to a lack of accessibility in wet areas. The ash component has been heavily impacted by the emerald ash borer. The graph includes 54 acres that have a final harvest pending and these acres are shown in the regeneration prescription class.

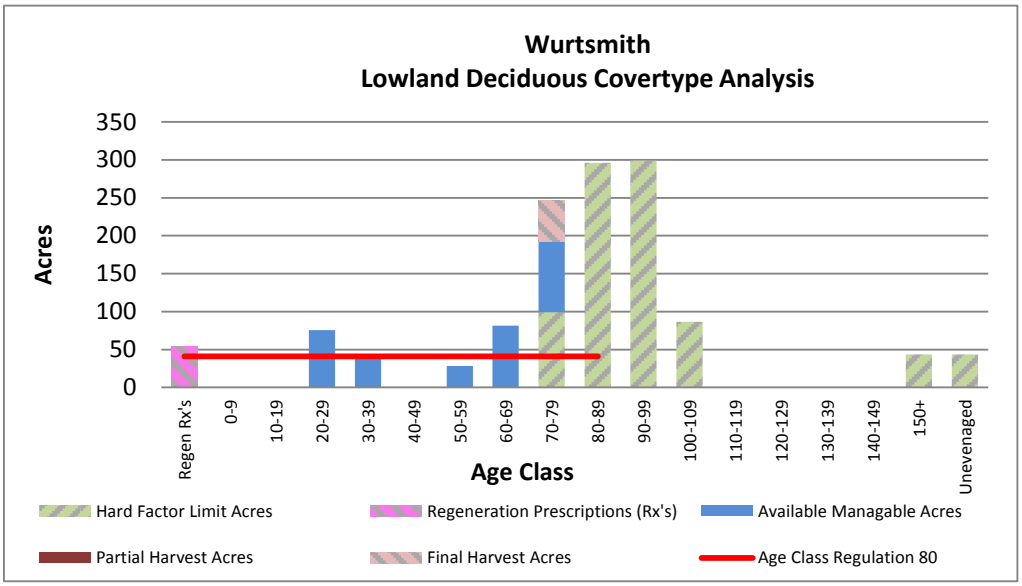

Figure 4.26.4.Age-class distribution for lowland deciduous in the Wurtsmith management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland deciduous types will be sustainably managed with acres balanced between 0-89 years for a continuous supply of forest products and as a source of mast and habitat for wildlife.

10-Year Management Objectives

- Seek opportunities to harvest where it can be done in a manner that will not adversely impact wetland soils;
- Conduct regeneration harvests on a projected 41 acres to begin the process of regenerating older age classes;
- Follow the Emerald Ash Borer Guidelines for managing ash in lowland deciduous stands; and
- Consider opportunities to conduct non-commercial harvests to manage for habitat and a balanced age-class distribution.

Long-Term Management Objectives

- Where feasible, continue to seek opportunities to conduct regeneration harvests;
- It is acceptable that due to the emerald ash borer the amount of ash in lowland deciduous forests will decrease significantly and will be replaced by other lowland species; and
- A desired future harvest level is projected at 41 acres for final harvest per 10-year period.

Section 4.26.1.5 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 1,782 acres or 2% of the management area (Table 4.26.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.26.1.6 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 285 acres or 1% of the management area. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.26.1.7 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: white pine 837 acres or 4% of the management area, red pine 566 acres (3%), lowland conifers 337 acres (2%). Other forested and non-forested communities total 169 acres or 1% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct final (regeneration) harvests on a projected 49 acres of red pine, 82 acres of upland mixed forest and 23 acres of upland spruce/fir;
- Consider methods to ensure adequate regeneration lowland types;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry; and
- Partial harvests are projected for 104 acres of white pine, 49 acres of red pine and 76 acres of northern hardwoods.

Long-Term Management Objectives

- Where operations are not limited by access or operability, continue management of lowland types; and
- Consider methods to ensure regeneration of lowland types.

4.26.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this cycle of state forest planning:

- American woodcock
- Beaver
- Black bear
- Eastern massasauga rattlesnake
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- White-tailed deer

The primary focus of wildlife habitat management in the Wurtsmith management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Woodcock

The goal for woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/ac for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water; and
  - Implementation of the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
  - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than 5 acres in size with a savannah-like dispersion of large trees (< 50% canopy cover) with open under story and include tall trees or snags of large (> 12 inches) diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old); even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory), aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry, and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous, and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.26.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed three listed species and one natural communities of note occurring in the management area as listed in Table 4.26.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.26.5, the only special conservation area is the 2500 acre Wurtsmith Bombing and Gunnery Range Formerly Used Defense Site.

There are no high conservation value areas or ecological reference areas identified for the Wurtsmith management area as illustrated in Figure 4.26.5.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.26.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Wurtsmith management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Floodplain forest		S3/G3?	Confirmed				Lowland mixed	Mid
Insect								
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Reptile								
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Plant								
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

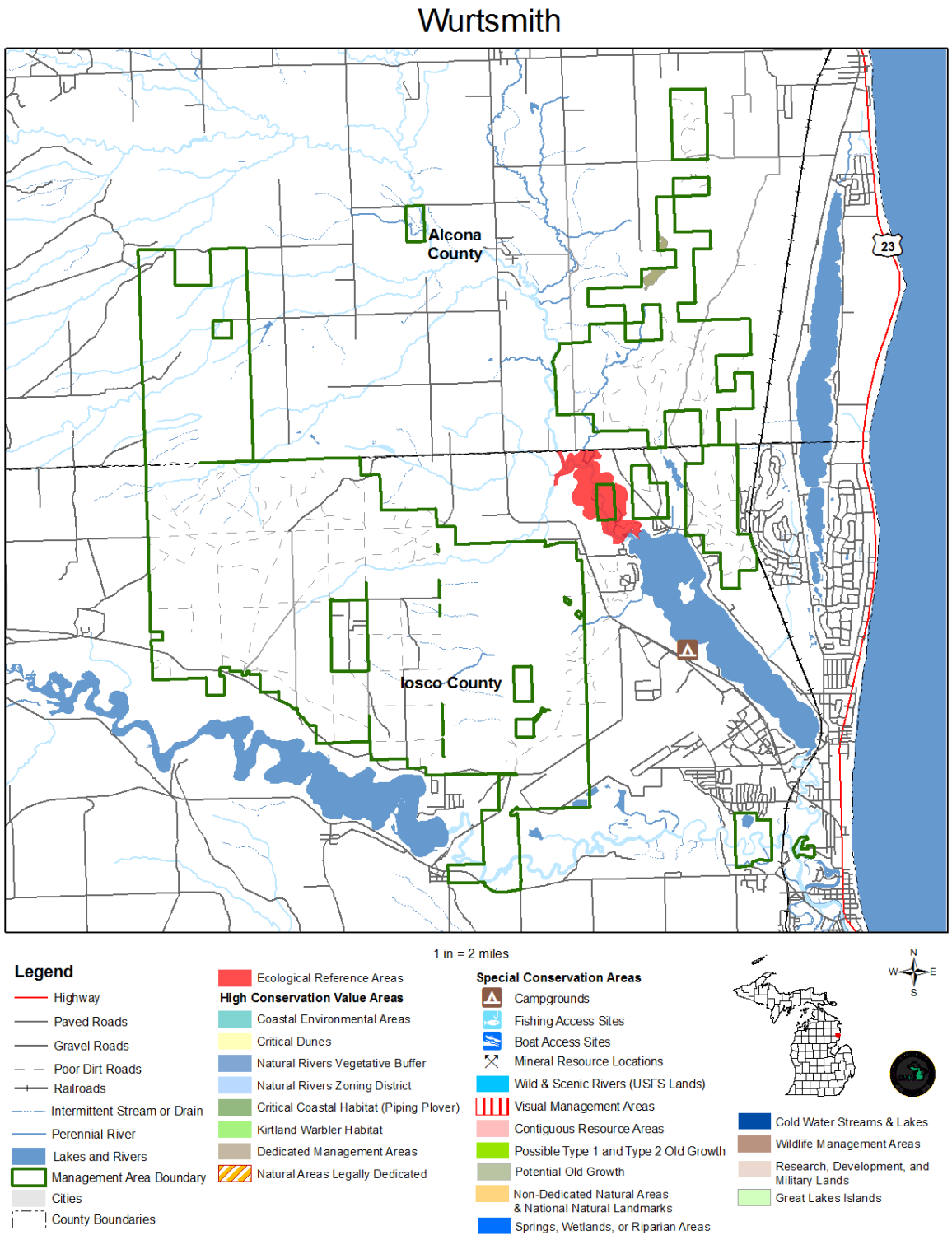

Figure 4.26.5. A map of the Wurtsmith management area showing the special resource areas.

4.26.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health issues in this management area include oak decline, oak wilt and emerald ash borer and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.
- Oak wilt is found in this area. Epicenters need to be identified and treated. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced. Other management activities that can lead to damage of residual red oak trees – oil and gas development, recreational trail improvement, etc. – should be not be conducted during this high-risk period.
- Follow emerald ash borer guidelines for salvage of ash that may be impacted by emerald ash borer. It is expected that small diameter black ash in inaccessible lowland areas will not be salvageable and that the ash will be replaced by some other species.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Currently, no invasive species have been detected within the management area or within a five-mile buffer of the management area. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. Local staff has noted the presence of garlic mustard and *Phragmites* in the management area. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

4.26.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process, and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.26.1 and listed in Appendix F.

4.26.6 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types and small inclusions of grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider re-introduction of fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Develop and implement formal fuel breaks in high hazard areas.

4.26.7 Public Access and Recreation

Access is restricted on approximately 2,500 acres except to operate motorized vehicles on existing open roads or with a written permit issued by the department. Where access is limited on state forest land, the department will continue to seek access across adjacent private property. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Recreation facilities and infrastructure are limited in this management area, perhaps due to the isolation from other blocks of state forestland or past military use. A portion of the Old State House Off-Road Vehicle route and snowmobile trail (Figure 4.26.1) and the Vanetten State Forest Campground and Boating Access Site are in the management area.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the Department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.26.8 Oil, Gas and Mineral Development

Surface sediments consist of fine-textured till, ice-contact outwash sand and gravel and lacustrine (lake) sand and gravel. The glacial drift thickness varies between 200 and 600 feet. Sand and gravel pits are located in this management area and there is potential.

The Mississippian Marshall Sandstone and Coldwater Shale subcrop below the glacial drift. The Marshall was previously used for building material elsewhere in the state.

Sparse oil and gas drilling has occurred on these lands, with two wells drilled for the Antrim Shale being plugged. Well spacing for the Antrim is 80 acres. The Collingwood Formation does not appear to have potential in this management area and none of the lands are currently leased.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance, and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and that all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.27 MA 27 – Upper Muskegon Management Area

Summary of Use and Management

Vegetation management in the Upper Muskegon management area (MA) (Figure 2.27.1) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management for this 10-year period will focus on harvesting older jack pine and balancing age class distributions of oak, aspen and red pine. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation. Expected trends within this 10-year planning period are the need to manage exotic species (especially *Phragmites* and glossy buckthorn), the need to continue to manage cover types for a balanced age-class distribution and an expected increase in recreation pressure.

Introduction

There are 185,682 acres of state forest land in the Upper Muskegon management area primarily located in Missaukee and Roscommon Counties with smaller portions in Wexford, Kalkaska, Mecosta, Crawford, Clare and Gladwin Counties. The primary attributes which identify the management area include:

- The dominant landform consisting of sandy outwash plains with large ridges of ice-contact sands surrounded by poorly drained outwash channels and plains.
- Houghton and Higgins lakes are adjacent to this area and the Upper Muskegon River flows near this management area.
- There is a significant amount of relatively inaccessible lowland types.
- The management area falls within Grayling Outwash Plain sub-region as classified by Albert (1995).
- This area is popular for hunting and mushroom picking, fishing and other activities for the nearby communities of Harrison, Houghton Lake, Grayling and Roscommon.
- Numerous recreational trails including, but not limited to the Leota, West Higgins, Denton Creek, North Missaukee and Michigan Cycle Conservation Club Trail off-road vehicle trails, Fur Farm Snowmobile Trail and Tisdale Triangle, Lost Twin Lakes, Cadillac, Trout Lake and Green Pine Lake ski and hiking trails cross the management area.
- These recreational uses combined with the quantity and availability of wood fiber contributes significant social and economic values to the area.
- The Gladwin Field Trial Area is located in this management area.
- This management area contains one or more of the northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.
- There are extensive natural gas development injection sites and pipeline right-of-ways (Cranberry Gas Storage Field, Norwich Gas Field).
- House Lake, Trout Lake, Mud Lake, Goose Lake, Long Lake, Long Lake Wexford and Hopkins Creek equestrian state forest campgrounds are located in the management area.
- Threatened, endangered or species of special concern located by Michigan Natural Features Inventory surveys include wood turtle, Hill's thistle, dusted skipper, secretive locust, common loon, osprey, bald eagle, red-shouldered hawk, tawny crescent, northern goshawk and Kirtland's warbler.

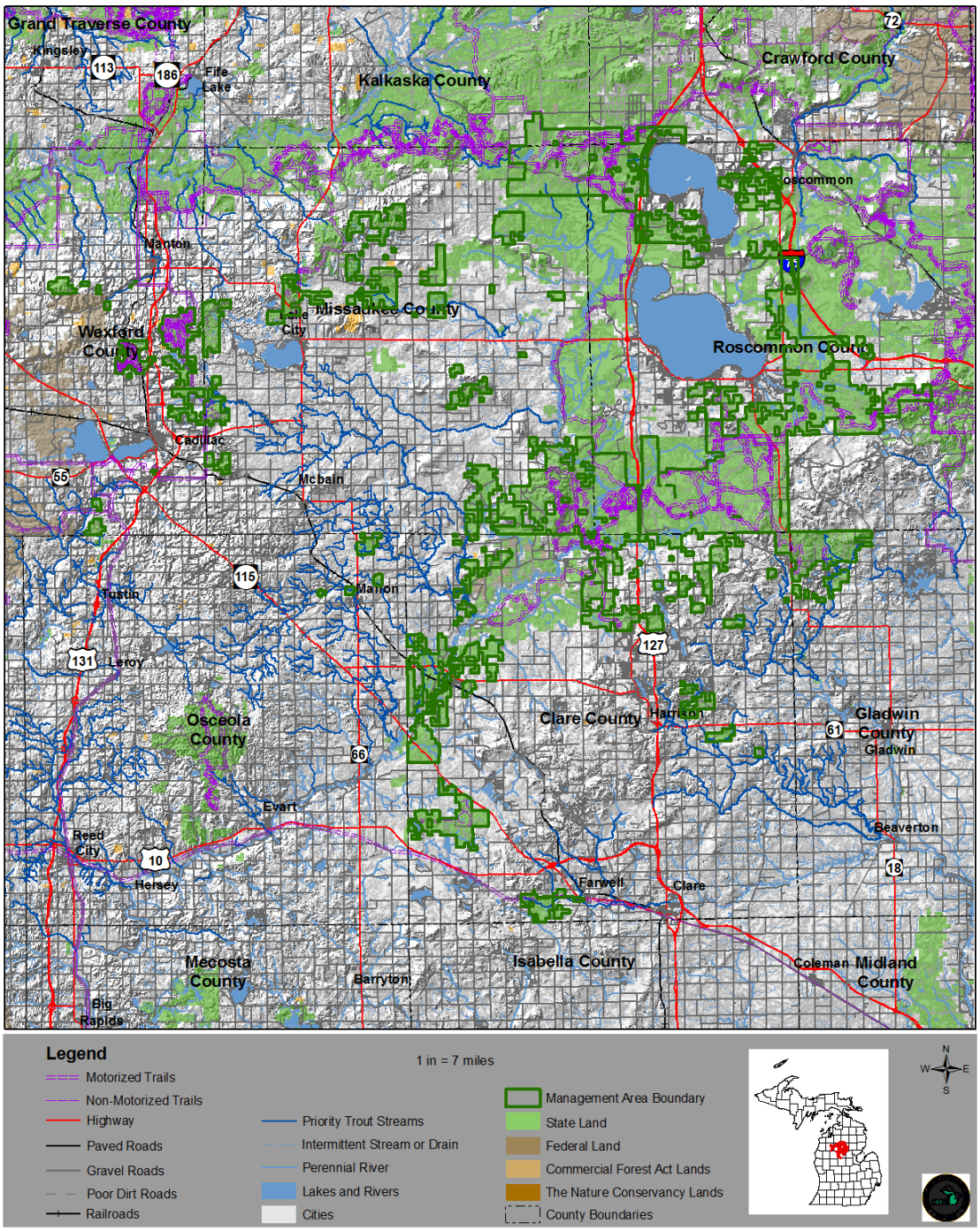

Figure 4.27.1. A map of the Upper Muskegon management area (dark green boundary) in relation to surrounding state forest and other lands in Wexford, Missaukee, Roscommon, Mecosta, Clare, Gladwin, Kalkaska and Crawford counties.

Table 4.27.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Upper Muskegon management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	29%	52,976	1,098	51,878	9,368		52,976	8,646	
Oak	15%	28,008	8,161	19847	1,342	4,714	28,008	2,206	5,128
Red Pine	9%	17,633	1,484	16149	3,066	5,910	17,633	1,794	7,479
Jack Pine	7%	12,618	698	11920	730		12,618	1,703	
Lowland Conifers	4%	8,236	6,602	1634	182		8,236	182	
Lowland Deciduous	4%	8,225	5,774	2451	272		8,225	272	
Mixed Upland Deciduous	3%	6,389	344	6045	863	1,363	6,389	863	1,363
Northern Hardwood	3%	5,701	67	5634		1,397	5,701		1,925
Cedar	3%	5,066	5,073	-7			5,066		
Upland Open/Semi-Open Lands	4%	7,575		7575			7,575		
Lowland Open/Semi-Open Lands	8%	15,527		15527			15,527		
Misc Other (Water, Local, Urban)	2%	4,061	7	4054			4,061		
Others	7%	13,667	3,185	10482	2,055	2,889	13,667	1,084	3,045
Total		185,682	32,493	153,189	17,879	16,273	185,682	16,750	18,940

4.27.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

Section 4.27.1.1 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total 52,976 or 29% of the management area (Table 4.27.1) throughout the management area including glacial till areas on habitat class PArVHa and PArVVb sites. There are 1,098 acres of aspen have met harvest criteria (Figure 4.27.2), but have site conditions that limit harvest (hard factor limit acres). There are 4,470 acres of stands that have a regeneration harvest pending and these acres are included in the regeneration prescription class. There are 107 acres with a partial harvest pending and these acres are shown in their current age class.

The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in the release of aspen. These acres are included in the 0-9 year-old age-class.

Desired Future Condition

- Aspen will be managed on suitable sites with acres balanced within the 0-59 year age classes to provide early successional habitat, recreational opportunities and a sustainable level of wood fiber.

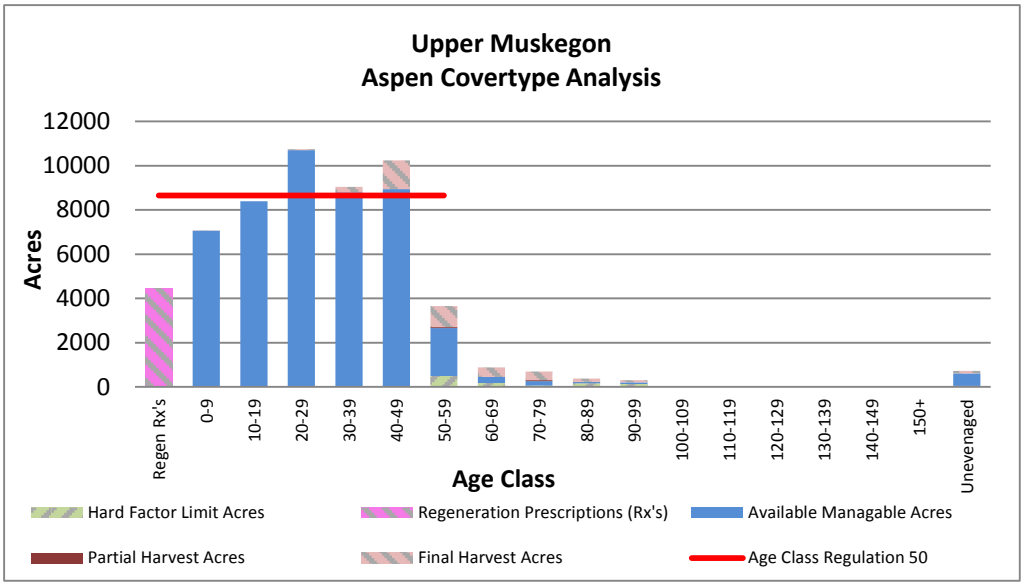

Figure 4.27.2. Age-class distribution for aspen in the Upper Muskegon management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 9,368 acres;
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions; and
- Aspen within the identified Grouse Enhanced Management Systems area may be managed differently than the rest of the aspen within the management area, with a shorter rotation age, small patch cuts and carefully considered stand adjacency.

Long-Term Management Objectives

- Continue to manage for balanced age-class distribution for sustainable levels of wood fiber and wildlife habitat;
- A desired future harvest level is projected at 8,646 acres for final harvest per 10-year period; and
- Aspen within the identified Grouse Enhanced Management Systems area may be managed slightly different than the rest of the aspen within the management area, with a shorter rotation age and small patch cuts.

Section 4.27.1.2 Forest Cover Type Management – Oak

Current Condition

Oak acres total 28,008 acres or 15% of the management area (Table 4.27.1). Oak is located on the moraine ridges on habitat class PArVVb sites. Oak is a frequent component of aspen, red pine and white pine types. The age-class distribution is dominated by stands between the ages of 70-100+ years old (Figure 4.27.3) with a lack of oak in the 10-69 year-old age classes. The origin of this oak resource was the aftermath of the logging era in the late 1800s and early 1900s when most of the red and white pines were removed. This cutting combined with subsequent wildfires resulted in a period of extensive oak regeneration during the late 1800s and early 1900s. However, despite the age of the oak in this management area the vigor of the oak is good and it is an important contributor to wildlife habitat and forest diversity. There are 8,161 acres of oak have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 1,389 acres of stands that have a final harvest pending and these acres are included in the regeneration prescription class. There are 2,878 acres with a partial harvest pending and these acres are included in their current age class. The graph displays the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of a different understory species. These acres are included in the regeneration prescription class.

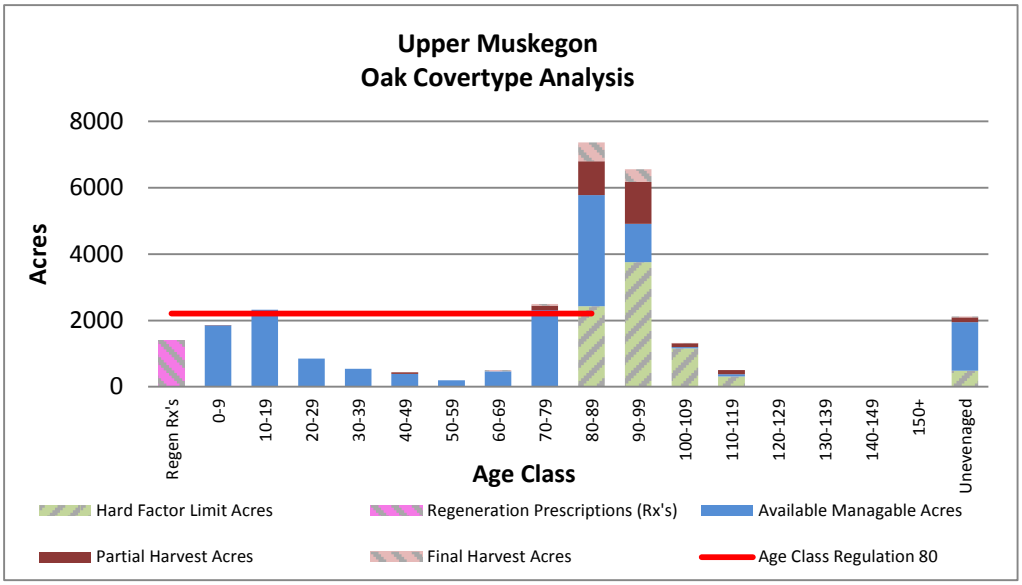

Figure 4.27.3. Age-class distribution for oak in the Upper Muskegon management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management to provide for timber products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Conduct partial harvests on a projected 4,714 acres with a concentration on stands that are younger and/or have a higher basal area;
- Conduct restarting harvests on a projected 1,342 acres with a concentration on stands that are older and/or have a lower basal area;
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types; and
- Where white pine, other conifers or red maple are well established in the oak understory, resource managers may decide to manage these areas as mixed stands resulting in improved stand diversity.

Long-Term Management Objectives

- Continue work towards maintaining oak as the predominant species in selected stands through restarting harvests;
- It is acceptable that some oak stands may become mixed stands through partial removal of an oak over story, planting pine in oak stands or through natural regeneration of other species;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area; and
- A desired future harvest level is projected at 2,206 acres for final harvest per 10-year period.

Section 4.27.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 17,633 acres or 10% of the management area (Table 4.27.1) on outwash and glacial till areas on habitat class PVCd, PArVHa and PArVVb sites. Many of the red pine sites are mixed with oak, which provides a source of mast. The age distribution is heavily skewed toward the older age classes (Figure 4.27.4) and there is a lack of acres in the 20- 49 year-old age classes. Red pine plantations in this management area are commercially valued for pulp, saw logs and utility poles. There are 1,484 acres of red pine have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 409 acres of stands that have a regeneration harvest pending and these acres are shown in the regeneration prescription class. There are 2,217 acres with a partial harvest pending and these acres

are shown in their current age class. The graph includes the projected number of acres converted to red pine as a result of treatments that remove an overstory species and planting of red pine. These acres are included in the regeneration prescription class.

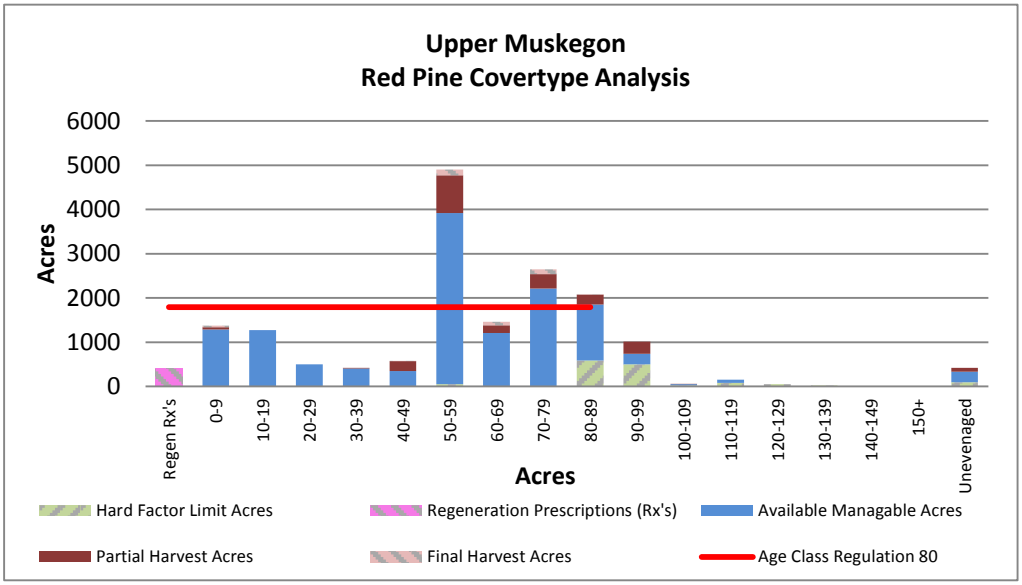

Figure 4.27.4. Age-class distribution for red pine in the Upper Muskegon management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Red pine will be located on suitable sites with acres balanced in the 0-89 year age classes.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distribution;
- Conduct partial harvests on a projected 5,910 acres, concentrating on stands of better quality red pine that has the potential for a higher product value in larger size classes; and
- Conduct regeneration harvests, based on projections, on 3,066 acres of red pine beginning with the oldest age classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- In identified special conservation areas, especially those with natural red pine on dry-mesic sites, consider management of red pine to a biological rotation of 200+ years; and
- A desired future harvest level is projected at 1,794 acres for final harvest and 7,479 acres for partial harvest per 10-year period.

Section 4.27.1.4 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open lands totals 15,527 acres or 8% of the management area (Table 4.27.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue to protect lowland open/semi-open land from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.27.1.5 Forest Cover Type Management – Jack Pine

Current Condition

Natural and planted jack pine acres total 12,618 acres or 7% of the management area (Table 4.27.1) on till areas including habitat class PArVHa, PArVVb and PVCd sites. Forest communities dominated primarily by jack pine in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation.

There are 698 acres of jack pine that have met harvest criteria (Figure 4.27.5), but have site conditions that limit harvest (hard factor limit acres). There are 449 acres that have a regeneration harvest pending and these acres are shown in the regeneration prescription class. The graph includes the projected number of acres converted to jack pine as a result of treatments that remove an overstory and planting of jack pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Jack pine of either natural origin or in planted stands will be located on suitable sites, primarily PArVHa, PArVVb, PVCd with acres balanced between 0-69 years of age.

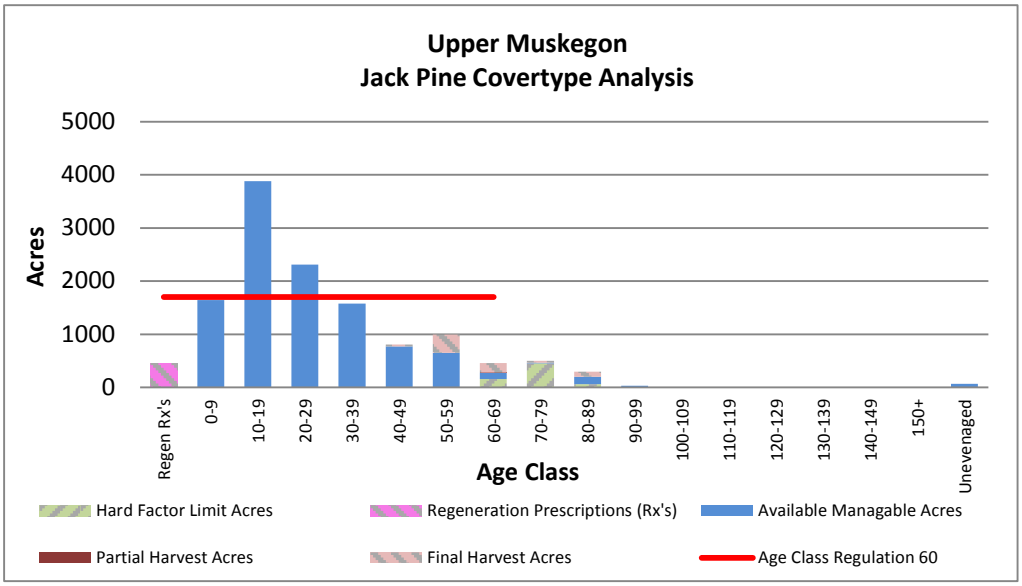

Figure 4.27.5. Age-class distribution for jack pine in the Upper Muskegon management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 730 acres targeting jack pine over the age of 60. This is an override of the model for forest health and to expedite the balancing of the age-class distribution.

Long-Term Management Objectives

- Achieve a more balanced 0-69 year age-class distribution for jack pine which will take at least one entire rotation to achieve; and
- A desired future harvest level is projected at 1,703 acres for final harvest per 10-year period.

Section 4.27.1.6 Forest Cover Type Management – Lowland Deciduous

Current Condition

Lowland deciduous acres total 8,225 or 4% of the management area (Table 4.27.1) and are located on wetland sites. As shown in Figure 4.27.6, most of the acres are in the age classes above the age of 60. Lowland deciduous stands may be managed as even-aged stands on drier sites. On wetter sites, uneven-aged management is preferred. The residual trees keep the sites from becoming even wetter, resulting in a conversion to marsh. Tip-overs and windthrow may also be an issue in stands that have been reduced below a residual basal area of 80 square feet per acre.

Green ash, red maple and aspen are frequent components of swamp hardwoods (lowland hardwoods) and treatments on more mesic sites may convert lowland deciduous stands to aspen or red maple. It is expected that much of the ash will be affected by emerald ash borer. There are currently 4,074 acres factor limited that are not available for harvest (hard factor limited acres), often because the sites are too wet or due to other site factors.

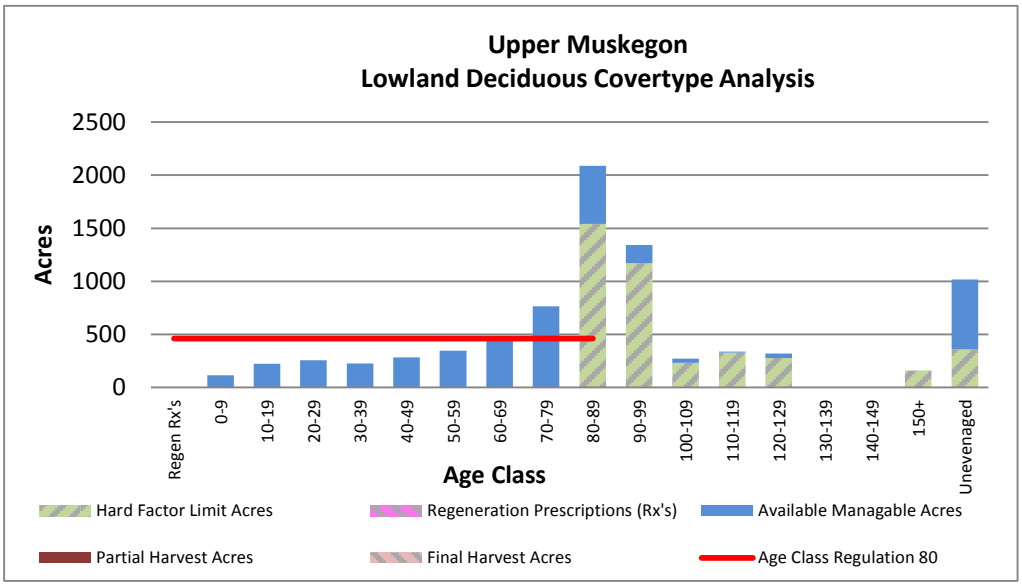

Figure 4.27.6. Age-class distribution for lowland deciduous in the Upper Muskegon management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland deciduous stands will be located on suitable sites in a compositionally diverse forest which contains coarse woody debris, scattered large trees and scattered snags; and
- These lowland types will provide a sustainable level of forest products along with wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Conduct final (regeneration) harvests on 461 acres with consideration for retention and potential for wind throw on wetter sites.

Long-Term Management Objectives

- Where feasible, continue to seek opportunities to conduct regeneration harvests;
- It is acceptable that due to the emerald ash borer the amount of ash in lowland deciduous forests will decrease significantly and will be replaced by other lowland species; and
- A desired future harvest level is projected at 461 acres for final harvest per 10-year period.

Section 4.21.7 Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open acres total 7,575 or 4% of the management area (Table 4.27.1). This category is a combination of the following non-forested land cover types: herbaceous open land; upland shrub, low density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.27.1.8 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: mixed lowland deciduous 6,389 or 3% of the management area, northern hardwood 5,701 acres (3%) and cedar 5,066 acres (3%). Other forested and non-forested communities total 13,667 acres or 7% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct regeneration harvests on a projected 312 acres of cedar and 401 acres of lowland conifer where feasible;
- Consider methods to ensure cedar and lowland conifer regeneration**;**
- The following species are projected for restarting or regeneration harvests: mixed upland deciduous 863 acres, white pine 820 acres, natural mixed pines 198 acres, upland mixed forest 317 acres, upland spruce/fir 354 acres, lowland mixed forest 22 acres, lowland aspen/balsam poplar 66 acres, upland conifers 279 acres and lowland spruce/fir 124 acres; and
- The following species are projected for partial harvests: northern hardwood 1,397 acres, white pine 1,008 acres, natural mixed pines 913 acres, upland mixed forest 576 acres, planted mixed pines 116 acres, hemlock 30 acres and upland conifers 246 acres.

Long-Term Management Objectives

- Continue to manage other types for timber, wildlife habitat and recreational opportunities;
- Continue efforts to regenerate lowland types where feasible; and
- Desired future harvest levels for final harvest are projected at 401 acres of lowland conifer and 312 acres of cedar per 10-year period.

4.27.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this cycle of state forest planning:

- American bittern (Cannon Creeks Flooding State Wildlife Management Area)
- American woodcock
- Beaver
- Black bear
- Eastern massasauga rattlesnake (Backus Creek State Game Area and Cannon Creeks Flooding State Wildlife Management Area)
- Mallard (Backus Creek State Game Area, Bear Creek Flooding State Wildlife Management Area, Cannon Creeks Flooding State Wildlife Management Area, and Denton Creek Flooding State Wildlife Management Area)
- Golden-winged warbler
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- White-tailed deer
- Wood duck (Backus Creek State Game Area, Bear Creek Flooding State Wildlife Management Area, Cannon Creeks Flooding State Wildlife Management Area and Denton Creek Flooding State Wildlife Management Area)

The primary focus of wildlife habitat management in the Upper Muskegon management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; large open grassland complexes and marsh/grassland complexes; the retention of large over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

This management area includes a northern Lower Peninsula Grouse Enhanced Management System. The boundary will be delineated during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager. Aspen stands that fall within the Grouse Enhanced Management System area boundary may be managed on a shortened rotation with multiple age classes and smaller stand sizes to enhance hunting opportunities for ruffed grouse, woodcock, deer, turkey and hare. The remainder of the management area (outside the boundary) will be managed based on the direction in the management area write up.

A more detailed overview of featured species is included in Section 3.

American Bittern

The goal for bittern in the northern Lower Peninsula is maintain or increase available habitat. American bittern prefer large (>10 acre), shallow (average depth four inches) wetlands with open water in the center, a band of emergent vegetation around periphery and idle grassland in the adjacent uplands (4:1 grassland to wetland ratio). State forest management should focus on priority wildlife management areas with suitable shallow water marsh (hemi-marsh).

<u>Wildlife Habitat Specifications:</u>

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat. Ideal wetland/upland complexes are greater than 50 acres.
    - Implementation of the wildlife management area master plan for Cannon Creeks Flooding State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain water levels from the April through August breeding season.

American Woodcock

The goal for woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems/ac for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
  - Implementation of the 10-year management direction for aspen, lowland aspen, and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
    - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
    - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting and brood rearing. Mallard pair-bonding wetlands are typically 0.25-20 acres in size and brood rearing wetlands are typically 1.2-30 acres in size. Optimal hemi-marsh sites are greater than 2.5 acres with open water portions having extensive portions less than three feet deep and 4:1 area of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within ~ 200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
    - Implementation of the wildlife management area master plans for Backus Creek State Game Area; and Bear Creek Flooding, Cannon Creeks Flooding and Denton Creek Flooding state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
    - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than 5 acres in size with a savannah-like dispersion of large trees (< 50% canopy cover) with open under story and include tall trees or large snags (> 12 inches in diameter at breast height). State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease, and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than 12 inches in diameter at breast height.
    - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres, and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old); even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
    - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
    - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry, and other mast producing shrub components.
    - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.
- Manage the aspen cover type for smaller patch size, a shorter rotation and a more deliberate habitat configuration within the designated Grouse Enhanced Management Systems areas where appropriate.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
    - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.

- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous, and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood ducks are most limited by available nesting and brood rearing habitat. Wood duck nest in tree cavities near rivers, streams, swamps, beaver ponds, and marshes. Nests require mature hardwood trees with 10 inches or larger diameter at breast height. Brood rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands, and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority wildlife management areas with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plans for Backus Creek State Game Area; and Bear Creek Flooding, Cannon Creeks Flooding and Denton Creek Flooding state wildlife management areas and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification.
- Maintain stable water levels at managed floodings from April through August.

4.27.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in “DNR’s *Approach to the Protection of Rare Species on State Forest Lands*” (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed fifteen listed species and two natural communities of note occurring in the management area as listed in Table 4.27.2. A colony of great blue herons has also been identified. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.27.7, the Gladwin Field Trial Area is the only special conservation area that has been identified in the Upper Muskegon management area.

There are no high conservation value areas or ecological reference areas identified for the Upper Muskegon management area as illustrated in Figure 4.27.7.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Table 4.27.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Upper Muskegon management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Bog		S4/G3G5	Confirmed				Lowland open/semi-open	N/A
Floodplain forest		S3/G3?	Confirmed				Lowland mixed	Mid
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Kirtland's warbler	*Dendroica kirtlandii*	LE/E/G1/S1	Confirmed	PS	Very High	Pine barrens	Jack Pine	Early
						Dry northern forest	Jack Pine, Red Pine	Early
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Osprey	*Pandion haliaetus*	SC/G5/S2-3	Confirmed	PS	Low	Coastal fen	Lowland open/semi-open	N/A
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland Mixed	Mid
						Hardwood-conifer swamp	Lowland Mixed	Mid
Fish								
Bigmouth shiner	*Notropis dorsalis*	SC/G5/S4	Confirmed	MV	Moderate	Rivers	Aquatic	N/A
Butterfly								
Dusted skipper	*Atrytonopsis hianna*	Sc/G4G5/S2S3	Confirmed	MV	Low	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Tawny crescent	*Phyciodes batesii*	SC/G4/S4	Confirmed	PS	Low	Coastal fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Mesic sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
Insect								
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Mussel								
Slippershell mussel	*Alasmidonta viridis*	T/G4G5/S2S3	Confirmed	EV	Very High	Headwater Stream	Aquatic	N/A
						Mainstem streams	Aquatic	N/A
						Inland lake	Aquatic	N/A
Reptile								
Spotted trutle	*Clemmys guttata*	T/G5/S2	Confirmed	HV	Low	Prairie fen	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Interdunal wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Lakeplain wet prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Inundated shrub swamp	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Plant								
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Ram's head lady's-slipper	*Cypripedium arietinum*	SC/G3/S3	Confirmed			Rich conifer swamp	Tamarack	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
						Volcanic bedrock lakeshore	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Poor fen	Lowland open/semi-open	N/A
						Wooded dune & swale complex	Upland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Great Lakes barrens	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Volcanic bedrock glade	Upland open/semi-open	N/A
						Granite bedrock glade	Upland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

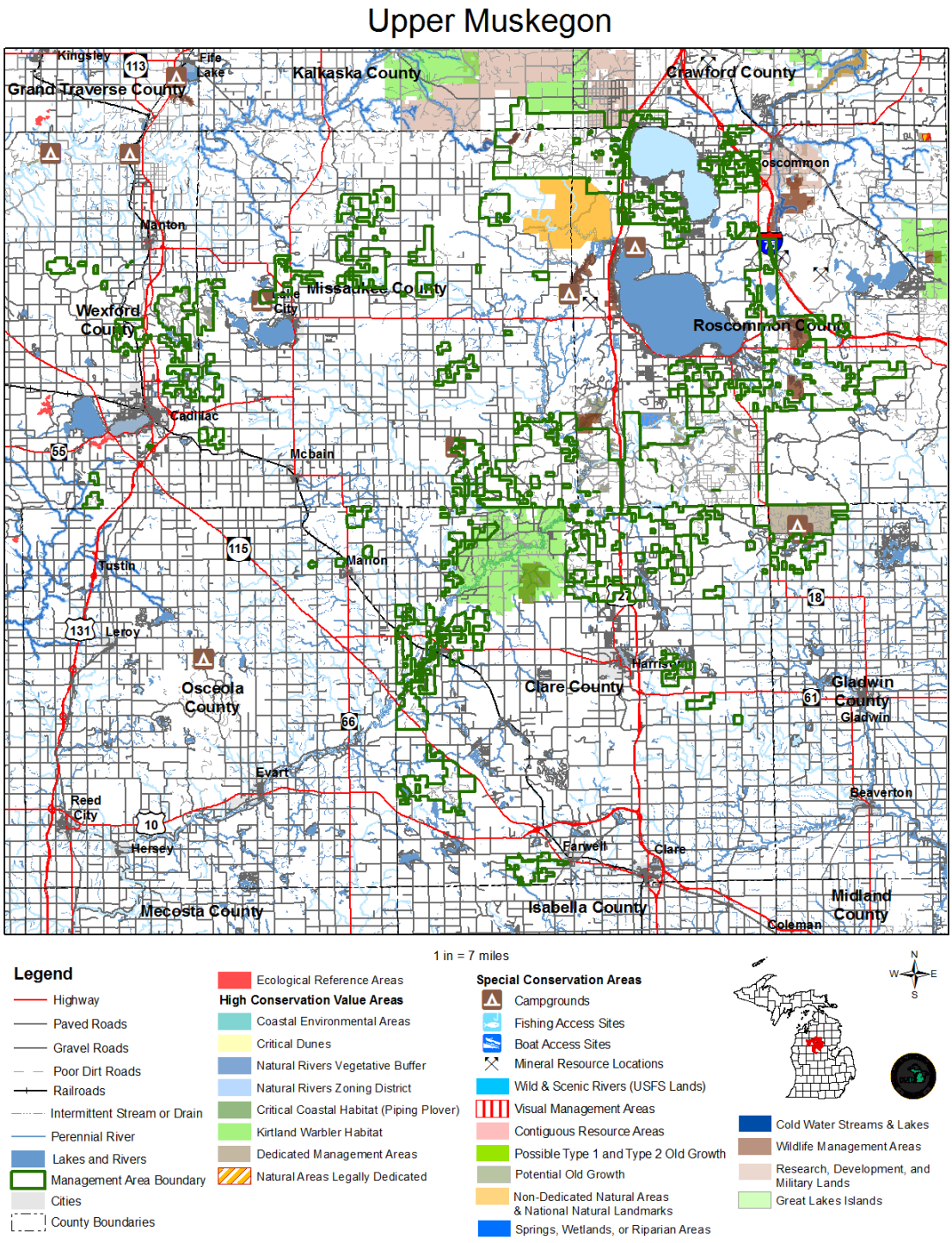

Figure 4.27.7 A map of the Upper Muskegon management area showing the special resource areas.

4.27.4 Forest Health Management

Although forest health issues span the entire landscape, some threats are more important in this management area due to the species composition, site quality or other factors. One of the more important forest health issues in this management area includes oak decline and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains;
- Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot; and
- Shorter rotations will reduce risk of decline.

4.27.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.27.1 and listed in Appendix F.

4.27.6 Fire Management

Disturbance through fire has historically played an important role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen or grass/upland brush types. Wildfire risk and fuel loading is increased in young dense conifer plantations and mature jack pine affected by jack pine budworm.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings;
- Reduce fuel loading and therefore the risk of wildfire in jack pine stands by harvesting at maturity; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.27.7 Public Access and Recreation

Access for management and/or recreation is generally very poor throughout this management area as there is a significant amount of lowland. Where access is limited on state forest land, the department will continue to seek access across adjacent private property. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Specific hunting recreation improvements such as parking lots, gates, trail planting and trail establishment, as well as the preparation and dissemination of specific promotional material, may be made as a result of Grouse Enhanced Management Systems areas planning in this management area.

The diverse qualities of recreational opportunities are showcased within this management area. Six rustic campgrounds - varying in size from the eight sites available at Mud Lake, to Goose Lake, which offers 41 sites, are within this management area (Figure 4.27.7). Both House and Trout Lake state forest campgrounds which are located within the Gladwin Field Trial Area (Figure 4.27.7) and located near high population centers are two of the busiest rustic facilities in the state. Both House and Trout lakes state forest campgrounds are heavily used by field trial participants that come from all over the world to train their dogs. Off-road vehicle enthusiasts have a variety of options, including the narrowest of trails preferred by motorcyclists, to wide trails used by 4X4 trucks (Figure 4.27.1). Winter offers numerous snowmobile trail options and the non-motorized Cadillac pathway is a favorite trail for cross country skiers (Figure 4.27.1). Current and future recreation opportunities will continue to be an important part of this management area. Below are the recreational facilities that can be found within this management area.

Campgrounds

- Goose Lake State Forest Campground
- Long Lake (Wexford) State Forest Campground
- Long Lake (Missaukee) State Forest Campground
- House Lake State Forest Campground
- Trout Lake State Forest Campground
- Mud Lake State Forest Campground

Boating Access Sites (BAS)

- Goose Lake BAS
- Long Lake (Wexford) BAS
- Long Lake (Missaukee) BAS
- Mud Lake (BAS)

Off-Road Vehicle Trails

- Long Lake Cycle Trail
- Missaukee Junction Trail
- West Higgins Trail
- Denton Creek Trail and Route
- St. Helen Trail and Route
- Leota Trail

Snowmobile Trails

- Various

Non-Motorized Trails

- Cadillac Pathway

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.27.8 Oil, Gas and Mineral Development

Surface sediments consist of end moraines of fine-textured and coarse-textured till, glacial outwash sand and gravel and postglacial alluvium, ice-contact outwash sand and gravel, coarse-textured and fine-textured tills and lacustrine (lake) sand and gravel. The glacial drift thickness varies between 200 and 1,000 feet. Sand and gravel pits are located in this management area and there is potential for additional pits.

The Jurassic Red Beds, Pennsylvanian Saginaw Formation, Mississippian Bayport limestone and Michigan Formation sub-crop below the glacial drift. The Saginaw is quarried for clay in brick making, the Bayport for Limestone and the Michigan for gypsum elsewhere in the state.

Considerable exploration and development for oil and gas from the shallow Mississippian Stray Sandstone to the deep Ordovician Prairie du Chien has occurred in this large management area. Well spacing ranges from 40 acres up to 640 acres for the deeper formations. There is potential for additional development for these formations in this management area. The Collingwood Formation's first well was drilled for gas in Missaukee County and additional wells have been

permitted. Spacing will most likely be 640 acres or larger. Most of the management area is currently leased, either for the known producing formations and other areas most likely for Collingwood development. If drilling is successful in the Collingwood Formation additional leasing and drilling will continue in this management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance, and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and that all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.28 MA 28 – Ogemaw Hills Management Area

Summary of Use and Management

Vegetation management in the Ogemaw Hills management area (MA) (Figure 4.28.1) will provide timber products; maintain or enhance wildlife habitat; protect areas of unique threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management for this 10-year planning period will focus on harvesting older jack pine, balancing the age-class distributions of oak and aspen and regenerating red pine. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation opportunity. Expected trends within this 10-year planning period are the need to regenerate oak and red pine, continue to balance aspen age-class distributions, an expected increase in recreation pressure and continued wildfire prevention and suppression.

Introduction

There are 61,965 acres of state forest land in the Ogemaw Hills management area located in Roscommon and Ogemaw Counties near the town of St. Helens with smaller portions in Crawford and Oscoda counties. The primary attributes which identify the Ogemaw Hills management area include:

- The dominant landform consists of large ridges of ice-contact sands surrounded by poorly drained outwash channels and plains.
- The management area falls within Grayling Outwash Plain sub-region as classified by Albert (1995).
- Some of the land is under short-term military lease.
- This area is popular for hunting and mushroom hunting and other activities for the nearby communities of Grayling, West Branch, Houghton Lake, Roscommon and Mio.
- This use, combined with the quantity and availability of wood fiber contributes significant social and economic values to the area.
- Threatened, endangered or species of special concern located by Michigan Natural Features Inventory surveys include eastern massasauga rattlesnake, Hill's thistle, prairie *agoseris,* secretive locust, Kirtland's warbler, great blue heron colony, red-legged spittlebug, rough fescue and Henry's elfin.

The current predominant cover types, acreages and projected harvest acres in the management area are shown in Table 4.28.1.

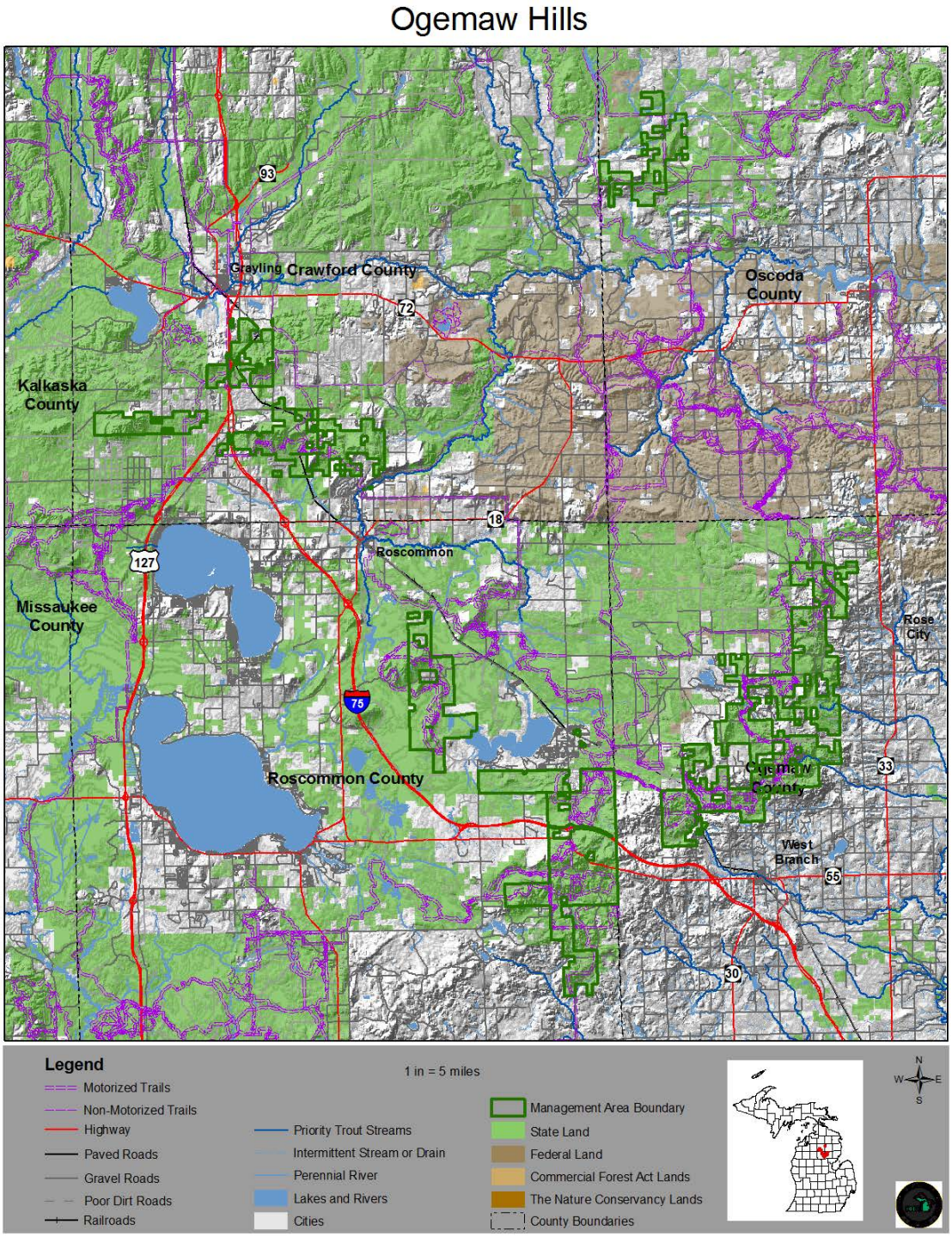

Figure 4.28.1. A map of the Ogemaw Hills management area (dark green boundary) in relation to surrounding state Forest and other lands in Ogemaw, Roscommon, Oscoda and Crawford counties, MI.

Table 4.28.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Ogemaw Hills management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	40%	24,575	446	24,129	3,525		24,575	3,447	
Oak	23%	14,098	4,619	9479		2,458	14,098	1,053	2,458
Jack Pine	9%	5,382	511	4871	93		5,382	696	
Mixed Upland Deciduous	7%	4,098		4098		446	4,098	585	446
Red Pine	4%	2,716	438	2278	503	429	2,716	253	1,098
Northern Hardwood	3%	1,846	43	1803		388	1,846		388
White Pine	2%	969	78	891	196	339	969	81	388
Lowland Conifers	2%	961	781	180	20		961	20	
Cedar	2%	944	944				944		
Upland Open/Semi-Open Lands	3%	1,627		1627			1,627		
Lowland Open/Semi-Open Lands	2%	1,373		1373			1,373		
Misc Other (Water, Local, Urban)	1%	674		674			674		
Others	4%	2,702	749	1953	256	429	2,702	223	450
Total		61,965	8,609	53,356	4,594	4,489	61,965	6,358	5,228

4.28.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Current Conditions, Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. Management areas consist of stands that are defined by their predominant vegetative cover type, landform and other similar attributes. While most stands have a variety of trees species and other vegetation, they are classified by the predominant species.

Section 4.28.1.1 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total 24,575 acres or 40% of the management area (Table 4.28.1). Aspen is distributed throughout the management area including the till areas on dry to mesic/poor (habitat classes: PArVHa, PArVVb) sites. There are 446 acres of aspen have met harvest criteria (Figure 4.28.2), but have site conditions that limit harvest (hard factor limit acres).

There are 1,637 acres of stands that have a regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen will be located on suitable sites with acres balanced within the 0-69 year age-class rotation to provide early successional habitat for species viability and a sustainable level of wood fiber.

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 3,525 acres in this 10-year planning period;
- Concentrate harvests on the oldest age classes first; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

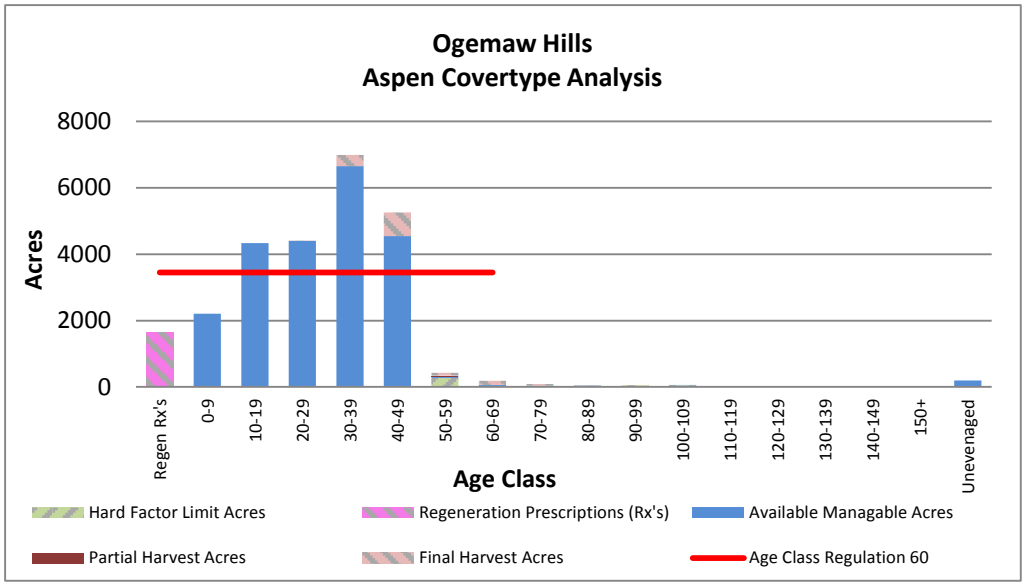

Figure 4.28.2. Age-class distribution for aspen in the Ogemaw Hills management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue to manage aspen at current levels for a balanced age-class distribution for sustainable fiber production and habitat; and
- A desired future harvest level is projected at 3,447 acres for final harvest per 10-year period.

Section 4.28.1.2 Forest Cover Type Management – Oak

Current Condition

Oak acres total 14,098 or 23% of the management area (Table 4.28.1) including the till areas on very dry to mesic/poor-medium sites (habitat classes: PArVHA, PArVVb). Oak is well represented in the 0-9 year-old age classes and the 70-89 year-old age classes (Figure 4.28.3). However, there is a lack of acres in the 10-69 year-old age classes. Although oak has been regenerated, on most sites red maple is a significant competitor for oak regeneration. A thick sedge groundcover may also hinder seedling regeneration and exposed oak in frost pockets is prone to late spring freezes. There are 4,619 acres of oak that have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres).

There are 997 acres of stands that have a regeneration harvest pending and these acres are included in the regeneration prescription class. There are 688 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of oak. These acres are included in the regeneration prescription class.

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management to provide for timber products, wildlife habitat and recreational opportunities.

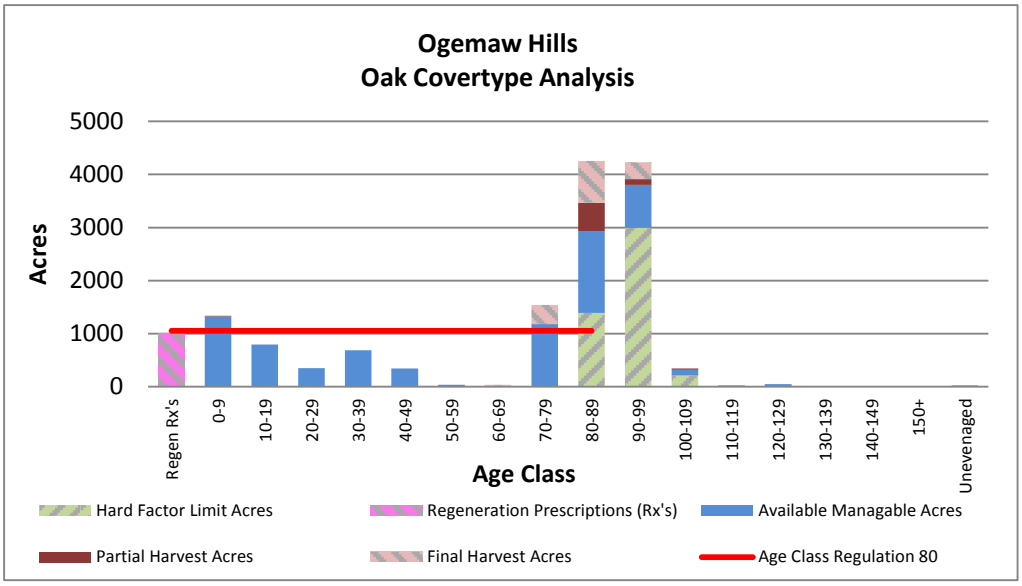

Figure 4.28.3. Age-class distribution for oak in the Ogemaw Hills management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct partial harvests on a projected 2,458 acres with a concentration on acres in the oldest age groups;
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration in other cover types;
- Consider opportunities to plant oak to increase oak throughout the management area;
- In areas of oak wilt or in proximity to oak wilt areas, consider favoring white oak where present; and
- Consider opportunities to selectively remove the conifer cover to release understory oak on mesic/poor sites.

Long-Term Management Objectives

- Continue aggressive management efforts outlined above to regenerate and establish oak on mesic/poor (PArVVb) sites; and
- A desired future harvest level is projected at 1,053 acres for final harvest and 2,458 acres for partial harvest per 10-year period.

Section 4.28.1.3 Forest Cover Type Management – Jack Pine

Jack pine acres total 5,382 or 9% of the management area (Table 4.28.1). Jack pine is found on PArVHa/PArVVb and PArVHa habitat class sites. Forest communities dominated primarily by jack pine in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. There are 467 acres of jack pine have met harvest criteria (Figure 4.28.4) but have site conditions that limit harvest (hard factor limited acres). There are 165 acres of stands that have a regeneration harvest pending and these acres are included in the regeneration prescription class.

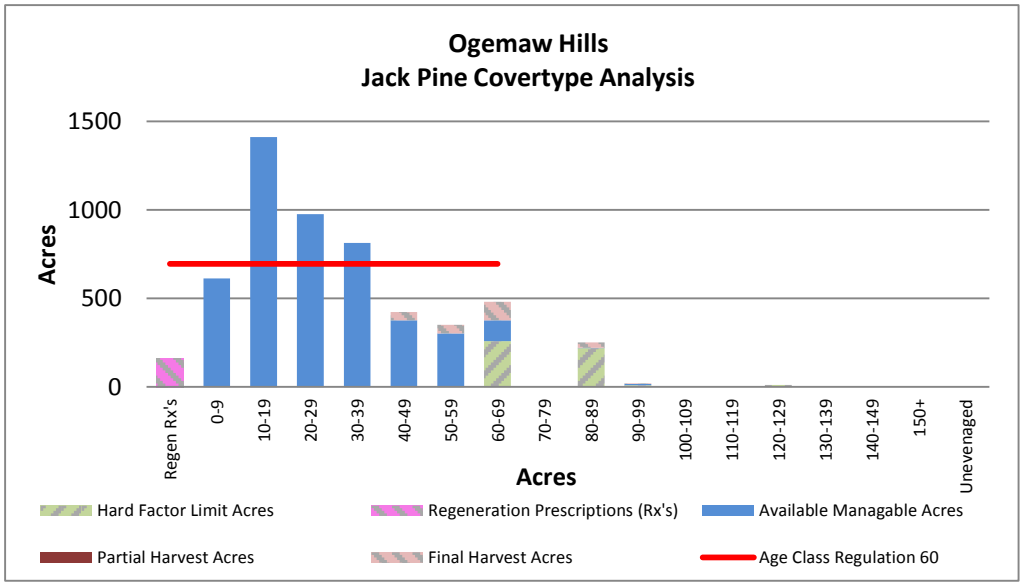

Figure 4.28.4. Age-class distribution for jack pine in the Ogemaw Hills management area (2012 Department of Natural Resources inventory data).

The graph includes the projected acres converted to the cover type as a result of treatments that remove an overstory and planting to jack pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Jack pine dominated forest communities will be maintained on operable sites through even-aged management with acres balanced between 0-69 years of age to provide for regulated harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct final harvests on a projected 93 acres.

Long-Term Management Objectives

- Consider the potential impacts of jack pine budworm outbreaks in management decisions;
- Continue harvests to balance age-class distributions; and
- A desired future harvest level is projected at 696 acres for final harvest per 10-year period.

Section 4.28.1.4 Forest Cover Type Management – Red Pine

Current Condition

Natural and planted red pine acres total 2,716 acres or 4% of the management area (Table 4.28.1) on till areas. The habitat classes for red pine sites range from PArVHa to PArVVb. There is a pronounced spike in the 70-89 year-old age classes which represents a previous era of active planting (Figure 4.28.5).

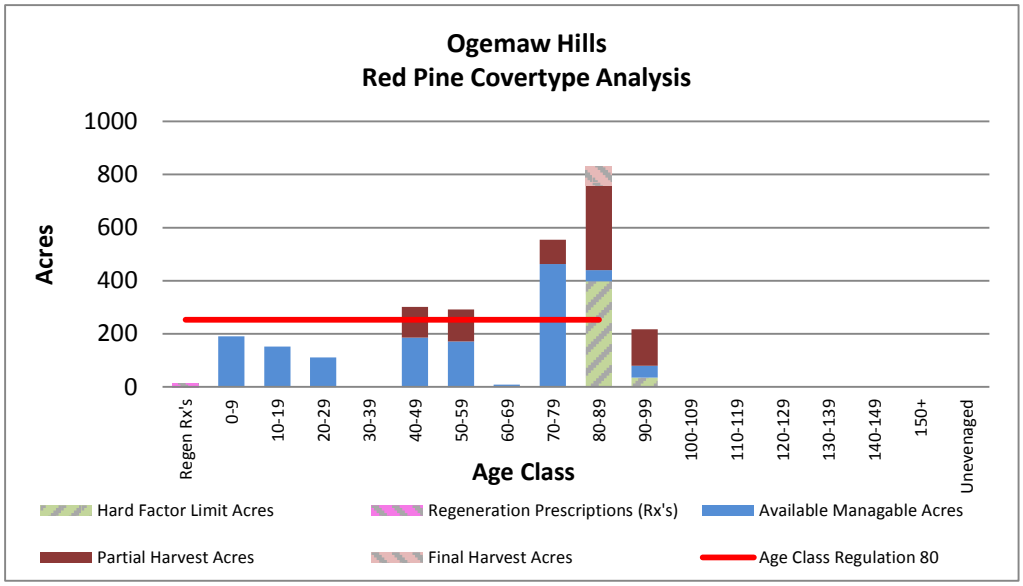

Figure 4.28.5. Age-class distribution for red pine in the Ogemaw Hills management area (2012 Department of Natural Resources inventory data).

Red pine plantations in this management area are commercially valued for pulp, saw logs and utility poles. There are 438 acres of red pine that have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 12 acres that have a regeneration harvest pending and these acres are included in the regeneration prescription class. There are 783 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to red pine as a result of treatments that remove an overstory species and planting to red pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine of either natural origin or in planted stands will be located on suitable sites with acres balanced in the 0-89 year age classes to provide a steady flow of forest products.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distributions;
- Conduct partial harvests on a projected 429 acres, concentrating on stands of better-quality red pine that has the potential for a higher product value in larger size classes; and
- Conduct regeneration harvests on a projected 503 acres of red pine beginning with the oldest age-classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- In identified special conservation areas, especially those with natural red pine on dry-mesic sites, consider management of red pine to a biological rotation of 200+ years;
- Continue management to balance the age-class distributions; and
- A desired future harvest level is projected at 253 acres for final harvest and 1,098 acres for partial harvest per 10-year period.

Section 4.28.1.5 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 1,373 acres or 2% of the management area (Table 4.28.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.28.1.6 Forest Cover Type Management – Mixed Upland Deciduous

Current Condition

Mixed upland deciduous (primarily aspen, oak and red maple) acres total 4,098 acres or 7% of the management area (Table 4.28.1). Due to the age-classes of this type (Figure 4.28.7); it would appear that these stands are mixed oak stands (older age classes) with aspen and red maple (younger age classes). The community is distributed throughout the management area on habitat class PArVHa sites. Forest communities classed as mixed upland deciduous in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, white-tailed deer, squirrels and various birds and commercially for firewood and industrial lumber.

Desired Future Condition

- These communities will be managed on operable sites, contributing to the compositional diversity of the landscape while providing for continual harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species.

10-Year Management Objectives

- These areas will be managed primarily through selection harvests that may select an individual species for harvest; and
- Conduct regeneration harvests on a projected 446 acres to regenerate those species which meet silvicultural criteria.

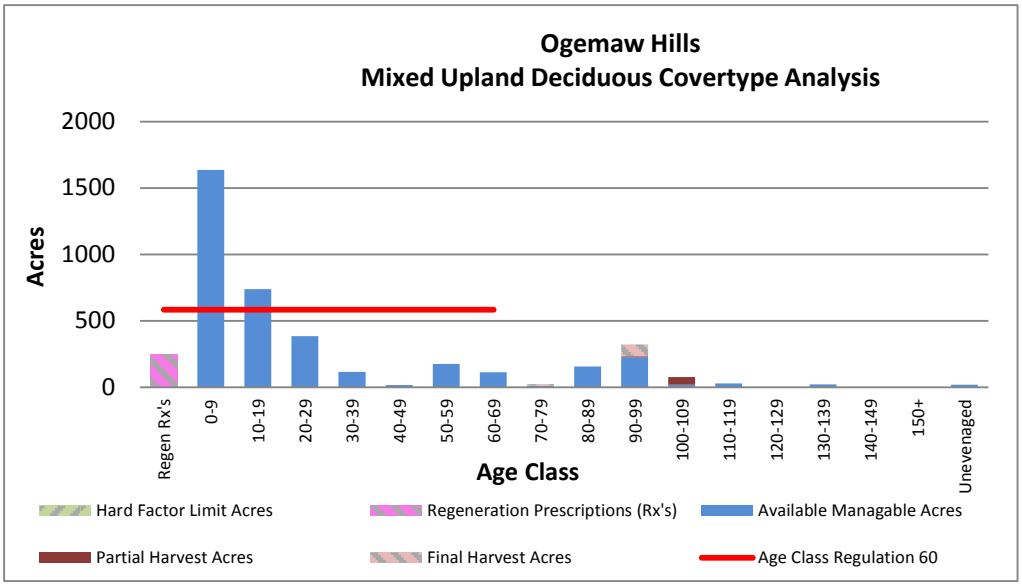

Figure 4.28.6. Age-class distribution for mixed upland deciduous in the Ogemaw Hills management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Maintain these mixed types through continued management to provide a diverse cover type that provides habitat and forest products on a sustainable basis; and
- A desired future harvest level is projected at 585 acres for final harvest and 446 acres for partial harvest per 10-year period.

Section 4.28.1.5 Forest Cover Type Management – Upland Open/Semi- Open Lands

Current Condition

Upland open/semi-open lands acres total 1,627 acres or 3% of the management area (Table 4.28.1). This category is a combination of the following non-forested land cover types: herbaceous openland, upland shrub, low density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-openlands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-openlands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.28.1.6 Forest Cover Type Management – Other Types

Current Condition

Cover types which may cover less than 5% of the management area include: northern hardwood 1,846 acres or 3% of the management area, white pine 969 acres (2%), lowland conifers 961 acres (2%) and cedar 944 acres (2%). Other forested and non-forested communities total 2,702 acres or 4% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct regeneration harvests on a projected 20 acres of lowland conifer;
- Consider methods to ensure adequate cedar and lowland conifer regeneration;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry;
- The following species are projected for restarting or regeneration harvests: 196 acres of white pine, 26 acres of upland mixed forest, 53 acres of natural mixed pines, 133 acres of upland spruce/fir and 44 acres of planted mixed pines; and

- Partial harvests are projected for 388 acres of northern hardwood, 339 acres of white pine, 197 acres of upland mixed forest, 157 acres of natural mixed pines and 68 acres of planted mixed pines.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types;
- Continue to manage these other types to provide forest products, wildlife habitat and recreational opportunities; and
- Desired future harvest levels for final harvest are projected at 40 acres of lowland conifer per 10-year period.

4.28.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

A more detailed overview of featured species is included in Section 3.

The following have been identified as featured species for this management area during this cycle of state forest planning:

- American bittern (Robinson Creek Flooding State Wildlife Management Area)
- American woodcock
- Beaver
- Black bear
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer
- Wood duck (Robinson Creek Flooding State Wildlife Management Area)

The primary focus of wildlife habitat management in the Ogemaw Hills management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area the maintenance of young forest; large open grassland complexes and marsh/grassland complexes; the retention of large over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

American Bittern

The goal for American bittern in the northern Lower Peninsula is maintain or increase available habitat. American bittern prefer large (>10 acre), shallow (average depth four inches) wetlands with open water in the center, a band of emergent vegetation around periphery and idle grassland in the adjacent uplands (4:1 grassland to wetland ratio). State forest management should focus on priority wildlife management areas with suitable shallow water marsh (hemi-marsh).

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat. Ideal wetland/upland complexes are greater than 50 acres.
    - Implementation of the wildlife management area master plan for Robinson Creek Flooding State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain water levels from the April through August breeding season.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems per acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specification:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop, or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than 5 acres in size with a savannah-like dispersion of large trees (< 50% canopy cover) with open under story and include tall trees or snags of large (> 12 inches) diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease, and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old); even-aged deciduous stands that typically support 8,000-10,000 woody stems per acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland openland will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting, and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland openland will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland openland and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.

- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood ducks are most limited by available nesting and brood rearing habitat. Wood ducks nest in tree cavities near rivers, streams, swamps, beaver ponds, and marshes. Nests require mature hardwood trees with 10 inches or larger in diameter at breast height. Brood rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority wildlife management areas with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plan for Robinson Creek Flooding State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification.
- Maintain stable water levels at managed floodings from April through August.

4.28.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in DNR's *Approach to the Protection of Rare Species on State Forest Lands* (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed no listed species or natural communities of note occurring in the management area. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys. There have been no special resource areas, high conservation value areas or ecological reference areas identified in the Ogemaw Hills management area as illustrated in Figure 4.28.7.

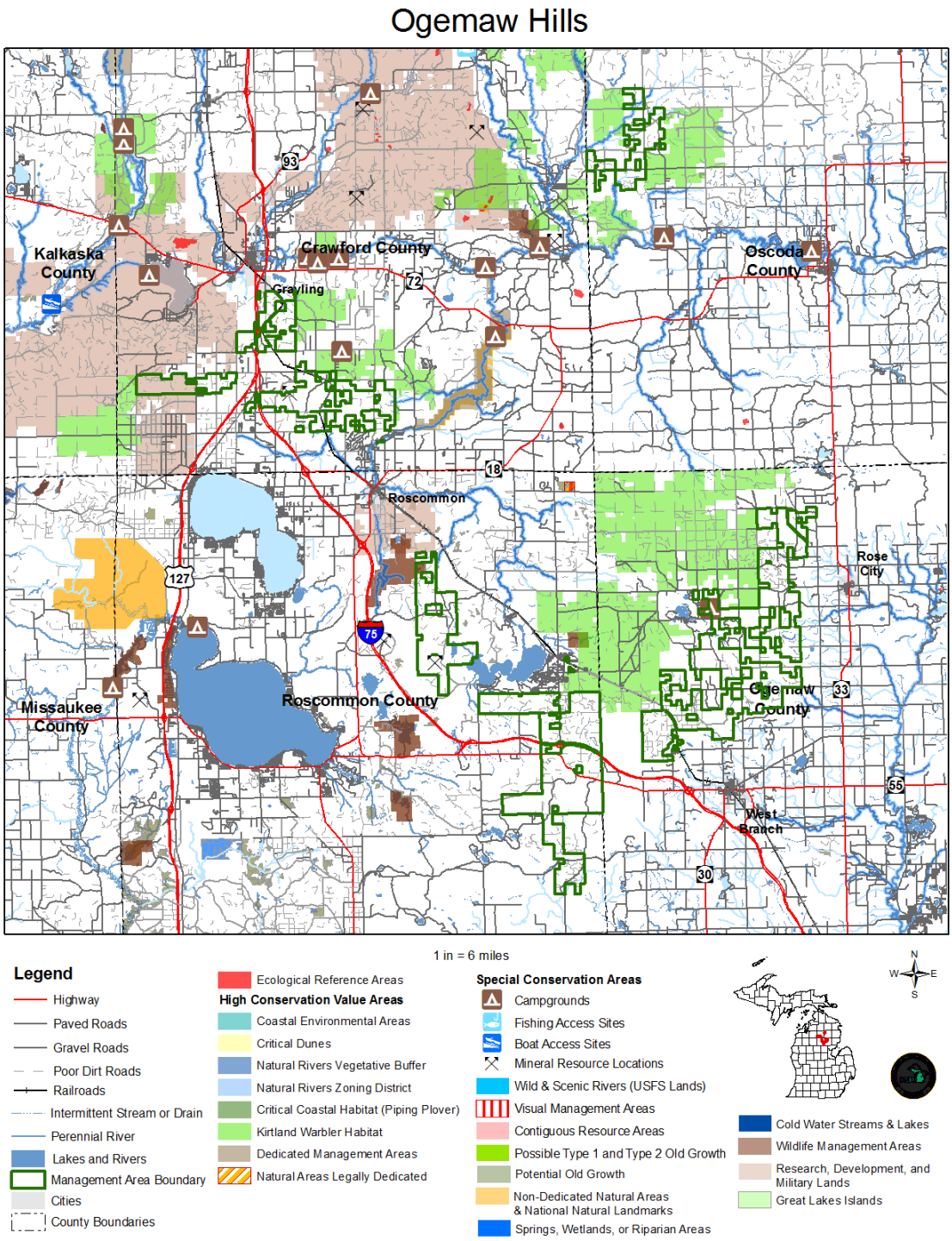

Figure 4.28.7. A map of the Ogemaw Hills management area showing the special resource areas.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

4.28.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests include oak decline and oak wilt and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.
- Oak wilt is found in this area. Epicenters need to be identified and treated. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced. Other management activities that can lead to damage of residual red oak trees, such as oil and gas development, recreational trail improvement, etc., should be not be conducted during this high-risk period.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Currently there are no invasive species mapped within the management area or within the five-mile buffer of the management area. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

4.28.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.28.1 and listed in Appendix F.

4.28.6 Fire Management

Historically, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen or grass/upland brush types. Wildfire risk and fuel loading is increased in young dense conifer plantations and mature jack pine affected by jack pine budworm.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings;
- Reduce fuel loading and therefore the risk of wildfire in jack pine stands by harvesting at maturity; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.28.7 Public Access and Recreation

Access for management and/or recreation is generally very good throughout this management area as there is very little lowland and a well-developed road/trail system. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Recreation opportunities within this management area are predominantly associated with motor sport activities. Numerous off-road vehicle trails traverse and wind thru this management area (Figure 4.28.7). Improved in 2007, the Ambrose Lake State Forest Campground (Figure 4.28.7) was designed with the off-road vehicle enthusiasts in mind with large sites and access to the many off-road vehicle trails, along with a new boating access site serving beautiful Ambrose Lake. Snowmobile trails within this management area (Figure 4.28.1) offer users the experience of riding thru large red pine stands. Those recreationalists interested in hiking and cross country skiing on groomed trails can use the Ogemaw Hills Pathway (Figure 4.28.1), which is located in a forest cover type dominated by northern hardwoods. The recreation features provided in this management area are listed below:

Campgrounds

- Ambrose Lake State Forest Campground

Boating Access Sites

- Ambrose Lake Boating Access Site

Off-Road Vehicle Trails

- Rose City Trail
- Beaver Creek Michigan Cycle Conservation Club Trail
- Geels Trail
- St. Helen Trail and Route
- St. Helen to Ogemaw Hills Michigan Cycle Conservation Club Trail
- Ogemaw Hills to Ambrose Lake Michigan Cycle Conservation Club Trail
- Ambrose Lake Trail
- M-30 to St. Helen Michigan Cycle Conservation Club Trail
- Ogemaw Hills Trail and Route

Snowmobile Trials

- Various

Non-Motorized Trails

- Ogemaw Hills Pathway

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42, and the Department of Natural Resources Within Stand Retention Guidelines.

4.28.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium and ice-contact outwash sand and gravel. The glacial drift thickness varies between 100 and 1,000 feet. Sand and gravel pits are located in this management area, including state leased pits and there is good potential for additional pits.

The Pennsylvanian Saginaw Formation, Mississippian Bayport limestone and Michigan Formation and the Devonian Marshall Sandstone and Coldwater Shale subcrop below the glacial drift. The Saginaw is quarried for clay in brick making, the Bayport for Limestone and the Michigan for gypsum elsewhere in the state.

Exploration and development for oil and gas from the shallow Mississippian Stray Sandstone to the deep Ordovician Prairie du Chien has occurred in this management area. Well spacing ranges from 40 acres up to 640 acres for the deeper formations. There is potential for additional development for these formations in this management area. The Collingwood Formation's first well was drilled for gas in Missaukee County and additional wells have been permited. Spacing will most likely be 640 acres or larger. The west half of the management area is currently leased, either for the known producing formations and other areas most likely for Collingwood development. If drilling is successful for the Collingwood Formation additional leasing and drilling will continue in this management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and that all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.29 MA 29 – Lake County Outwash Management Area

Summary of Use and Management

Vegetation management in the Lake County Outwash management area (MA) (Figure 4.29.1) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management for this 10-year planning period will focus on harvesting older jack pine and balancing the age-class distribution of aspen. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation; maintaining soft and hard mast sources including oak; and preserving related recreational opportunity.

Expected trends within this 10-year planning period are the need to minimize jack pine budworm damage by reducing the amount of more susceptible older jack pine; the need to regenerate oak and red pine; the need to target some accessible aspen in older age-classes for harvest; and increased recreational pressure.

Introduction

The Lake County Outwash management area contains 38,787 acres of state forest land and is located in Central Lake County just west of the town of Luther, Michigan and northeast of Baldwin. Primary attributes which identify the Lake County Outwash management area include:

- A predominance of outwash plains which accounts for 80% of the landforms.
- The management area falls almost entirely within the Newaygo Outwash Plain sub-region (Albert, 1995).
- Due to the proximity of this management area to more populated areas of Southern Michigan and the popularity of this area for dispersed recreation and the quantity and availability of wood fiber the forest resources contribute significant social and economic values to the area.
- The Baldwin River, South Branch of Cole Creek and the North Branch of Cole Creek originate in the management area and are tributaries of the Pere Marquette River, a designated natural river.
- The Baldwin-Luther Swamp covers a large portion of the management area.
- In addition to dispersed recreation in the form of hunting and mushroom picking, the Pine Forest Pathway and Little Manistee Route which are used for off-road vehicles and snowmobiles as well as the Bray Creek, Leverentz Lake Rustic and Carrieville Campgrounds which are located in the management area.
- Surveys have located rare, threatened, or species of special concern including eastern massasauga rattlesnake, dusted skipper, common loon, a great blue heron colony, wood turtle, eastern box turtle and the Great Plains spittlebug.

Currently, jack pine, oak, swamp hardwoods and aspen cover the majority of the area. The predominant cover types and acreages in the management area are shown in Table 4.29.1. Relative to other cover types in the management area, the jack pine areas have historically been impacted by frequent fire.

The current predominant cover types, acreages and projected harvest acres in the management area are shown in Table 4.29.1.

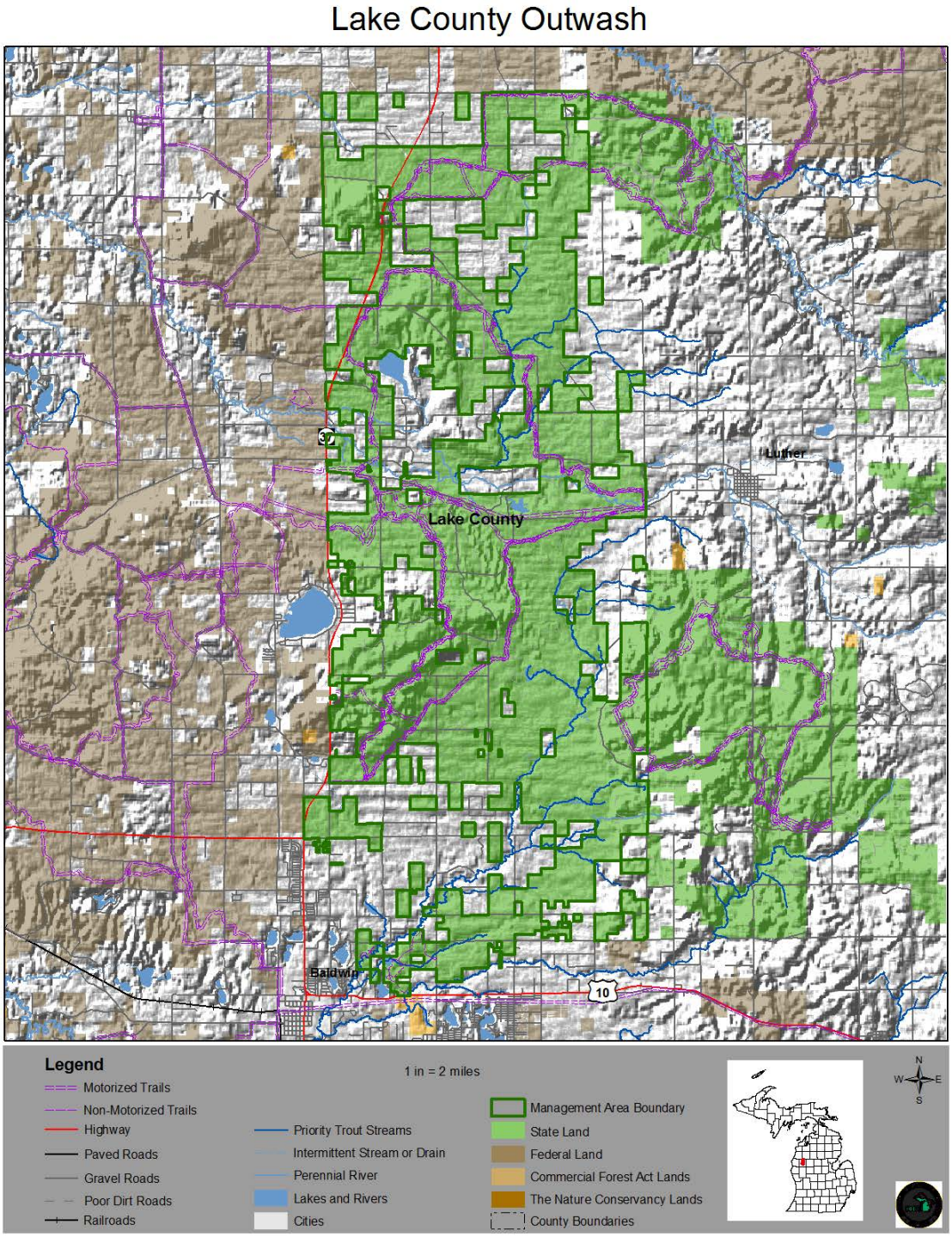

Figure 4.29.1. Location of the Lake County Outwash management area (dark green boundary) in relation to surrounding state forest and other lands in Lake County, MI.

Table 4.29.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Lake County Outwash management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Oak	22%	8,554	1,167	7,387	651	1,541	8,554	821	1,541
Jack Pine	22%	8,406	155	8251			8,406	1,179	
Aspen	11%	4,102	30	4072	1,055		4,102	679	
Lowland Deciduous	9%	3,389	515	2874	319		3,389	319	
Mixed Upland Deciduous	5%	1,830		1830	97	446	1,830	261	446
Lowland Conifers	4%	1,687	2	1685	187		1,687	187	
White Pine	4%	1,425	32	1393	62	486	1,425	127	486
Red Pine	4%	1,374		1374	337	660	1,374	153	660
Natural Mixed Pines	3%	1,147		1147		221	1,147	104	221
Upland Open/Semi-Open Lands	3%	1,294		1294			1,294		
Lowland Open/Semi-Open Lands	8%	2,925		2925			2,925		
Misc Other (Water, Local, Urban)	0%	100	0	100			100		
Others	7%	2,554	55	2499	639	307	2,554	241	317
Total		38,787	1,956	36,831	3,347	3,661	38,787	4,071	3,671

4.29.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of **Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

4.29.1.1 Forest Cover Type Management – Oak

Current Condition

Oak acres total 8,554 or 22% of the management area (Table 4.29.1) on PArVHA and PArVVb habitat classification sites. Although oak is evenly distributed across most age classes, there are very few acres in the 10-69 year-old age classes. There are 1,167 acres of oak that have met harvest criteria (Figure 4.29.2), but have site conditions that limit harvest (hard factor limit acres). There are 1,319 acres that have regeneration harvest pending and these acres are included in the regeneration prescription class.

There are 166 acres with a partial harvest pending and these acres are included in their current age-class. The graph includes the projected number of acres converted to oak as a result of treatments that remove an overstory species resulting in the release of oak. These acres are included in the regeneration prescription class.

Desired Future Condition

- Oak dominated stands will be located on suitable sites through even- and uneven-aged management, while providing for sustainable harvest, wildlife habitat and recreation opportunity.

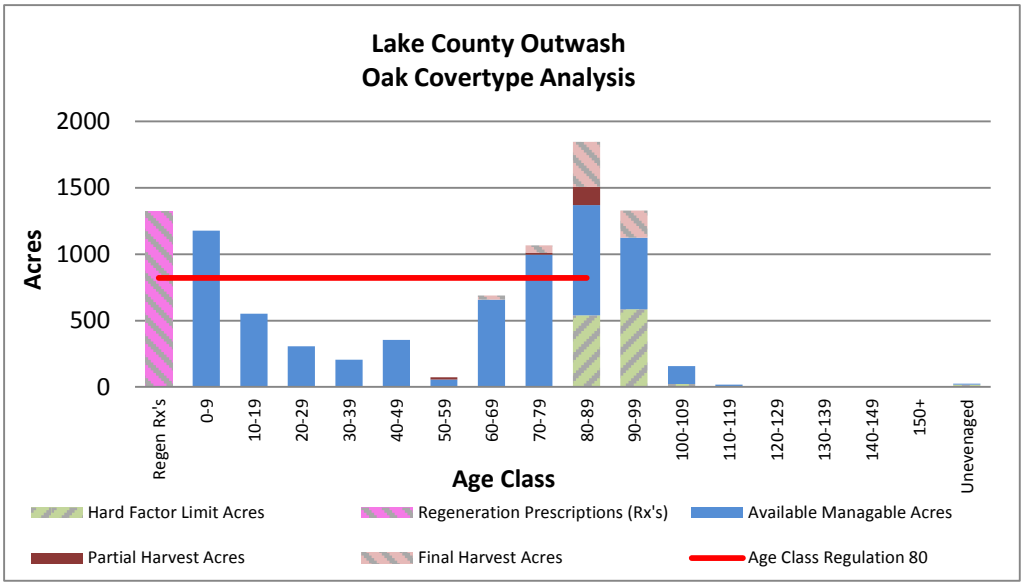

Figure 4.29.2. Age-class distribution for oak in the Lake County Outwash management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct partial harvests on a projected 1,541 acres concentrating on stands that have not been previously harvested or those stands that have a sufficient basal area for a partial harvest;
- Conduct regeneration harvests on a projected 651 acres to begin balancing the age-class distribution; and
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types.

Long-Term Management Objectives

- Continue to aggressively regenerate oak as the predominant species in selected stands through restarting harvests;
- It is acceptable that some oak stands may become mixed stands through partial removal of an oak over story, planting pine in oak stands or through natural regeneration of other species;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area; and
- A desired future harvest level is projected at 821 acres for final harvest and 1,541 acres for partial harvest per 10-year period.

4.29.1.2 Forest Cover Type Management – Jack Pine

Current Condition

Jack pine acres total 8,406 or 22% of the management area (Table 4.29.1) on ridges and outwash areas (habitat classes: PVCd, PArVHA and PArVVb). With the exception of a large spike in acres in the age classes from 10-19 years of age, jack pine age classes are well balanced. There are 74 acres of jack pine that have met harvest criteria (Figure 4.29.3), but have site conditions that limit harvest (hard factor limit acres).

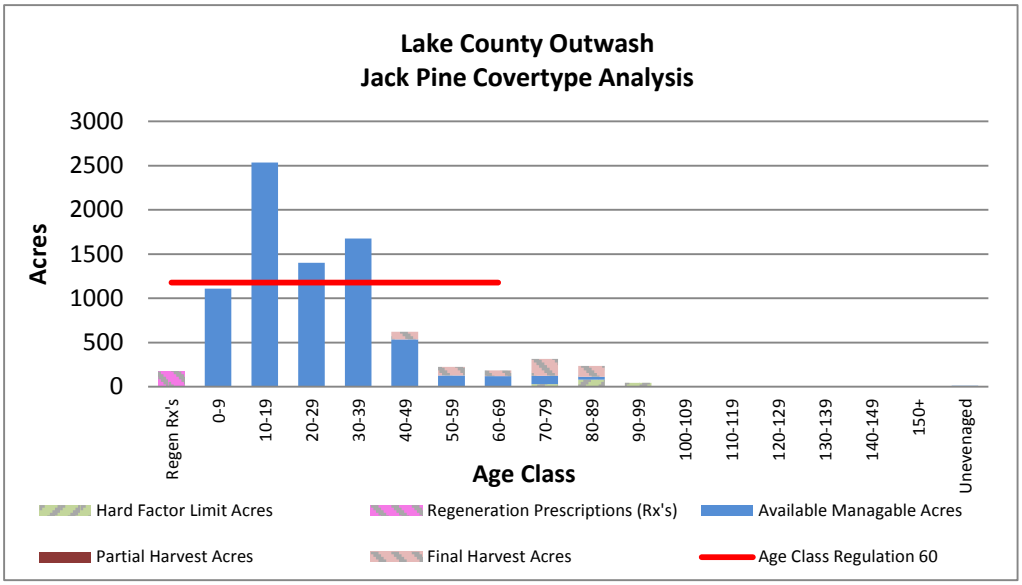

Figure 4.29.3. Age-class distribution for jack pine in the Lake County Outwash management area (2012 Department of Natural Resources inventory data).

There are 172 acres that have regeneration harvest pending and these acres are included in the regeneration prescription class. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory and planting jack pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Jack pine will be evenly distributed in age-classes between 0-69 years on suitable sites; and
- Jack pine will be managed to minimize mortality due to jack pine budworm and the associated wildfire risks due to an increase in fuel loads.

10-Year Management Objectives

- There are no projected harvests in this 10-year planning period; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite balancing of age-class distributions.

Long-Term Management Objectives

- Continue management of jack pine on appropriate sites with an emphasis on reducing over mature stands to minimize losses from jack pine budworm and associated fire risks due to increased fuel loads;
- As the age classes currently in the 0-9 and 10-19 year age classes reach rotation age, these acres will be harvested with the younger age classes to help fill the current shortage in the regeneration prescription class; and
- A desired future harvest level is projected at 1,179 acres for final harvest per 10-year period.

4.29.1.3 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 4,102 or 11% of the management area (Table 4.29.1). Aspen is distributed throughout the management area including the ridges and outwash areas on habitat class PArVHa, PArVVb and AFO sites.

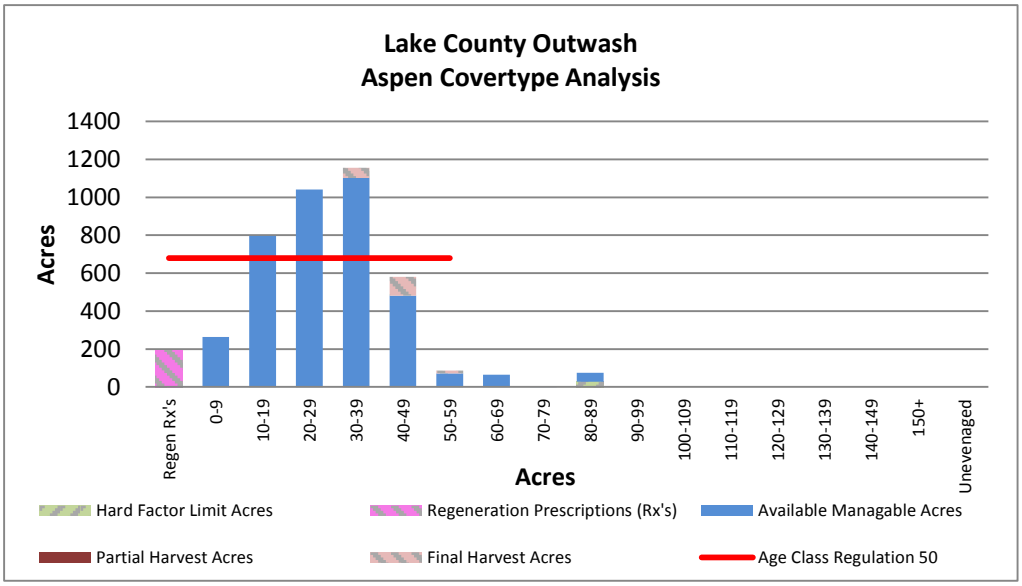

Figure 4.29.4. Age-class distribution for aspen in the Lake County Outwash management area (2012 Department of Natural Resources inventory data).

Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. There are 30 acres of aspen that have met harvest criteria (Figure 4.29.4), but have site conditions that limit harvest (hard factor limit acres). There are 192 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen will be located on suitable sites with acres balanced within the 0-59 year age-class rotation; and
- Aspen acres will be maintained on currently operable sites to provide early successional habitat for species viability, recreation and a sustainable level of wood fiber.

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 1,055 acres;
- Concentrate harvests on the oldest age classes above 60 years of age first; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue work through restarting harvests to achieve a balanced age-class structure; and
- A desired future harvest level is projected at 679 acres for final harvest per 10-year period.

4.29.1.4 Forest Cover Type Management – Lowland Deciduous

Current Condition

Lowland deciduous acres total 3,389 or 12% of the management area (Table 4.29.1) and are predominantly located in the Baldwin-Luther Swamp. There are 515 acres of lowland deciduous have met harvest criteria (Figure 4.29.5), but have site conditions that limit harvest (hard factor limit acres).

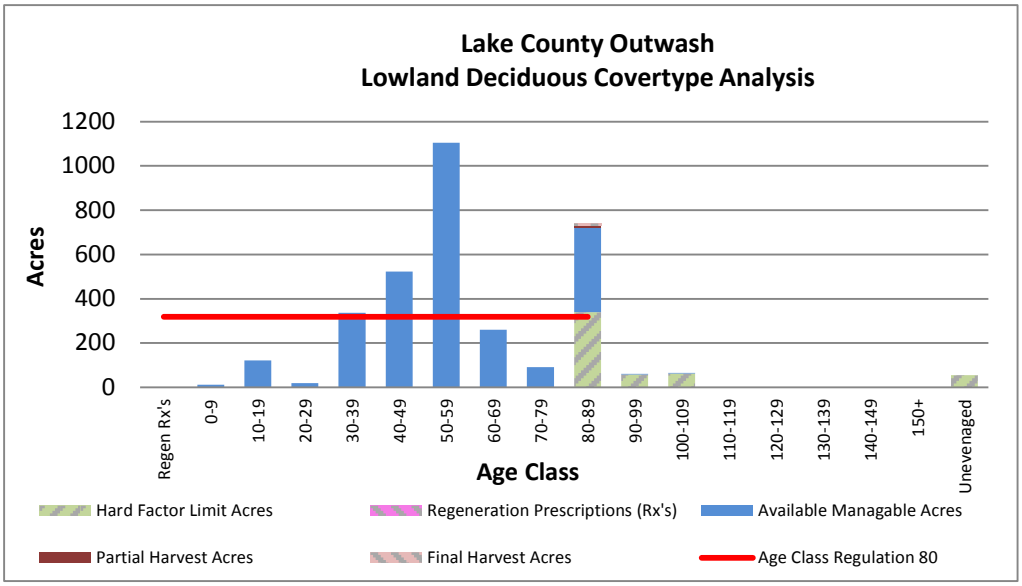

Figure 4.29.5. Age-class distribution for lowland deciduous in the Lake County Outwash management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland deciduous stands will be mixed species in uneven-aged stands to provide habitat and forest products.

10-Year Management Objectives

- Conduct final (regeneration) harvests on a projected 679 acres using selective harvests primarily from the age-classes above 80 and from the more accessible areas; and
- Due to high water tables, harvests should leave a residual canopy sufficient to prevent a loss of evapotranspiration which will result in an increase in surface water and cover type conversion to types more tolerant of extremely wet areas.

Long-Term Management Objectives

- Where feasible, continue to conduct partial harvests of lowland deciduous types where opportunities exist for management; and
- A desired future harvest level is projected at 679 acres for final harvest per 10-year period.

4.29.1.5 Forest Cover Type Management – Mixed Upland Deciduous

Current Condition

Mixed upland deciduous (primarily aspen, oak and red maple) total 1,830 acres or 5% of the management area (Table 4.29.1 and Figure 4.29.6). Due to the age classes of this type, it would appear that these stands are oak stands (older ages) mixed with larger amounts of aspen and red maple (younger ages). The community is distributed throughout the management area on habitat class PArVHa sites.

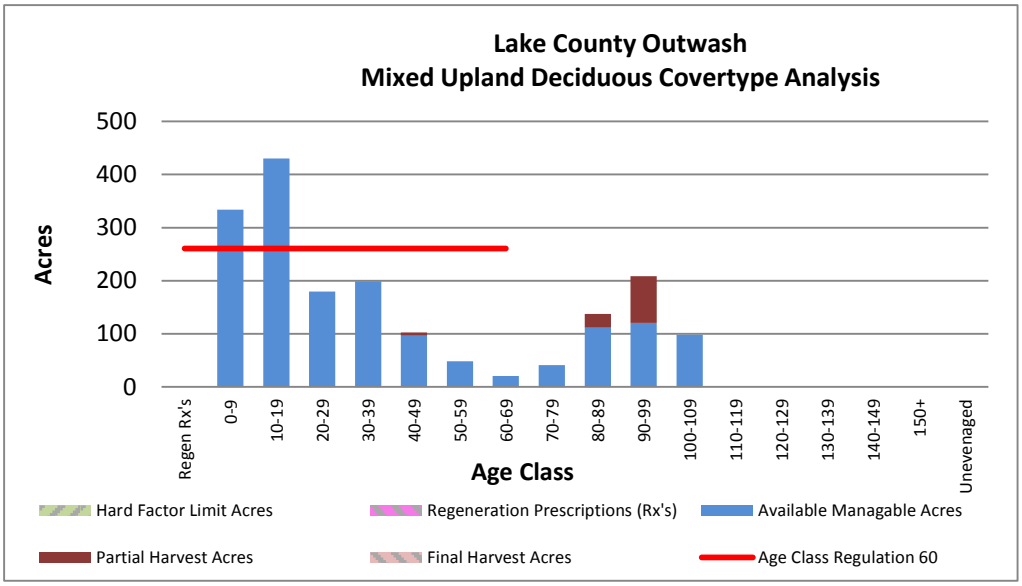

Figure 4.29.6. Age-class distribution for mixed upland deciduous in the Lake County Outwash management area (2012 Department of Natural Resources inventory data).

Forest communities classed as mixed upland deciduous in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, white-tailed deer, squirrels and various birds and commercially for firewood and industrial lumber.

Desired Future Condition

- These communities will be managed on operable sites, contributing to the compositional diversity of the landscape while providing for continual harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species.

10-Year Management Objectives

- These areas will be managed primarily through selection harvests that may select an individual species for harvest;
- Conduct regeneration harvests on a projected 97 acres to regenerate those species which meet silvicultural criteria; and
- Conduct partial harvests, primarily in oak, on a projected 446 acres.

Long-Term Management Objectives

- Maintain these mixed types through continued management to provide a diverse cover type that provides habitat and forest products on a sustainable basis; and
- A desired future harvest level is projected at 261 acres for final harvest and 446 acres for partial harvest per 10-year period.

4.29.1.6 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open land acres total 2,925 acres (8%) of the management area. Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife.

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue preventative measures against illegal off-road vehicle use on these sites; and
- If necessary and feasible, consider control methods for invasive exotic species which may degrade the quality of openings.

4.29.1.7 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open lands acres total 1,294 acres or 3% of the management area (Table 4.29.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- Maintain upland open/semi-open lands at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.29.1.8 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: lowland conifers 1,687 acres or 4% of the management area, white pine 1,425 acres (4%), red pine 1,374 acres (4%) and natural mixed pines 1,147 acres (3%). Other forested and non-forested acres total 2,554 or 7% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Conduct regeneration harvests on a projected 14 acres of cedar and 187 acres of lowland conifer where feasible;
- Consider methods to ensure adequate cedar and lowland conifer regeneration;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years-of-entry;
- Conduct final (regeneration) harvests on a projected 62 acres of white pine, 337 acres of red pine, 313 acres of lowland mixed forest, 177 acres of upland mixed forest, 71 acres of planted mixed pines, 49 acres of cedar and 65 acres of lowland aspen/balsam poplar; and
- Conduct partial harvests on a projected 486 acres of white pine, 660 acres of red pine, 221 acres of natural mixed pines, 117 acres of planted mixed pines and 190 acres of upland mixed forest.

Long-Term Management Objectives

- Desired future harvest levels for final harvest are projected at 14 for cedar and 187 acres of lowland conifer.

4.29.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this cycle of state forest planning:

- American marten
- American woodcock
- Beaver
- Black bear
- Eastern massasauga rattlesnake
- Golden-winged warbler
- Mallard (Widewaters Flooding State Wildlife Management Area)
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer
- Wood duck (Widewaters Flooding State Wildlife Management Area)

The primary focus of wildlife habitat management in the Lake County Outwash management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; large open grassland complexes and marsh/grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Marten

The goal for American marten in the northern Lower Peninsula is to increase available habitat. American marten needs mature mixed forest stands or old conifer-dominated stands, with dead and down material for maintaining a stable and sufficient supply of small mammals as prey. American marten are rarely found outside the forest canopy. This species depends upon live-tree dens, snags and coarse woody debris for loafing (resting) and denning sites. State forest management should address the maintenance and improvement of extensive and mature forest tracts, corridors, dead wood and conifer components in priority landscapes.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore large forested tracts and forested corridors.
- In even-aged management systems, within-stand retention should focus on large diameter (>15 inches diameter at breast-height) trees, known cavity trees and/or mesic conifers to maintain/increase denning and loafing sites.
- Where possible, increase both standing-dead and downed-dead wood by:
  - Applying at least the minimum level of within-stand retention to all stands in management area;
  - Writing harvest specifications to leave slash at the stump or to minimize the removal of slash; and
  - Limiting or prohibiting firewood permits at marten-occupied sites.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems per acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
  - Implementation of the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors that connect larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices that maintain or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
    - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
    - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Mallard

Mallards prefer complexes of grassland and shallow seasonal or semi-permanent marshes in association with permanent hemi-marshes for pair bonding, nesting and brood rearing. Mallard pair-bonding wetlands are typically 0.25-20 acres in size and brood rearing wetlands are typically 1.2-30 acres in size. Optimal hemi-marsh sites are greater than 2.5 acres with open water portions having extensive portions less than three feet deep and 4:1 area of adjacent grasslands to hemi-marsh. Mallards nest on upland sites, normally within ~200 yards from water.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
    - Implementation of the wildlife management area master plan for Widewaters Flooding State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this mallard habitat specification.
- Maintain stable water levels at managed floodings from April through August.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
    - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than 5 acres in size with a savannah-like dispersion of large trees (< 50% canopy cover) with open under story and include tall trees or snags of large (> 12 inches) diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than 12 inches in diameter at breast height.
    - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old) even-aged deciduous stands that typically support 8,000-10,000 woody stems per acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
    - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
    - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
    - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
    - Implementation of beaver wildlife habitat specifications and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor that restricts turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting, and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous, and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

Wood Duck

The goal for wood duck in the northern Lower Peninsula is to maintain or increase available habitat. Wood ducks are most limited by available nesting and brood rearing habitat. Wood duck nest in tree cavities near rivers, streams, swamps, beaver ponds and marshes. Nests require mature hardwood trees with 10 inches in diameter at breast height or larger. Brood rearing habitat is composed of wetland areas such as forested wetlands, shrub-scrub wetlands and emergent marshes that maintain adequate water through the brood rearing period. Hemi-marshes with nearby shrub-scrub or forest are important, where marshes are typically within 100 yards of woody cover. Optimal breeding habitat includes 1.25 acres or larger hemi-marsh and/or swamp (forested and shrub-scrub wetlands) located within 1,100 yards of mature hardwood forest. State forest management should focus on the protection of forest wetlands and adjacent snags and the management of priority wildlife management areas with suitable habitat.

Wildlife Habitat Specifications:

- Maintain priority wetlands in hemi-marsh condition, with 50/50 open water to emergent marsh, for both breeding and non-breeding habitat.
  - Implementation of the wildlife management area master plan for Widewaters Flooding State Wildlife Management Area and application of the beaver wildlife habitat specifications will be sufficient to meet this wood duck habitat specification.
- Maintain stable water levels at managed floodings from April through August.

4.29.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in "DNR's *Approach to the Protection of Rare Species on State Forest Lands*" (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed six listed species and no natural communities of note occurring in the management area as listed in Table 4.29.2. A colony of great blue herons has also been identified. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.29.7, the Baldwin-Luther Swamp is the only special conservation area that has been identified in the Lake County Outwash management area.

The Pere Marquette River and its tributaries have been identified as a natural river and along with their corridors it has also been designated as high conservation value areas. Although the Pere Marquette River does not flow through this management area, the Baldwin River and the North and South Branches of Cole Creek are its tributaries and do flowing through the management are as shown in Figure 4.29.7 and hence are high conservation value areas.

There are no ecological reference areas identified for the Lake County Outwash management area.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Future development and recreational pressure associated with expected population growth in the vicinity of this management area will be primary challenge to successful management for rare fish, wildlife and plants.

Table 4.29.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Lake County Outwash management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Birds								
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
Common tern	*Stema hirundo*	T/G5/S2	Confirmed	MV	Moderate	Sand & gravel beach	Upland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Butterfly								
Dusted skipper	*Atrytonopsis hianna*	Sc/G4G5/S2S3	Confirmed	MV	Low	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
Reptile								
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S2S3	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Eastern box turtle	*Terrapene carolina carolina*	SC/S2S3/G5T5	Confirmed	HV	Moderate	Northern hardwood swamp	Black Ash	Late
						Great Lakes marsh	Lowland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Inundated shrub swamp	Lowland open/semi-open	N/A
						Northern shrub thicket	Upland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Prairie fen	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Coastal fen	Lowland open/semi-open	N/A

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

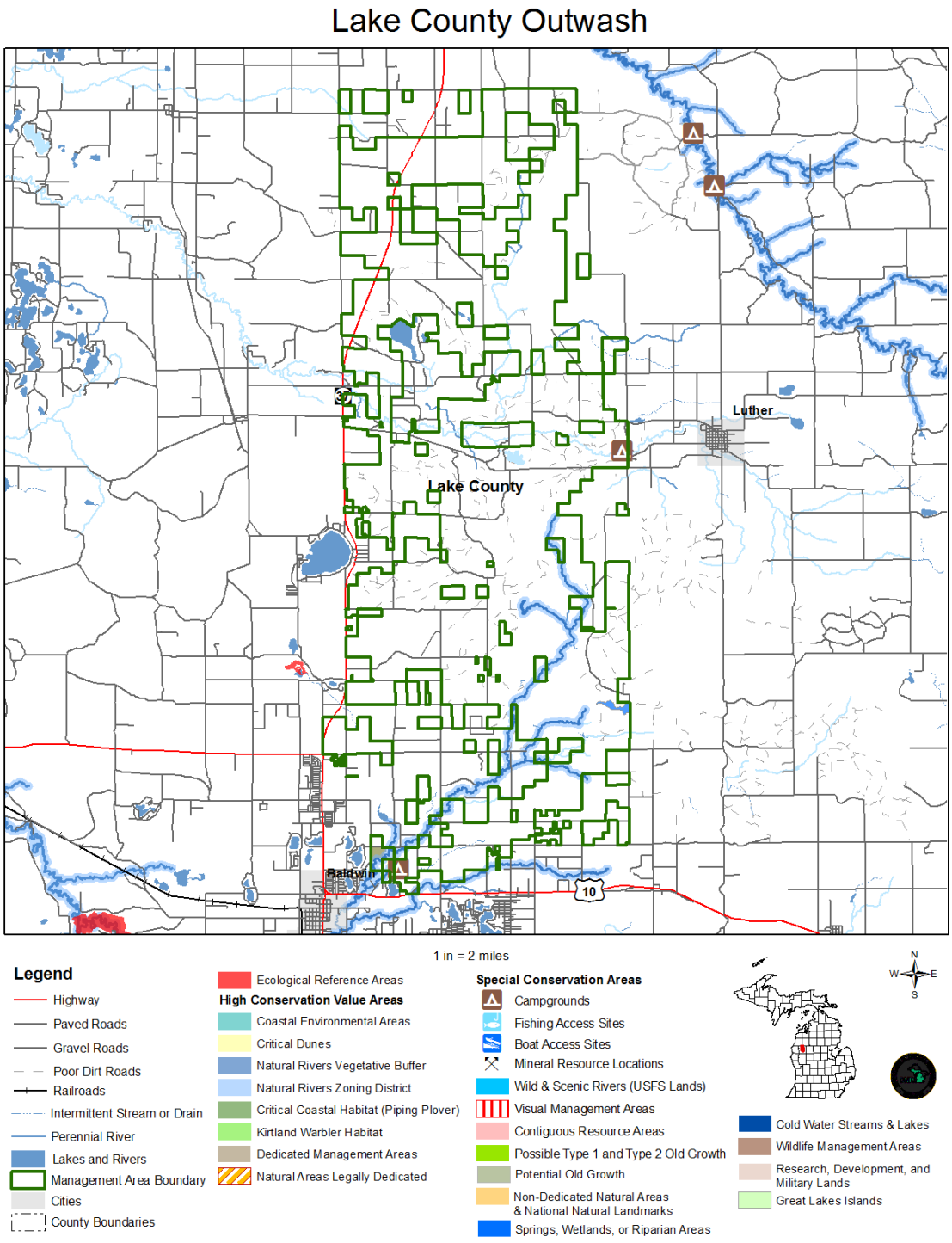

Figure 4.29.7. A map of the Lake County Outwash MA showing the special resource areas.

4.29.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health issues in this management area include oak decline and oak wilt and management should be adapted as follows:

- Oak decline on frost-prone, nutrient poor outwash plains is always a risk due to the cyclic nature of drought and insect defoliation (e.g., gypsy moth and forest tent caterpillar). Economic losses can be reduced by managing these sites on a shorter rotation.
- Oak wilt is prevalent in this area. Epicenters need to be identified and treated. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced. Other management activities that can lead to damage of residual red oak trees (oil and gas development, recreational trail improvement, etc.) should be not be conducted during this high-risk period.
- Emerald ash borer in black ash on lowland sites will be difficult to control due to access issues. It is expected that other species will replace ash on lowland sites.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Currently there are no invasive species mapped in the management area or within a five-mile buffer of the management area. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

4.29.5 Fire Management

Disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen or grass/upland brush types. Wildfire risk and fuel loading is increased in young dense conifer plantations and mature jack pine affected by jack pine budworm.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider re-introducing fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Reduce fuel loading and therefore the risk of wildfire in jack pine stands by harvesting at maturity;
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.29.6 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.29.1 and listed in Appendix F.

4.29.7 Public Access and Recreation

Access for management and/or recreation with the exception of the Baldwin-Luther Swamp is very good as there is a well-developed road/trail system. In accordance with the DNR's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

The types of recreational opportunities within this management area vary, providing experiences for most all that frequent the area. This management area encompasses the heart of Lake County, where the economy is dependent upon recreation and the tourism industry provided in part by recreation opportunities on the state forest. Rustic camping with direct access to the Little Manistee off-road vehicle trail system (Figure 4.29.1) is provided at Carrieville State Forest Campground (Figure 4.29.7). Carrieville State Forest Campground (Figure 4.29.7) is unique, in that it was designed and constructed with the off-road vehicle enthusiast in mind. Both Leverentz Lake and Bray Creek State Forest Campgrounds (Figure 4.29.7) are situated near Baldwin-providing a quality rustic camping experience yet close enough to town to obtain urban amenities. Off-road vehicle trails (Figure 4.29.1) provide a unique experience winding through forests dominated by jack pine and oak cover types. Two new bridges servicing both the off-road vehicle and snowmobile programs were constructed in 2009. Snowmobiling is popular as trails (Figure 4.29.1) pass through both state and federal lands. For the non-motorized users, both Sheep Ranch and Pine Forest pathways (Figure 4.29.1) provide a quiet opportunity to see the various wildlife species associated within this management area. Due to the economic importance of recreation in this management area increased use is likely and the potential to expand all recreation amenities is plausible.

The recreation features provided in this management area are listed below.

Campgrounds
- Carrieville State Forest Campground
- Leverentz Lake State Forest Campground
- Bray Creek State Forest Campground

Boating Access Sites
- Leverentz Lake Boating Access Sites
- Rocky Boating Access Sites

Off-Road Vehicle Trails
- Little Manistee Trail and Route
- Tincup Trail and Route
- Lincoln Hills Trail and Route

Snowmobile Trails
- Various

Non-Motorized Trails
- Sheep Ranch Pathway
- Pine Forest Pathway

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to

minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidance.

4.29.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium and an end moraine of coarse-textured till. The glacial drift thickness varies between 400 and 800 feet. Sand and gravel pits are located in this management area, including state leased pits and there is good potential for additional pits.

The Pennsylvanian Saginaw Formation, Mississippian Bayport limestone and Michigan Formation subcrop below the glacial drift. The Saginaw is quarried for clay in brick making, the Bayport for Limestone and the Michigan for gypsum elsewhere in the state.

Exploration and development for oil and gas has been sparse in this management area. There is potential for several formations to be developed with well spacing ranging from 40 acres up to 640 acres for the deeper formations. The Collingwood Formation does not appear to have potential in this management area and very little of the state lands are currently leased.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and that all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.30 MA 30 – Lake County Moraines Management Area

Summary of Use and Management

Vegetation management in the Lake county Moraines management area (MA) (Figure 4.30.1) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique threatened, endangered and special concern species and provide for forest-based recreational uses. Timber management for this 10-year planning period will focus on balancing the age class distributions of aspen and regenerating red pine and oak. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation opportunity. Expected trends within this 10-year planning period are increased recreational pressure (including illegal off-road vehicle impacts) and the need to successfully regenerate and establish oak.

Introduction

The Lake County Moraines management area contains 20,533 acres of state forest land located in eastern Lake County with parcels to the north and south of the town of Luther, Michigan. The primary attributes which identify this management area include:

- Predominance of moraine ridges, moraines or till which account for 83% of the landforms.
- The management area falls almost entirely within Albert's High Plains sub-region (Albert, 1995).
- Due to the popularity of this area for dispersed recreation and the quantity and availability of wood fiber the forest resources contribute significant social and economic values to the area.
- This management area contains one or more of the northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.
- Sandborn Creek, a tributary of the Pere Marquette River and a designated natural river, originates in the management area.
- In addition to dispersed recreation in the form of hunting and mushroom picking, the Silver Creek Pathway is used for hiking and biking and the Lincoln Hills Route is used for off-road vehicles and snowmobiling. The Lincoln Hills Motorcycle Trail crosses the northern portion of the management area and the Tin Cup Spring Motorcycle Trail is located in the central portion. The Lincoln Creek and Silver Creek Campgrounds are also located in the management area.
- Surveys have located great blue heron colonies on the edge of the management area.

The current predominant cover types, acreages and projected harvest acres in the management area are shown in Table 4.30.1.

Table 4.30.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Lake county Moraines management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	45%	9,157	108	9,049	2,598		9,157	1,508	
Oak	29%	6,015	1,283	4732		1,072	6,015	526	1,072
Red Pine	5%	1,127		1127	350	145	1,127	125	634
White Pine	4%	832		832	33	182	832	76	182
Northern Hardwood	4%	732	1	731		146	732		146
Mixed Upland Deciduous	3%	620		620	159	195	620	89	195
Jack Pine	2%	428		428	0		428	61	
Upland Open/Semi-Open Lands	2%	453		453			453		
Lowland Open/Semi-Open Lands	0%	83		83			83		
Misc Other (Water, Local, Urban)	0%	20		20			20		
Others	5%	1,066	484	582	62	100	1,066	61	117
Total		20,533	1,876	18,657	3,202	1,840	20,533	2,446	2,346

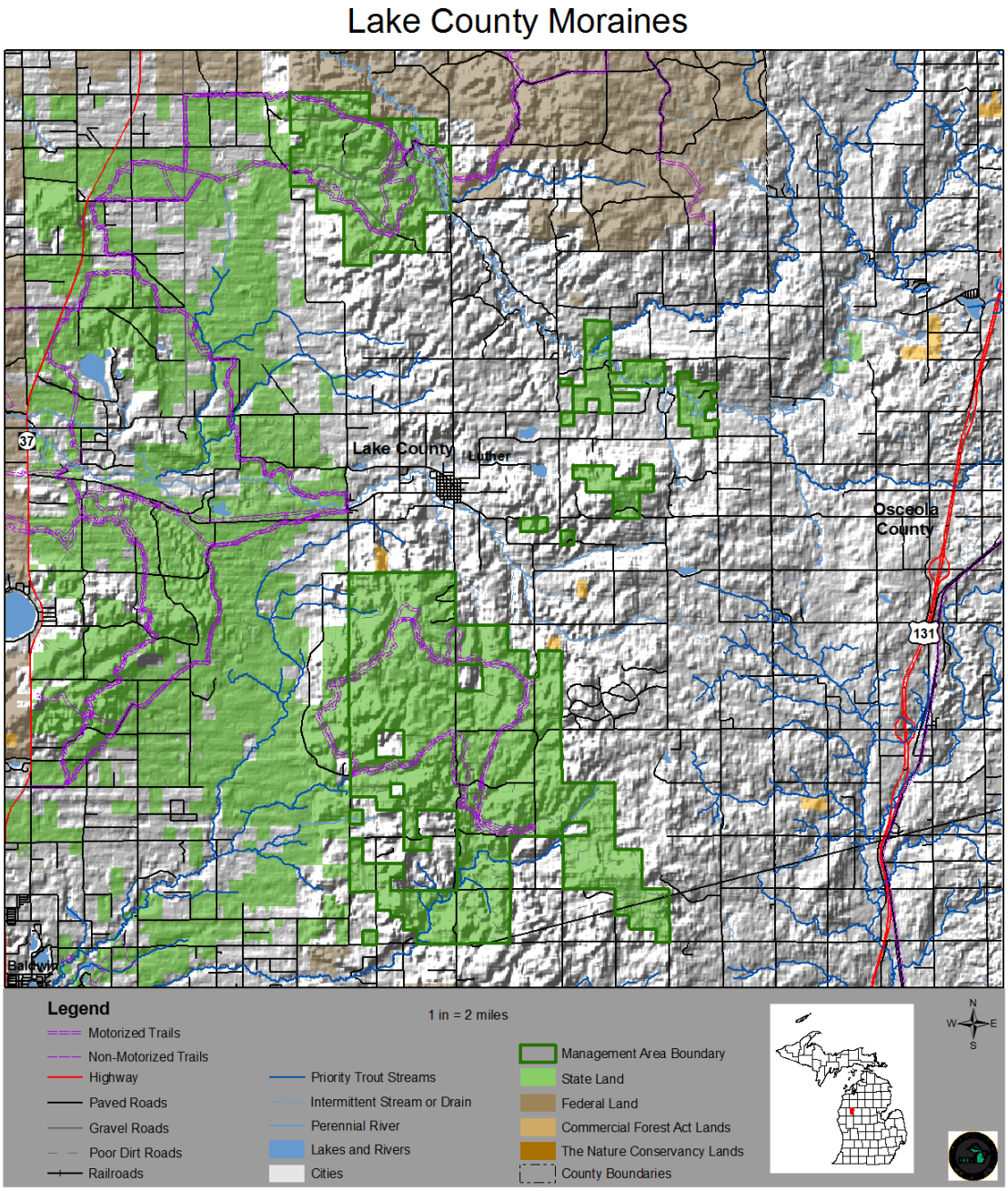

Figure 4.30.1. Location of the Lake county Moraines management area (dark green boundary) in relation to surrounding state forest and other lands in Lake County, MI.

4.30.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of Current Conditions, Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, passive management resulting in natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, they are classified by the predominant species.

Section 4.30.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 9,157 or 45% of the management area (Table 4.30.1). Aspen is distributed throughout the management area including the moraine ridges, moraines and till areas on habitat class PArVHa, PArVVb and AFO sites. The age classes of aspen have slight spikes in the 20-29 and 30-39 year-old age classes (Figure 4.30.2). There are 108 acres of aspen have met harvest criteria, but have site conditions limiting harvest (hard factor limit acres). Currently, 665 acres have a final harvest pending and these acres are included in the regeneration prescription class.

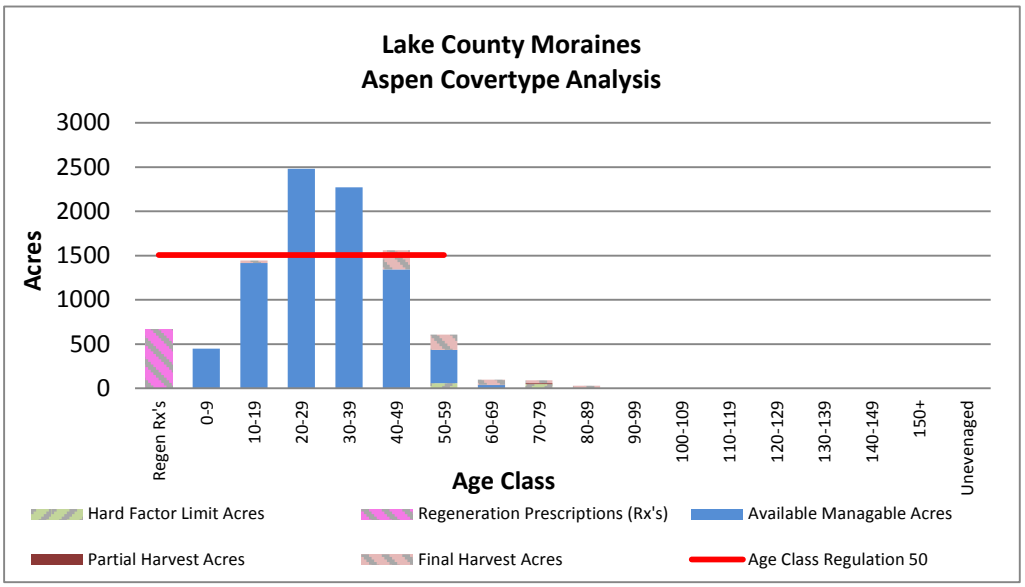

Figure 4.30.2. Age class distribution for aspen in the Lake county Moraines management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Aspen will be located on suitable sites with acres balanced between 0-59 years of age; and
- Aspen acres will be maintained on currently operable sites to provide early successional habitat for wildlife species viability, while also providing a sustainable level of wood fiber.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 2,598 acres;
- Concentrate harvests on the oldest age classes first;
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions; and
- Aspen within the identified Grouse Enhanced Management Systems area may be managed differently than the rest of the aspen within the management area, with a shorter rotation age**,** small patch cuts and carefully considered stand adjacency.

Long-Term Management Objectives

- Continue to manage aspen through final harvests at a projected level of 1,508 acres per 10-year period for a balanced age-class distribution, sustainable fiber production and habitat; and
- A desired future harvest level is projected a 1,508 acres for final harvest per 10-year period.

Section 4.30.1.2 – Forest Cover Type Management – Oak

Current Condition

Oak acres total 6,015 or 29% of the management area (Table 4.30.1) on moraine ridges, moraines or till areas (habitat classes: PArVHA, PArVVb and AFO). The age classes are heavily skewed towards the age classes older than 70-years of age (Figure 4.30 3). Forest communities dominated primarily by oak in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, deer, squirrels and various birds and commercially for firewood and industrial lumber. There are 1,283 acres of oak that have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). Currently, 1,005 acres have a final harvest pending and these acres are included in the regeneration prescriptions (Rx's) classes. There are 482 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to oak as a result of treatments that remove an overstory species resulting in release of oak. These acres are included in the regeneration prescriptions class.

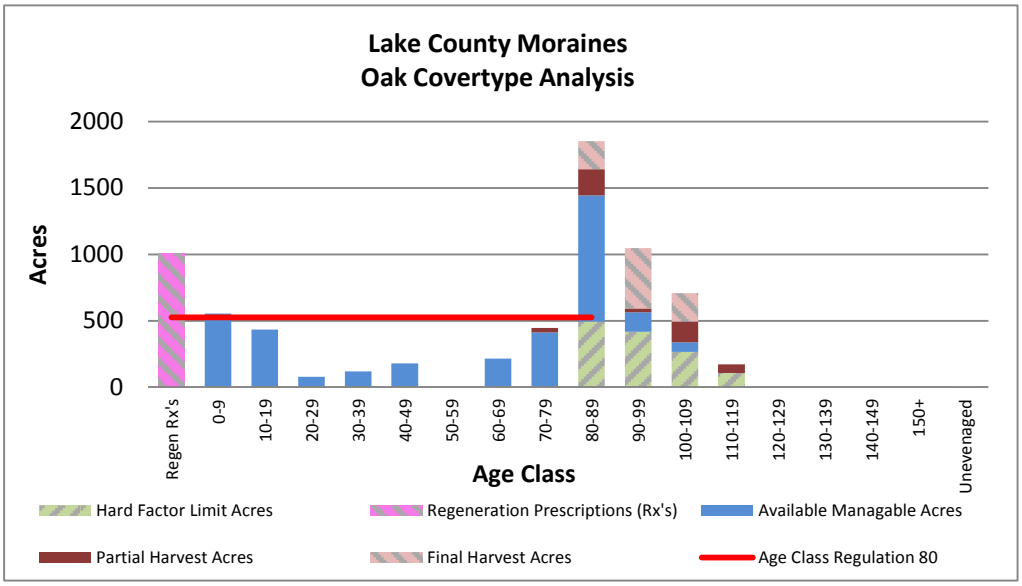

Figure 4.30.3. Age class distribution for oak in the Lake County Moraines management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management with acres balanced in the 0-89 year age classes to provide for timber products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Conduct partial harvests on a projected 1,072 acres with a concentration on stands have not been previously harvested or those stands have a sufficient basal area for a partial harvest;
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration in other cover types; and
- Consider opportunities to selectively remove the conifer cover to release understory oak on mesic/poor sites.

Long-Term Management Objectives

- Continue aggressive management efforts outlined above to regenerate and establish oak on rich nutrient sites (AFO) and mesic/poor (PArVVb) sites;
- Continue work towards maintaining oak as the predominant species in selected stands through restarting harvests;
- It is acceptable some oak stands may become mixed stands through partial removal of an oak over story, planting pine in oak stands or through natural regeneration of other species;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area; and
- A desired future harvest level is projected at 526 acres for final harvest and 1,072 acres for partial harvest per 10-year period.

Section 4.30.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 1,127 acres or 6% of the management area (Table 4.30.1) and are located on outwash plains, coarse textured moraines and moraine complexes (coarse textured end moraines, ground moraines, outwash plains, till plains and undifferentiated end moraine). These sites range from very dry/poor-nutrient (habitat class PArVHa) and dry to dry-mesic/poor- to medium-nutrient (habitat class PArVVb) and mesic/medium to rich-nutrient (habitat class AFO) sites. There is a pronounced spike in the 40-59 year age classes (which represents a previous era of active planting) (Figure 4.30.4) and almost no recent regeneration. There are 63 acres that have regeneration harvest pending and these acres are included in the regeneration prescription class. There are 502 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to the cover type as a result of final harvests and planting of a red pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine will be located on suitable sites with acres balanced in the 0-89 year age classes to provide a sustainable yield of forest products.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distribution;
- Conduct partial harvests on a projected 145 acres, concentrating on stands of better quality red pine that has the potential for a higher product value in larger size classes; and
- Conduct regeneration harvests, based on projections, on 350 acres of red pine beginning with the oldest age classes and with a concentration on stands with less potential for a higher product value.

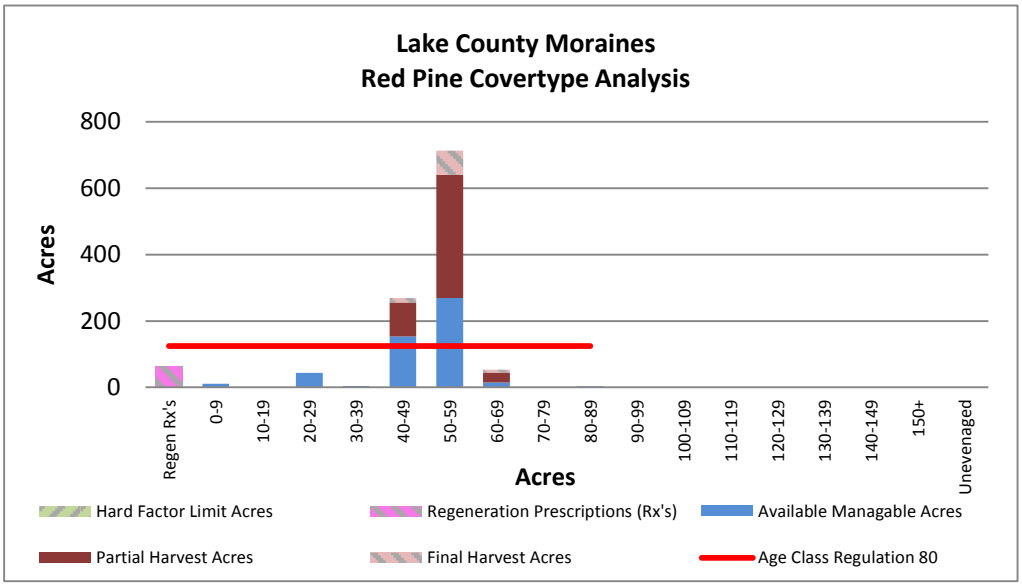

Figure 4.30.4. Age class distribution for red pine in the Lake County Moraines management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue to thin younger stands until the stands are replaced by seed tree harvests or final harvests at economic maturity (80 years); and
- A desired future harvest level is projected at 125 acres for final harvest and 634 acres for partial harvest per 10-year period.

Section 4.30.1.4 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open land acres total 453 or 2% of the management area (Table 4.30.1). Upland open/semi-open lands communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife and recreationally for hunting, wildlife viewing and camping. This category is a combination of the following non-forested land cover types: herbaceous openland, upland shrub, low density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas.

Desired Future Condition

- Upland open/semi-open lands will be maintained at or above current levels on sites that are natural openings due to frost or low soil fertility/moisture and on sites that have been historically been maintained as openings to provide habitat for species that use openings.

10-Year Management Objectives

- Where necessary and feasible, consider methods to maintain upland open/semi-open lands during this management cycle.

Long-Term Management Objectives

- Continue to maintain herbaceous openland and upland shrub openings at or above current levels in order to promote wildlife values and recreational opportunity;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.30.1.5 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: white pine 832 acres or 4% of the management area, northern hardwood 732 acres (4%), mixed upland deciduous 620 acres (3%) and jack pine 428 acres (2%). Other forested and non-forested communities total 1,066 acres or 5% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Final or regeneration harvests are projected for: mixed upland deciduous 159 acres, upland conifers 37 acres and upland mixed forest 25 acres;
- Consider methods to ensure regeneration of lowland types;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry; and
- Partial harvests are projected for: 182 acres of white pine, 146 acres of northern hardwood, 195 acres of mixed upland deciduous, 38 acres of natural mixed pines and 45 acres of upland mixed forest.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- Continue to manage these other types to provide forest products, wildlife habitat and recreational opportunities.

4.30.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

This management area will include one or more northern Lower Peninsula Grouse Enhanced Management System areas. The boundaries will be delineated during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager. Aspen stands that fall within the Grouse Enhanced Management System area boundary may be managed on a shortened rotation with multiple age classes and smaller stand sizes to enhance hunting opportunities for ruffed grouse, woodcock, deer, turkey and hare. The remainder of the management area (outside the boundary) will be managed based on the direction in the management area write up.

The following have been identified as featured species for this management area during this 10-year planning period.

- American marten
- American woodcock
- Beaver
- Black bear
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Lake County Moraines management area will be to address the habitat requirements identified for the listed featured species. Based on selected featured species, some of the most

significant wildlife management issues in the management area are the maintenance of young forest and large open grassland complexes; the retention of large, over-mature trees and snags; and the maintenance and expansion of hard mast and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Marten

The goal for American marten in the northern Lower Peninsula is to increase available habitat. American marten needs mature mixed forest stands or old conifer-dominated stands, with dead and down material for maintaining a stable and sufficient supply of small mammals as prey. American marten are rarely found outside the forest canopy. This species depends upon live-tree dens, snags and coarse woody debris for loafing (resting) and denning sites. State forest management should address the maintenance and improvement of extensive and mature forest tracts, corridors, dead wood and conifer components in priority landscapes.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore large forested tracts and forested corridors.
- In even-aged management systems, within-stand retention should focus on large diameter (>15 inches in diameter at breast-height) trees, known cavity trees and/or mesic conifers to maintain/increase denning and loafing sites.
- Where possible, increase both standing-dead and downed-dead wood by:
  - Applying at least the minimum level of within-stand retention to all stands in management area;
  - Writing harvest specifications to leave slash at the stump or to minimize the removal of slash; and
  - Limiting or prohibiting firewood permits at marten-occupied sites.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. The American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems per acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
  - Implementation of the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Black Bear

The goal for black bear in the northern Lower Peninsula is to maintain or improve habitat. Black bears have large home ranges and require large contiguous tracts of diverse forests with a mixture of cover types. They tend to use forested riparian corridors in their movements (which can be extensive). Hard mast is critical in the fall for bears to achieve adequate weight gains before denning. State forest management for the species should focus on improving existing habitat by minimizing forest fragmentation and maintaining oak to offset potential population declines due to changes in land-use.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore forested corridors connecting larger forested tracts, paying particular attention to riparian zones.
  - Implementation of riparian guidance (best management practices) will be sufficient to meet the black bear habitat specifications related to preventing fragmentation and maintaining corridors.
- Conduct silvicultural practices maintaining or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Pileated woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than 5 acres in size with a savannah-like dispersion of large trees (<50% canopy cover) with open under story and include tall trees or snags of large (>12 inches) diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than 12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres, and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old) even-aged deciduous stands that typically support 8,000-10,000 woody stems per acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with

staggered harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.
- Manage the aspen cover type for smaller patch size, a shorter rotation and a more deliberate habitat configuration within the designated Grouse Enhanced Management Systems areas where appropriate.

Snowshoe Hare

The goal for snowshoe hare in the northern Lower Peninsula is to maintain or increase available habitat. Hare populations use areas of dense, young (sapling/pole) forest and shrub communities and prefer alder and coniferous swamps. Dense understory cover is the primary limiting factor as escape/thermal cover is more important than food availability. In mature forests, hare are associated with beaver ponds and aspen harvests, feeding upon available cuttings and finding cover in the resulting re-vegetation. State forest management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash, increasing mesic conifer components and increasing beaver.

Wildlife Habitat Specifications:

- Maintain young aspen and lowland shrub (alder or willow) communities that have a conifer understory or young aspen stands adjacent to lowland/swamp conifer and mesic conifers. Conduct silvicultural practices that maintain or increase mesic conifer components in aspen stands.
  - Implementation of beaver wildlife habitat specifications and the 10-Year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this hare habitat specification.
- When conducting site-prep herbicide treatments, encourage more diverse stands by using application-skips in pockets or along stand edges.
- In snowshoe hare habitat, limit biomass harvesting and whole-tree chipping operations, retain slash and create brush piles.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is maintain available habitat. In northern Lower Peninsula, snow depth is the primary limiting factor restricting turkey population expansion as deep snow limits access to winter food. The availability of acorns can help mediate the impacts of deep snow. A secondary limiting factor throughout their range is good brood cover. Openings with grasses and forbs and little or no overstory trees are preferred. State forest management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
  - Implementation of 10-year management direction for upland openland will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting, and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management directions for upland openland will be sufficient to meet this turkey habitat specification.

- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management directions for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland openland and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.30.3 Rare Fish, Wildlife and Plant Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations, following the guidance in "DNR's *Approach to the Protection of Rare Species on state forest lands*" (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed no listed species or natural communities of note occurring in the management area. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

The Pere Marquette River and its tributaries have been identified as a natural river and along with their corridors it has also been designated as high conservation value areas. Although the Pere Marquette River does not flow through this management area, the Sandborn Creek is a tributary and does flow through the management are as shown in Figure 4.30.5 and hence is a high conservation value area.

There have been no ecological reference areas identified in the Lake County Moraines management unit.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

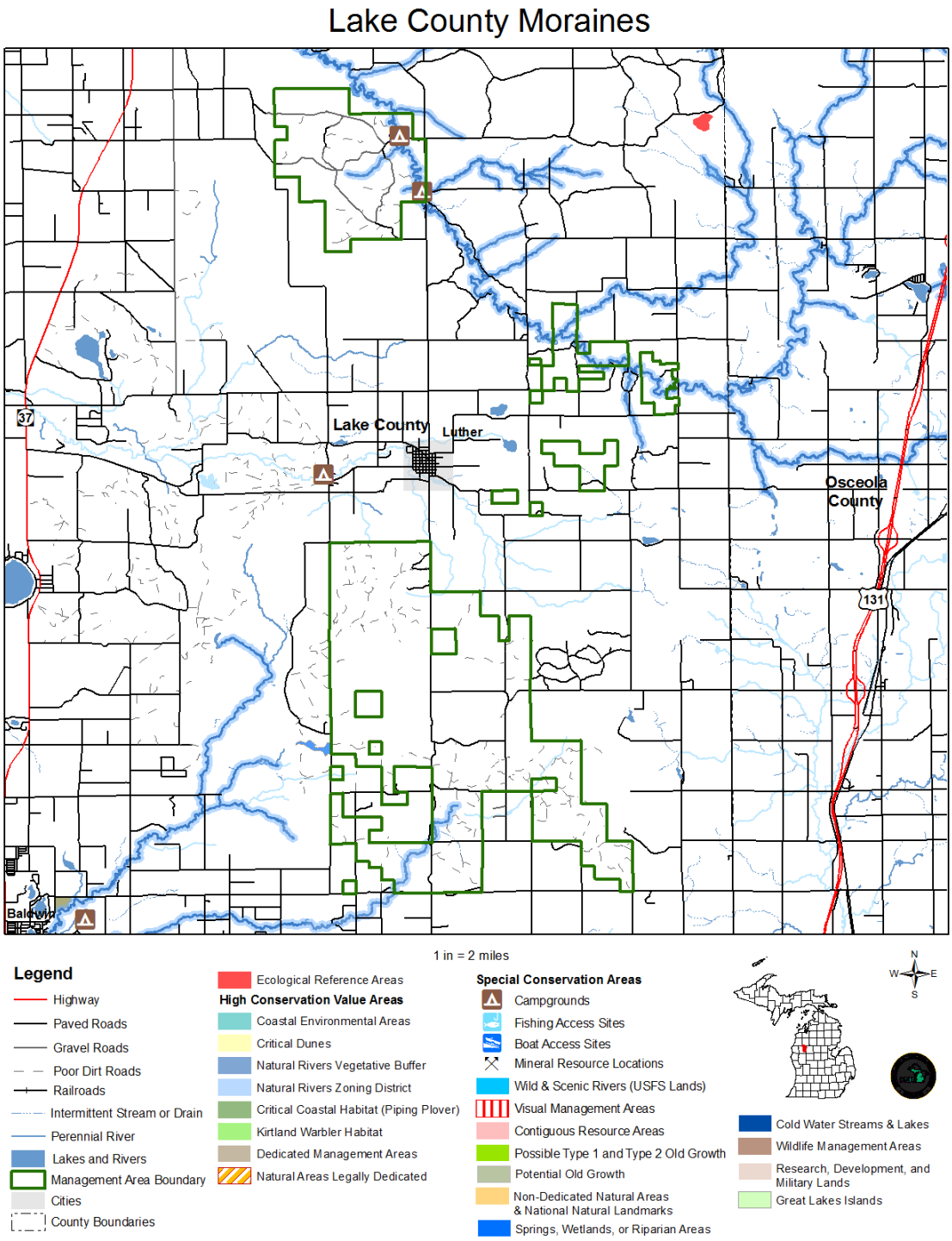

Figure 4.30.5. A map of the Lake County Moraines management area showing the special resource areas.

4.30.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Forest health issues in this management area include oak decline and oak wilt and management should be adapted as follows:

- Oak decline on frost-prone, nutrient poor outwash plains is always a risk due to the cyclic nature of drought and insect defoliation (e.g., gypsy moth and forest tent caterpillar). Economic losses can be reduced by managing these sites on a shorter rotation. See oak management guidelines for more information.

- Oak wilt is prevalent in this area. Epicenters need to be identified and treated. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced. Other management activities can lead to damage of residual red oak trees (oil and gas development, recreational trail improvement, etc.) should be not be conducted during this high-risk period.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five mile buffer of the management area are summarized in the Table 4.30.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species threatening sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Invasive exotic species (specifically plants) also pose a significant health threat to forested and non-forested areas throughout the management area. Although there exists no list of species that pose the greatest threat currently exists and surveys of invasive species are generally incomplete. Populations of invasive species detected through regular forest inventory or other means that are determined to merit control measures should be addressed on a case-by-case basis.

Table 4.30.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Lake County Moraines - FRD Management Areas	Cases within FRD Areas	Cases within 5 Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	1	1	1

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5 Mile Buffer	Occurrences
-	-	Phragmites (Common Reed) *Phragmites australis*	1

4.30.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.30.1 and listed in Appendix F.

4.30.6 Fire Management

Fire disturbance has played an important historical role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen and grass/upland brush types. Wildfire risk and fuel loading is increased in young, dense conifer plantations and mature jack pine affected by jack pine budworm.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependant on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.30.7 – Public Access and Recreation

Access for management and/or recreation is generally very good throughout this management area, with very little lowland and a well-developed road/trail system. In accordance with the DNR's *Sustainable Soil and Water Quality Practices of Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Specific hunting recreation improvements such as parking lots, gates, trail planting and trail establishment, as well as the preparation and dissemination of specific promotional material, may be made as a result of Grouse Enhanced Management Systems areas planning in this management area.

Recreational opportunities within this management area are diverse, as this area includes the water type recreation activities associated with the scenic Pine River, along with motorized recreation associated with dry upland soils. Rustic camping is popular at Silver Creek and Lincoln Bridge campgrounds, both of which sit on the edge of the Pine River (Figure 4.30.5). The Silver Creek pathway (Figure 4.30.1) provides non-motorized users with a scenic hike along the Pine River. Boating access sites are common, as using the Pine River is a favored form of recreation in this management area. Both the Tin Cup and Lincoln Hills off-road vehicle trail systems (Figure 4.30.1) are popular recreation activities as they use the undulating terrain associated with this management area. The recreation features provided in this management area are listed below:

Campgrounds
- Silver Creek State Forest Campground
- Lincoln Bridge State Forest Campground

Boating Access Sites (BASs)
- Lincoln Bridge BAS
- Silver Creek BAS
- Coe Creek BAS
- Edgett's Bridge BAS
- Meadowbrook Bridge BAS

Off-Road Vehicle Trails
- Tin Cup Trail and Route
- Lincoln Hills Trail and Route

Snowmobile Trails – N/A

Non-Motorized Trails
- Silver Creek Pathway

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetation management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the

public on the DNR's timber management policies may be considered. Specifications and Guidance for management around trails may include, but is not limited to: vegetation management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the DNR Within Stand Retention Guidelines.

4.30.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium and an end moraine of coarse-textured till. The glacial drift thickness varies between 400 and 800 feet. Sand and gravel pits are located in this management area, including state leased pits and there is excellant potential for additional pits.

The Pennsylvanian Saginaw Formation, Mississippian Bayport limestone and Michigan Formation subcrop below the glacial drift. The Saginaw is quarried for clay in brick making, the Bayport for Limestone and the Michigan for gypsum elsewhere in the state.

Exploration and development for oil and gas has been sparse in this management area. There is potential for several formations to be developed with well spacing ranging from 40-acres up to 640-acres for the deeper formations. The Collingwood Formation does not appear to have potential in this management area and very little of the state lands are currently leased.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil/Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil/Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species, designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.31 MA 31 Evart Block Management Area

Summary of Use and Management

Vegetation management in the Evart Block management area (MA) (Figure 4.31.1) will provide timber products; maintain or enhance wildlife habitat; protect areas of unique threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management for this 10-year planning period years will focus on balancing the age-class distributions for aspen and regenerating oak. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation opportunity. Expected trends within this 10-year planning period are the need to regenerate oak, the need to continue to balance aspen age classes, the need to diversify forest cover types and an increase in recreation pressure.

Introduction

The Evart Block management area is located in Central Osceola County and contains approximately 17,305 acres of state forest land. The primary attributes which identify the Evart Block management area include:

- A hilly landscape with large well-drained sand ridges and outwash channels of thick till. This area is in the transition zone between the southern forest and northern forest, has naturally growing hickory and other central hardwoods.
- Historically, some areas of this management area were used as a sheep ranch.
- The management area falls within the Cadillac sub-region of the northern Lower Peninsula ecoregion as classified by Albert (1995).
- Due to the proximity of this management area to more populated areas of southern Michigan and the communities of Cadillac, Evart, Reed City, Harrison and Clare. This area is popular for dispersed recreation.
- This management area contains one or more of the northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.
- This recreational use combined with the quantity and availability of wood fiber contributes significant social and economic values to the area.
- Oil and gas development is not significant.
- Surveys do not show any threatened or endangered species in this management area. However, surrounding properties do show common loon, Blanding's turtle and wood turtle.
- Currently, aspen and oak are the predominant types as shown in Table 4.1.

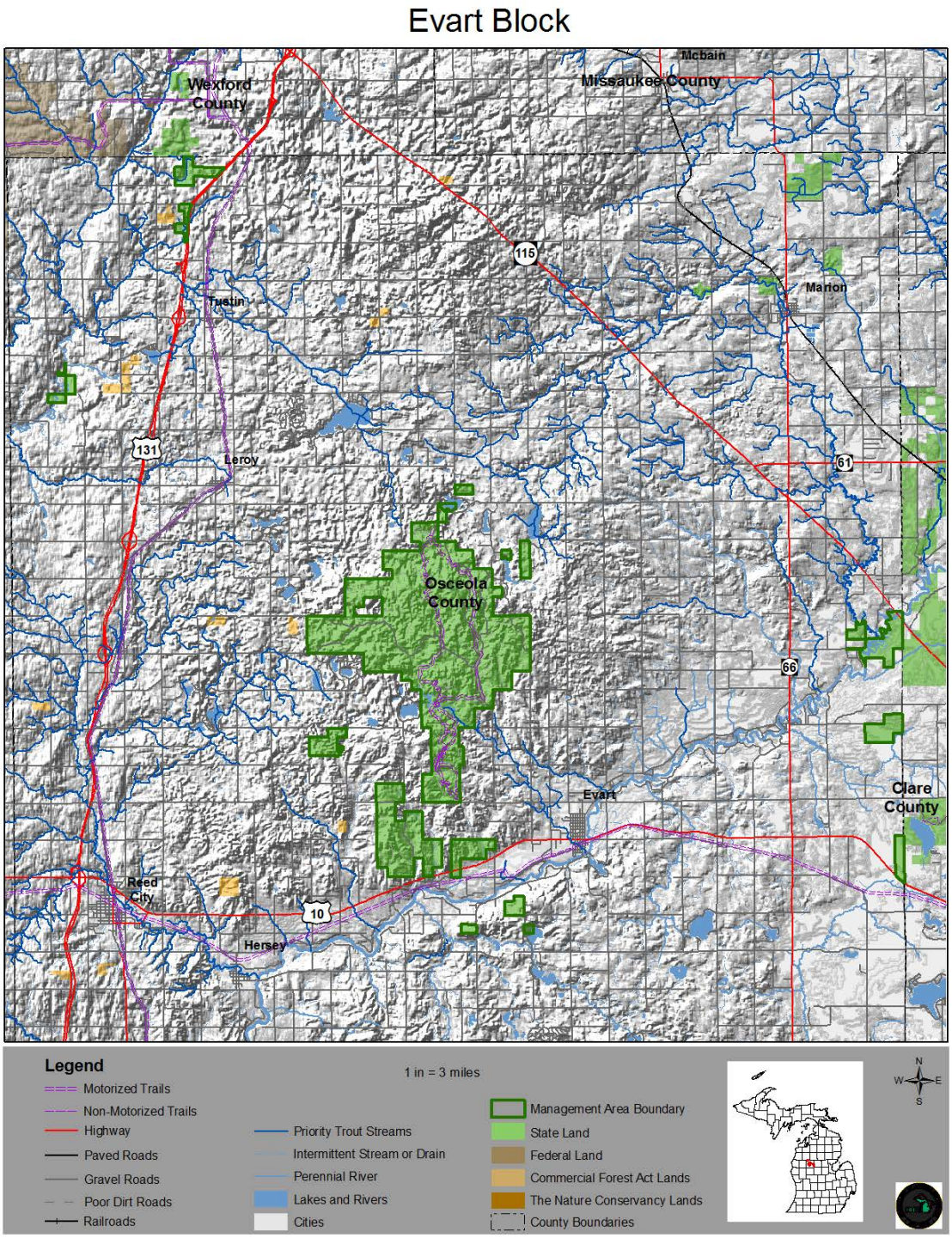

Figure 4.31.1. A map of the Evart Block management area (dark green boundary) in relation to surrounding state forest and other lands in Osceola County, Michigan.

Table 4.31.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Evart Block management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	58%	10,107	63	10,044	2,717		10,107	1,674	
Mixed Upland Deciduous	5%	841		841	262	253	841	120	338
Red Pine	3%	581	17	564	147	193	581	63	331
Northern Hardwood	3%	543		543		71	543		186
Lowland Deciduous	3%	498	351	147	17		498	17	
Upland Open/Semi-Open Lands	3%	558		558			558		
Lowland Open/Semi-Open Lands	3%	472		472			472		
Misc Other (Water, Local, Urban)	1%	182		182			182		
Others	3%	534	282	252	36	3	534	30	7
Total		17,305	1,186	16,119	3,624	1,294	17,305	2,183	1,636

4.31.1 Forest Cover Type Management Direction

The following sections contain information on the management direction in the form of **Current Forest Condition, Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of tree species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

Section 4.31.1.1 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total 10,107 or 58% of the management area (Table 4.31.1) and are located on moraine ridges, moraines and till areas on PArVHa and PArVVb habitat class sites. The age classes of aspen are somewhat imbalanced (Figure 4.31.2) with spikes in the 20-29 and 30-39 year age classes.

There are 63 acres that have a factor limit (hard factor limit acres) as these acres are inaccessible or otherwise unavailable for management. There are 653 acres with a regeneration prescription pending and these acres are shown in the regeneration prescription class.

Desired Future Condition

- Aspen will be maintained on suitable sites with acres balanced between 0-59 years of age to provide early successional habitat for species viability, timber products and recreational opportunities.

10-Year Management Objectives

- Conduct restarting harvests on a projected 2,717 acres of aspen;
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions;
- Non-commercial harvests to manage habitat may be needed where access is limited; and
- Aspen within the identified Grouse Enhanced Management Systems area may be managed differently than the rest of the aspen within the management area, with a shorter rotation age**,** small patch cuts and carefully considered stand adjacency.

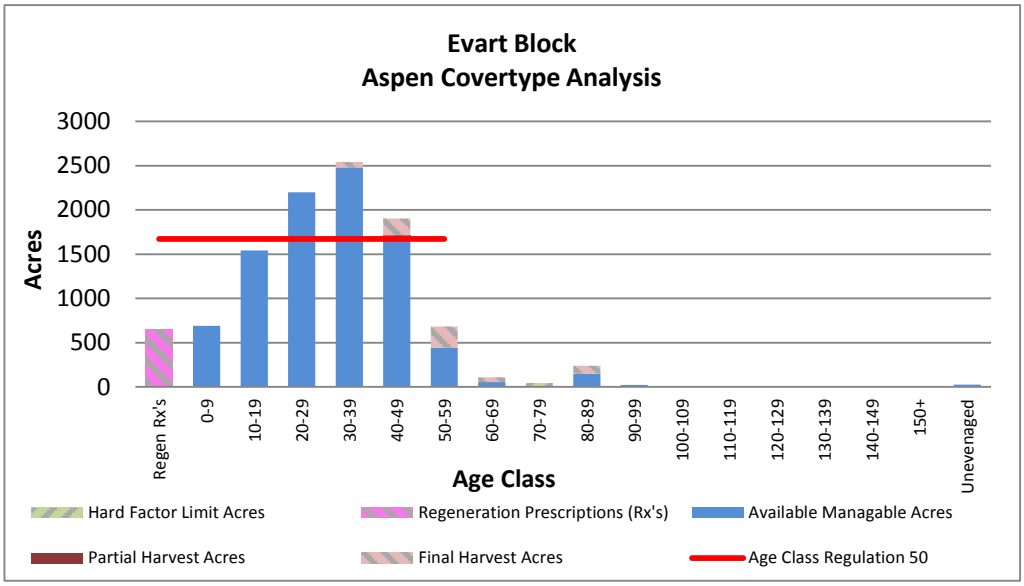

Figure 4.31.2. Age-class distribution for aspen in the Evart Block management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- As the aspen in the 30-39 year-old age class spikes reaches maturity, consider treatments to balance the age-class distribution; and
- A desired future harvest level is projected at 1,674 acres for final harvest per 10-year period.

Section 4.31.1.2 Forest Cover Type Management – Oak

Current Condition

Oak acres total 2,989 or 17% of the management area (Table 4.31.1) on moraine ridges, moraines or till areas on habitat class PArVVb sites.

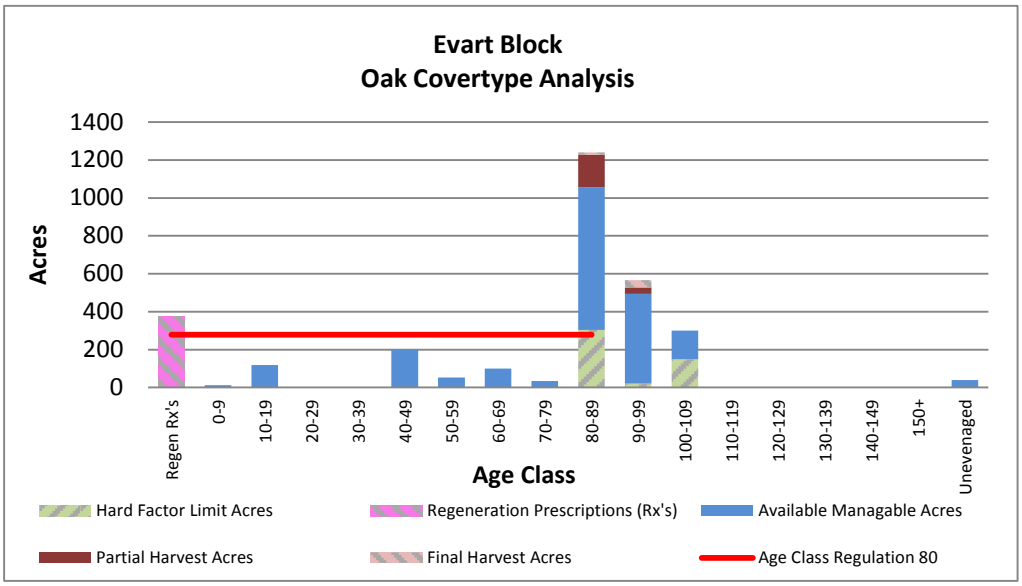

Figure 4.31.3. Age-class distribution for oak in the Evart Block management area (2012 Department of Natural Resources inventory data).

On most sites red maple, especially from stump sprouting, is a significant competitor for oak regeneration. Oak is frequently a component of aspen stands. The age class distribution (Figure 4.31.3) would appear to be heavily skewed toward the age classes above 80 years of age. However, as the cover type is based on the predominant species by canopy coverage, younger oak which is in the understory may not be reflected in the age-class distributions. There are 474 acres of oak have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 50 acres that have regeneration harvest pending and these acres are included in the regeneration prescription class. There are 206 acres with a partial harvest pending and these acres are included in their current age class. The graph displays the projected number of acres converted to oak as a result of treatments that remove an overstory species resulting in release of oak. These acres are included in the regeneration prescription class.

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management to provide for timber products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Conduct partial harvests on a projected 774 acres on oak sites that have not been previously treated nor have a suitable basal area level;
- Conduct final harvests on a projected 446 acres; and
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration on other cover types.

Long-Term Management Objectives

- Continue aggressive management efforts outlined above to regenerate and establish oak on PArVVb sites;
- It is acceptable some oak stands may become mixed stands through partial removal of an oak over story, planting pine in oak stands or through natural regeneration of other species;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area; and
- A desired future harvest level is projected at 279 acres for final harvest and 774 acres for partial harvest per 10-year period.

Section 4.31.1.3 Forest Cover Type Management – Mixed Upland Deciduous

Current Condition

Mixed upland deciduous acres total 841 or 5% of the management area (Table 4.31.1). This includes species such as aspen, oak and red maple where one species does not dominate. These acres are evenly distributed across the management area.

The age classes are heavily skewed towards the older age classes above 80 years (Figure 4.31.4). This advanced age is an indication that oak is more common in the mixed upland deciduous cover type than aspen and red maple. There are 91 acres with a partial harvest pending and these acres are included in their current age class.

Desired Future Condition

- The mixed upland deciduous cover type will provide timber products and a diverse cover and mast at sustainable levels.

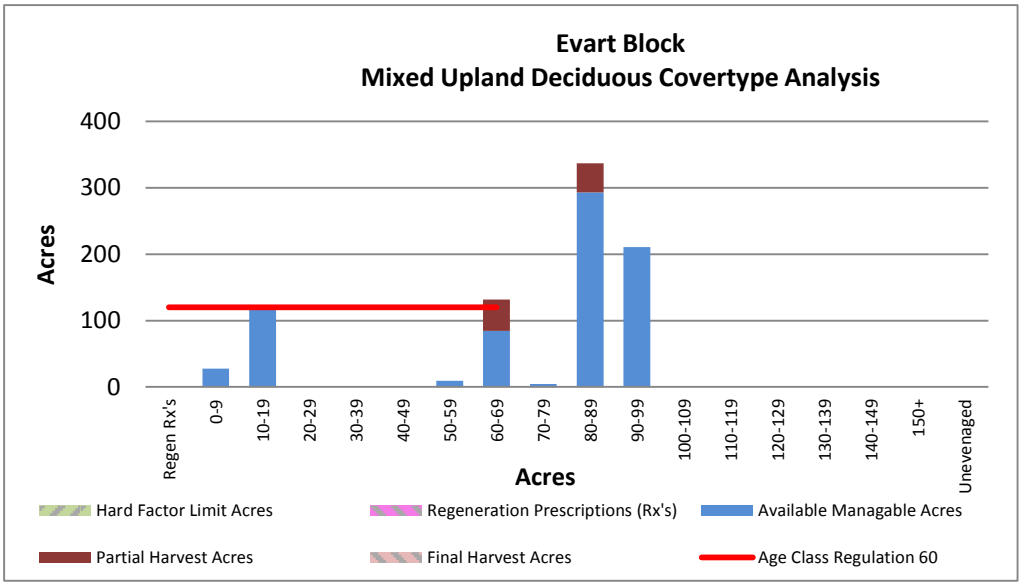

Figure 4.31.4. Age-class distribution for mixed upland deciduous in the Evart Block management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct final (regeneration) harvests on a projected 262 acres. These harvests will mostly target small oak and aspen pockets in the mixed stands for regeneration; and
- Conduct partial harvests on a projected 253 acres.

Long-Term Management Objectives

- It is acceptable that management through regeneration harvests of mixed upland deciduous may convert some areas to either aspen or oak cover types; and
- A desired future harvest level is projected at 120 acres for final harvest and 338 acres for partial harvest per 10-year period.

Section 4.31.1.4 Forest Cover Type Management – Red Pine

Current Condition

Natural and planted red pine acres total 518 acres or 3% of the management area (Table 4.31.1) There is a pronounced spike in the 50-59 year class which represents a previous era of active planting (Figure 4.31.5).

Red pine plantations in this management area are commercially valued for pulp, saw logs and utility poles. There are 17 acres of red pine that have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). There are 29 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class. There are 159 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to red pine as a result of final harvests and planting to red pine. These acres are included in the regeneration prescriptions class.

Desired Future Condition

- Red pine of either natural origin or in planted stands will be located on suitable sites with acres balanced in the 0-89 year age classes to provide a steady flow of forest products.

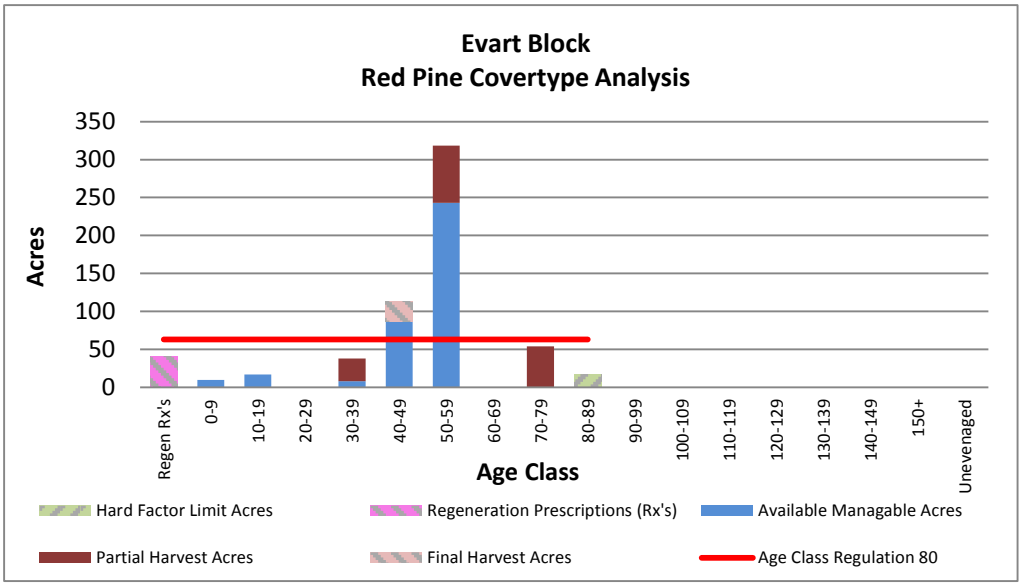

Figure 4.31.5. Age-class distribution for red pine in the Evart Block management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distributions;
- Conduct partial harvests on a projected 193 acres, concentrating on stands of better-quality red pine that has the potential for a higher product value in larger size classes; and
- Conduct regeneration harvests on a projected 147 acres of red pine beginning with the oldest age-classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- In identified special conservation areas, especially those with natural red pine on dry-mesic sites, consider management of red pine to a biological rotation of 200+ years;
- Continue management to balance the age-class distributions; and
- A desired future harvest level is projected at 63 acres for final harvest and 331 acres for partial harvest per 10-year period.

Section 4.31.1.5 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 543 acres or 3% of the management area on habitat class PArVVb, AFO and AFOCa sites (Table 4.31.1). Forest communities dominated by northern hardwoods in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation.

There are 60 acres with a partial harvest pending and these acres are included in their basal area range.

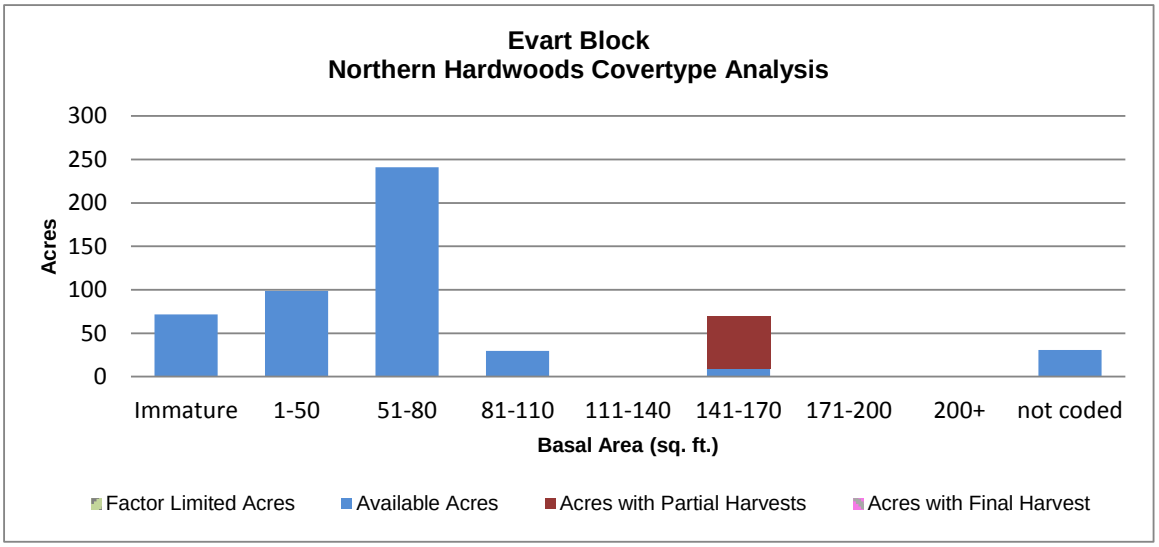

Figure 4.31.6. Basal area distribution for northern hardwoods in the Evart Block management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Northern hardwood stands will be maintained and managed through selection harvests to provide a sustainable timber supply, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- A projected 71 acres will be harvested through selection harvests to produce uneven aged stands.

Long-Term Management Objectives

- Continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer in northern hardwood stands using Beech Bark Disease Guidelines and Emerald Ash Borer Guidelines;
- Delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands;
- Continue to manage for stands with an uneven age class; and
- A desired future harvest level is projected at 186 acres for partial harvest per 10-year period.

Section 4.31.1.6 Forest Cover Type Management – Lowland Deciduous

Current Condition

Lowland deciduous acres total 498 or 3% of the management area (Table 4.31.1) and are located on wetland sites. As shown in Figure 4.31.7, most of the acres are in the age-classes above the age of 60.

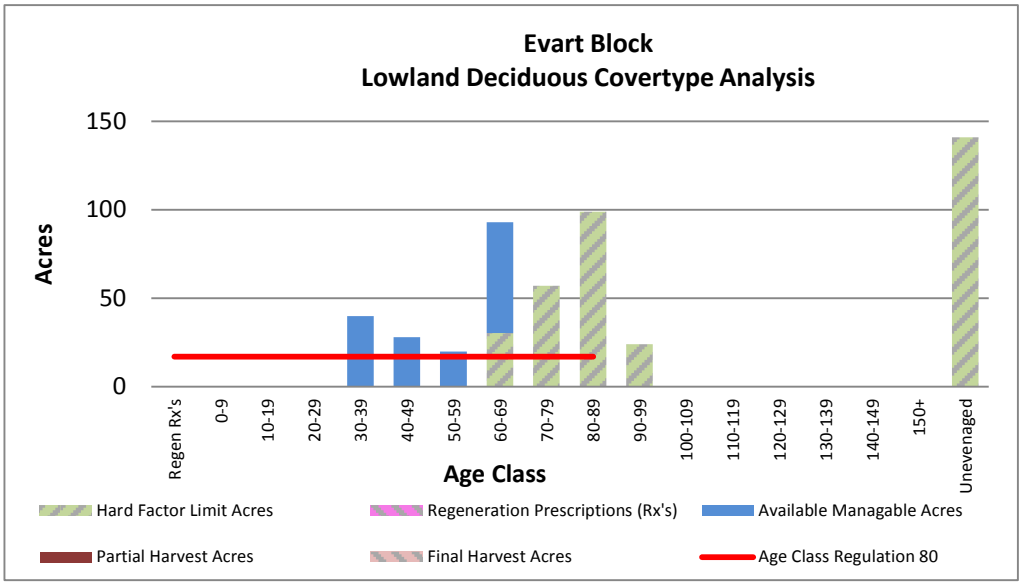

Figure 4.31.7 Age-class distribution for lowland deciduous in the Evart Block management area (2012 Department of Natural Resources inventory data).

Tip-overs and windthrow may also be an issue in stands that have been reduced below a residual basal area of 80 square feet per acre. The residual trees also keep the sites from becoming even wetter, resulting in a conversion to marsh. Black ash, red maple and aspen are frequent components of swamp hardwoods (lowland hardwoods) and treatments on more mesic sites may convert lowland deciduous stands to aspen or red maple. It is expected that much of the ash will be affected by emerald ash borer. There are currently 351 acres factor limited that are not available for harvest (hard factor limit acres), often because the sites are too wet or due to other site factors.

Desired Future Condition

- Lowland deciduous stands will be located on suitable sites in a compositionally diverse forest which contains coarse woody debris, scattered large trees and scattered snags; and
- These lowland types will provide a sustainable level of forest products along with wildlife habitat and recreational opportunity.

10-Year Management Objectives

- Conduct final harvests on a projected 17 acres.

Long-Term Management Objectives

- Continue to manage lowland deciduous stands for timber products, wildlife habitat and recreational opportunities;
- Lowland deciduous stands will continue to be managed with individual tree selection, group selection or final harvest to produce a sustainable level of forest products and wildlife habitat;
- Consider the impact of emerald ash borer on ash in lowland deciduous stands in management decisions; and
- A desired future harvest level is projected at 17 acres of final harvest per 10-year period.

Section 4.31.1.7 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 472 acres or 3% of the management area (Table 4.31.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.31.1.8 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open lands total approximately 558 acres or 3% of the management area (Table 4.31.1). This category is a combination of the following non-forested land cover types: herbaceous openland, upland shrub, low density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy.

Desired Future Condition

- Upland open/semi-openland types will be sustained at current levels order to ensure an adequate level of habitat for species which use openings.

10-Year Management Objectives

- Upland open/semi-open lands are self-sustaining as they are in frost pockets that impede encroachment from woody vegetation. Little or no management is needed to perpetuate these openings.

Long-Term Management Objectives

- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.31.1.9 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include forested and non-forested communities which total 135 acres or 1% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species. Because this area is a transition zone to the southern hardwood species there are occasional hickory mixed in with the northern hardwoods. The northern hardwoods are fairly young stands and only a few have achieved sufficient density necessary for selective cutting. The lowland deciduous sites are fairly young stands of less than 81 square feet per acre of basal area in relatively inaccessible areas.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas; and
- Final harvests are projected for 20 acres of white pine.

Long-Term Management Objectives

- The acreage of these cover types will remain steady over time and there will be minimal conversion of other types.

4.31.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

This management area will include one or more northern Lower Peninsula Grouse Enhanced Management System areas. The boundaries will be delineated during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager. Aspen stands that fall within the Grouse Enhanced Management System area boundary may be managed on a shortened rotation with multiple age classes and smaller stand sizes to enhance hunting opportunities for ruffed grouse, woodcock, deer, turkey and hare. The remainder of the management area (outside the boundary) will be managed based on the direction in the management area write up.

The following have been identified as featured species for this management area during this 10-year planning period:

- Pileated woodpecker
- Ruffed grouse
- White-tailed deer.

The primary focus of wildlife habitat management in the Evart Block management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; the retention of large over-mature trees and snags; the maintenance/expansion of hard mast; and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. The pileated woodpecker prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15-year old) even-aged deciduous stands that typically support 8,000-10,000 woody stems/acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered

harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management directions for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management directions for upland brush will be sufficient to meet this grouse habitat specification.
- Manage the aspen cover type for smaller patch size, a shorter rotation and a more deliberate habitat configuration within the designated Grouse Enhanced Management Systems areas where appropriate.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland openland and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-Year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-Year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.31.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in "DNR's *Approach to the Protection of Rare Species on State Forest Lands*" (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed no listed species or natural communities of note occurring in the management area. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

There have been no high conservation value areas or ecological reference areas identified in the Evart Block management unit as illustrated in Figure 4.31.8.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Future development and recreational pressure associated with expected population growth in the vicinity of this management area will be primary challenge to successful management for rare fish, wildlife and plants.

Evart Block

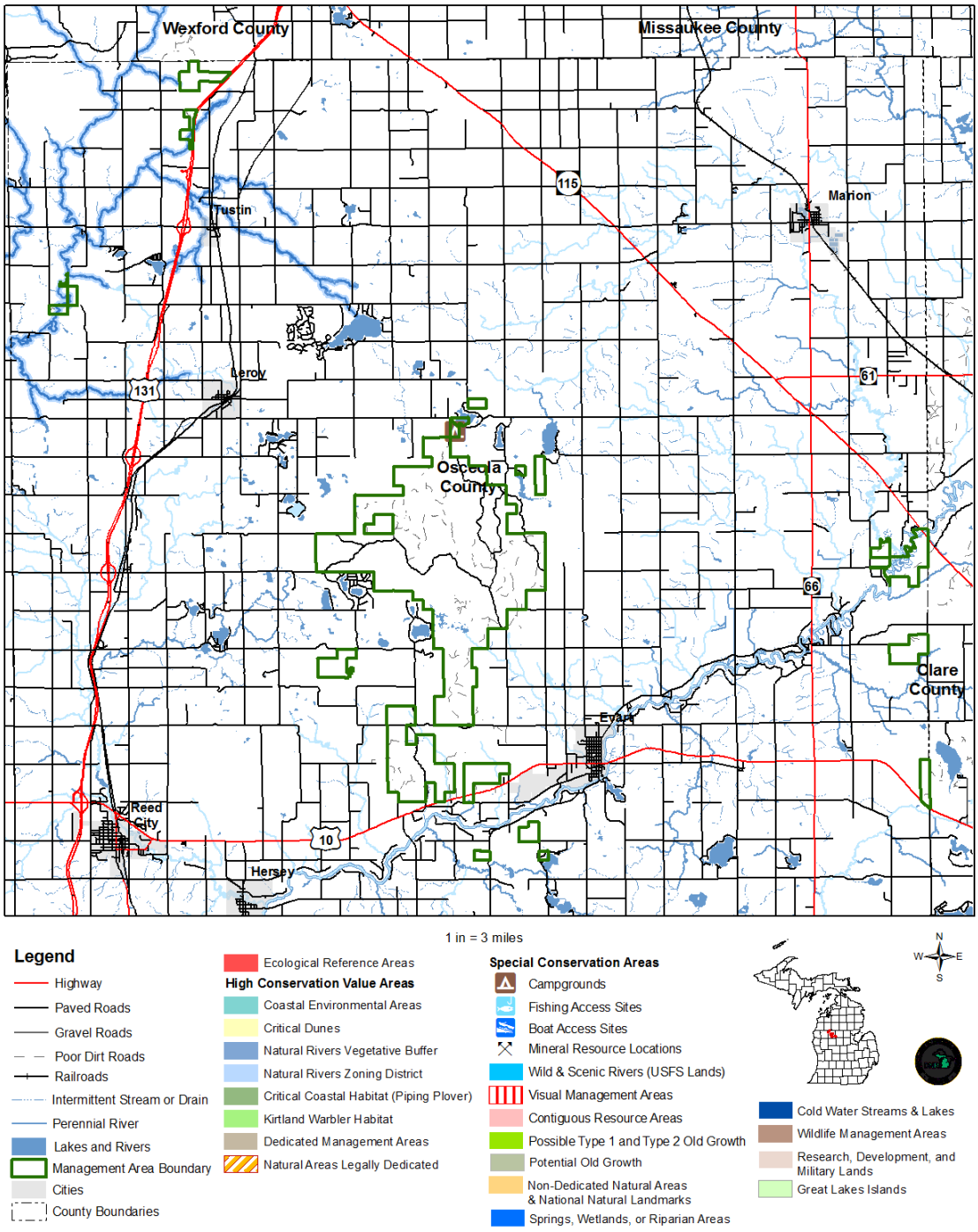

Figure 4.31.8. A map of the Evart Block management area showing the special resource areas.

4.31.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health issues in this management area include oak wilt, oak decline, *Diplodia* shoot blight and management should be adapted as follows:

- Oak wilt is prevalent in adjacent management areas. Early detection and treatment of oak wilt introductions is needed to protect the oak resource. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced.
- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.31.2. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources show the extent and location of invasives should be used to inform of the potential for additional sightings should be documented. Invasives that merit eradication efforts are those species threatening sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.31.2. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Evart Block - FRD Management Areas	Cases within FRD Areas	Cases within 5 Mile Buffer	Total Number of Cases	Total Number of Different Invasive Species
	14	21	35	9

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5 Mile Buffer	Occurrences
Glossy Buckthorn *Rhamnus frangula*	3	Common Buckthorn *Rhamnus cathartica*	1
Reed Canary Grass *Phalaris arundinacea*	3	Glossy Buckthorn *Rhamnus frangula*	10
Tatarian Honeysuckle *Lonicera tatarica*	1	Japanese Knotweed *Fallopia japonica*	1
		Multiflora Rose *Rose Multiflora*	1
-	-	Phragmites (Common Reed) *Phragmites australis*	1
-	-	Purple Loosestrife *Lythrum salicaria*	2
-	-	Reed Canary Grass *Phalaris arundinacea*	1
-	-	Spotted Knapweed *Centaurea stoebe*	2
-	-	Tatarian Honeysuckle *Lonicera tatarica*	2

4.31.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.31.1 and listed in Appendix F.

4.31.6 Fire Management

Disturbance through fire has historically played a role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen or grass/upland brush types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Where feasible, seek opportunities to use fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.31.7 Public Access and Recreation

Access for management and/or recreation is generally very good throughout this management area as there is very little lowland and a well-developed road/trail system which includes the Evart Cycle Trail. In accordance with the DNR's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Specific hunting recreation improvements such as parking lots, gates, trail planting and trail establishment, as well as the preparation and dissemination of specific promotional material, may be made as a result of Grouse Enhanced Management Systems areas planning in this management area.

Due to its relative isolation to development and private lands, the Evart Block offers a sense of the back country and is very popular with hunters and dispersed camping enthusiasts. The only dedicated recreational trail use is the Evart Cycle Trail (Figure 4.31.1) which is seen as a premier cycle trail based on its narrowness, topography and challenge for riders. This trail is designated cycle only, providing motorcyclists with a unique riding experience. Sunrise Lake Campground (Figure 4.31.8), boat access site and the non-motorized Osceola Pathway (Figure 4.31.1) are located at the north end of the entrance point to the management area.

Current Recreational Infrastructure:

- Sunrise Lake Campground and Boat Access site
- Evart Cycle Trail
- Osceola Pathway

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where

modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the DNR's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the DNR Within Stand Retention Guidelines.

4.31.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium and an end moraine of coarse-textured till. The glacial drift thickness varies between 400 and 1,000 feet. Sand and gravel pits are located in this management area and there is good potential for additional pits.

The Jurassic Red Beds and Pennsylvanian Saginaw Formation subcrop below the glacial drift. The Saginaw is quarried for clay in brick making elsewhere in the state. Most of this area has been leased for nonmetallic mineral potash exploration. The only solution potash production, in the state, comes from the nearby Hersey area.

Exploration and development for oil and gas from the shallow Mississippian Stray Sandstone to the deep Ordovician Prairie du Chien has occurred around this management area. Well spacing ranges from 40 acres up to 640 acres for the deeper formations. There is potential for additional development for these formations and most of the lands are currently leased in this management area. The Collingwood Formation does not appear to have potential in this management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.32 MA 32 Gladwin Lake Plain Management Area

Summary of Use and Management

Vegetation management in the Gladwin Lake Plain management area (MA) (Figure 4.32.1) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique character including the Rifle River, a designated natural river; the Lame Duck Foot Access Area, a high conservation value area; several wildlife area floodings; threatened, endangered and special concern species; and provide for forest-based recreational uses. Timber management for this 10-year planning period will focus on balancing the age-class distributions for aspen and red pine. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation opportunity. Expected trends in this 10-year planning period will be the continued need to address illegal off-road vehicle use, trash dumping and increased recreational pressure.

Introduction

There are 121,229 acres of state forest land in the Gladwin Lake Plain management area located in Gladwin and Arenac counties with smaller areas in Ogemaw and Iosco counties. The primary attributes which identifies the Gladwin Lake Plain management area include:

- The dominant landform consisting of lake plain (98% of the management area) which consists of poorly drained flat clay plains with broad sand channels. State forest lands have a higher percentage of sandy soils than the overall lake plain.
- Although much of the management area has not been classified by land type association, what has been classified is in the Saginaw Bay Lake Plain Region (Albert, 1995).
- The Rifle River and several tributaries, a designated natural river, cross parts of the management area.
- This area is popular for hunting, and concentrated recreation including off-road vehicle riding on the Gladwin Trail and Gladwin Route and canoeing and kayaking on the Rifle River for the nearby community of Gladwin and the population centers of southern Michigan.
- This management area contains one or more of the northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.
- This area also includes the Bentley Marsh, Molasses River Floodings and the Lame Duck Foot Access Area, a designated management area.
- These social uses combined with a limited amount of oil/gas sites, the quantity and availability of wood fiber contributes significant social and economic values to the area.
- Threatened, endangered or species of special concern located by Michigan Natural Features Inventory surveys include eastern massasauga rattlesnake, slippershell, bald eagle, great blue heron heronry, Doll's merolonche, ellipse and red-shouldered hawk.

Aspen, swamp hardwoods, oak, jack pine and red pines are the predominant types as shown in Table 4.32.1.

Gladwin Lake Plain

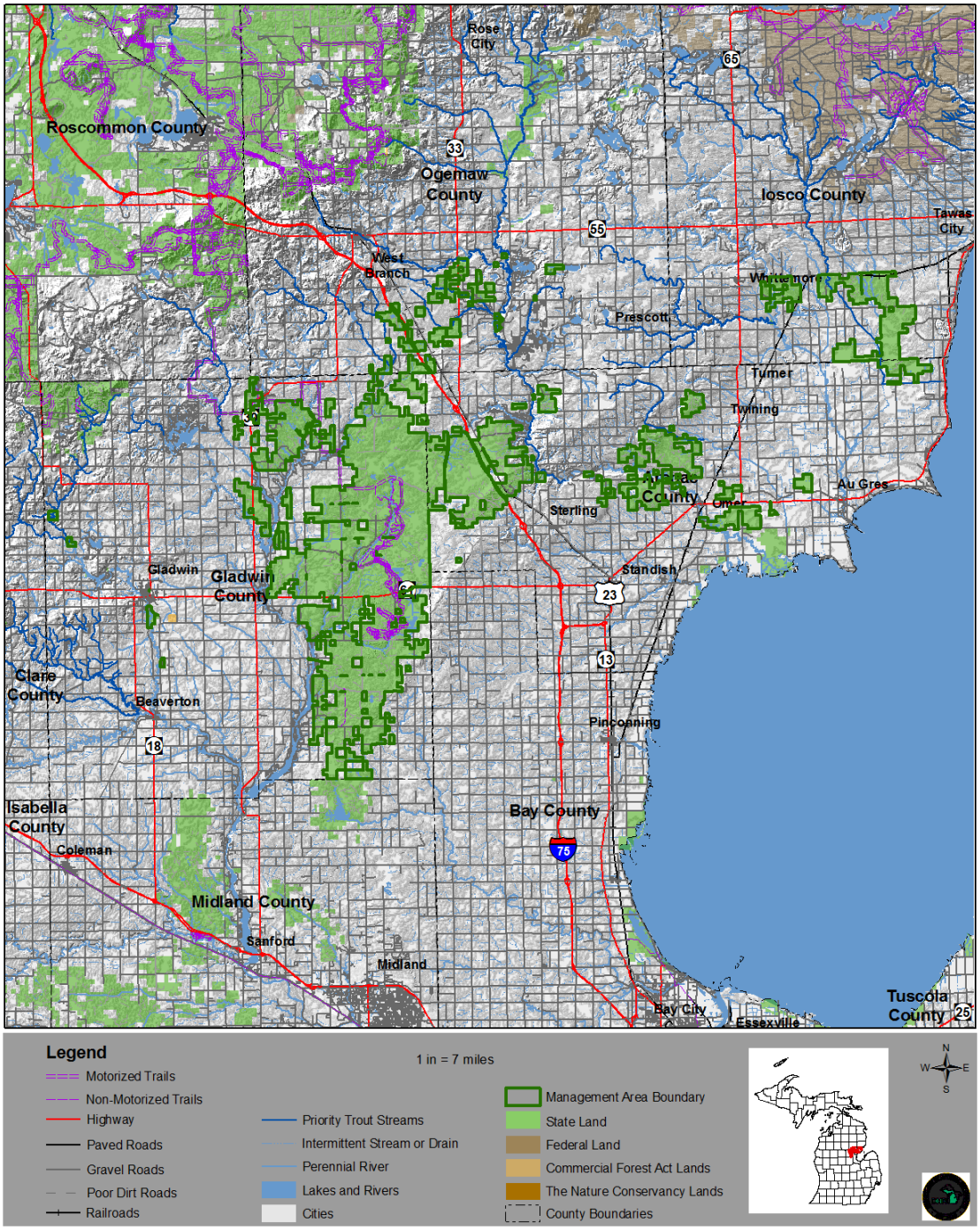

Figure 4.32.1. A map of the Gladwin Lake Plain management area (dark green boundary) in relation to surrounding state forest and other lands in Gladwin, Arenac, Ogemaw and Iosco counties, MI.

Table 4.32.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Gladwin Lake Plain management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	32%	38,990	1,385	37,605	8,809		38,990	6,268	
Lowland Deciduous	19%	22,954	16,013	6941	244	531	22,954	775	
Oak	9%	10,416	1,036	9380		1,162	10,416	1,179	1,162
Jack Pine	4%	4,537	118	4419	240		4,537	631	
Lowland Aspen/Balsam Poplar	3%	4,132	2,103	2029	346		4,132	346	
Mixed Upland Deciduous	3%	3,175	29	3146	489	534	3,175	449	602
White Pine	2%	2,658	68	2590	530	727	2,658	235	848
Red Pine	2%	2,486	129	2357	108	900	2,486	236	900
Upland Open/Semi-Open Lands	2%	2,837		2837			2,837		
Lowland Open/Semi-Open Lands	17%	20,837		20837			20,837		
Misc Other (Water, Local, Urban)	1%	1,565		1565			1,565		
Others	5%	6,642	2,647	3995	196	973	6,642	292	973
Total		121,229	23,528	97,701	10,963	4,827	121,229	10,411	4,485

4.32.1 Forest Cover Type Management Direction

The following sections contain information on the management direction in the form of **Current Forest Condition, Desired Future Conditions, 10-Year management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of tree species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

Section 4.32.1.1 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total 38,990 or 32% of the management area (Table 4.32.1). Aspen is distributed throughout the management area on habitat classes PArVCo and PArVHA. Aspen age classes below the age of 50 are fairly evenly distributed (Figure 4.32.2). Aspen is frequently mixed with red maple and oak. Although the aspen quality is below average, it is providing wildlife habitat. There are 1,385 acres of aspen that have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 2,459 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen will be located on suitable sites with acres balanced within the ages of 0-59 years to provide a sustainable level of wood fiber and early successional habitat for wildlife.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 8,809 acres;
- Concentrate harvests on the oldest age-classes first; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.
- Aspen within the identified Grouse Enhanced Management Systems area may be managed differently than the rest of the aspen within the management area, with a shorter rotation age, small patch cuts and carefully considered stand adjacency.

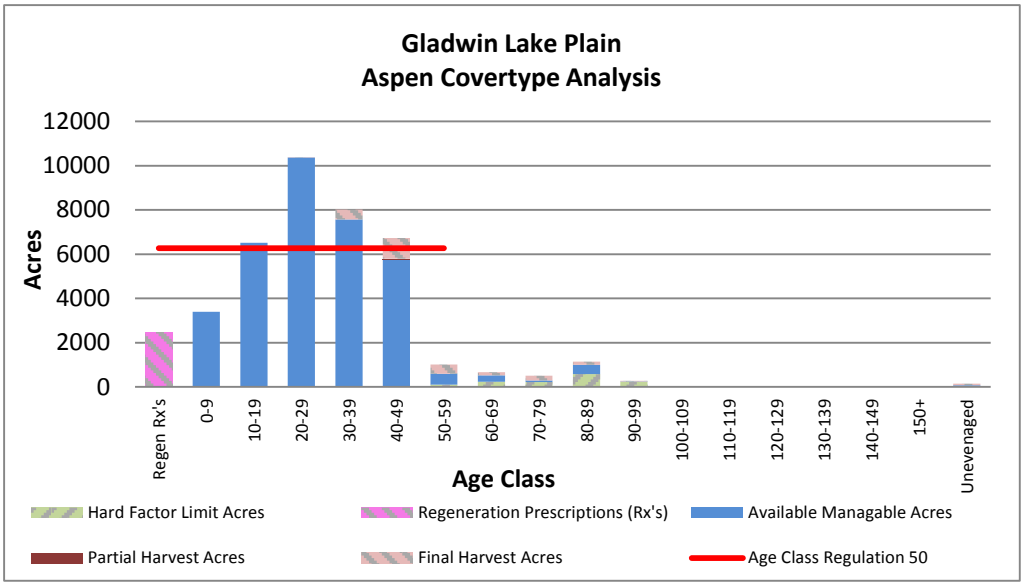

Figure 4.32.2. Age-class distribution for aspen in the Gladwin Lake Plain management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue to manage aspen for a balanced age-class distribution for sustainable fiber production and habitat; and
- A desired future harvest level is projected at 6,268 acres for final harvest per 10-year period.

Section 4.32.1.2 Forest Cover Type Management – Lowland Deciduous

Current Condition

Lowland deciduous acres total 22,954 or 19% of the management area (Table 4.32.1) and are located on PArVCo or unclassified wetland habitat class sites. Most of the acres are in the age classes above the age of 60 (Figure 4.32.3). Uneven-aged management is the preferred method for regeneration, which replicates the natural disturbance regime and provides the opportunity to manage for high quality sawtimber. Lowland deciduous stands have been managed as even-aged stands where quality stems were not present. Stands on the drier end of the spectrum were successfully restarted with even-aged management, while wetter stands converted to non-forest types. On these lowland sites, uneven-aged management reduces the potential for conversion. The residual stand keeps the sites from becoming even wetter, preventing a conversion to marsh. Excessive tip-overs and windthrow can become an issue in stands that have been reduced below a residual basal area of 80 square feet per acre.

Green ash, red maple and aspen are frequent components of swamp hardwoods and treatments on more mesic sites may convert lowland deciduous stands to aspen or red maple. There are 16,013 acres of lowland deciduous stands have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 399 acres with a final harvest pending and these acres are included in the regeneration prescription class. There are 964 acres with a partial harvest pending and these acres are included in the current age classes.

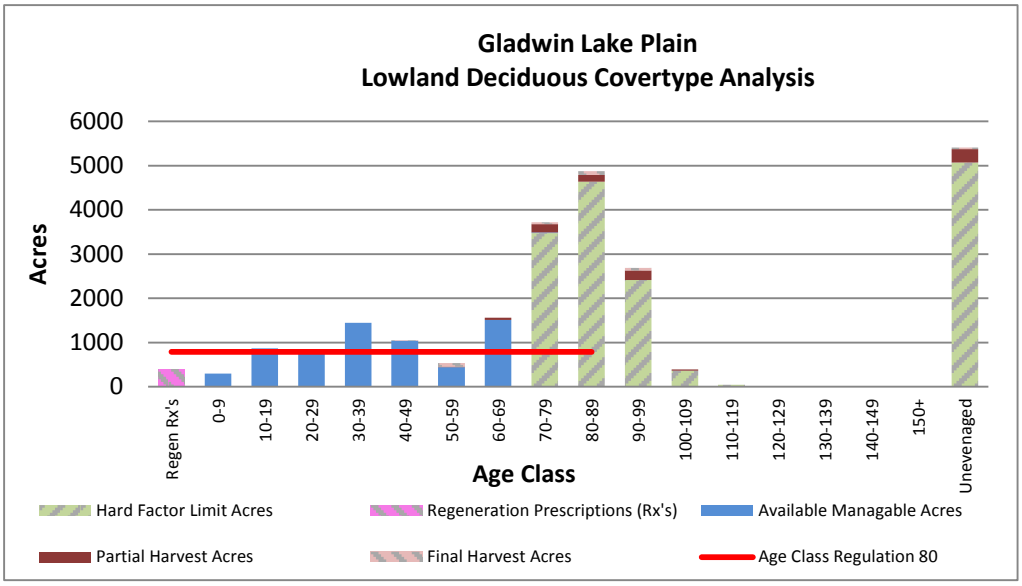

Figure 4.32.3. Age-class distribution for the lowland deciduous cover type in the Gladwin Lake Plain management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland deciduous stands will be located on suitable sites in a compositionally diverse forest which contains coarse woody debris, scattered large trees and scattered snags.

10-Year Management Objectives

- Conduct final harvests on a projected 244 acres with a concentration on poorer quality stands with poor stem quality, multiple stemmed trees and low basal area; and
- Conduct partial harvests on a projected 531 acres with a concentration on better quality stands with good stem quality and high basal area.

Long-Term Management Objectives

- Lowland deciduous stands will continue to be managed with using multi-aged regeneration and final harvests where necessary to produce a sustainable level of forest products and wildlife habitat;
- Consider the impact of emerald ash borer on ash in lowland deciduous stands in management decisions;
- A desired future harvest level of final and partial harvests is projected at 775 acres per 10-year period; and
- If needed, consider partial harvests in better quality stands.

Section 4.32.1.3 Forest Cover Type Management – Oak

Current Condition

Oaks acres total 10,416 acres or 9% of the management area (Table 4.32.1) on PArVHa and PVCd habitat class sites. Competition from red maple can be an issue which has required prescribed fire. In a few locations natural white pine has become a part of the understory. Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs and for a wide range of forest recreation.

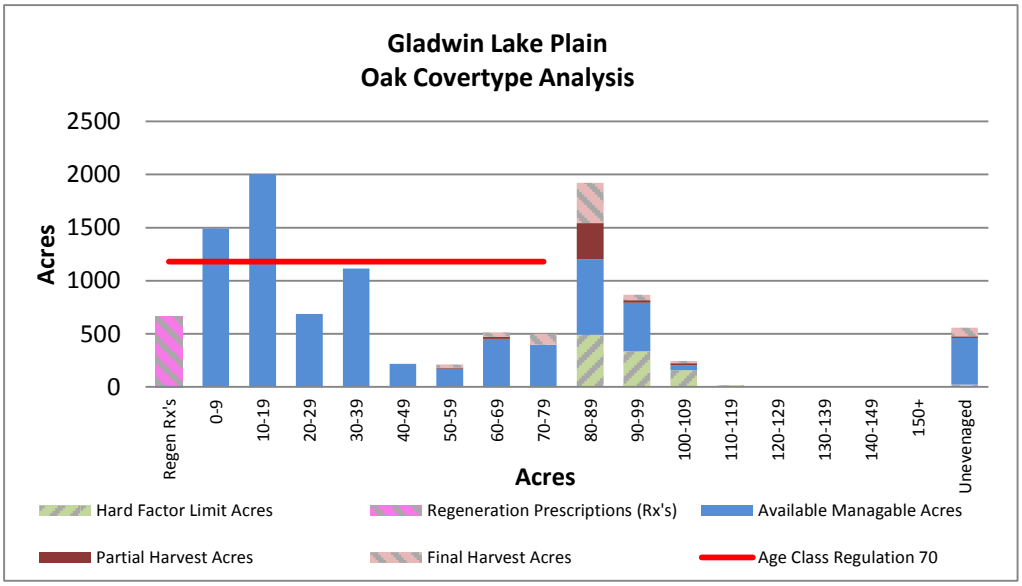

Figure 4.32.4. Age-class distribution for oak in the Gladwin Lake Plain management area (2012 Department of Natural Resources inventory data).

There are 846 acres of oak that have met harvest criteria (Figure 4.32.4), but have site conditions that limit harvest (hard factor limited acres). There are 662 acres that have regeneration harvest pending and these acres are included in the regeneration prescription class. There are 396 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of oak. These acres are included in the regeneration prescription class.

Desired Future Condition

- Oak will be located on suitable sites between 0-79 years of age for sustainable production of wood products, wildlife habitat and recreation opportunities.

10-Year Management Objectives

- Conduct partial harvests on a projected 1,162 acres concentrating on stands that have not been previously harvested or those stands that have a sufficient basal area for a partial harvest.

Long-Term Management Objectives

- Continue management to achieve a more balanced 0-79 year age-class distribution;
- In stands where the expense and difficulty of controlling red maple is prohibitive, consider whether some oak stands with a significant red maple understory should be allowed to succeed to red maple dominated stands where oak will remain a component of the stand for wildlife mast production; and
- A desired future harvest level is projected at 1,179 acres for final harvest and 1,162 acres for partial harvest per 10-year period.

Section 4.32.1.4 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands acres total approximately 20,837 or 17% of the management area (Table 4.32.1). Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife.

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.32.1.5 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open land acres total 2,837 or 2% of the management area (Table 4.32.1). Upland open/semi-open lands communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife and recreationally for hunting, wildlife viewing and camping. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas.

Desired Future Condition

- Upland open/semi-open lands will be maintained at or above current levels on sites that are natural openings due to frost or low soil fertility/moisture and on sites that have been historically been maintained as openings to provide habitat for species that use openings.

10-Year Management Objectives

- Where necessary and feasible, consider methods to maintain upland open/semi-open lands during this management cycle.

Long-Term Management Objectives

- Continue to maintain herbaceous open land and upland shrub openings at or above current levels in order to promote wildlife values and recreational opportunity;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.32.1.6 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: jack pine 4,537 acres 4% of the management area, lowland aspen/balsam poplar 4,132 acres (3%), mixed upland deciduous 3,175 acres (3%), white pine 2,658 acres (2%) and red pine 2,486 acres (2%). Other forested and non-forested communities total 6,642 acres or 5% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- The following species are projected for regeneration harvests: lowland aspen/balsam poplar 346 acres, mixed upland deciduous 489 acres, white pine 530 acres, red pine 108 acres, natural mixed pines 46 acres, lowland

mixed forest 21 acres, lowland conifers 17 acres, upland spruce/fir 38 acres, upland conifers 30 acres and paper birch 44 acres;
- Consider methods to ensure regeneration lowland types;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry; and
- The following species are projected for partial harvests: mixed upland deciduous 534 acres, white pine 727 acres, red pine 900 acres, northern hardwood 427 acres, upland mixed forest 194 acres, natural mixed pines 283 acres and upland conifers 55 acres.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible;
- Continue to manage these other types to provide forest products, wildlife habitat and recreational opportunities; and
- A desired future harvest level is projected at 17 acres for final harvest for lowland conifers.

4.32.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this 10-year planning period:

- American woodcock
- Beaver
- Eastern massasauga rattlesnake
- Golden-winged warbler
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- White-tailed deer.

The primary focus of wildlife habitat management in the Gladwin Lake Plain management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest and marsh/grassland complexes; the retention of large over-mature trees and snags; the maintenance and expansion of hard mast; and mesic conifer components.

This management area will include one or more northern Lower Peninsula Grouse Enhanced Management System areas. The boundaries will be delineated during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager. Aspen stands that fall within the Grouse Enhanced Management System area boundary may be managed on a shortened rotation with multiple age classes and smaller stand sizes to enhance hunting opportunities for ruffed grouse, woodcock, deer, turkey and hare. The remainder of the management area (outside the boundary) will be managed based on the direction in the management area write up.

A more detailed overview of featured species is included in Section 3.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. The American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems per acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
  - Implementation of the Dingman Marsh and French Farm Flooding master plans and the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
  - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

Golden-Winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. The golden-winged warbler nests in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets, young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-9 year-old age class.

Pileated woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. The pileated woodpecker prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management, and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-Headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. The red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than 5 acres in size with a savannah-like dispersion of large trees (< 50% canopy cover) with open under story and include tall trees or snags of large (>12 inches) diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than 12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old) even-aged deciduous stands typically support 8,000-10,000 woody stems per acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management directions for aspen and oak will be sufficient to meet this grouse habitat specification.

- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management directions for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management directions for upland brush will be sufficient to meet this grouse habitat specification.
- Manage the aspen cover type for smaller patch size, a shorter rotation and a more deliberate habitat configuration within the designated Grouse Enhanced Management Systems areas where appropriate.

White-Tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual management of at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-Year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-Year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.32.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in “DNR’s *Approach to the Protection of Rare Species on State Forest Lands*” (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed six listed species and no natural communities of note occurring in the management area as listed in Table 4.32.2. A colony of great blue herons has also been identified. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

The Rifle River and its tributaries have been identified as a natural river and along with their corridors are also designated as high conservation value areas as shown in Figure 4.32.5. The Lame Duck Foot Access Area is a dedicated management area that is also a high conservation value area (Figure 4.32.5).

There are no ecological reference areas identified for the Gladwin Lake Plain management area.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Future development and recreational pressure associated with expected population growth in the vicinity of this management area will be the primary challenge to successful management for rare fish, wildlife and plants.

Table 4.32.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Gladwin Lake Plain management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common tern	*Stema hirundo*	T/G5/S2	Confirmed	MV	Moderate	Sand & gravel beach	Upland open/semi-open	N/A
Moth								
Doll's merolonche	*Merolonche dolli*	SC/G3G4/S1S2	Confirmed	MV	Moderate	Pine barrens	Jack Pine	Early
						Oak-pine barrens	Oak	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Mesic northern forest	Northern Hardwood	Late
						Bog	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Rich conifer swamp	Tamarack	Late
Mullusk								
Ellipse	*Venustaconcha ellipsiformis*	SC/G4/S2S3	Confirmed	EV	Moderate	Mainstem & Headwater streams	Aquatic	N/A
Mussel								
Slippershell mussel	*Alasmidonta viridis*	T/G4G5/S2S3	Confirmed	EV	Very High	Headwater Stream	Aquatic	N/A
						Mainstem streams	Aquatic	N/A
						Inland lake	Aquatic	N/A
Reptile								
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

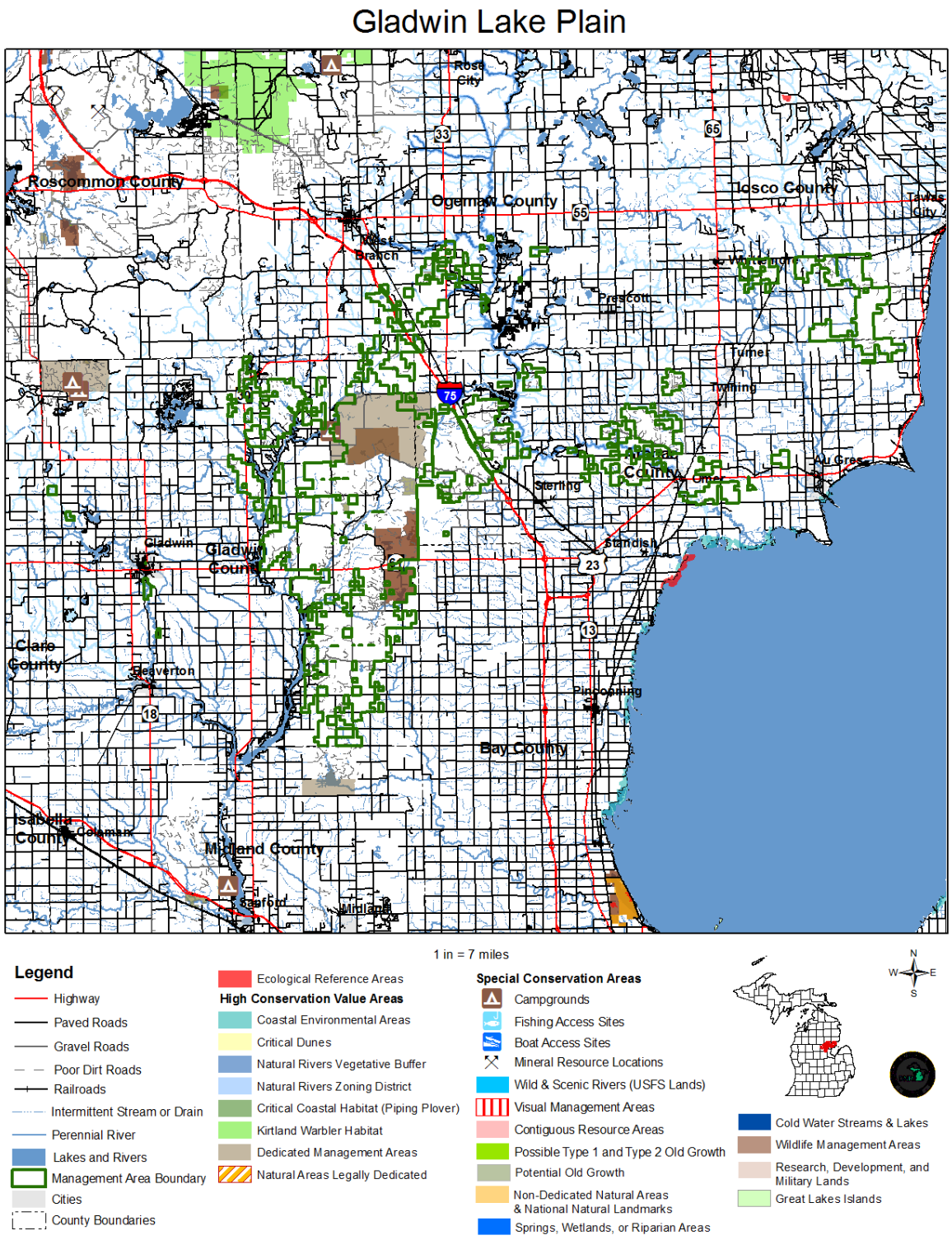

Figure 4.32.5. A map of the Gladwin Lake Plain management area showing the special resource areas.

4.32.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include oak decline and oak wilt and management should be adapted as follows:

- Oak decline is most prevalent on frost-prone, nutrient poor outwash plains. Old age and drought predispose areas to two-lined chestnut borer and *Armillaria* root rot. Shorter rotations will reduce risk of decline.
- Oak wilt is prevalent in adjacent management areas. Early detection and treatment of oak wilt introductions is needed to protect the oak resource. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Currently no invasive species are mapped in management area or within a five-mile buffer of the management area. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. Local staff have noted the presence of *Phragmites* in this management area. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives merit eradication efforts are those species threaten sensitive sites due to their location or growth characteristics and have population levels and may be successfully controlled.

4.32.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practices on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.32.1 and listed in Appendix F.

4.32.6 Fire Management

Lowland deciduous stands which have historically been a major component of this management area are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen or open land herbaceous/upland shrub types.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependant on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.32.7 Public Access and Recreation

Access in this management area is primarily by dirt road, two-tracks and the Gladwin Trail. Seasonal flooding due to a high water table may severely limit access. In accordance with the DNR's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized. Specific hunting recreation improvements such as parking lots, gates, trail planting and trail establishment, as well as the preparation and dissemination of specific promotional material, may be made as a result of Grouse Enhanced Management Systems areas planning in this management area.

The following trails and recreation facilities are located in this management area:

Boating Access Sites (Figure 4.32.3)

- Kenneth Road – Rifle River
- Secord Lake North
- Secord Lake South

Off-Road Vehicle Trails (Figure 4.32.1)

- Gladwin Route
- Gladwin Trail
- Gladwin Trail and Michigan Cycle Conservation Club Trail
- M-30 North Gladwin Michigan Cycle Conservation Club Trail

Non-Motorized Trails (Figure 4.32.1)

- Midland to Mackinaw Boy Scout Trail

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the DNR's timber management policies may be considered. Specifications and Guidance for management around trails may include, but is not limited to: vegetative management system sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the DNR Within Stand Retention Guidance.

4.32.8 Oil, Gas and Mineral Development

Surface sediments consist of lacustrine (lake) sand, gravel, clay and silt, Fine-textured till, an end moraine of fine-texture till, glacial outwash sand and gravel and postglacial alluvium and dune sand. The glacial drift thickness varies between 10 and 400 feet. Sand and gravel pits are located in this management area and there is potential for additional pits.

The Jurassic Red Beds and Pennsylvanian Saginaw Formation, Bayport Limestone and Michigan Formation, and Mississippian Marshall Sandstone and Coldwater Shale subcrop below the glacial drift. The Saginaw is quarried for clay in brick making, the Bayport for limestone and the Michigan for gypsum elsewhere in the state. The southern end of the Gladwin county has been leased for nonmetallic mineral potash exploration. The only solution potash production,in the state comes from the Hersey area in Osceola county.

Exploration and development for oil and gas from the shallow Mississippian Stray Sandstone to the deep Ordovician Prairie du Chien has occurred around this management area. Well spacing ranges from 40 acres up to 640 acres for the deeper formations. There is potential for additional development for these formations and some of the lands are currently leased in this management area. The Collingwood Formation does not appear to have much potential in this management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.

4.33 SLP MA 1 – Midland-Isabella Management Area

Summary of Use and Management

Vegetation management in the Midland-Isabella management area (MA) (Figure 4.33.1) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique character including the Kawkawlin Creek Flooding; threatened, endangered and special concern species; and provide for forest-based recreational uses. A significant portion of the management area is swampy and therefore relatively inaccessible. Timber management for this 10-year planning period will focus on balancing the age-class distributions for aspen and oak. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation opportunity. Expected trends in this 10-year planning period will be the continued need to address illegal off-road vehicle use and trash dumping.

Introduction

The Midland-Isabella management area is primarily located in the Tittabawassee River watershed in Midland and Isabella Counties and contains 45,258 acres of state forest land (Figure 4.33.1). The primary attributes which identifies the Midland-Isabella management area include:

- The dominant lake plain landform which consists of poorly drained flat clay plains with broad sand channels.
- This area is also in a unique ecological transition zone between the southern and northern forest types of Michigan.
- This area falls within the Saginaw Bay Lake Plain Region of the southern Lower Peninsula ecoregion as classified by Albert (1995).
- This area is in close proximity to the cities of Midland to the east and Mt. Pleasant to the west and as such, there is a high level of dispersed recreation.
- Illegal off-road vehicle activities and trash dumping are significant issues.
- The Kawkawlin Creek Flooding which is a dedicated management area provides wetland habitat and hunting opportunities.
- These social uses combined with a moderate amount of oil/gas sites and the quantity and availability of wood fiber contributes significant social and economic values to the area.
- Threatened, endangered or species of special concern located by surveys include bald eagle, great blue heron heronries, black tern, red-shouldered-hawk, broad-leaved puccoon and beak grass.

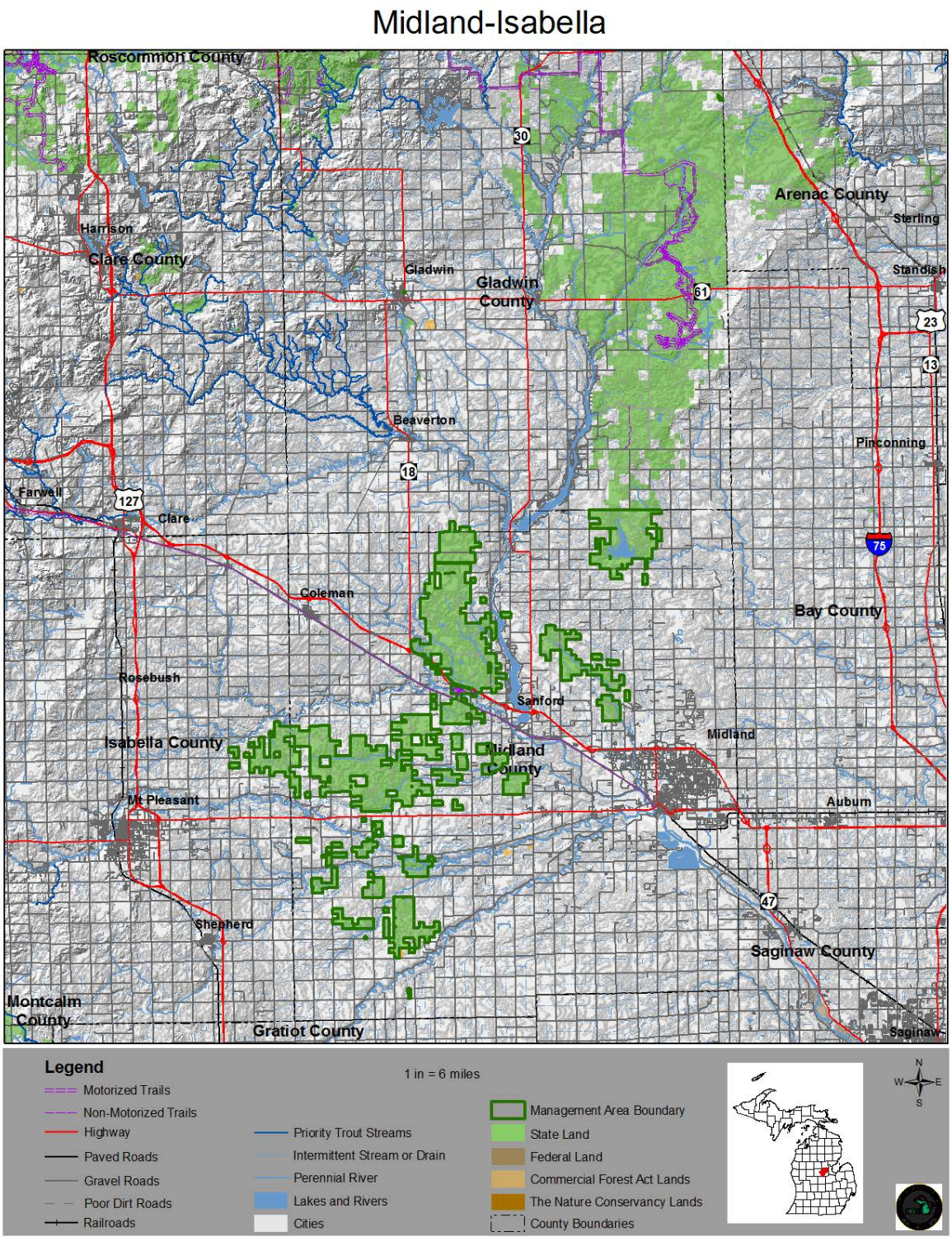

Figure 4.33.1. Location of the Midland-Isabella management area (dark green boundary) in Midland and Isabella Counties, MI.

Table 4.33.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Midland-Isabella management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	35%	15,857	520	15,337	5,665		15,857	3,067	
Lowland Deciduous	24%	10,933	7,705	3228	90	269	10,933	359	
Oak	11%	4,810	891	3919	53	664	4,810	435	664
Lowland Aspen/Balsam Poplar	4%	1,603	829	774	129		1,603	129	
Mixed Upland Deciduous	3%	1,339	51	1288	294	6	1,339	184	208
Northern Hardwood	3%	1,140		1140		291	1,140		291
Upland Open/Semi-Open Lands	2%	927		927			927		
Lowland Open/Semi-Open Lands	15%	6,575		6575			6,575		
Misc Other (Water, Local, Urban)	2%	1,083		1083			1,083		
Others	2%	1,009	220	789	70	194	1,009	75	206
Total		45,276	10,215	35,061	6,300	1,424	45,276	4,249	1,369

4.33.1 Forest Cover Type Management Direction

The following sections contain information on the management direction in the form of **Current Forest Condition, Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives** for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting or mowing) will be conducted. In other portions of the state forest, natural succession will achieve ecological objectives. While most stands have a variety of tree species and other vegetation, stands or communities are classified by the species which has the dominant canopy coverage.

Section 4.33.1.1 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total approximately 15,857 or 35% of the management area (Table 4.33.1). Aspen is distributed throughout the management area and it should be noted that no habitat classifications have been done for this area in the Southern Lower Peninsula region. The age-classes of aspen are somewhat imbalanced (Figure 4.33.2), with spikes in the 10-19, 20-29 and 30-39 year-old age classes. There are 520 acres of aspen have met harvest criteria but have site conditions that limit (hard factor limited acres). There are 631 acres that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

- Aspen will be located on suitable sites with acres balanced within the 0-49 year age class rotation; and
- Aspen acres will be maintained on currently operable sites to provide early successional habitat for species viability, while also providing a sustainable level of wood fiber.

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 5,665 acres during this 10-year planning period;
- Concentrate harvests on the oldest age classes first; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

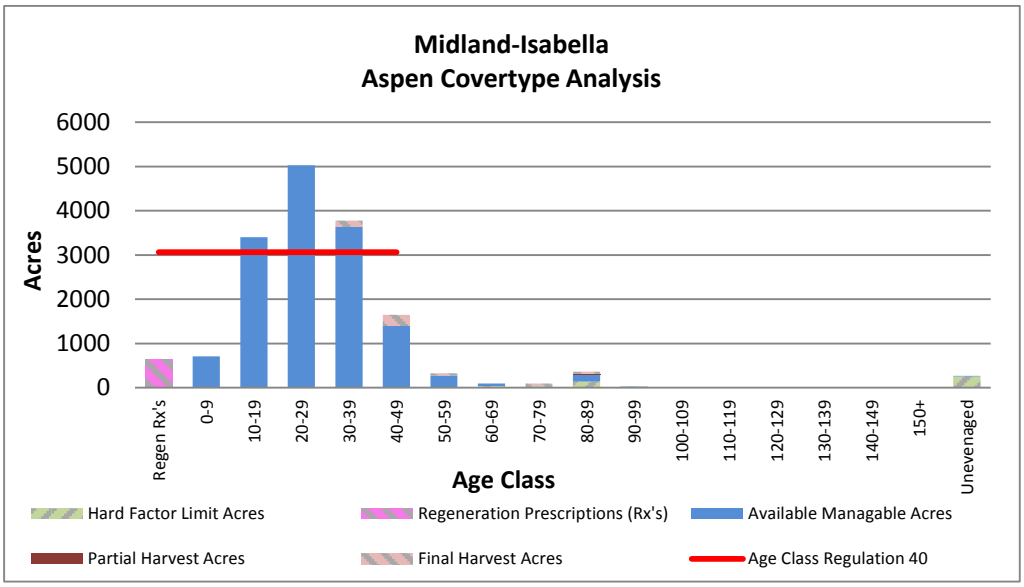

Figure 4.33.2. Age-class distribution for aspen in the Midland-Isabella management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue to manage aspen for regeneration to balance the age-class distributions; and
- A desired future harvest level is projected at 3,067 acres for final harvest per 10-year period.

Section 4.33.1.2 Forest Cover Type Management – Lowland Deciduous

Current Condition

Lowland deciduous acres total 10,933 or 24% of the management area (Table 4.33.1 and Figure 4.33.3). Uneven-aged management is the preferred method for regeneration, which replicates the natural disturbance regime and provides the opportunity to manage for high-quality sawtimber. Lowland deciduous stands have been managed as even-aged stands where quality stems were not present. Stands on the drier end of the spectrum were successfully restarted with even-aged management, while wetter stands converted to non-forest types. On these lowland sites, uneven-aged management reduces the potential for conversion. The residual stand keeps the sites from becoming even wetter, preventing a conversion to marsh. Excessive tip-overs and windthrow can become an issue in stands that have been reduced below a residual basal area of 80 square feet per acre. There are 7,705 acres hard factor limited due to accessibility or operability.

Desired Future Condition

- Lowland deciduous stands will contain coarse woody debris, scattered large trees and scattered snags; and
- Lowland deciduous stands will be located on suitable sites and will produce a sustainable level of forest products along with wildlife habitat and recreation opportunities.

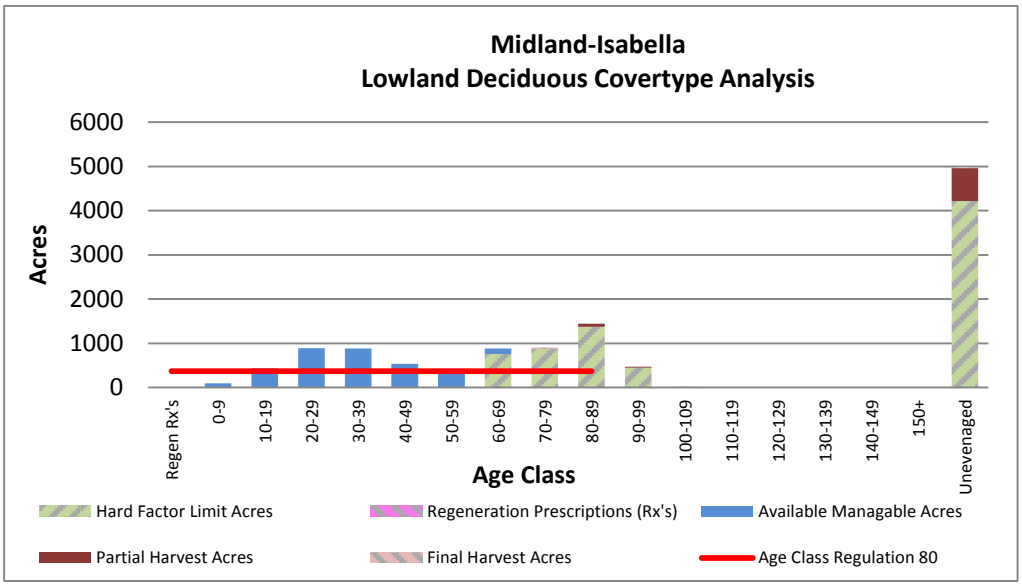

Figure 4.33.3. Age-class distribution for the lowland deciduous cover type in the Midland-Isabella management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct final harvests on a projected 90 acres with a concentration on stands with poor stem quality, multi-stemmed trees and low basal area; and
- Conduct partial harvests on a projected 269 acres with a concentration on stands with good quality stems and high basal area.

Long-Term Management Objectives

- Lowland deciduous stands will continue to be managed with using multi-aged regeneration and final harvests where necessary to produce a sustainable level of forest products and wildlife habitat;
- Desired future harvests levels are projected at 359 acres for final and partial harvests per 10-year period;
- If needed, consider final harvests in poor-quality stands; and
- Consider the impact of emerald ash borer on ash in future management decisions.

Section 4.33.1.3 Forest Cover Type Management – Oak

Current Condition

Oak acres total 4,810 or 11% of the management area (Table 4.33.1). Forest communities dominated primarily by oak in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, deer, squirrels and various birds and commercially for firewood and industrial lumber. There are 891 acres of oak have met harvest criteria (Figure 4.33.4), but have site conditions that limit harvest (hard factor limited acres). There are 344 acres that have regeneration harvest pending and these acres are included in the regeneration prescription class. There are 289 acres with a partial harvest pending and these acres are included in their current age class.

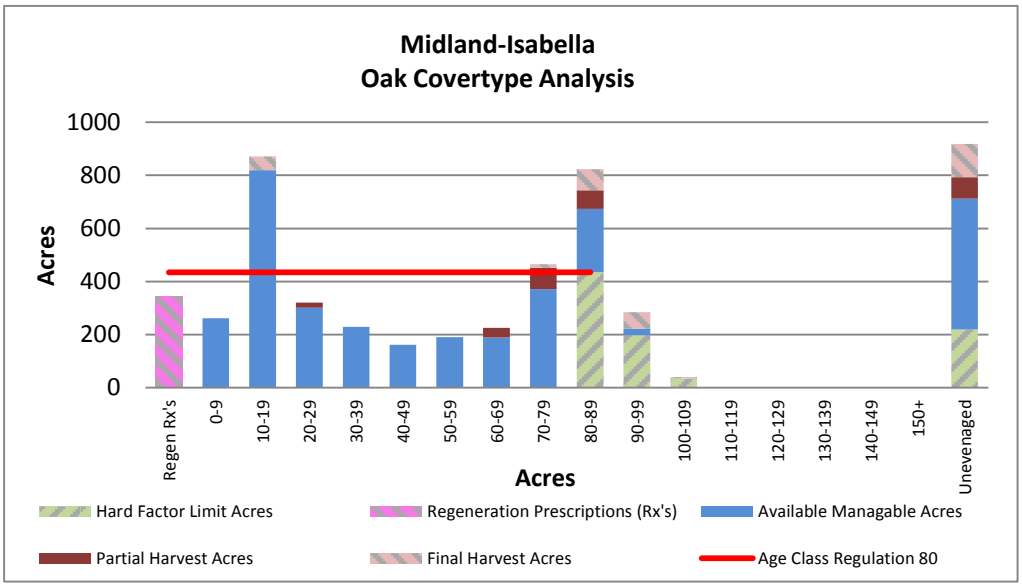

Figure 4.33.4. Age-class distribution for oak in the Midland-Isabella management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Oak will be evenly distributed in the 0-89 year age classes and continue to provide mast for wildlife species and a sustainable level of timber production.

10-Year Management Objectives

- Conduct partial harvests on a projected 664 acres concentrating on stands that have not been previously harvested or those stands that have a sufficient basal area for a partial harvest; and
- Conduct final harvests on a projected 53 acres.

Long-Term Management Objectives

- Where the expense and difficulty of controlling red maple is prohibitive, consider allowing oak stands with a significant red maple understory to succeed to red maple dominated stands where oak will remain a component of the stand for wildlife mast production; and
- A desired future harvest level is projected at 435 acres for final harvest and 664 acres for partial harvest per 10-year period.

Section 4.33.1.4 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland shrub/herbaceous acres total 927 acres or 2% of the management area (Table 4.33.1). Upland open/semi-open lands communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife and recreationally for hunting, wildlife viewing and camping. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas.

Desired Future Condition

- Upland open/semi-open lands will be maintained at or above current levels on sites that are natural openings due to frost or low soil fertility/moisture and on sites that have been historically been maintained as openings to provide habitat for species that use openings.

10-Year Management Objectives

- Where necessary and feasible, consider methods to maintain upland open/semi-open lands during this management cycle.

Long-Term Management Objectives

- Continue to maintain herbaceous open land and upland shrub openings at or above current levels in order to promote wildlife values and recreational opportunity;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.33.1.5 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 6,575 acres or 15% of the management area (Table 4.33.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at or above current levels to provide wildlife habitat.

10-Year Management Objectives

- Management in lowland open/semi-open lands will be minimal. What little maintenance that will be done will be to maintain the hydrology and open characteristics.

Long-Term Management Objectives

- Continue management to maintain upland open/semi-open lands at or above current levels;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

Section 4.33.1.6 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: lowland aspen/balsam poplar 1,603 acres or 4% of the management area, mixed upland deciduous 1,339 acres (3%) and northern hardwood 1,140 acres (3%). Other forested and non-forested communities total 1,009 acres or 2% of the management area and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

10-Year Management

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Regeneration harvests are projected for 129 acres of lowland aspen/balsam poplar, 294 acres of mixed upland deciduous, 33 acres of white pine and 36 acres of natural mixed pines; and
- The following species are projected for partial harvests: 291 acres of northern hardwood, 26 acres of red pine, 74 acres of white pine, 60 acres of natural mixed pines and 25 acres of upland mixed forest.

Long-Term Management

- Continue to manage lowland types for forest products and wildlife habitat.

4.33.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management.

The following have been identified as featured species for this management area during this 10-year planning period:

- American woodcock
- Beaver
- Golden-winged warbler
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- White-tailed deer

The primary focus of wildlife habitat management in the Midland-Isabella management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; the retention of large over-mature trees and snags; the maintenance and expansion of hard mast; and mesic conifer components.

A more detailed overview of featured species is included in Section 3.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems per acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams that are not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
  - Implementation of the10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-Year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (>12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

- Maintain a component of large diameter trees greater than 12 inches in diameter at breast height.
  - Implementation of Within-Stand Retention Guidance, factor-limited acres, uneven-aged management in the northern hardwoods type, special conservation areas with objectives for big tree management and continued mortality from insect and disease will be sufficient to meet the pileated woodpecker habitat specifications for large trees in this management area.

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than 5 acres in size with a savannah-like dispersion of large trees (< 50% canopy cover) with open under story and include tall trees or snags of large (> 12 inches) diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than 12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

The goal for grouse in the northern Lower Peninsula is maintain available habitat. Ruffed grouse prefer young (6-15 year old) even-aged deciduous stands that typically support 8,000-10,000 woody stems per acre. Although ruffed grouse use many different forest types (aspen, birch, oak-hickory) aspen can support higher densities than those attained in other forest types. The juxtaposition of different age classes allows for different life history requirements to be met within a small area and promotes higher grouse densities. Ideal aspen stands will be of 40-160 acres under a 40-year rotation with staggered harvests of 25% every ten years in 10-40-acre harvest units. Larger harvest units should have irregular

boundaries and include one or two, 1-3-acre unharvested inclusions. State forest management should focus on maintaining and balancing the age-class distribution for aspen and oak cover types in priority landscapes.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

White-tailed Deer

The goals for white-tailed deer habitat in the northern Lower Peninsula are to: 1) Maintain spring and summer forage and improve recreational access through openings management; 2) Maintain the overall proportion of potential woody browse such as aspen; 3) Maintain or increase the oak component in forest stands and promote oak regeneration; and 4) Maintain and promote functional shelter in wintering complexes.

Wildlife Habitat Specifications:

- Annual manage at least 3,000 acres of forest openings across the ecoregion to provide spring and summer forage and recreational opportunities.
  - Implementation of 10-year management direction for upland open land and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-Year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-Year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.33.3 Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in “DNR’s *Approach to the Protection of Rare Species on State Forest Lands*” (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed six listed species and no natural communities of note occurring in the management area as listed in Table 4.33.2. Colonies of great blue herons has also been identified. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

Table 4.33.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Midland-Isabella management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Oak-Pine barrens		S2/G3	Confirmed				Oak	Mid
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Black tern	*Chlidonias niger*	SC/G4/S3	Confirmed	MV	Very High	Great Lakes marsh	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Emergent Marsh	Lowland open/semi-open	N/A
Common tern	*Stema hirundo*	T/G5/S2	Confirmed	MV	Moderate	Sand & gravel beach	Upland open/semi-open	N/A
Reptile								
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Plant								
Broad-leaved puccoon	*Lithospermum latifolium*	SC/G4/S2S3	Confirmed			Floodplain forest	Lowland mixed	Mid

Climate Change Vulnerability Index: EV – Extremely Vulnerable; HV – Highly Vulnerable; MV – Moderately Vulnerable; PS – Presumed Stable; and IL – Increase Likely.

The Kawkawlin Creek Flooding is a dedicated management area that is also a high conservation value area (Figure 4.32.5) in the Midland-Isabella management area.

There are no ecological reference areas identified for the Midland-Isabella management area.

Management goals during this planning period:

- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status as a special resource area.
- Develop and maintain management and monitoring plans for ecological reference areas on state forest land.

Future development and recreational pressure associated with expected population growth in the vicinity of this management area will be primary challenge to successful management for rare fish, wildlife and plants.

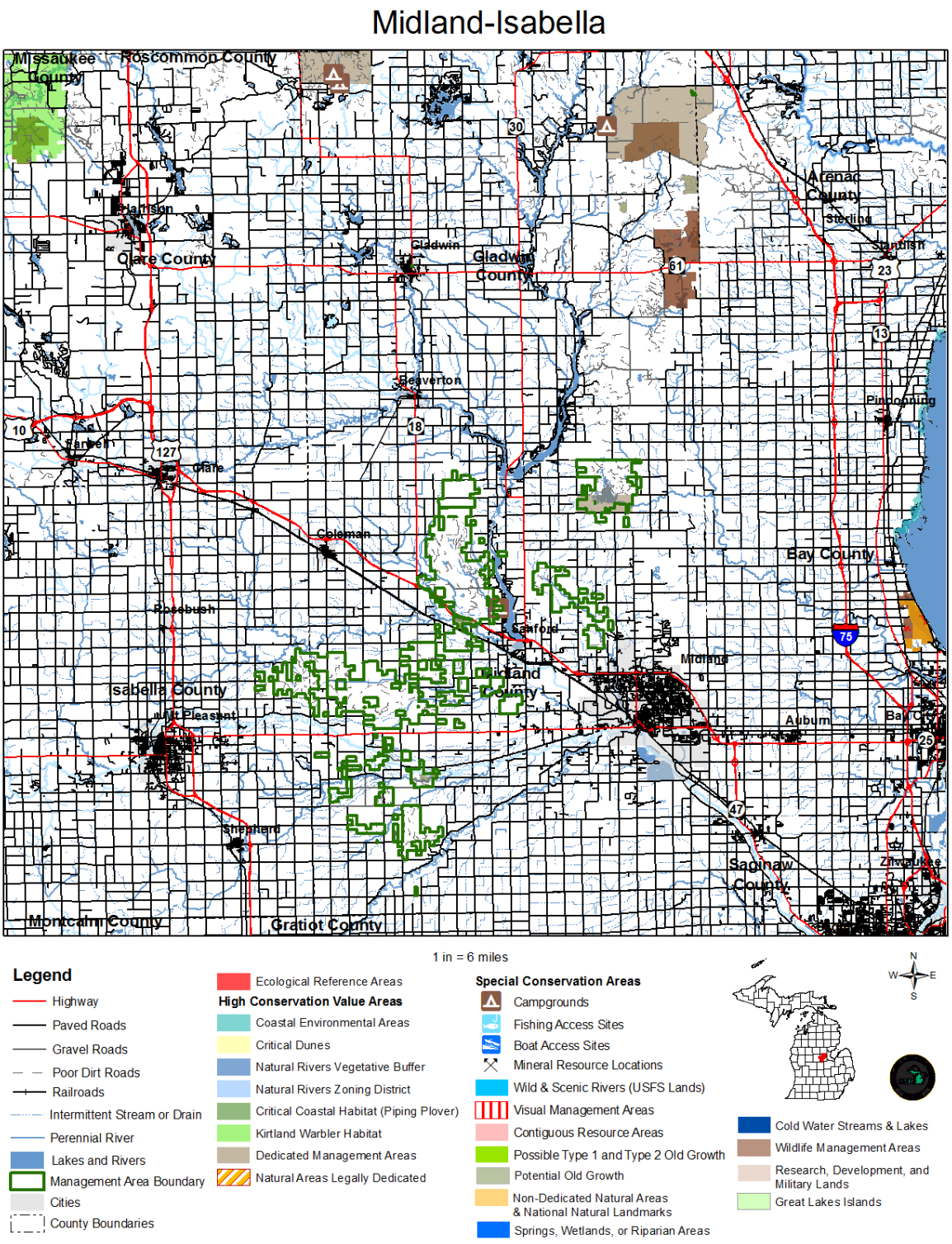

Figure 4.33.5. A map of the Midland-Isabella management area showing the special resource areas.

4.33.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. However, there are no significant forest health issues in this management area.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Currently there are no invasive species mapped in the management area or within a five-mile buffer of the management area. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

4.33.5 Aquatic Resources

Fisheries Division management unit biologists will review proposed forest management activities using the compartment review process and will consider the potential impact of proposed prescriptions upon riparian and aquatic values. Management prescriptions will be modified to account for riparian and aquatic values by applying the standards and guidance documents listed in the introduction to this plan section to the unique conditions specific to any given forest stand.

Prescription of riparian management zone widths greater than the minimum widths provided in IC4011 (*Sustainable Soil and Water Quality Practice on Forest Land*) must be justified and documented during the compartment review process.

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.33.1 and listed in Appendix F.

4.33.6 Fire Management

Lowland deciduous stands which have historically been a major component of this management area are rarely impacted by natural fire regimes.

The Michigan DNR has a prescribed fire program and maintains a well-trained staff to conduct prescribed burns for silviculture, habitat maintenance or habitat restoration. Each year, all burns prescribed on state forests, parks and wildlife game lands are evaluated and ranked, with funding allocated to the highest priority burns. The ability to fund prescribed burns is based on available funding, the total acres prescribed for burning and the prioritized ranking of individual burns. The demand for prescribed burning money frequently exceeds the amount of funding and some recommended burns may not be funded for that fiscal year. Once funded, the ability to implement a burn is dependent on suitable prescribed burning weather, a suitable fuel (vegetation) condition, local staffing and other resources.

The following fire management concepts should be applied in the management area:

- Consider opportunities to re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.33.7 Public Access and Recreation

Access for management and/or recreation is generally poor throughout this management area as a significant portion of the management area is swampy and inaccessible. In accordance with the Department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

The following trails and recreation facilities are located in this management area:

State Forest Campground (Figure 4.33.5)

- Black Creek State Forest Campground

Non-Motorized Trails (Figure 4.33.1)

- Midland to Mackinaw Boy Scout Trail
- Pere Marquette Rail-Trail

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

Management modifications that may minimize possible recreational trail and other infrastructure impacts are agreed upon by recreation staff in Parks and Recreation Division and Forest Resources Division staff through the compartment review process. Public input received through meetings, including the compartment review process and other forums, will also be considered. Trail protection specifications can be applied through the vegetative management system in the design and administration of timber management activities. Guidance for within stand retention may also be used along trails to minimize impacts which may include modifications to management such as maintaining conifers to shade winter snow trails or retaining trees along single track off-road vehicle trails to maintain the integrity of narrow trails. Where modifications to management may not be compatible with timber management objectives, opportunities to educate the public on the department's timber management policies may be considered. Specifications and guidance for management around trails may include, but is not limited to: vegetative management system sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the Department of Natural Resources Within Stand Retention Guidelines.

4.33.8 Oil, Gas and Mineral Development

Surface sediments consist of lacustrine (lake) sand, gravel, clay and silt and dune sand. The glacial drift thickness varies between 100 and 400 feet. Sand and gravel pits are located in this management area and there is potential for additional pits.

The Jurassic Red Beds and Pennsylvanian Saginaw Formation sub-crop below the glacial drift. The Saginaw is quarried for clay in brick making elsewhere in the state. Isabella and the western part of Midland County have been leased for nonmetallic mineral potash exploration. The only solution potash production in the state comes from the Hersey area in Osceola County.

Exploration and development for oil and gas from the shallow Mississippian Stray Sandstone to the deep Ordovician Prairie du Chien has occurred in and around this management area. Well spacing ranges from 40 acres up to 640 acres for the deeper formations. There is potential for additional development for these formations and most of the lands are currently leased in this management area. This is the very southern end of the Collingwood Formation and it may not have much potential in this management area.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.

Administration of oil and gas development on state forest land is provided by both the DNR and Department of Environmental Quality to ensure that minerals shall be developed in an orderly manner to optimize revenue consistent with other public interest and natural resource values.

Lease classification of state lands is guided by DNR Oil and Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil and Gas Lease Agreement are environmental terms which detail requirements for permits to drill issued by the Department of Environmental Quality, supervisor of wells pursuant to Part 615, 1994 PA 451, as amended. No operations are to take place in a wetland (as defined in Part 303 of 1994 PA 451, as amended) habitat critical to the survival of an endangered species and designated under provisions of Part 365 of 1994 PA 451, as amended or a site designated by the secretary of state to be of historical or archeological significance unless a plan to eliminate negative impacts to archeological or historical resources is agreed upon. In areas identified as having special wildlife, environmental, recreational significance and/or state surface require a development plan which will minimize negative impacts and will minimize surface waste while remaining consistent with the spacing requirements established by the supervisor of wells. All pipelines from the well site are required to follow existing well roads or utility corridors and that all pipelines are to be buried below plow depth. Abandoned well sites should be incorporated back into state forest stands as either forest openings or re-forested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.