

## 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.

# Upper Muskegon

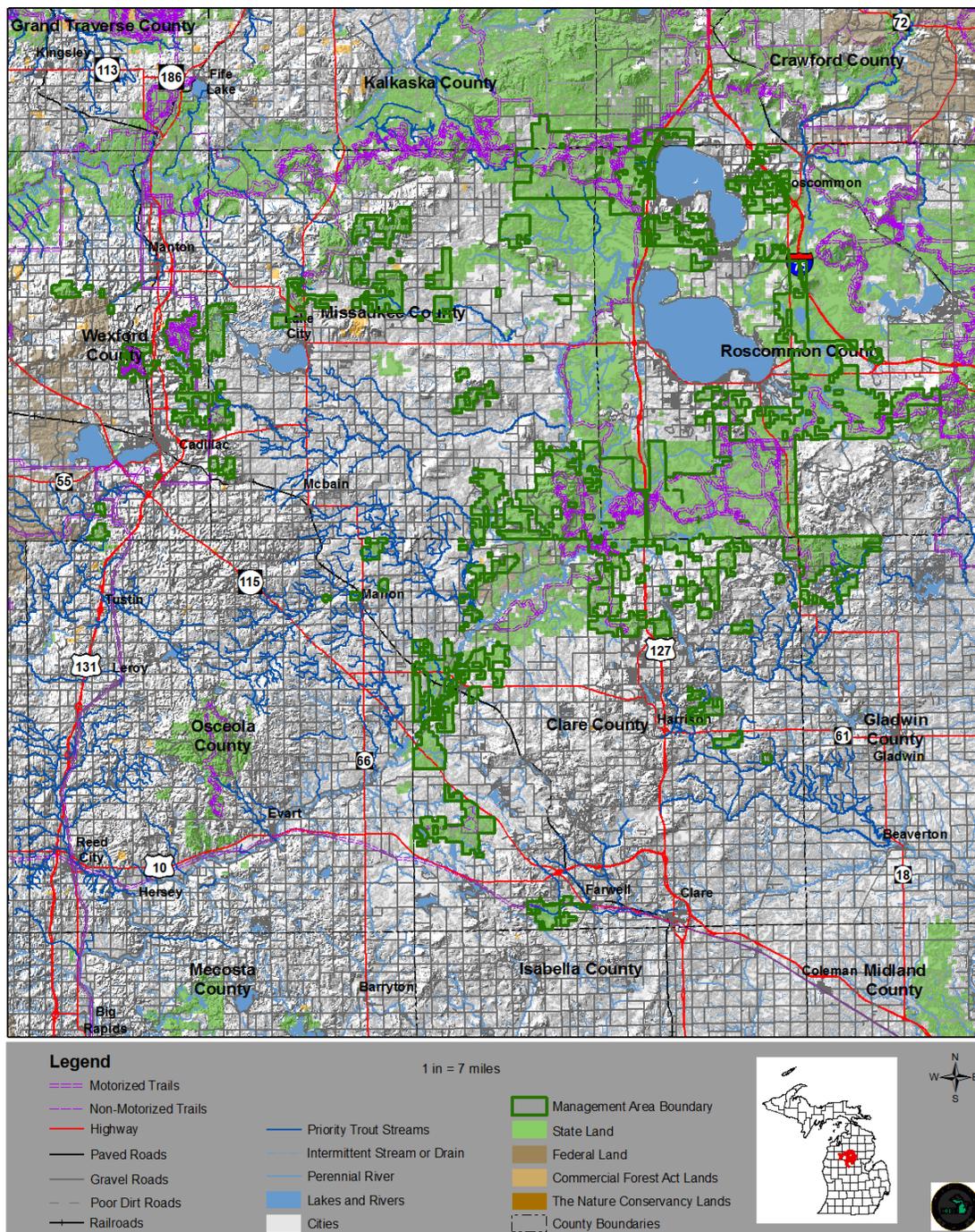


Figure 4.27.1. A map of the Upper Muskegon management area (dark green boundary) in relation to surrounding state forest and other lands in Wexford, Missaukee, Roscommon, Mecosta, Clare, Gladwin, Kalkaska and Crawford counties.

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.

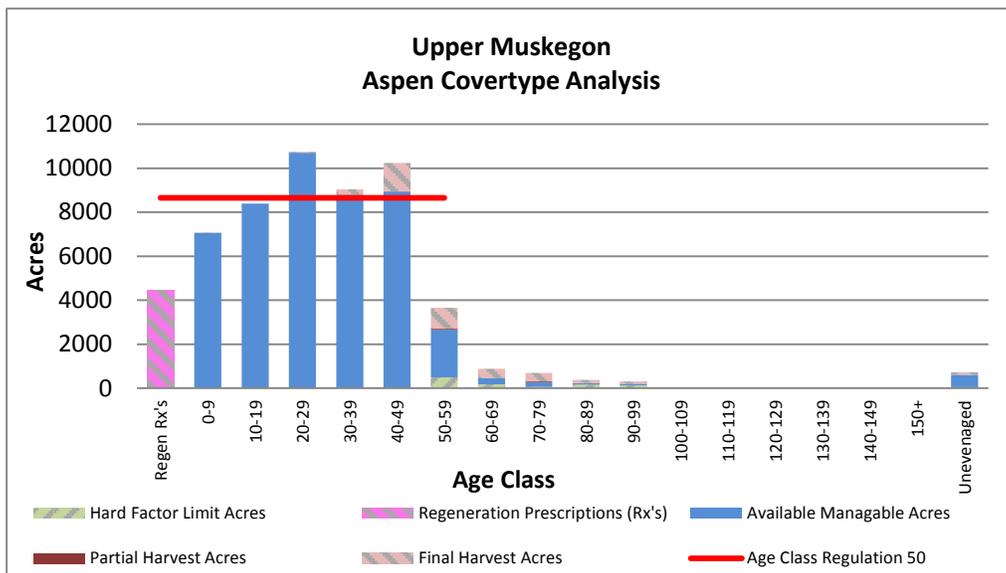


Figure 4.27.2. Age-class distribution for aspen in the Upper Muskegon management area (2012 Department of Natural Resources inventory data).

### 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.

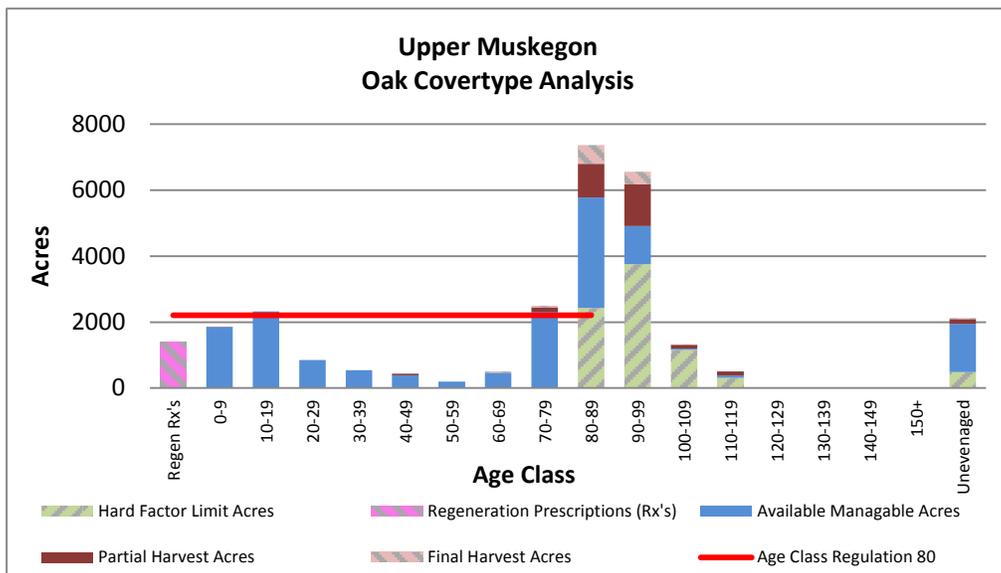


Figure 4.27.3. Age-class distribution for oak in the Upper Muskegon management area (2012 Department of Natural Resources inventory data).

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.

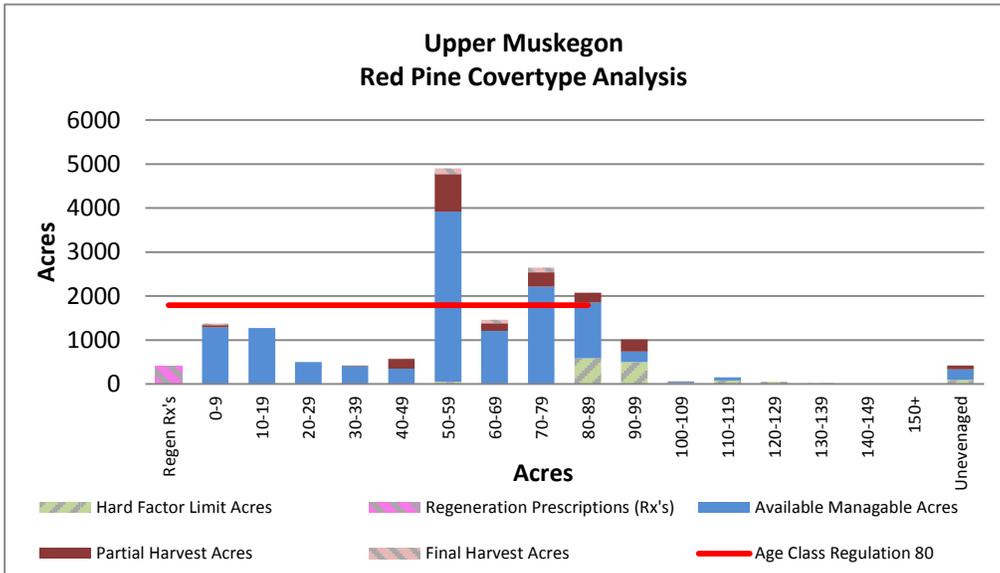


Figure 4.27.4. Age-class distribution for red pine in the Upper Muskegon management area (2012 Department of Natural Resources inventory data).

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.

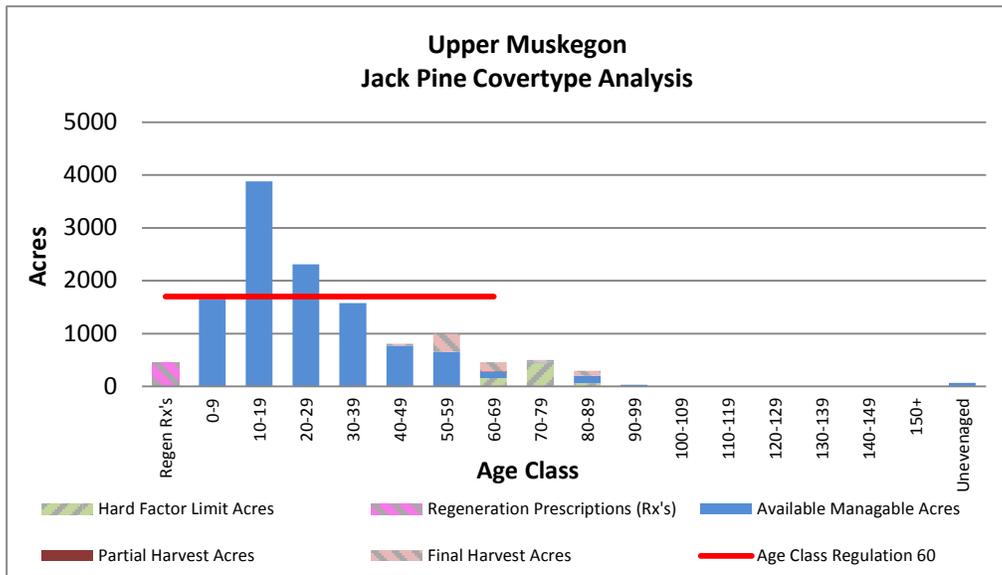


Figure 4.27.5. Age-class distribution for jack pine in the Upper Muskegon management area (2012 Department of Natural Resources inventory data).

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.

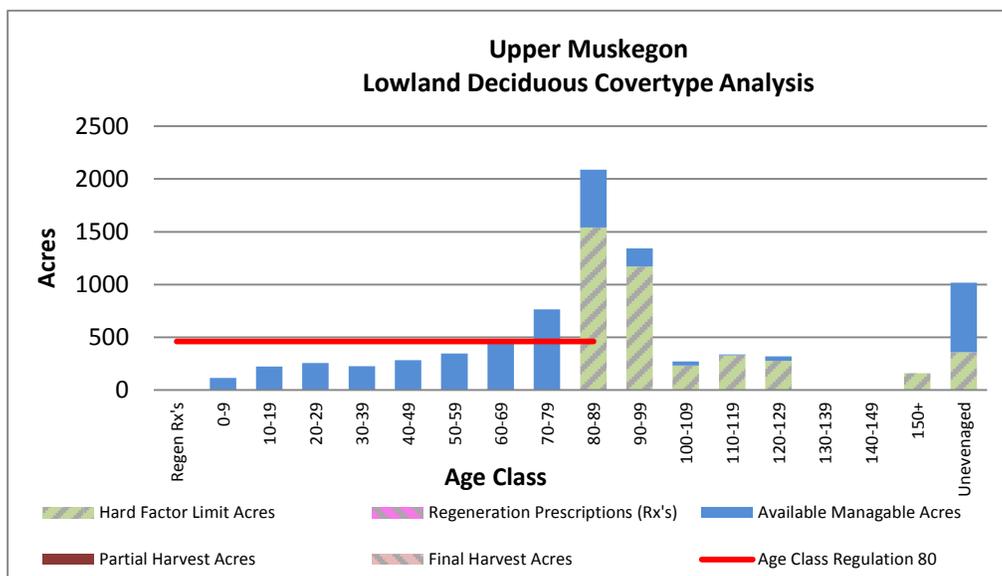


Figure 4.27.6. Age-class distribution for lowland deciduous in the Upper Muskegon management area (2012 Department of Natural Resources inventory data).

#### 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).

#### 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 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 than 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 junberry, 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:

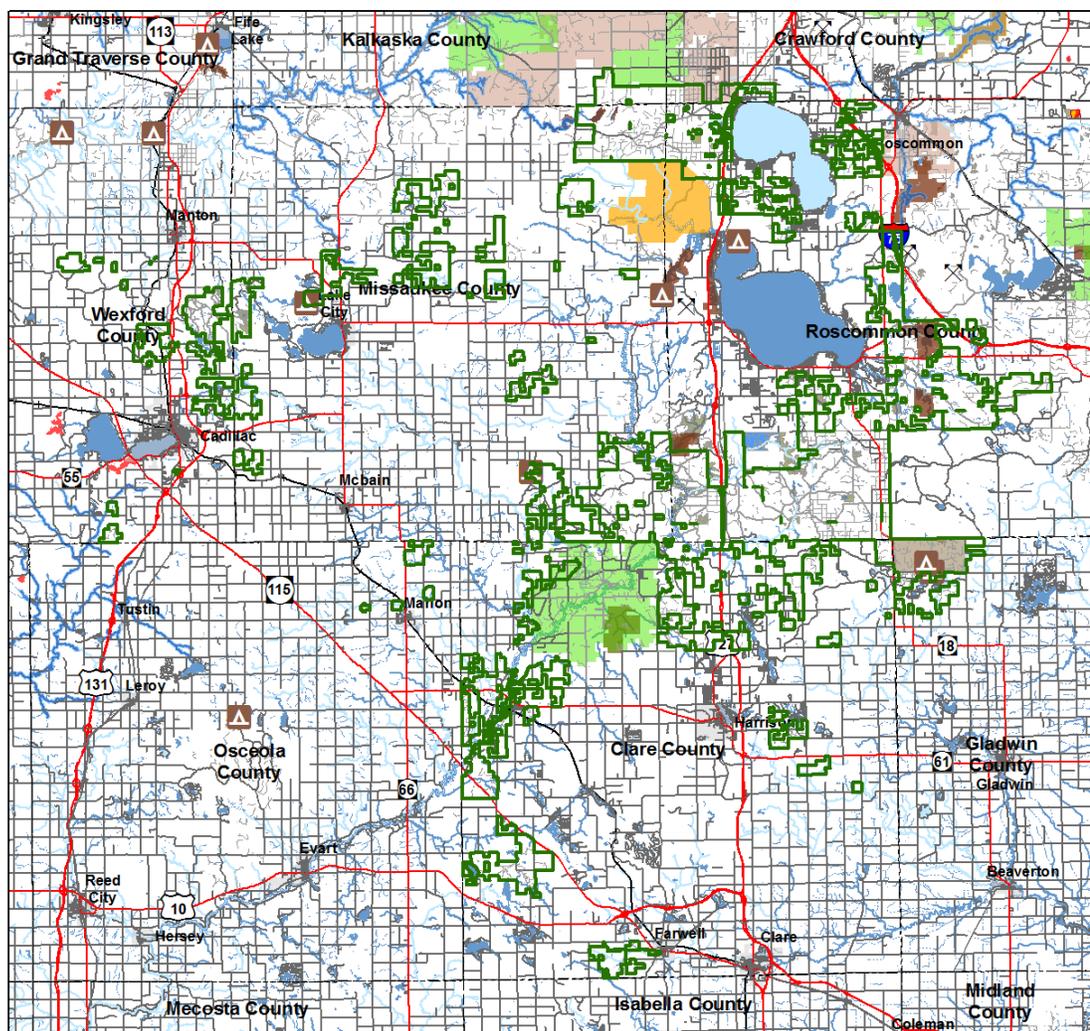
- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status 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						
<b>Natural Communities</b>														
Bog		S4/G3G5	Confirmed				Lowland open/semi-open	N/A						
Floodplain forest		S3/G3?	Confirmed				Lowland mixed	Mid						
<b>Birds</b>														
Northern goshawk	<i>Accipiter gentilis</i>	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						
Red-shouldered hawk	<i>Buteo lineatus</i>	T/G5/S3-4	Confirmed	PS	Very High	Boreal forest	Upland & Lowland Sp/F	Mid						
						Floodplain forest	Lowland mixed	Mid						
						Dry-mesic northern forest	White Pine	Late						
						Mesic northern Forest	Northern Hardwood	Late						
						Pine barrens	Jack Pine	Early						
						Dry northern forest	Jack Pine, Red Pine	Early						
Kirtland's warbler	<i>Dendroica kirtlandii</i>	LE/E/G1/S1	Confirmed	PS	Very High	Pine barrens	Jack Pine	Early						
						Dry northern forest	Jack Pine, Red Pine	Early						
Common loon	<i>Gavia immer</i>	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	<i>Haliaeetus leucocephalus</i>	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						
Osprey	<i>Pandion haliaetus</i>	SC/G5/S2-3	Confirmed	PS	Low	Dry-mesic northern forest	White Pine	Late						
						Mesic northern Forest	Northern Hardwood	Late						
						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						
<b>Fish</b>														
Bigmouth shiner	<i>Notropis dorsalis</i>	SC/G5/S4	Confirmed	MV	Moderate	Rivers	Aquatic	N/A						
<b>Butterfly</b>														
Dusted skipper	<i>Atrytonopsis hianna</i>	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	<i>Phyciodes batesii</i>	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						
<b>Insect</b>														
Secretive locust	<i>Appalochia arcane</i>	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						
						<b>Mussel</b>								
Slippershell mussel	<i>Alasmidonta viridis</i>	T/G4G5/S2S3	Confirmed	EV	Very High	Headwater Stream	Aquatic	N/A						
						Maintstem streams	Aquatic	N/A						
						Inland lake	Aquatic	N/A						
<b>Reptile</b>														
Spotted troutle	<i>Clemmys guttata</i>	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						
						<b>Wood turtle</b>								
						Wood turtle	<i>Glyptemys insculpta</i>	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												
<b>Plant</b>														
Hill's thistle	<i>Cirsium hillii</i>	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	<i>Cypripedium arietinum</i>	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.

# Upper Muskegon



### Legend

<ul style="list-style-type: none"> <li>— Highway</li> <li>— Paved Roads</li> <li>— Gravel Roads</li> <li>— Poor Dirt Roads</li> <li>— Railroads</li> <li>— Intermittent Stream or Drain</li> <li>— Perennial River</li> <li>— Lakes and Rivers</li> <li>— Management Area Boundary</li> <li>— Cities</li> <li>— County Boundaries</li> </ul>	<ul style="list-style-type: none"> <li>Ecological Reference Areas</li> <li><b>High Conservation Value Areas</b></li> <li>Coastal Environmental Areas</li> <li>Critical Dunes</li> <li>Natural Rivers Vegetative Buffer</li> <li>Natural Rivers Zoning District</li> <li>Critical Coastal Habitat (Piping Plover)</li> <li>Kirtland Warbler Habitat</li> <li>Dedicated Management Areas</li> <li>Natural Areas Legally Dedicated</li> </ul>	<ul style="list-style-type: none"> <li><b>Special Conservation Areas</b></li> <li>Campgrounds</li> <li>Fishing Access Sites</li> <li>Boat Access Sites</li> <li>Mineral Resource Locations</li> <li>Wild &amp; Scenic Rivers (USFS Lands)</li> <li>Visual Management Areas</li> <li>Contiguous Resource Areas</li> <li>Possible Type 1 and Type 2 Old Growth</li> <li>Potential Old Growth</li> <li>Non-Dedicated Natural Areas &amp; National Natural Landmarks</li> <li>Springs, Wetlands, or Riparian Areas</li> </ul>	<div style="text-align: center;"> </div> <div style="text-align: center;"> </div> <ul style="list-style-type: none"> <li>Cold Water Streams &amp; Lakes</li> <li>Wildlife Management Areas</li> <li>Research, Development, and Military Lands</li> <li>Great Lakes Islands</li> </ul>
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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.