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.

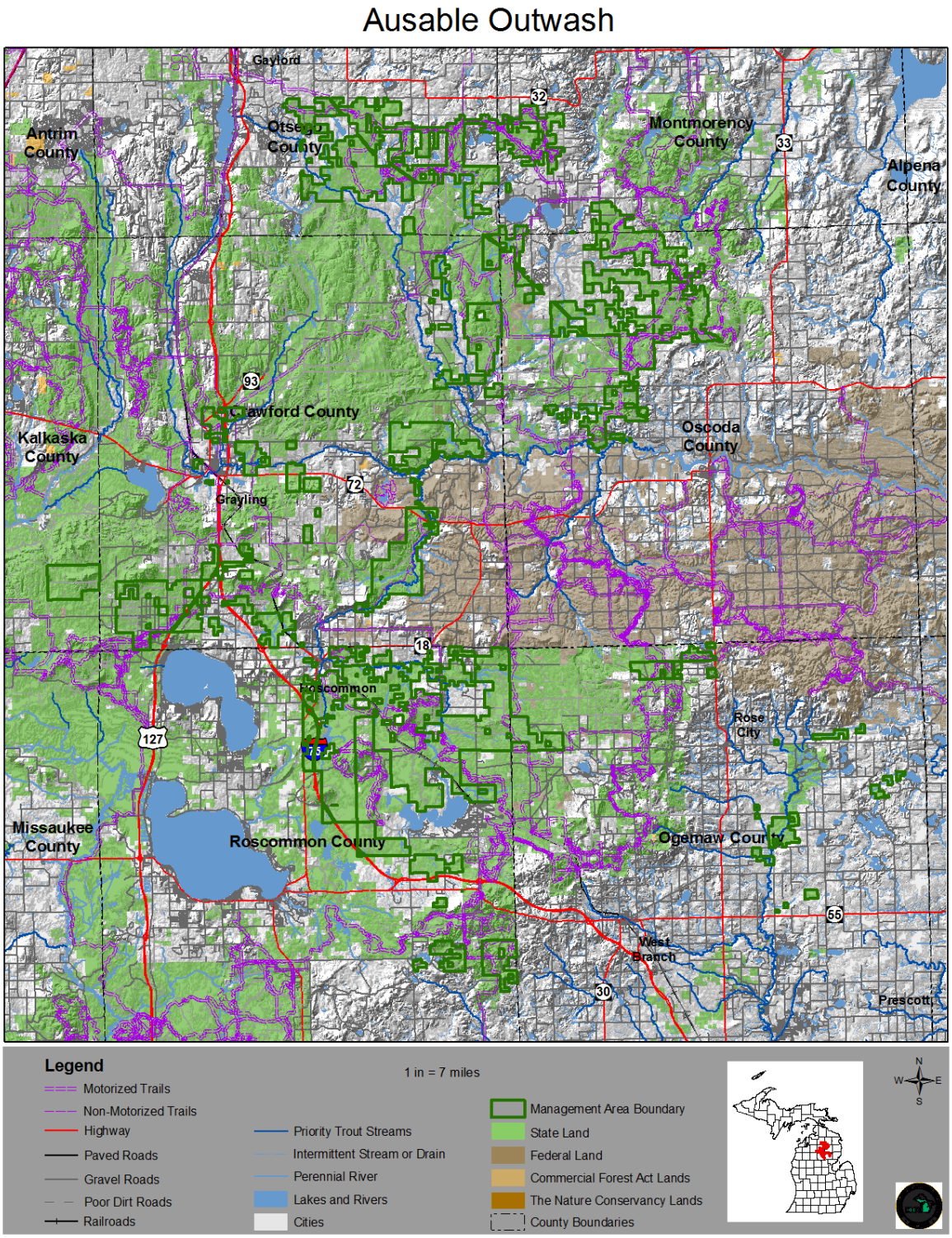

Figure 4.25.1. A map of the AuSable Outwash management area (dark green boundary) in relation to surrounding state forest and other lands in Otsego, Montmorency, Oscoda, Crawford, Roscommon, Kalkaska and Ogemaw counties, Michigan.

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.

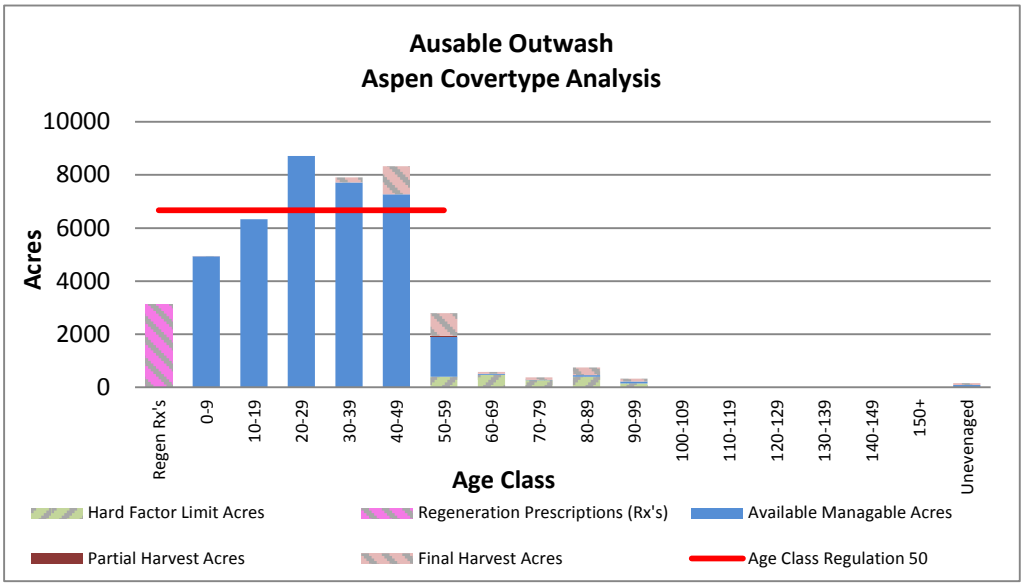

Figure 4.25.2. Age-class distribution for aspen in the AuSable Outwash management area (2012 Department of Natural Resources inventory data).

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.

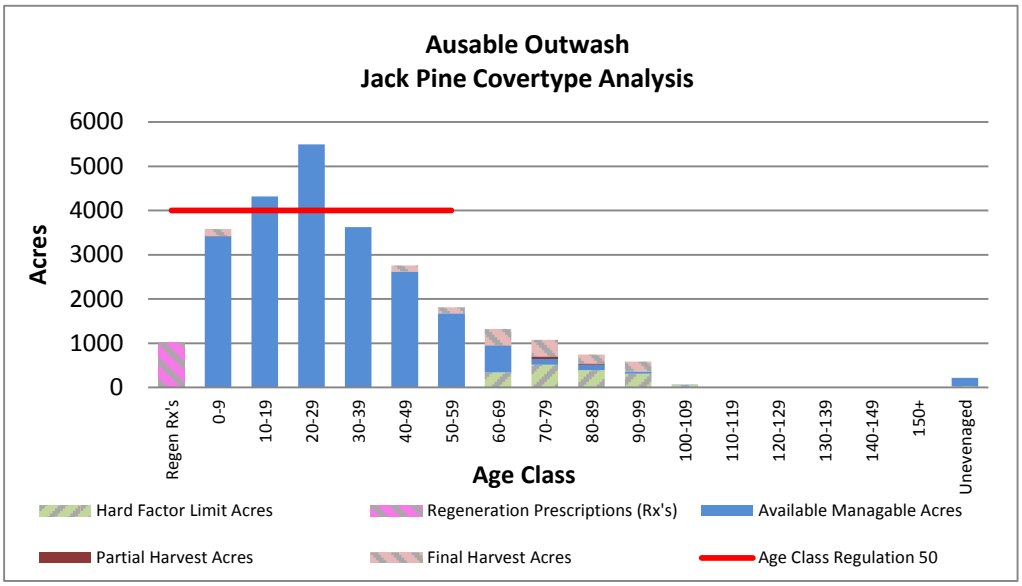

Figure 4.25.3. Age-class distribution for jack pine in the AuSable Outwash management area (2012 Department of Natural Resources inventory data).

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.

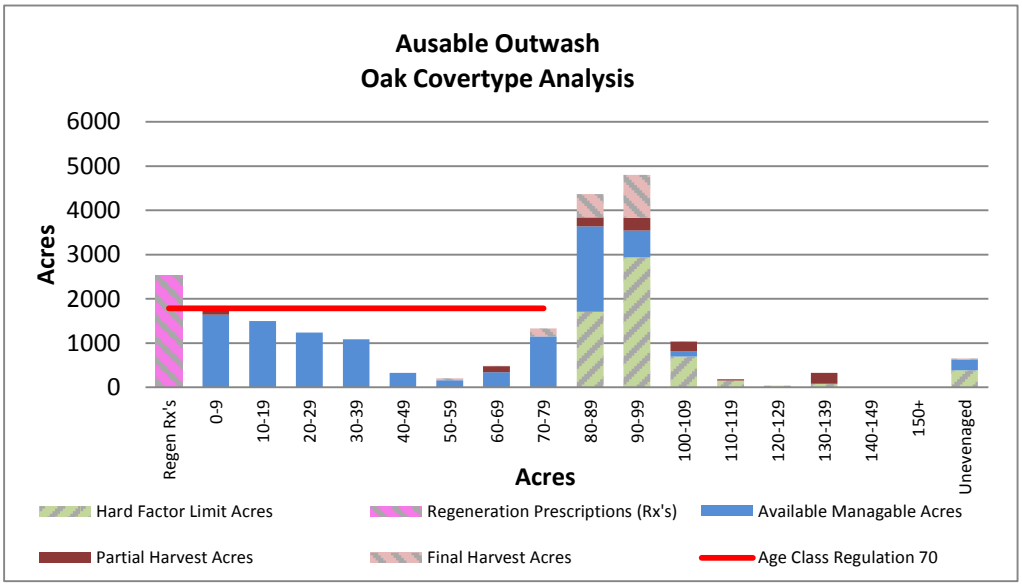

Figure 4.25.4. Age-class distribution for oak in the AuSable Outwash management area (2012 Department of Natural Resources inventory data).

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.

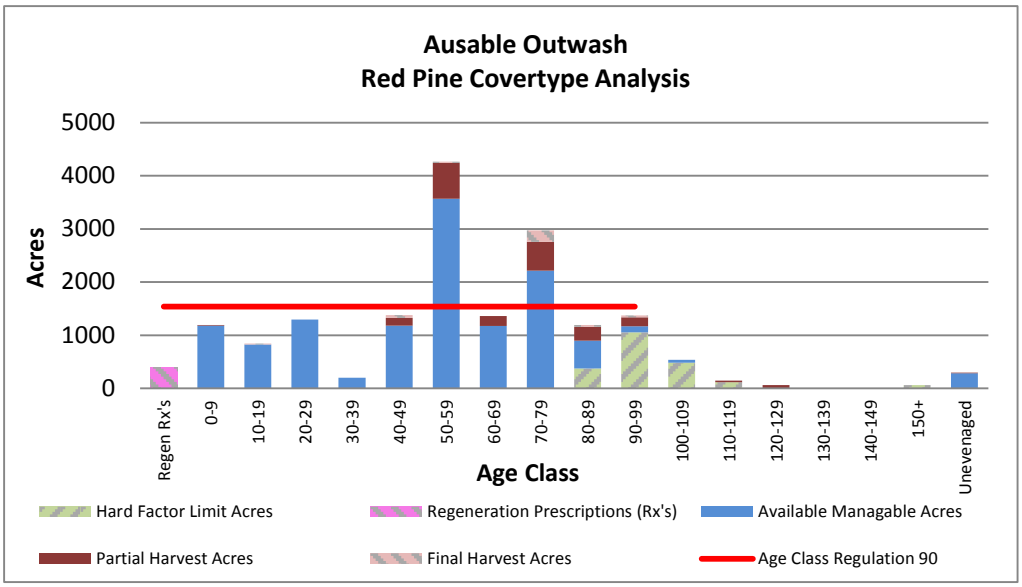

Figure 4.25.5. Age-class distribution for red pine in the AuSable Outwash management area (2012 Department of Natural Resources inventory data).

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.

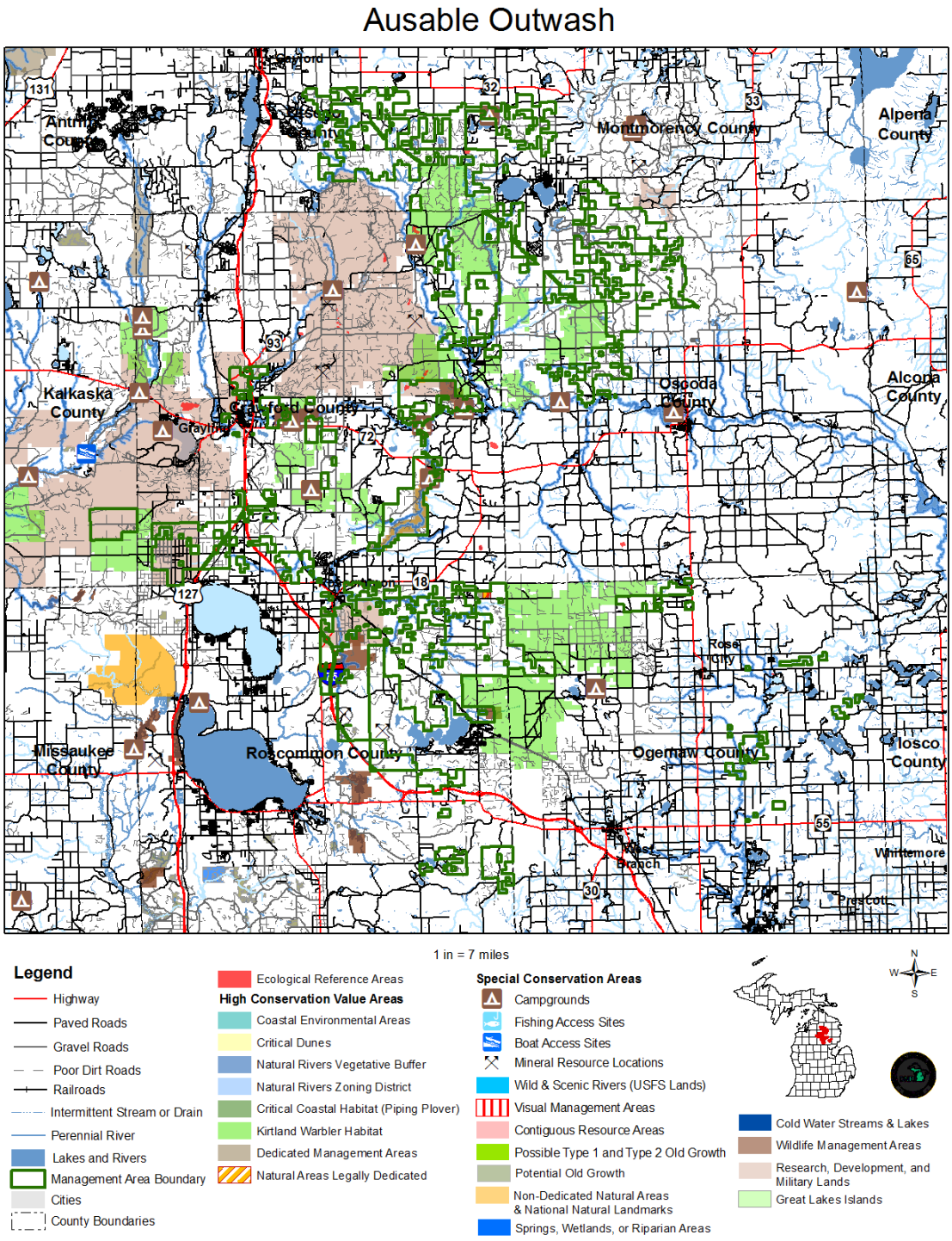

Figure 4.25.6. A map of the AuSable Outwash management area showing the special resource areas.

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.