

4.2 MA 2 – Mackinaw Lake Plain Management Area

Summary of Use and Management

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

Mackinaw Lake Plain

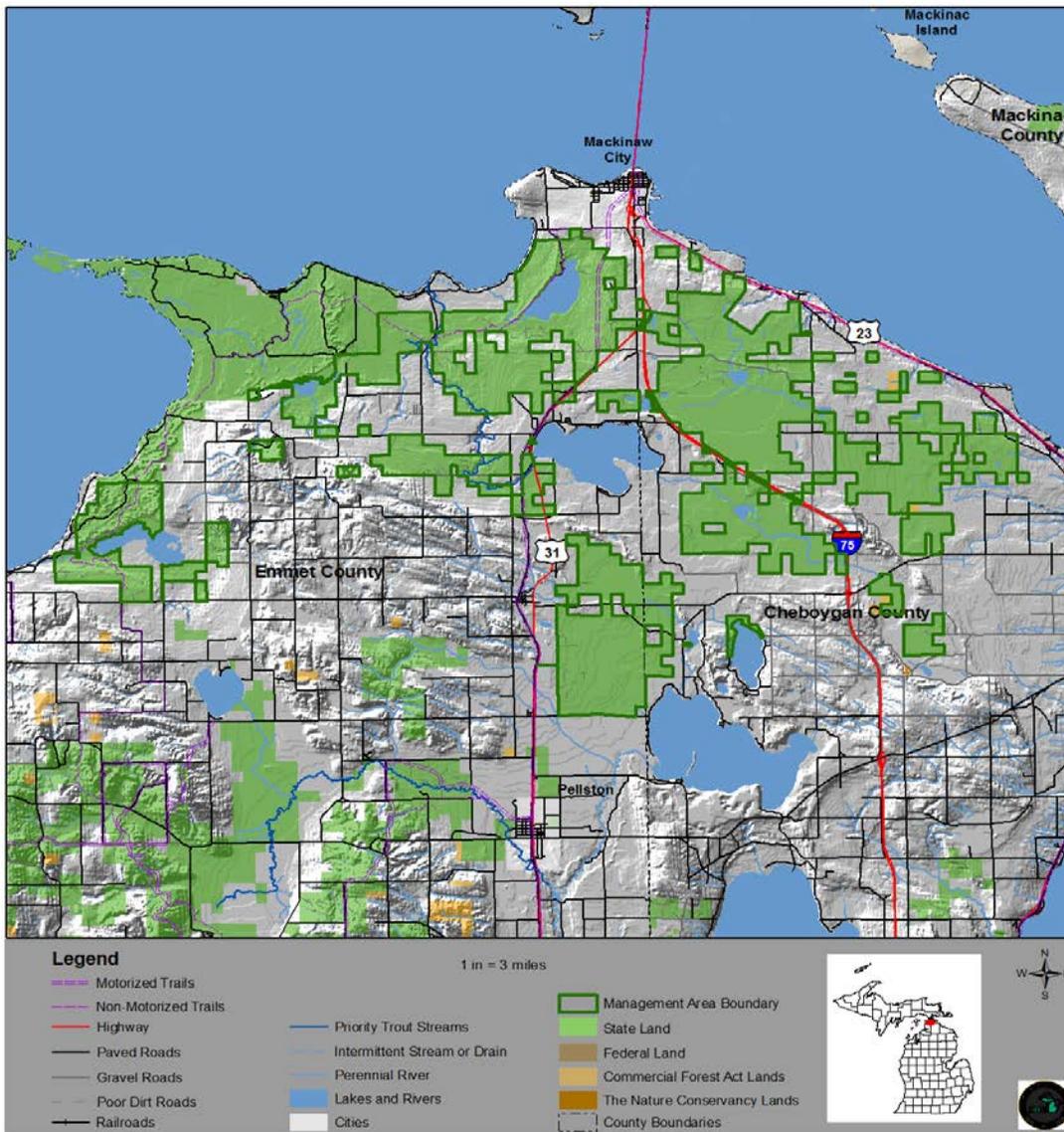


Figure 4.2.1. A map of the Mackinaw Lake Plain management area (dark green boundary) in relation to surrounding state forest and other lands in Emmet and Cheboygan counties, Michigan.

Introduction

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

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

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

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

4.2.1 Forest Cover Type Management

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

4.2.1.1 Forest Cover Type Management – Aspen

Current Condition

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

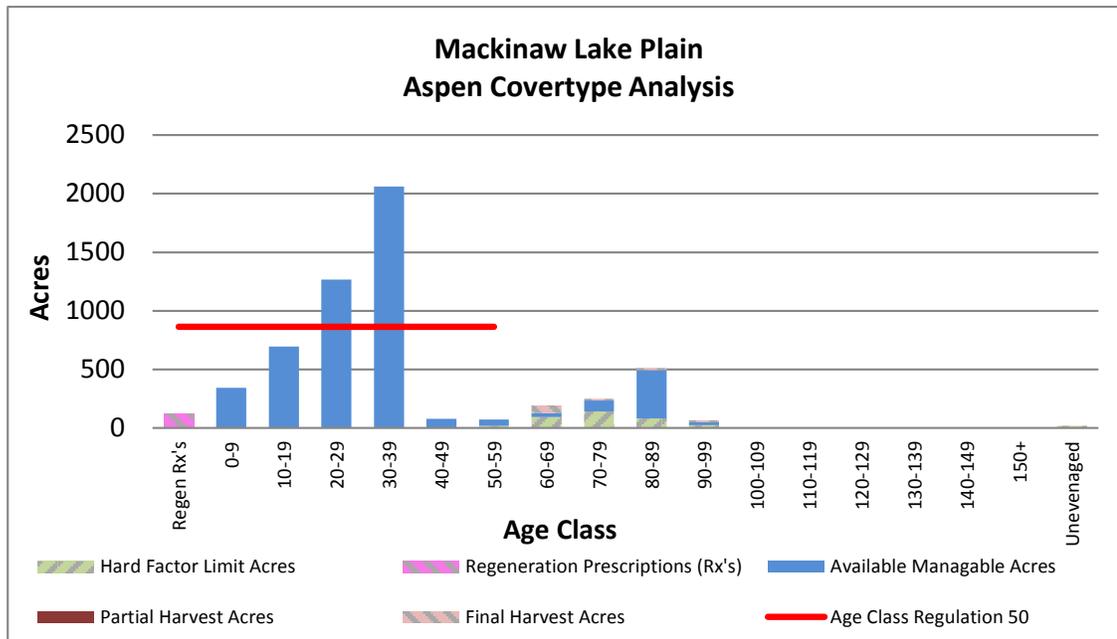


Figure 4.2.2. Age-class distribution for aspen in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

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

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

Desired Future Condition

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

10-Year Management Objectives

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

Long-Term Management Objectives

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

4.2.1.2 Forest Cover Type Management – Cedar and Lowland Conifer

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

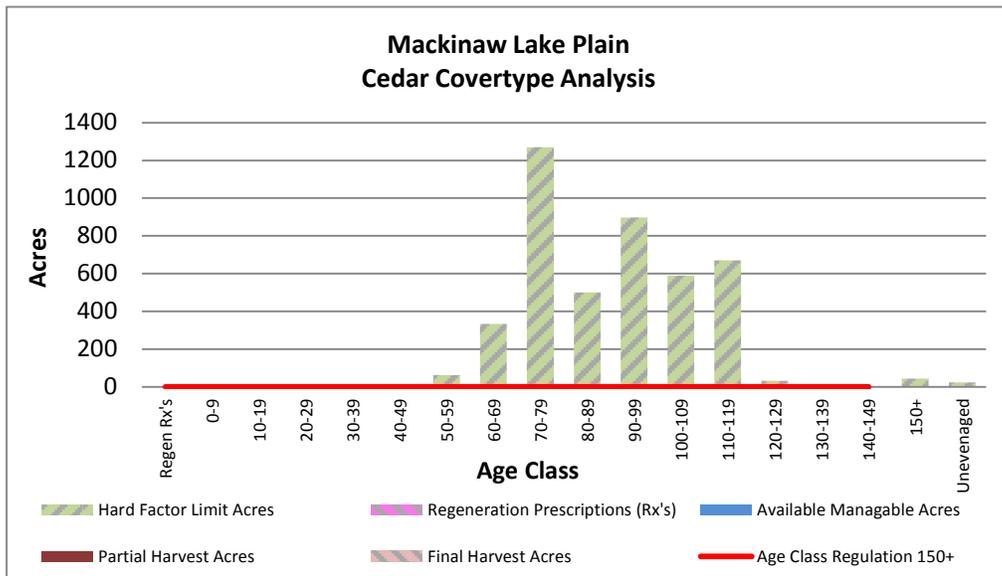


Figure 4.2.3. Age-class distribution for cedar in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

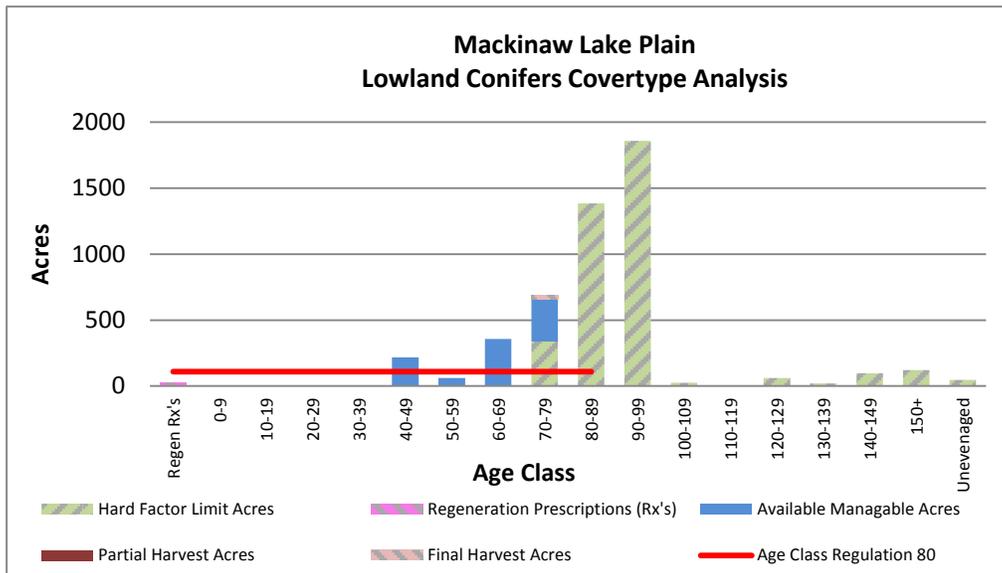


Figure 4.2.4. Age-class distribution for lowland conifers in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

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

10-Year Management Objectives

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

Long-Term Management Objectives

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

4.2.1.3 Forest Cover Type Management – Lowland Aspen/Balsam Poplar

Current Condition

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

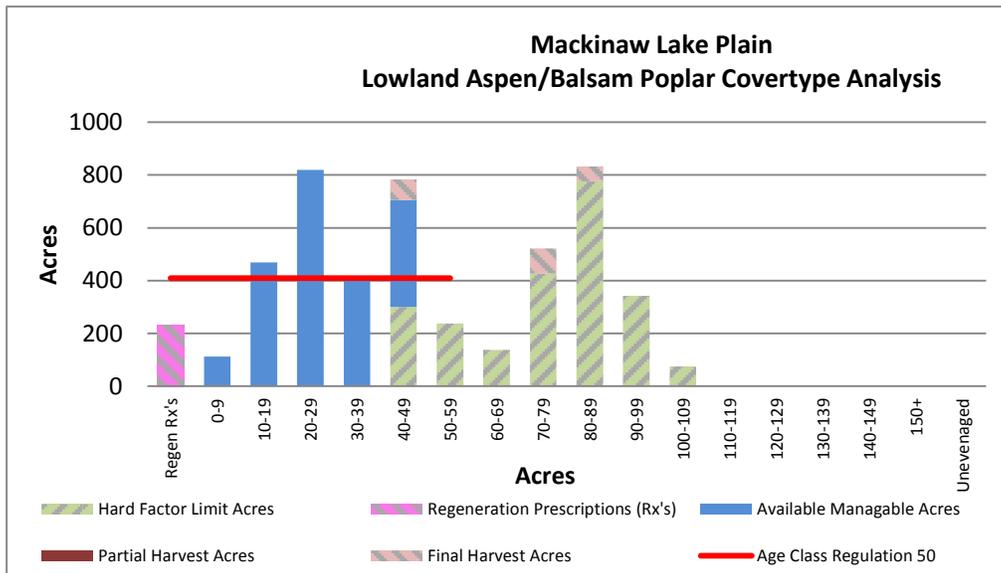


Figure 4.2.5. Age-class distribution for lowland aspen/balsam poplar in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

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

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

Desired Future Condition

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

10-Year Management Objectives

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

Long-Term Management Objectives

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

4.2.1.4 Lowland Deciduous

Current Condition

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

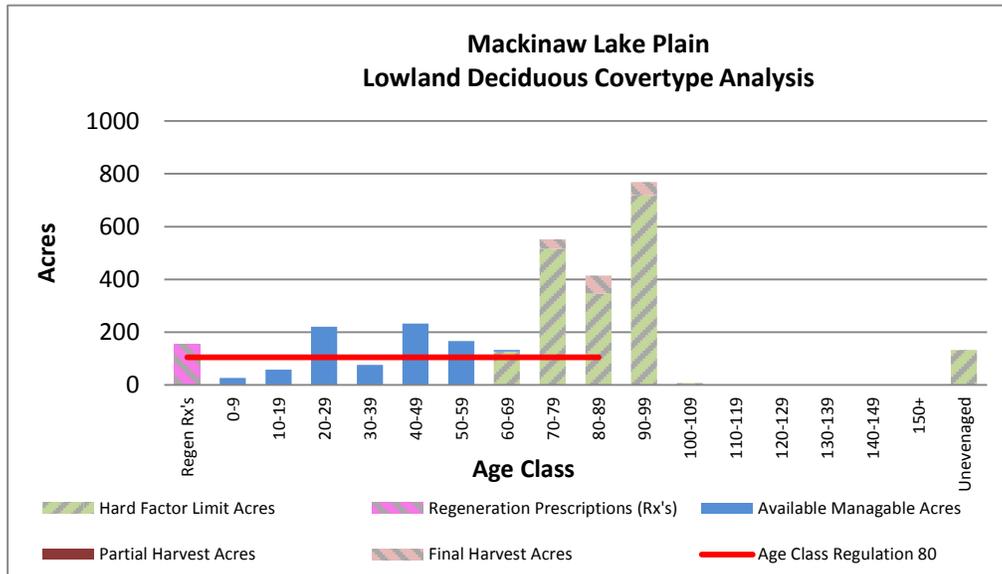


Figure 4.2.6. Age-class distribution for lowland deciduous in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

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

Desired Future Condition

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

10-Year Management Objectives

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

Long-Term Management Objectives

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

4.2.1.5 Forest Cover Type Management – Red Pine

Current Condition

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

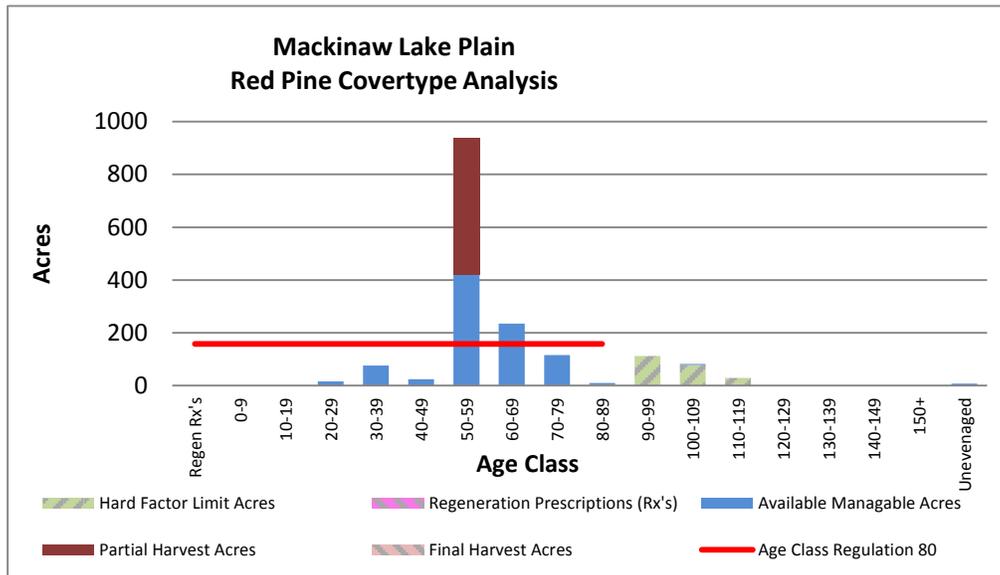


Figure 4.2.7. Age-class distribution for red pine in the Mackinaw Lake Plain management area (2012 Department of Natural Resources inventory data).

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

Desired Future Condition

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

10-Year Management Objectives

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

Long-Term Management Objectives

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

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

4.2.1.6 Forest Cover Type Management – Other Types

Current Condition

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

Desired Future Condition

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

10-Year Management Objectives

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

Long-Term Management Objectives

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

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

Current Condition

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

Desired Future Condition

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

10-Year Management Objectives

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

Long-Term Management Objectives

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

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

Current Condition

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

Desired Future Condition

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

10-Year Management Objectives

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

Long-Term Management Objectives

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

4.2.2 Featured Wildlife Species

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

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

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

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

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

American Woodcock

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

Wildlife Habitat Specifications:

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

Beaver

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

Wildlife Habitat Specifications:

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

Black Bear

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

Wildlife Habitat Specifications:

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

Golden-winged Warbler

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

Wildlife Habitat Specifications:

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

Mallard

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

Wildlife Habitat Specifications:

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

Pileated Woodpecker

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

Wildlife Habitat Specifications:

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

Red-headed Woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than five acres in size with a savannah-like dispersion of large trees (<50% canopy cover) with open understory and include tall trees or snags larger than 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 >12-inches in diameter at breast height.
 - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags in this management area.

Ruffed Grouse

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

Wildlife Habitat Specifications:

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

Snowshoe Hare

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

Wildlife Habitat Specifications:

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

Wild Turkey

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

Wildlife Habitat Specifications:

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

White-tailed Deer

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

Wildlife Habitat Specifications:

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

Wood Duck

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

Wildlife Habitat Specifications:

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

4.2.3 Rare Species and Special Resource Area Management

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

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

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

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

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

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

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

Mackinaw Lake Plain

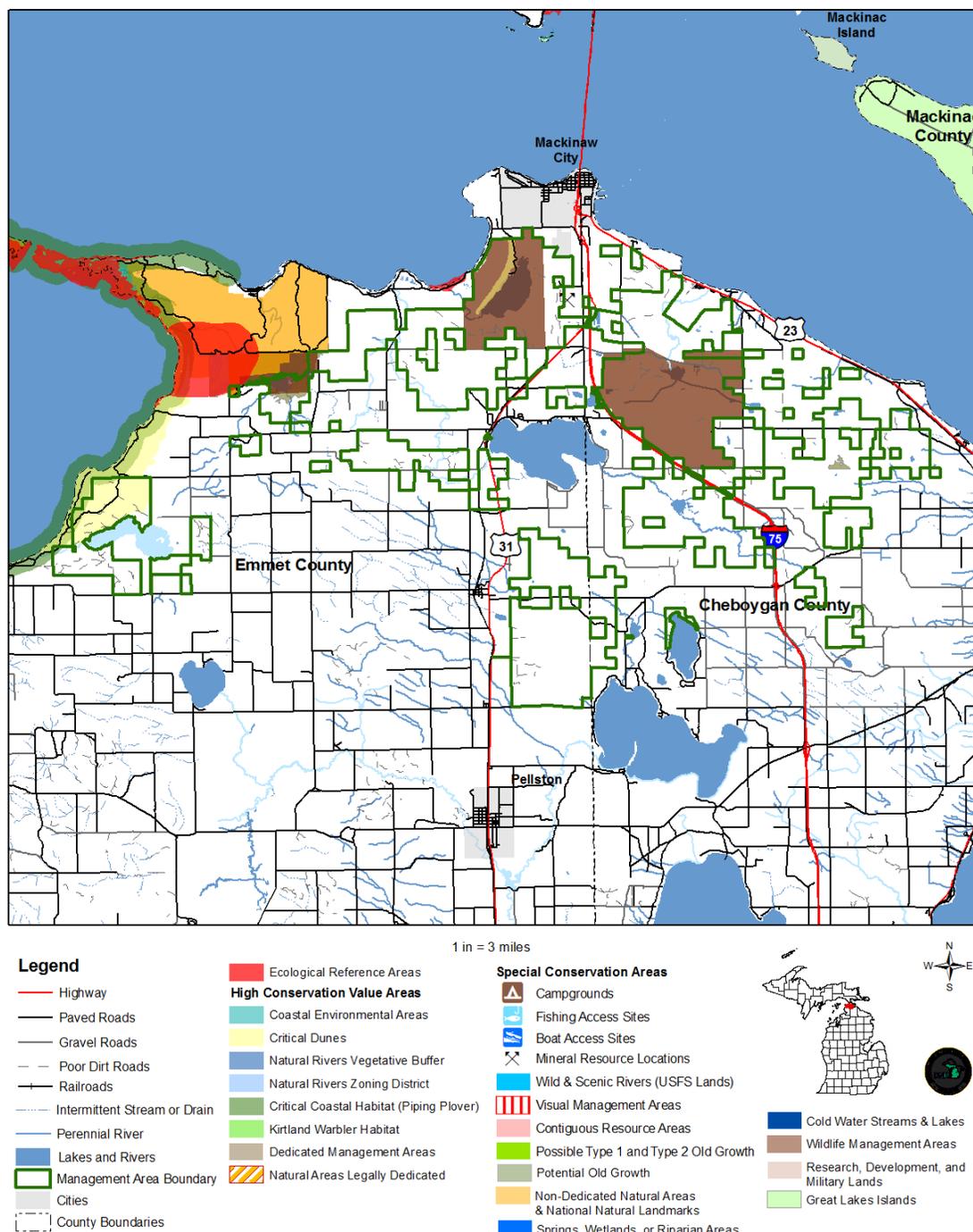


Figure 4.2.8. A map of the Mackinaw Lake Plains management area showing the special resource areas.

Management goals during this planning period:

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

4.2.4 Forest Health Management

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

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

Invasive Species

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

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

Mackinaw Lake Plain - FMD MAs	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	3	28	31	8
Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences	
Reed Canary Grass <i>Phalaris arundinacea</i>	1	Glossy Buckthorn <i>Rhamnus frangula</i>	4	
Spotted Knapweed <i>Centaurea stoebe</i>	1	Japanese Knotweed <i>Fallopia japonica</i>	2	
Wild Parsnip <i>Pastinaca sativa</i>	1	Phragmites (Common Reed) <i>Phragmites australis</i>	18	
-	-	Purple Loosestrife <i>Lythrum salicaria</i>	2	
-	-	Reed Canary Grass <i>Phalaris arundinacea</i>	1	
-	-	Tatarian Honeysuckle <i>Lonicera tatarica</i>	1	

4.2.5 Aquatic Resources

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

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

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

4.2.6 – Fire Management

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

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

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

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

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

4.2.7 Public Access and Recreation

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

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

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

4.2.8 Oil, Gas and Mineral Development

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

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

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

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

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

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

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