

4.20 MA 20 – Mackinac Mix Management Area

Summary of Use and Management

Vegetative management in the Mackinac Mix management area (MA) (Figure 4.20.1) will emphasize balancing the age classes of aspen and maintaining the red pine resource. Management will strive to produce a sustainable yield of various timber products, enhance game and non-game wildlife habitat, protect areas of unique character and provide for forest-based recreational uses. Expected issues in this 10-year planning period include: introduced pests and diseases, invasive non-native species, replacement of aging water crossings and increased recreational pressure.

Introduction

The Mackinac Mix management area is located in the south and western portion of the eastern Upper Peninsula in Mackinac and Chippewa counties. It has 65,648 acres of state-owned land. The primary attributes for this management area is timber production. Additional attributes which were important in identifying this management area include:

- The management area falls within the Niagaran Escarpment and Lake Plain subsection 8.1 of the eastern Upper Peninsula ecoregion (Albert, 1995).
- Landforms consist of large areas of lacustrine sand deposits that have flat to gently undulating surfaces. On this topography, only a few inches of elevation change can greatly alter drainage conditions. Drainage conditions also depend on depth to underlying bedrock or fine-textured substrate. Glacial erratic boulders consist of dolomite and provide habitat for special plants. Gravel extraction occurs in this landform. Depth to bedrock is often less than 50 feet. Several gravel pits are located within this management area.
- There are several known historical and prehistoric sites in this management area. This management area held the Rexton Civilian Conservation Corp camp and several logging camps. The Daughters of the American Revolution Red Pine stand is located near Rexton. The management area contains traditional areas for gathering cranberries, blueberries and morel mushrooms.
- Recreational opportunities include: snowmobiling, fishing and hunting, camping, motorcycling, ORV-riding.
- The management area contains special conservation area, deer wintering areas and a bog ecological reference area.

The state land within this management area is fairly concentrated and falls within the Sault Forest Management Unit. The Hiawatha Sportsman's Club borders the west side of the management area covering several thousand acres. The predominant cover types, acreages and projected harvest acres for the management area are shown in Table 4.20.1.

Mackinac Mix

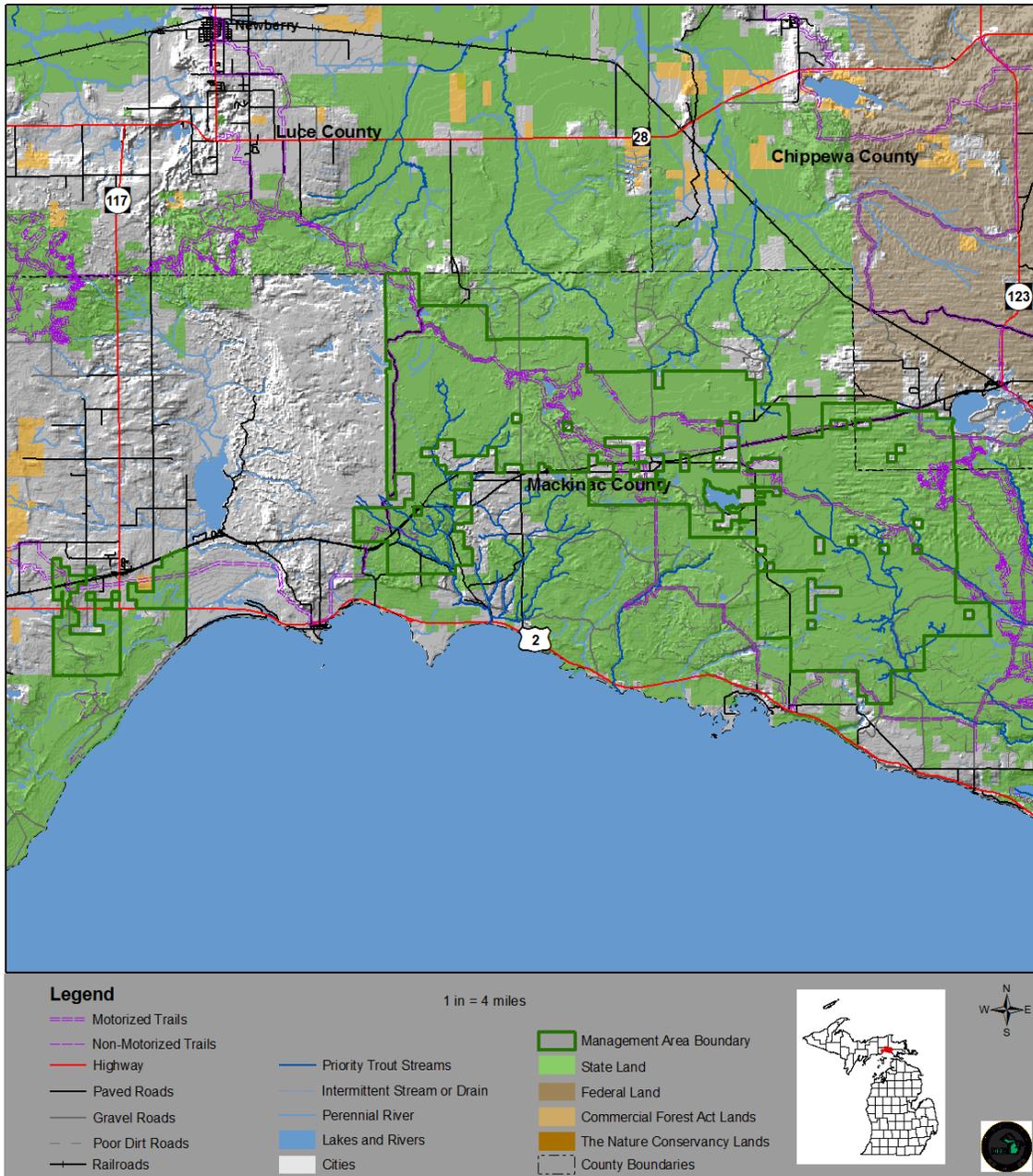


Figure 4.20.1. Location of the Mackinac Mix management area (dark green boundary) in relation to surrounding state forest lands, other ownerships and Lake Michigan.

Table 4.20.1. Current cover types, acreages, projected harvest acres and projected ten-year cover type acreage for the Mackinac Mix management area, eastern Upper 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
Cedar	25%	16,210	1,504	14,706	100	0	16,210	919	0
Lowland Open/Semi-Open Lands	17%	11,150	0	11,150	0	0	11,150	0	0
Aspen	13%	8,827	94	8,733	267	0	8,827	1,455	0
Northern Hardwood	11%	7,271	91	7,180	0	3,407	7,271	0	3,407
Lowland Conifers	6%	4,046	1,026	3,020	336	0	4,046	336	0
Red Pine	6%	3,816	44	3,772	0	1,318	3,816	419	1,318
Lowland Spruce/Fir	4%	2,924	1,409	1,515	168	0	2,924	168	0
Upland Open/Semi-Open Lands	3%	2,051	0	2,051	0	0	2,051	0	0
Mixed Upland Deciduous	2%	1,328	98	1,230	176	251	1,328	176	251
Upland Spruce/Fir	2%	1,012	22	990	95	0	1,012	141	0
Upland Mixed Forest	2%	1,010	10	1,000	244	362	1,010	111	362
Misc Other (Water, Local, Urban)	1%	512	0	512	0	0	512	0	0
Others	8%	5,491	1,542	3,949	442	473	5,491	425	598
Total	100%	65,648	5,840	59,808	1,828	5,811	65,648	4,150	5,936

Others include: tamarack, white pine, lowland deciduous, paper birch, lowland mixed forest, upland conifers, hemlock, lowland aspen/balsam poplar, natural mixed pines, jack pine and planted mixed pines.

4.20.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of Desired Future Conditions, 10-Year Management Objectives and Long-Term Management Objectives for each of the major cover types or forest communities within the management area. This information applies to those portions of the forest where active management (i.e., timber harvest, prescribed fire, planting and 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 tree species and other vegetation, they are classified by the predominant species.

All of the following cover types are valued commercially for their timber products; ecologically as sources of habitat for numerous species; and for the variety of recreational opportunities they provide. Harvesting these cover types will provide for a continuous flow of forest products and values.

Section 4.20.1.1 Forest Cover Type Management - Cedar

Current Condition

Cedar occurs on 16,210 acres (25%) of the management area (Table 4.20.1). There are several deer wintering habitat special conservation areas in this management area. Maintaining a closed canopy structure provides important cover for deer which reduces the snow depth within the stands. There has been a small amount of harvest and regeneration work in this management area, but none recently (Figure 4.20.2). Regeneration of cedar is often difficult here and some stands regenerated to a mix of conifers and tag alder rather than cedar.

Currently there are no acres of cedar with a harvest prescribed. There are 1,504 acres of cedar that have site conditions limiting harvest this entry period. These hard factor limited acres have been removed from the total number of manageable acres available for harvest calculations. Cedar stands in areas inaccessible for harvest will be subject to natural processes, resulting in a range of successional stages.

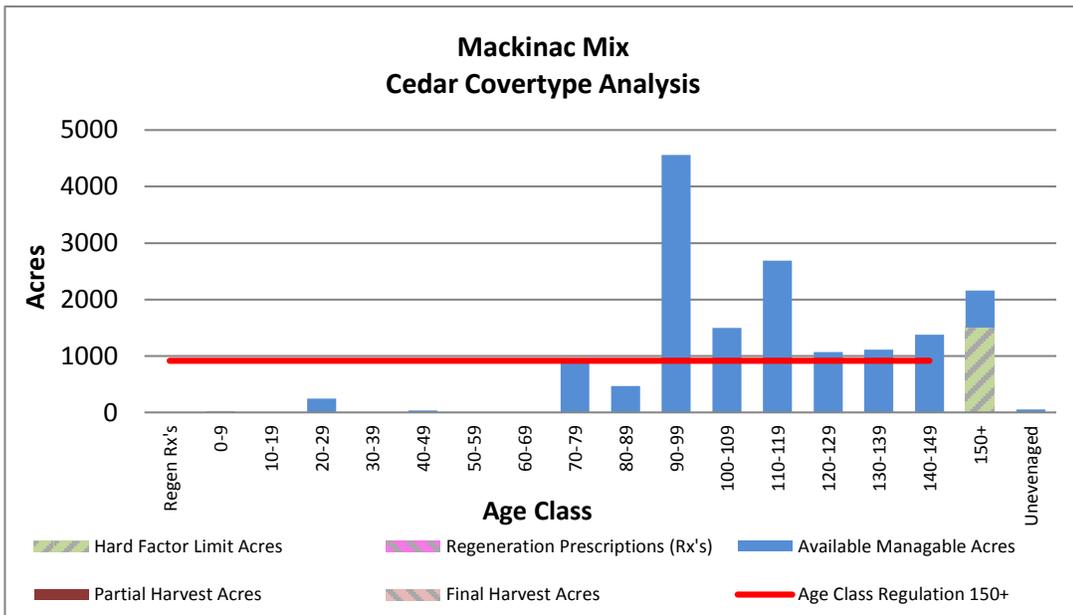


Figure 4.20.2. Age-class distribution of cedar in the Mackinac Mix management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- In areas where deer browse is a concern, these stands may not be actively harvested at this time; and
- Outside of deer wintering areas, cedar may be maintained through even aged management, balancing acres between 0-159 years of age providing for a regulated harvest, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- The 10-year projected final harvest of cedar is 100 acres. However harvest of this type, if it occurs, may vary widely from the projected harvest in order to meet the long term management objectives.
- Ensure that cedar and/or hemlock recruitment/regeneration is reliable if harvesting in this cover type.

Long-Term Management Objectives

- Develop a comprehensive deer wintering management plan;
- Cedar stands will be managed to maintain winter habitat for deer in wintering areas and to retain this forest type in the landscape;
- Look for opportunities to test different methods of regenerating cedar, especially outside the deer wintering areas; and
- Consider harvest of cedar before rotation age to begin to diversify the age classes providing for a regulated harvest of approximately 919 acres per decade (red line in Figure 4.20.2).

Section 4.20.1.2 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

Lowland open/semi-open lands occur on 11,150 acres (17%) (Table 4.20.1). This category is a combination of lowland shrub (5,071 acres), treed bog (3,137 acres), bog (1,843 acres) and marsh (1,099 acres). These cover types function ecologically as sources of habitat for numerous species of wildlife. These stands are found in association with creeks, rivers and lowland forested stands. Some of these stands fall within the special conservation area deer wintering areas and within the ecological reference areas.

Desired Future Condition

- Lowland open/semi-open lands will be retained in their current state to ensure an adequate level of wildlife habitat and recreational opportunity while protecting the special conservation area and ecological reference area values found in these cover types.

Long-Term Management Objectives

- Within these stands allow natural processes to occur while protecting their ecological values from man-made disturbances.

Section 4.20.1.3 Forest Cover Type Management - Aspen

Current Condition

Aspen stands occur on 8,827 acres (13%) of the management area (Table 4.20.1). Aspen is distributed throughout the management area on outwash plains, lake plains and moraines with dry-poor nutrient to mesic-medium to rich nutrient sites. Kotar habitat types include PARVAa, ATFD, AFPo and AFOAs (see appendix E). Aspen has been consistently harvested and regenerated resulting in almost 85% of the stands being less than 40 years old (Figure 4.20.3). Most of the aspen stands in this management area have a variety of other tree species mixed in, including: red maple, paper birch, balsam fir, white pine and cedar.

There are currently 266 acres of aspen prescribed for final harvest. Approximately 400 acres of other cover types are expected to convert to aspen after harvest. These acres are shown in Figure 4.20.3 the regeneration prescriptions column. There are 94 acres of aspen that have site conditions limiting their harvest at this time. These hard factor limited acres have been removed from the total number of manageable acres available for harvest calculations. Inaccessible aspen areas will eventually succeed to late successional species.

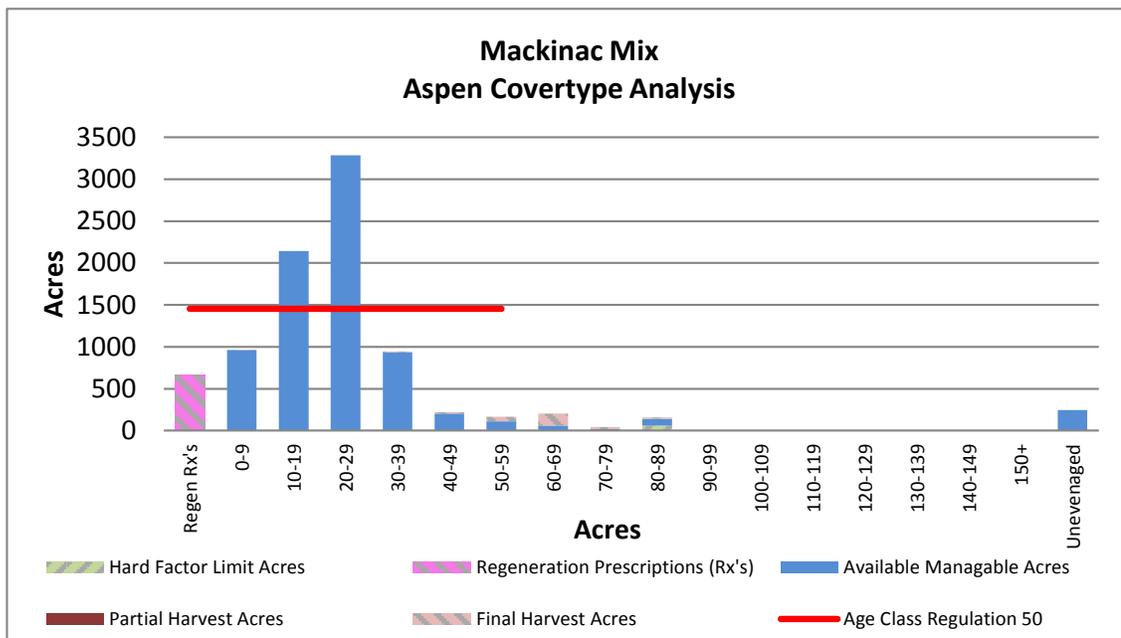


Figure 4.20.3. Age-class distribution of aspen in the Mackinac Mix management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Aspen dominated stands will be maintained on operable sites through even-aged management, with acres balanced between 0-59 years of age providing for regulated harvest, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- The projected 10-year final harvest of aspen is 267 acres which is significantly lower than the regulated amount as most of the aspen stands in the management area are well below rotation age.

Long-Term Management Objectives

- Balance the age classes of available aspen providing for a regulated harvest of approximately 1,455 acres per decade.

Section 4.20.1.4 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood stands occur on 7,271 acres (11%) of the management area (Table 4.20.1). The majority of the northern hardwood stands have been classified as uneven-aged. Northern hardwood stands are distributed on mesic-poor to rich nutrient sites with Kotar habitat types of PArVAa, ATFD, AFPo and AFOAs (see appendix E). Hardwood stands in this management area mainly consist of sugar maple associations of average to good quality. Some stands contain vernal ponds and small glacial depressions. In northern hardwood stands where quality warrants, use single tree selection harvests in stands with a basal area over 120 square feet per acre, decreasing stocking levels to a basal area of approximately 80 square feet per acre. In general, this will allow most hardwood stands to be select harvested every 20 years. These periodic selection harvests will continue to move the stands toward an uneven-aged, multi-storied structure. Where site quality is poor shelterwood and other even-aged harvesting systems will be considered. Past harvests using even-aged systems are shown in the immature column in Figure 4.20.4.

Beech bark disease has impacted these stands, resulting in high beech mortality. Many stands have had or will have salvage harvests. Northern hardwood stands that had a component of beech now have decreased stocking levels due to beech bark disease mortality and salvage harvesting. Further selection harvesting will be delayed due to resultant lower than normal residual basal area. Garlic mustard has been found in the management area negatively effecting the regeneration of hardwoods. Prescribed burning has been successful in reducing the amount of garlic mustard plants.

Currently there are 1,527 acres with a partial harvest or selection method of cut assigned (Figure 4.20.4). There are some acres of northern hardwood with a harvest assigned that are expected to convert to other cover types after harvest and some acres of other cover types that are expected to convert to northern hardwood after harvest. These acres are shown in Figure 4.20.4 as acres with final harvest prescribed and in the immature column. There are 91 acres of northern hardwood that have site conditions limiting their harvest at this time. These hard factor limited acres have been removed from the total number of manageable acres available for harvest calculations.

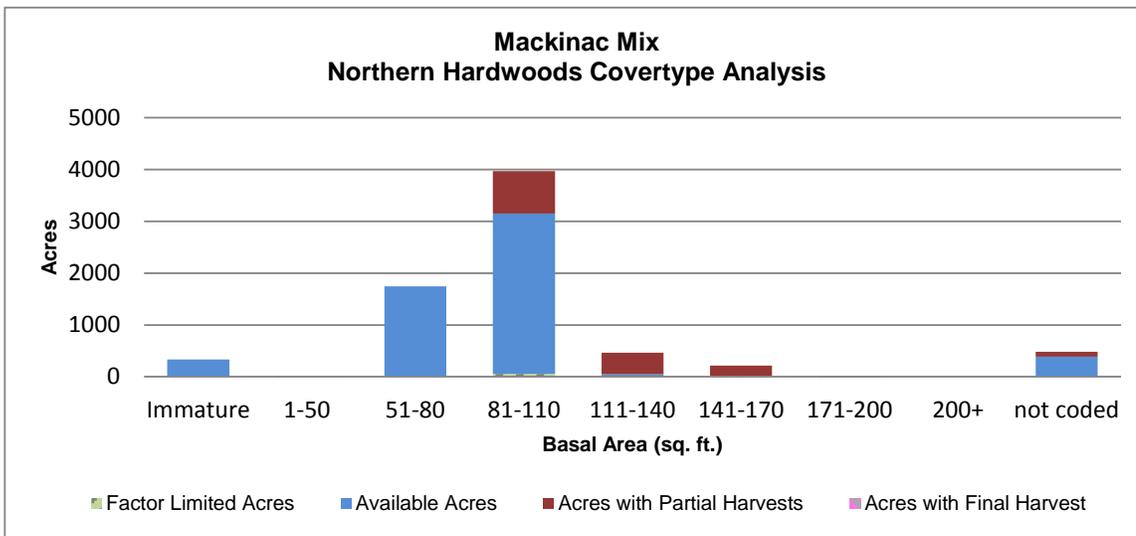


Figure 4.20.4. Basal area distribution of northern hardwood in the Mackinac Mix management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Northern hardwood communities will be maintained on operable sites by using individual tree selection harvesting to provide uneven-aged composition and structurally diverse stands; and
- Harvesting will provide for a continuous flow of timber products and a variety of wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Continue salvage harvests of beech affected by beech bark disease using Beech Bark Disease Management Guidelines;
- Evaluate stands that had a component of beech to determine the impact of beech bark disease on regeneration;
- Track beech regeneration in these stands;
- Consider herbicide applications and the planting of hard mast producing trees including oak and disease resistant beech; and
- The 10-year projected partial or selection harvest of northern hardwood is 3,407 acres.

Long-Term Management Objectives

- Select harvest northern hardwood stands on a 20-year cycle; and
- Continue efforts to eradicate garlic mustard.

Section 4.20.1.5 Forest Cover Type Management – Lowland Conifer

Current Condition

Lowland conifer occurs on 4,046 acres (6%) of the management area (Table 4.20.1). Lowland conifer stands in this area have been successfully harvested and regenerated with natural regeneration (Figure 4.20.5). Some of these stands are within deer wintering area special conservation areas. Many of the stands are found in association with streams and are sometimes inaccessible.

Currently there are 53 acres of lowland conifers with a final harvest prescribed. Approximately 55 acres of other cover types are expected to convert to lowland conifers after harvest. These acres are shown in Figure 4.20.5 in the regeneration prescriptions column. There are 1,026 acres of lowland conifers that have site conditions limiting their harvest this entry. These hard factor limited acres have been removed from the total number of manageable acres available for harvest calculations. Lowland conifer stands in areas inaccessible for harvest will be subject to natural processes, resulting in a range of successional stages.

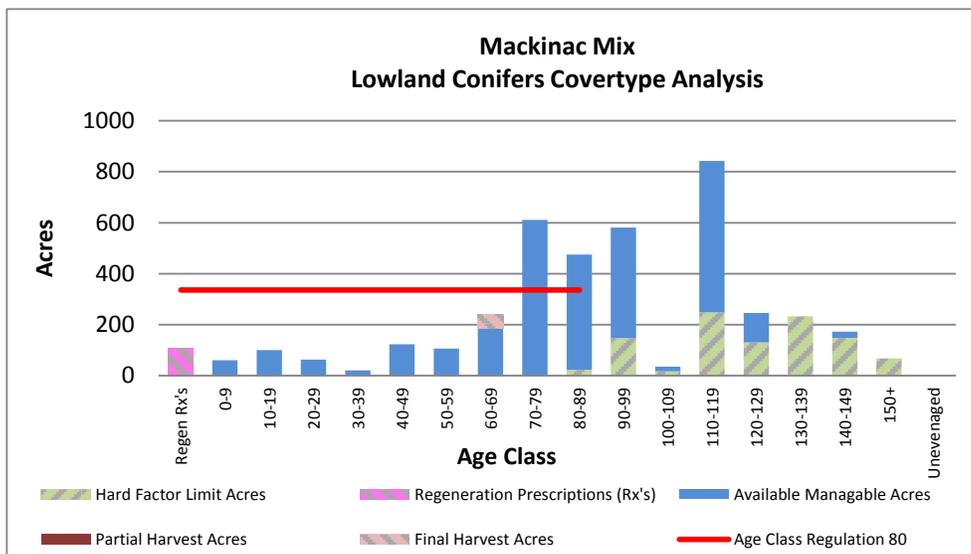


Figure 4.20.5. Age-class distribution of lowland conifers in the Mackinac Mix management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland conifer stands will be maintained on operable sites through even-aged management with acres balanced between 0-89 years of age to provide for continual harvest, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- The 10-year projected final harvest of lowland conifers is 336 acres.

Long-Term Management Objectives

- Balance the age-class structure of accessible lowland conifer stands providing for a regulated harvest of approximately 336 acres every decade.

Section 4.20.1.6 Forest Cover Type Management – Red Pine

Current Condition

Red pine stands occur on 3,816 acres (6%) of the management area (Table 4.20.1). Red pine stands are distributed throughout the management area on a range of sites including stands on all the Kotar habitat types, but mainly on better quality sites of ATFD and AFPO. The majority of the red pine stands is of planted origin and is intensively managed for timber production. Most of the stands have been thinned more than once and regeneration harvests followed by re-planting have started to diversify the age classes (Figure 4.20.6). As most of the planted red pine stands are on very productive sites prescribed burning or the use of herbicide may be necessary to control competing vegetation thus ensuring successful regeneration. Red pine stands on these high-quality sites are usually thinned every ten years, reducing basal area to approximately 120 square feet per acre, until replacement harvest age at 80.

Currently there are 251 acres of red pine prescribed with a final harvest and 379 acres prescribed for partial harvest or thinning. There are some stands in other cover types that are prescribed to be converted to red pine after harvest and some acres of red pine prescribed to be converted to other types. These acres are shown in Figure 4.20.6 in the regeneration prescriptions column. There are 44 acres of red pine that have site conditions limiting their harvest at this time. These hard factor limited acres have been removed from the total number of manageable acres available for harvest calculations. Red pine in inaccessible or sensitive areas may remain through biological maturity.

Desired Future Condition

- Red pine stands will be maintained and managed through thinning until stand replacement harvest at approximately age 80; and
- Balancing acres between 0-89 years of age will provide for continual harvesting, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- The 10-year projected final harvest of red pine is zero acres with the reduction from the regulated amount due to the large number of acres in the 0-9 and regeneration prescriptions columns; and
- The 10-year projected partial harvest of red pine is 1,318 acres in stands 40-80 years of age.

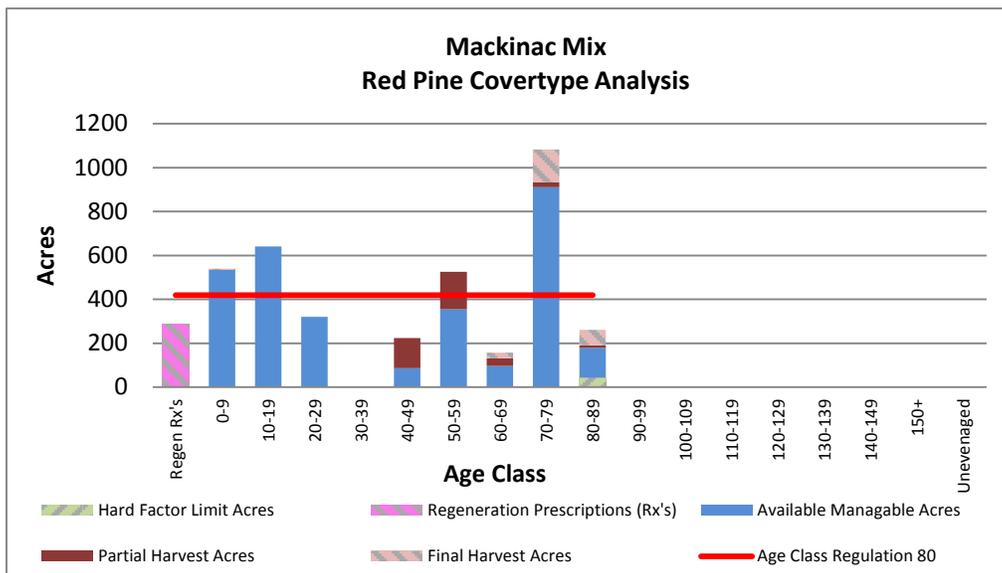


Figure 4.20.6. Age-class distribution of red pine in the Mackinac Mix management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Balance the age-class distribution of red pine providing for a regulated rotation harvest of approximately 419 acres per decade; and
- Stands will be periodically thinned until they meet silvicultural criteria.

Section 4.20.1.7 Forest Cover Type Management – Other Types

Current Condition

There are many other cover types spread across the management area that have less than 5% of the total management area acres (Table 4.20.1). Lowland spruce/fir (2,924 acres or 4%), upland open/semi-open lands (2,051 acres or 3%), mixed upland deciduous (1,328 acres or 2%), upland spruce/fir (1,012 acres or 2%) and upland mixed forest (1,010 acres or 2%) are the largest cover types in this section.

“Other types” is made up of forested cover types with less than 2% of the total acres and includes: tamarack (877 acres), white pine (849 acres), lowland deciduous (823 acres), paper birch (785 acres), lowland mixed forest (472 acres), upland conifers (463 acres), hemlock (429 acres), lowland aspen/balsam poplar (423 acres), natural mixed pines (288 acres), jack pine (66 acres) and planted mixed pines (16 acres). In addition there are 512 acres (1%) of “miscellaneous other” stands, which includes water, sand/soil and roads.

Most of these cover types with the exception of white pine and hemlock will be managed as even-aged stands using natural regeneration after harvest. Following general timber management guidelines, perform regeneration harvests in even-aged forested cover types, attempting to balance age classes where possible. Natural regeneration of species currently on site is expected. Schedule selection harvests in white pine and hemlock as needed.

There are 2,721 acres of these other minor cover types have site conditions limiting their harvest at this time. These hard factor limited acres have been removed from the total number of manageable acres available for harvest. Where stands are inaccessible, early successional cover types will be changed through natural succession.

Desired Future Condition

- These cover types may be managed on operable sites contributing to the compositional diversity of the landscape while providing for continual harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- The projected 10-year final harvest is 168 acres of lowland spruce/fir, 176 acres of mixed upland deciduous, 95 acres of upland spruce/fir, 244 acres of upland mixed forest and 442 acres of other types; and
- The projected 10-year partial harvest is 251 acres of mixed upland deciduous, 362 acres of upland mixed forest and 473 acres of other types.

Long-Term Management Objectives

- Continue management of these other cover types to provide a sustainable yield of forest products and wildlife habitat.

4.20.2 – Featured Species Management

There is a major deer wintering complex within this management area. In harvested stands, it is beneficial to wildlife to retain large diameter soft hardwoods, coarse woody debris, mast producing species and within stand diversity.

Black Bear

The goal for black bear in the eastern Upper Peninsula is to maintain or improve habitat. Management for the species should focus on improving existing habitat (minimizing fragmentation and maintaining hard and soft mast) to offset potential population declines due to changes in land-use.

Wildlife habitat specifications:

- Maintain or increase tree species that provide mast including beech, oak, black cherry and ironwood.
- Beech trees with bear claw scars on the bark are generally good mast producers and should be retained wherever possible.
- Retain some large diameter white pine and hemlock for bear refuge trees.
- Plant disease resistant beech and red oak where appropriate.
- Maintain or increase mast by providing forest clearings that promote food sources such as pin cherry, juneberry/serviceberry, hazel, raspberry, blackberry and blueberry. Minimize herbicide use that would be detrimental to this resource.
- Discourage land transactions, and use and management activities that facilitate fragmenting state lands within the management area.

Pileated Woodpecker

The goal for pileated woodpecker is to maintain or improve habitat. Management should focus on maintaining large diameter deciduous trees in timber sales in priority areas.

Wildlife habitat specifications:

- Identify and retain large (>15 inches in diameter at breast height) snags and cavity trees, coarse woody debris and reserve trees as possible to ensure a sustainable supply of future cavity/foraging trees and associated coarse woody debris. Poorly formed trees and those damaged by natural disturbance or earlier harvests, particularly deciduous trees, are good candidates for future snags and cavity trees; trees damaged by beech bark disease that were not salvaged are contributing towards this goal. Large diameter aspen and other soft hardwoods are preferred.
- Even-aged managed stands: Leave scattered retention patches around some 18 inches in diameter at breast height or greater secure trees as a nucleus, using the upper end of the Within Stand Retention Guidance.
- Uneven-aged managed stands: Retain a minimum of three secure cavity or snags per acre with one exceeding 18 inches in diameter at breast height. If snags or cavity trees are lacking, leave trees with defects of the maximum available size that will likely develop cavities.

- Salvage harvests deemed necessary to remove due to insect, disease, or fire will be offset within the same cover type and age class (within the compartment, management area or eastern Upper Peninsula ecoregion), to minimize impacts on pileated woodpecker habitat. Total allowable harvest in these situations will be evaluated on a case-by-case basis.

Ruffed Grouse

The goal for ruffed grouse in the eastern Upper Peninsula is to maintain or improve habitat. Management should focus on maintaining and balancing the age class distribution for aspen in priority landscapes.

Wildlife habitat specifications:

- Maintain the aspen cover type and increase the aspen component in mixed stands within the management area.
- Move to balance the age class distribution of aspen and birch cover types to maintain young forests across the management area.
- Ideal aspen stands will be of 40-160 acres under a 50-60 year rotation.
- Larger harvest units should have irregular boundaries and include one or two, 1-3 acre unharvested inclusions for every 40 acres exceeding 40 acres in size
- Evaluate the conifer component in aspen stands, holding or increasing where desirable. Leave conifer under four-inch diameter at breast height in mixed stands and aspen types as immediate residual escape cover and to promote corridors.
- Maintain cherry production for soft mast.

Snowshoe Hare

The goal for snowshoe hare in the eastern Upper Peninsula is to increase available habitat in the ecoregion. In priority landscapes, management should focus on maintaining young aspen adjacent to lowlands, maintaining jack pine, retaining slash and increasing mesic conifer components within stands.

Wildlife habitat specifications:

- Maintain young aspen and lowland shrub communities such as alder or willow that have a conifer understory or young aspen stands that are adjacent to lowland/swamp conifer and mesic conifers. Hold or increase the conifer component in aspen stands; leave conifers under four inch diameter at breast height.
- Regenerate black spruce stands to young, dense stocking adjacent to uplands.
- Balance age classes in the jack pine cover type to provide young, dense jack pine stands.
- When using herbicide treatments to prepare sites for planting red and jack pine in snowshoe hare habitat, encourage more diverse stands of pine and aspen by using application skips in pockets or along stand edges.
- In hare habitat, discourage biomass harvesting and chipping operations in this management area.
- Retain down coarse woody debris already present (before cutting) and resulting from incidental breakage of tops and limbs in the general harvest area, except on skid trails and landings, to the extent feasible. Retain slash and create brush piles within timber sales associated with hare habitat. In biomass timber sales, apply Michigan Biomass Harvesting Guidance, retaining the maximum residues.

White-tailed Deer

The eastern Upper Peninsula goals for white-tailed deer are to: 1) Maintain existing deer wintering complexes and 2) Expand the extent of areas suitable as winter deer habitat, especially in the medium and high snowfall zones. Management should focus on maintaining habitat quality in priority wintering complexes. DNR Department procedure 32.22-07 states "Coniferous swamps are important as winter deeryards and shall be managed primarily for deer. The objective shall be to maintain them for this purpose and through commercial cuttings and silvicultural practices, improve these areas to provide winter cover and food for deer." There is a complex relationship between deer abundance; available summer and winter habitat; timber management; and regeneration tree species, particularly white cedar and

hemlock. It is recognized that meeting both timber management and deer goals presents challenges for the department and our stakeholders. Information on deer wintering complexes is currently being updated and new management guidelines are being developed. When completed, these will provide additional direction for managing these critical areas for white-tailed deer.

Wildlife habitat specifications for deer wintering complexes:

- Strive to maintain > 50% of the land area within deer wintering complexes in mixed or pure stands of cedar, hemlock, white and black spruce, white and natural red pine, balsam fir, mixed swamp conifer and mixed upland conifer-hardwood.
- In northern white cedar and hemlock cover types that are commonly occupied by deer during severe winters, especially in medium and high snowfall zones, maintain canopy closure of >65%.
- In deer wintering complexes in low snowfall areas and within ¼-mile of severe-winter cover in the higher snowfall zones, write prescriptions that strive to maintain canopy closure of 40-65%, favoring cedar, hemlock, white spruce, black spruce, balsam fir and white pine.
- Provide winter forage in deer wintering complexes through stands of regenerating hardwood or brush, including preferred species of red maple, sugar maple, aspen, yellow birch, ashes, oaks, dogwood, crabapple, elderberry, high-bush cranberry, sumac and hazel.
- Enhance accessibility to winter browse within deer wintering complexes by maintaining mature mesic conifer components within upland hardwood stands or by maintaining or enhancing sheltered travel corridors between areas of conifer cover and browse.
- Provide spring break out areas by maintaining open hardwood stands on southern exposures and herbaceous openings adjacent to deer wintering complexes.
- When possible, timber harvests within deer wintering complexes should be carried out only during winter months and tops should be left. Chipping of non-bole wood and whole-tree harvesting in the deer wintering complexes should be avoided, but will be discussed on a case-by-case basis through the compartment review process.
- Harvests of cedar and hemlock may only be conducted when:
 - There is reasonable confidence of successful recruitment/regeneration of the cover types; or
 - There is a forest health issue (e.g., hemlock wooly adelgid); or
 - Part of an approved research project; or
 - Removal of selected trees will facilitate a reduction of harvest trails, landings, etc. to minimize soil sedimentation and possible soil compaction issues.
- Provide fall foods in the form of hard and soft mast, and provide dense escape cover or bedding areas in the form of early successional forests, brush and warm-season grasses that will encourage fall deer use in areas open to public hunting. Where habitat types are appropriate, increase diversity of hard mast by planting oak.

4.20.3 – Rare Species and Special Resource Area Management

All forest operations must be reviewed for potential conflicts between rare species and proposed forest operations following the guidance in “DNR’s Approach to the Protection of Rare Species on State Forest Lands” (IC4172). This is especially important when listed species are present, 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 fifteen listed species as well as four natural communities of note occurring in the management area as listed in Table 4.20.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

Special conservation areas found in the management area include: cold water streams and lakes, high priority trout streams and several deer wintering areas. Approximately 1,100 acres of potential old growth were coded for a broad range of reasons. These stands are also considered special conservation areas until they are evaluated. Concentrated recreation area special conservation areas (boat access sites and state forest campgrounds) are listed in the Recreation section 4.20.6 below.

There is one natural bog community ecological reference area of 48 acres shown in Figure 4.20.7. It will be managed to protect and enhance the natural vegetative and wildlife community as directed by an ERA-specific management plan.

Management goals during this planning period are:

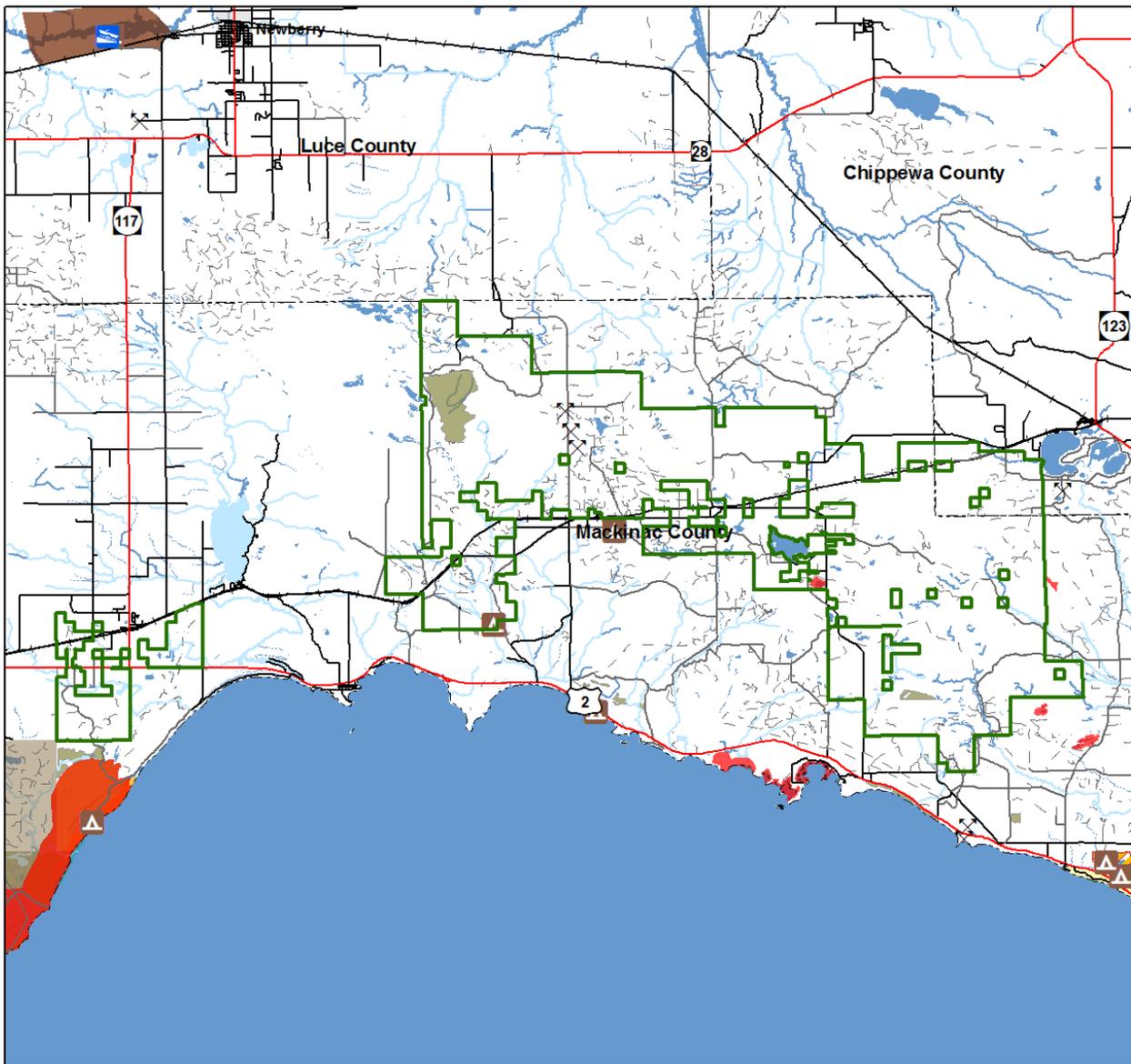
- Document occurrences of rare, threatened, endangered and special concern species and natural communities for the management area through the inventory process or with occasional focused surveys.
- Evaluate all potential Type 1, potential Type 2 and potential old growth areas to determine their status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

Table 4.20.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Mackinac Mix management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Bog		S4/G3G5	Confirmed				Lowland open/semi-open	N/A
Limestone bedrock glade		S2/G2G4	Confirmed				Upland open/semi-open	N/A
Muskeg		S3/G4G5	Confirmed				Lowland open/semi-open	N/A
Poor fen		S3/G3	Confirmed				Lowland open/semi-open	N/A
Birds								
Red-shouldered hawk	<i>Buteo lineatus</i>	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
Bald eagle	<i>Haliaeetus leucocephalus</i>	SC/G5/S4	Confirmed	IL	Moderate	Mesic northern Forest	Northern Hardwood	Late
						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
Snails								
Eastern flat-whorl	<i>Planogyra asteriscus</i>	SC/G4/S3	Confirmed	EV	Low	Limestone cliff	Upland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Northern shrub thicket	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
Widespread column	<i>Pupila muscorum</i>	SC/G5/SU	Confirmed	MV	Low	Rich conifer swamp	Tamarack	Late
						Mesic northern forest	Northern Hardwood	Late
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone cliff	Upland open/semi-open	N/A
Land snail	<i>Valloria gracilicosta albula</i>	E/G4Q/S1	Confirmed	HV	Moderate	Limestone cliff	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
Tapered vertigo	<i>Vertigo elatior</i>	SC/G5/S3	Confirmed	HV	Moderate	Northern fen	Lowland open/semi-open	N/A
						Limestone cobble shore	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone bedrock lakeshore	Upland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Prairie fen	Lowland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
Deep-throat vertigo	<i>Vertigo nylanderi</i>	E/G3G4/S3	Confirmed	EV	Moderate	Northern fen	Lowland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone bedrock lakeshore	Upland open/semi-open	N/A
Mammal								
Moose	<i>Alces alces americana</i>	SC/G5/S4	Confirmed	HV	Very High	Bog	Lowland open/semi-open	N/A
						Emergent Marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Patterned fen	Lowland open/semi-open	N/A
						Muskeg	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Poor fen	Lowland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Northern shrub thicket	Upland open/semi-open	N/A
						Boreal forest	Upland & Lowland Sp/F	Mid
						Mesic northern forest	Northern Hardwood	Late
Dry-mesic northern forest	White Pine	Late						
Plants								
Walking fern	<i>Asplenium rhizophyllum</i>	T/G5/S2S3	Confirmed			Mesic northern forest	Northern Hardwood	Late
						Limestone cliff	Upland open/semi-open	N/A
						Boreal forest	Upland & Lowland Sp/F	Mid
						Limestone lakeshore cliff	Upland open/semi-open	N/A
						Sinkhole	Upland open/semi-open	N/A
Goblin moonwort	<i>Botrychium mormo</i>	T/G3/S2	Confirmed			Mesic northern forest	Northern Hardwood	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Male fern	<i>Dryopteris filix-mas</i>	SC/G5/S3	Confirmed			Mesic northern forest	Northern Hardwood	Late
						Limestone cliff	Upland open/semi-open	N/A
						Sinkhole	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Volcanic bedrock glade	Upland open/semi-open	N/A
Moor rush	<i>Juncus stygius</i>	T/G5/S1S2	Confirmed			Northern fen	Lowland open/semi-open	N/A
						Patterned fen	Lowland open/semi-open	N/A
Alpine bluegrass	<i>Poa alpina</i>	T/G5/S1S2	Confirmed			Alvar	Upland open/semi-open	N/A
						Volcanic bedrock lakeshore	Upland open/semi-open	N/A
Alga pondweed	<i>Potamogeton confervoides</i>	SC/G4/S3	Confirmed			Submergent marsh	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
Hill's pondweed	<i>Potamogeton hillii</i>	T/G3/S2	Confirmed			Emergent marsh	Lowland open/semi-open	N/A

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

Mackinac Mix



1 in = 4 miles

Legend

- Highway
- Paved Roads
- Gravel Roads
- - - Poor Dirt Roads
- Railroads
- · - · - Intermittent Stream or Drain
- Perennial River
- Lakes and Rivers
- Management Area Boundary
- Cities
- - - County Boundaries

- Ecological Reference Areas
- High Conservation Value Areas**
- Coastal Environmental Areas
- Critical Dunes
- Natural Rivers Vegetative Buffer
- Natural Rivers Zoning District
- Critical Coastal Habitat (Piping Plover)
- Kirtland Warbler Habitat
- Dedicated Management Areas
- Natural Areas Legally Dedicated

Special Conservation Areas

- ▲ Campgrounds
- ⛶ Fishing Access Sites
- ⛶ Boat Access Sites
- ⛶ Mineral Resource Locations
- Wild & Scenic Rivers (USFS Lands)
- Visual Management Areas
- Contiguous Resource Areas
- Possible Type 1 and Type 2 Old Growth
- Potential Old Growth
- Non-Dedicated Natural Areas & National Natural Landmarks
- Springs, Wetlands, or Riparian Areas

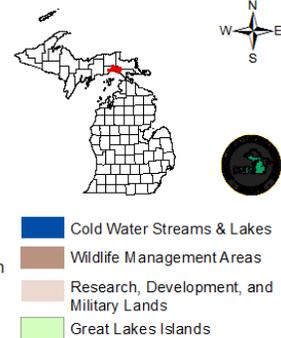


Figure 4.20.7. A map of the Mackinac Mix management area showing the special resource areas.

4.20.4 – Forest Health Management

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

- Northern hardwood: beech bark disease, emerald ash borer;
- Aspen and lowland aspen/balsam poplar: white trunk rot and *Hypoxylon* canker;
- Lowland conifers and lowland spruce/fir: spruce budworm, emerald ash borer, eastern larch beetle and larch casebearer; and
- Red pine: red-headed pine sawfly and pine engraver.

For further information on forest health refer to Section 3.

Invasive Species

Invasive exotic species, specifically plants, may pose a significant forest health threat to forested and non-forested areas throughout the management area. The statewide database of invasive plant species does not yet document any known species or locations within or surrounding the management area. Absence of data is likely due to lack of surveys and it should not be assumed there are no species present. Monitoring efforts should specifically look for new populations of the 10 priority invasive plant species identified in Section 3 of this plan. Prescribe eradication treatments to any new populations of priority invasive plant species found in the management area.

While it hasn't been officially recorded in the statewide database yet, invasive garlic mustard is within five miles of this management area. Control efforts, including use of prescribed burning, have been effective in reducing the amount of garlic mustard in the area.

4.20.5 – Fire Management

Evaluate managing the Cranberry bog complex through carefully prescribed fires, to allow for the propagation of blueberries and other fruiting shrubs and setting back the encroachment of upland brush and trees.

Fire suppression tactics should take into account the sensitive nature of some of the natural communities in this management area.

Prescribed fire may be used to maintain natural communities within the management area and to manage invasive species.

4.20.6 – Public Access and Recreation

Access for management and recreation is good throughout most of the management area using county and two-track roads. The area is between Naubinway and Newberry, with other small communities nearby, therefore state owned lands receive moderate to heavy use here.

Recreational facilities in the management area include the Black River State Forest Campground and Strouble Lake boat access site. The Hendricks Township day use area (managed through a lease agreement) is also in the management area.

Trail facilities (Figure 4.20.1) include snowmobile trails the Newberry-Rexton Motorcycle Trail and the Peters Creek Cross Country Ski Trail. The Newberry-Rexton Motorcycle Trail is designated motorcycle use only by Director's Order. Extreme care must be exercised to maintain the 24 inch trail bed.

Other popular recreational activities include: fishing, hunting, dispersed camping, berry picking and mushroom hunting.

4.20.7 Aquatic Resource Management

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. Parts of the Black, Brevort, Carp and Tahquamenon River watershed systems are designated as high priority trout streams in this management area and the details are shown in the Integrated Forest Monitoring Assessment and Prescription Geographic Decision Support Environment and in Figure 4.20.1.

4.20.8 Minerals

Surface sediments consist of lacustrine (lake) sand and gravel, peat and muck and coarse-textured till. There is insufficient data to determine the glacial drift thickness. Sand and gravel pits are located in this area and there is good potential for additional pits on the uplands.

The Silurian Engadine, Manistique and Burnt Bluff Groups subcrop below the glacial drift. The Engadine and Burnt Bluff are quarried for stone in the Upper Peninsula.

Exploration and development for oil and gas has been limited to a few wells drilled in the Upper Peninsula (four in Mackinac and 14 in Chippewa). No economic oil and gas production has been found in the Upper Peninsula.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations. There are several gravel pits on state owned land in this management area. Rexton gravel pit is within the area.