4.16 MA 16 – Avery Hills Management Area

Summary of use and management

Management in the Avery Hills management area (MA) will emphasize continuing balancing the age class of aspen on suitable sites and thinning the northern hardwoods, balancing age classes of red pine and regenerating the aging oak resource. Management will strive to sustainably produce various forest products; enhance game and non-game wildlife habitat such as Greasy Creek Grouse management area and Sage Lake Flooding; protect areas of unique character; and provide for forest-based recreational uses, especially the snowmobile trail system. Management activities may be constrained by poor access on the steep slopes. Expected trends within this 10-year planning period are increased recreational pressure; illegal off-road vehicle use; introduced pests and diseases, especially beech bark disease and emerald ash borer (beech and ash are significant species in northern hardwood stands); managing oil and gas development; and an increased need to regenerate oak.

Introduction

The Avery Hills management area is located in northeast Lower Peninsula in Montmorency and Oscoda Counties and contains approximately 45,313 acres of state forest (Figure 4.16.1). The primary attributes which identify the Avery Hills management area include:

- The management area falls mostly within Albert's Vanderbilt Moraines sub-region (Albert, 1995). State forest ownership is fairly concentrated.
- The historic cover types of mixed red, jack and white pines with some areas of upland hardwoods.
- The current predominant cover types include primarily aspen, oak and upland hardwoods. Approximately 9% of the area is relatively inaccessible lowland cover types.
- The dominant landforms consist of sandy, well-drained moraine ridges surrounded by poorly-drained outwash channels and plains.
- Due to the proximity of this management area to the communities of Atlanta, Fairview, Mio and Lewiston, the forest resources contribute social and economic values to the area.
- This management area contains one or more of the northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.
- The Department of Natural Resources (DNR) Hunt Creek Fish Laboratory, Greasy Creek Grouse management area and Sage Lake Flooding are located in this management area.
- This area has extensive Antrim and Niagaran gas development.
- DNR recreation facilities in this management area include Avery Lake, Big Oaks and Little Wolf Lake rustic campgrounds. Snowmobile and off-road vehicle trails cross the area. Resource damage from illegal off-road vehicle use is prevalent.
- The topography of this management area is some of the steepest in Lower Michigan, though the hills are relatively short.
- This management area contains one of the Northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production and ruffed grouse habitat. The boundary will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager.

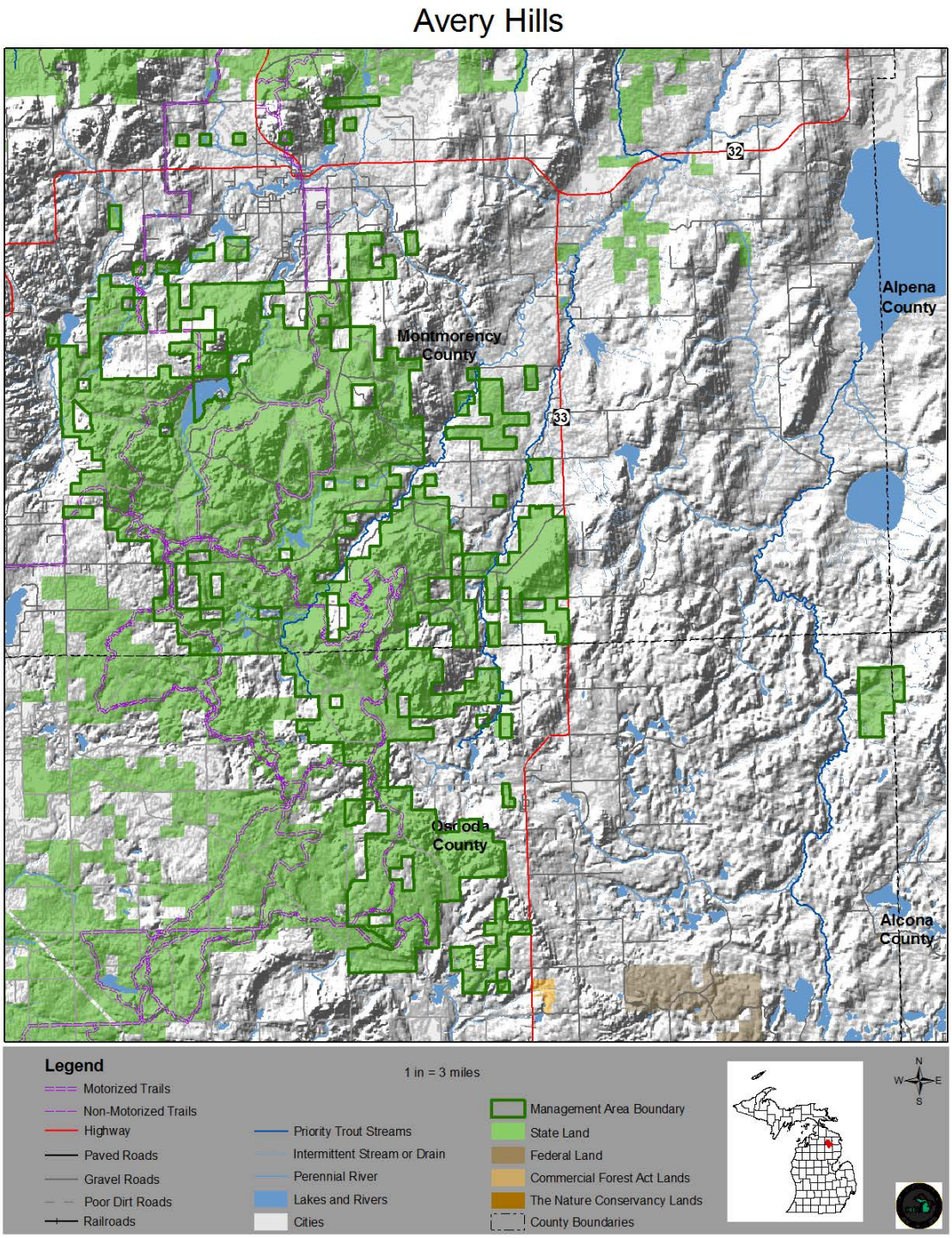

Figure 4.16.1. A map of the Avery Hills management area (dark green boundary) in relation to surrounding state forest and other lands in Montmorency and Oscoda counties, Michigan.

Table 4.16.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Avery Hills management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	45%	20,418	521	19,897	4,332		20,418	2,842	
Oak	17%	7,706	3,244	4462	338	1,556	7,706	279	1,756
Northern Hardwood	12%	5,620	654	4966		1,858	5,620		2,193
Cedar	5%	2,068	2,068				2,068		
Red Pine	3%	1,203	344	859	348	265	1,203	95	473
Jack Pine	3%	1,137	9	1128	353		1,137	161	
Lowland Conifers	2%	1,105	897	208	25		1,105	25	
Mixed Upland Deciduous	2%	999	57	942	213	69	999	135	251
Lowland Aspen/Balsam Poplar	2%	741	371	371	70		741	70	
Upland Open/Semi-Open Lands	5%	2,113		2113			2,113		
Lowland Open/Semi-Open Lands	1%	549		549			549		
Misc Other (Water, Local, Urban)	1%	522		522			522		
Others	2%	1,132	362	770	148	206	1,132	79	206
Total		45,313	8,526	36,787	5,827	3,954	45,313	3,686	4,879

4.16.1 Forest Cover Type Management Direction

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

4.16.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 20,418 or 45% of the management area (Table 4.16.1). Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs and for a wide range of forest recreation.

Aspen occurs throughout the area. Accessible aspen has been consistently harvested over the last 50 years. There are 521 acres of aspen that have met harvest criteria (Figure 4.16.2), but have site conditions that limit harvest (hard factor limit acres). There are approximately 2,971 acres of stands that have a final harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

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

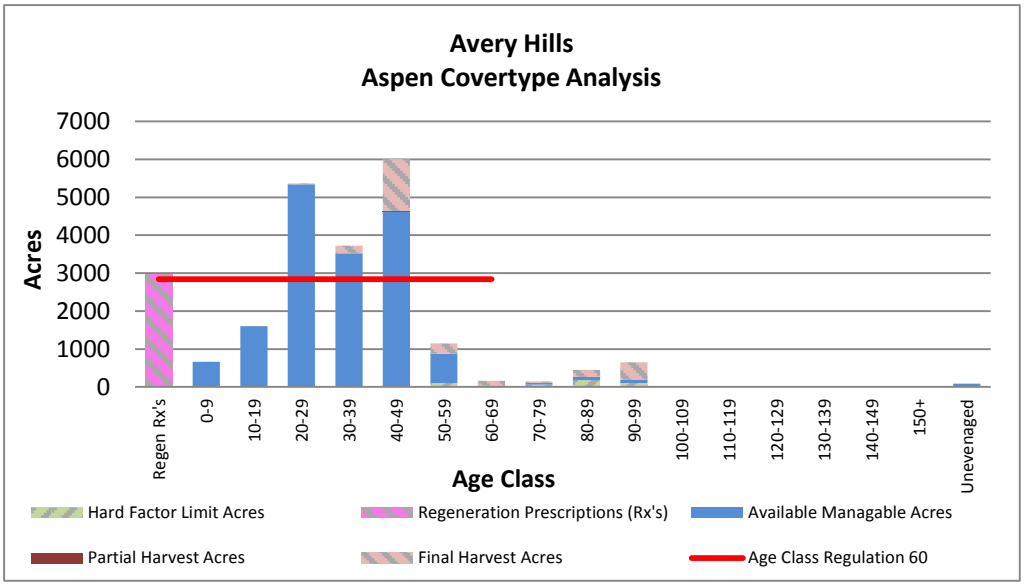

Figure 4.16.2. Age-class distribution for aspen in the Avery Hills management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct regeneration harvests on a projected 4,332 acres;
- Concentrate harvests on the oldest age classes first;
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions; and
- Aspen within the identified Grouse Enhanced Management Systems area may be managed differently than the rest of the aspen within the management area, with a shorter rotation age**,** small patch cuts and carefully considered stand adjacency.

Long-Term Management Objectives

- Continue management of aspen through regeneration harvests to balance the age-class distribution and to provide a steady flow of wood fiber, wildlife habitat and recreational opportunities; and
- A desired future harvest level is projected at 2,842 acres for final harvest per 10-year period.

4.16.1.2 Forest Cover Type Management – Oak

Current Condition

Oak acres total 7,706 or 17% of the management area (Table 4.16.1). Most (70%) of the stands are northern red oak and suitable for extending rotation age to 150 years. The balance is pin oak with moderate to well-stocked stands having a red maple component. The pin oak resource should be managed to an 80-year rotation (Figure 4.16.3). Red and white pine originally dominated the site.

Forest communities dominated primarily by oak in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, white-tailed deer, squirrels and various birds and commercially for firewood and industrial lumber. There are 3,244 acres of oak that have met harvest criteria, but have site conditions that limit harvest (hard factor limited acres). There are 441 acres of stands that have a regeneration harvest pending and these acres are shown in the regeneration prescription class. There are 1,167 acres with a partial harvest pending and these acres are shown in their current age class. Figure 4.16.3 includes the projected number of acres converted to oak as a result of treatments that remove an overstory species resulting in the release of oak. These acres are included in the regeneration prescription class.

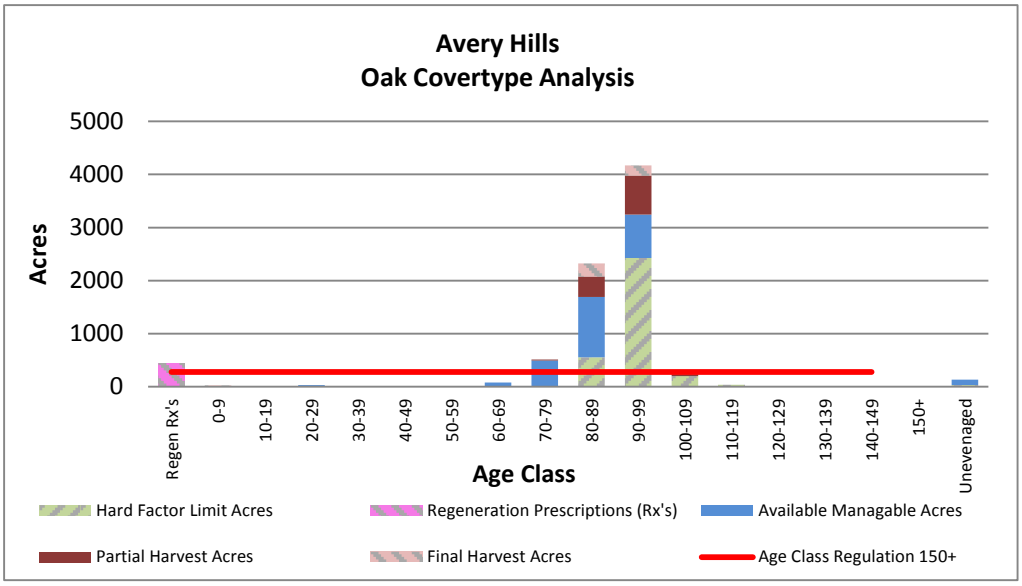

Figure 4.16.3. Age-class distribution for oak in the Avery Hills management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- The better quality northern red oak will be maintained to balance age classes between 0 and 159 years and the pin oak will be managed to for a balance between the ages of 0 and 89.

10-Year Management Objectives

- Conduct partial harvests on a projected 1,556 acres concentrating on stands that have not had any harvests or those stands that have a sufficient basal area for a partial harvest; and
- Conduct regeneration harvests on a projected 338 acres concentrating on poorer quality stands or stands that have been previously harvested and lack sufficient basal area for continued partial harvests.

Long-Term Management Objectives

- Over the next several decades, continue stand replacement harvests to balance age-class structure;
- Consider opportunities to introduce pine as a seed source or stand component to provide cover for oak regeneration and for stand diversity;
- Additional research is needed on regeneration of medium-quality oak stands;
- Consider opportunities to manage oak in mixed stands along with white pine and red maple; and
- Desired future harvest levels are projected at 279 acres for final harvest and 1,756 acres for partial harvest per 10-year period.

4.16.1.3 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 5,620 or 12% of the management area (Table 4.16.1). Northern hardwoods forest communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife including elk, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation.

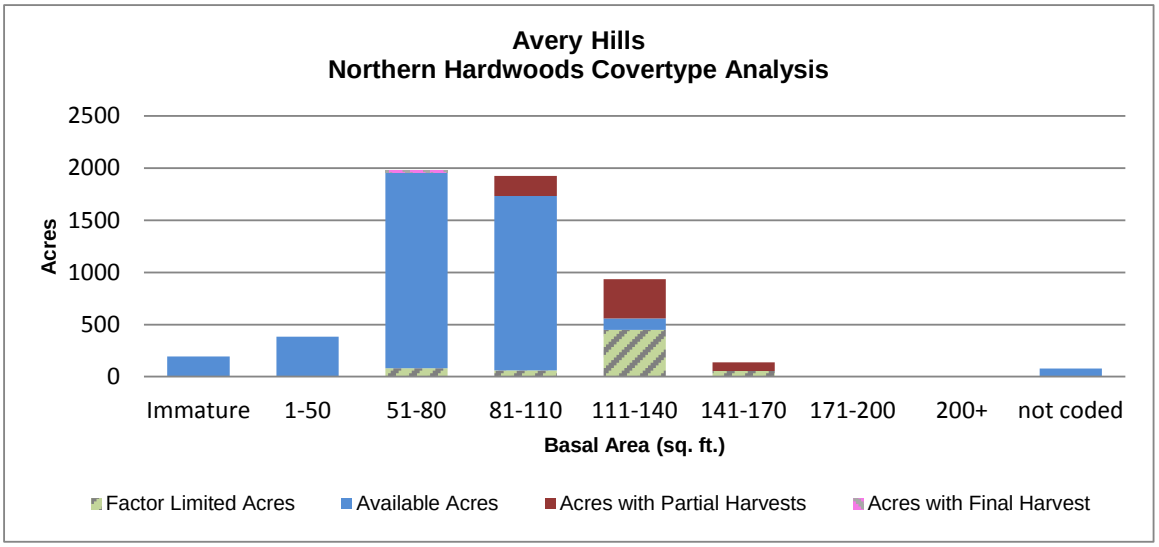

Figure 4.16.4. Basal area distribution for northern hardwood in the Avery Hills management area (2012 Department of Natural Resources inventory data).

Northern hardwoods are located throughout the management area on AFO, PArVVb/AFO and PArVHa/PArVVb habitat class sites (see Appendix E). There are 654 acres of northern hardwoods that have met harvest criteria (Figure 4.16.4), but have site conditions that limit harvest (hard factor limit acres). There are 53 acres that have a regeneration harvest pending and these acres are shown in the 0-9 year-old age class. There are 656 acres with a partial harvest pending and these acres are shown in their current age class.

Desired Future Condition

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

10-Year Management Objectives

- Conduct individual tree selection harvests, on a projected 1,858 acres of northern hardwood concentrating on those areas with a basal area above 110 square feet per acre;
- Where necessary and feasible, consider harvesting stands from lower basal area ranges to expedite the balancing of basal area distributions; and
- Consider the need to delay further selection harvesting due to resultant lower-than-normal residual basal area in post-salvage harvest stands.

Long-Term Management Objectives

- Emerald ash borer and beech bark disease will change the stand composition of the northern hardwoods in this management area;
- Consider whether to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands;
- As ash and beech decrease in the northern hardwood stands, consider introducing oak for mast in stands without oak; and
- A desired future harvest level is projected at 2,193 acres for partial harvest per 10-year period.

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

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog and bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 549 acres or 1% of the management area (Table 4.16.1).

Desired Future Condition

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

10-Year Management Objectives

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

Long-Term Management Objectives

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

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

Current Condition

Upland shrub and herbaceous open land acres total 2,113 acres (5% of the management area). These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas.

Desired Future Condition

- Upland open/semi-open lands will be maintained at or above the current level in order to provide habitat for species which use openings.

10-Year Management Objectives

- Where necessary and feasible, consider methods to maintain upland open/semi-open lands during this management cycle.

Long-Term Management Objectives

- Continue to maintain herbaceous open land and upland shrub openings at or above current levels in order to promote wildlife values and recreational opportunity;
- Continue to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.16.1.6 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: red pine, 1,203 acres (3% of the management area), jack pine, 1,137 acres (3%) and lowland conifers, 1,105 acres (2%). Other forest communities total 1,132 acres (2%) and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;

- The following species are projected for restarting or regeneration harvests: red pine 348 acres, jack pine 353 acres, lowland conifer 25 acres, mixed upland deciduous 213 acres, lowland aspen/balsam poplar 70 acres, lowland deciduous 7 acres, upland mixed forest 49 acres, lowland mixed forest 1 acres, planted mixed pines 20 acres and white pine 54 acres;
- Conduct partial harvests on a projected 265 acres of red pine, 69 acres of mixed upland deciduous, 45 acres of natural mixed pines, 84 acres of white pine, 48 acres of upland mixed forest and 25 acres of planted mixed pines;
- Consider methods to ensure adequate regeneration of lowland types; and
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry.

Long-Term Management Objectives

- Continue management to balance age classes to provide a steady flow of forest products, wildlife habitat and recreational opportunities;
- Continue management to regenerate lowland types; and
- Desired future harvest levels are projected at 129 acres cedar, 92 acres lowland conifers and 20 acres of lowland deciduous for final harvest per 10-year period.

4.16.2 Featured Wildlife Species

Each of the featured species outlined below includes recommended practices with regard to forest and/or wetland management. These recommended practices will not be employed across the management area as a whole, but rather in priority compartments, stands or wetlands as defined by local Wildlife Division and Forest Resources Division field staff.

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

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

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

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

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

Black Bear

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

Wildlife Habitat Specifications:

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

Pileated Woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than12 inches in diameter at breast height. State forest management should focus on the maintenance of a component of large diameter trees (greater than12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

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

Red-shouldered Hawk

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

Wildlife Habitat Specifications:

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

Ruffed Grouse

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

Wildlife Habitat Specifications:

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

Wild Turkey

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

Wildlife Habitat Specifications:

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

White-tailed Deer

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

Wildlife Habitat Specifications:

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

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

4.16.3 Rare Species and Special Resource Area Management

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

Past surveys have noted and confirmed eleven listed species and two natural communities of note occurring in the management area as listed in Table 4.16.2. A colony of great blue herons has also been identified. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

As shown in Figure 4.16.5, the Hunt Creek Fisheries Research Station is the only special conservation area (3,000 acres) that has been identified in the Avery Hills management area.

There are no high conservation value areas or ecological reference areas identified for the Avery Hills management area as illustrated in Figure 4.16.5.

Management goals during this planning period:

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

Table 4.16.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Avery Hills management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Dry-mesic northern forest		S3/G4	Confirmed				White Pine	Late
Rich conifer swamp		S3/G4	Confirmed				Tamarack	Late
Birds								
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
Common tern	*Stema hirundo*	T/G5/S2	Confirmed	MV	Moderate	Sand & gravel beach	Upland open/semi-open	N/A
Snail								
Spike-lip crater snail	*Appalachina sayanus*	SC/G5/SU	Confirmed	HV	Low	Mesic northern forest	Northern Hardwood	Late
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Floodplain forest	Lowland mixed	Mid
Insect								
Secretive locust	*Appalachia arcane*	SC/S2S3/G2G3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Pine barrens	Jack Pine	Early
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Dry northern forest	Jack Pine, Red Pine	Late
Reptile								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Plants								
Pale Agoseris	*Agoseris glauca*	T/G5/S2	Confirmed			Pine barrens	Jack Pine	Early
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry sand prairie	Upland open/semi-open	N/A
Small round-leaved orchis	*Amerorchis rotundifolia*	E/G5/S1	Confirmed			Patterned fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
Hill's thistle	*Cirsium hillii*	SC/G3/S3	Confirmed			Alvar	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Boreal forest	Upland open/semi-open	N/A
						Dry northern forest	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Dry-mesic northern forest	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Limestone bedrock glade	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Open dunes	Upland open/semi-open	N/A
Limestone oak fern	*Gymnocarpium robertianum*	T/G5/S2	Confirmed			Rich conifer swamp	Tamarack	Late
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone lakeshore cliff	Upland open/semi-open	N/A
Allegheny plum	*Prunus allighaiensis davisii*	SC/G4T3Q/S3	Confirmed			Dry sand prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early

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

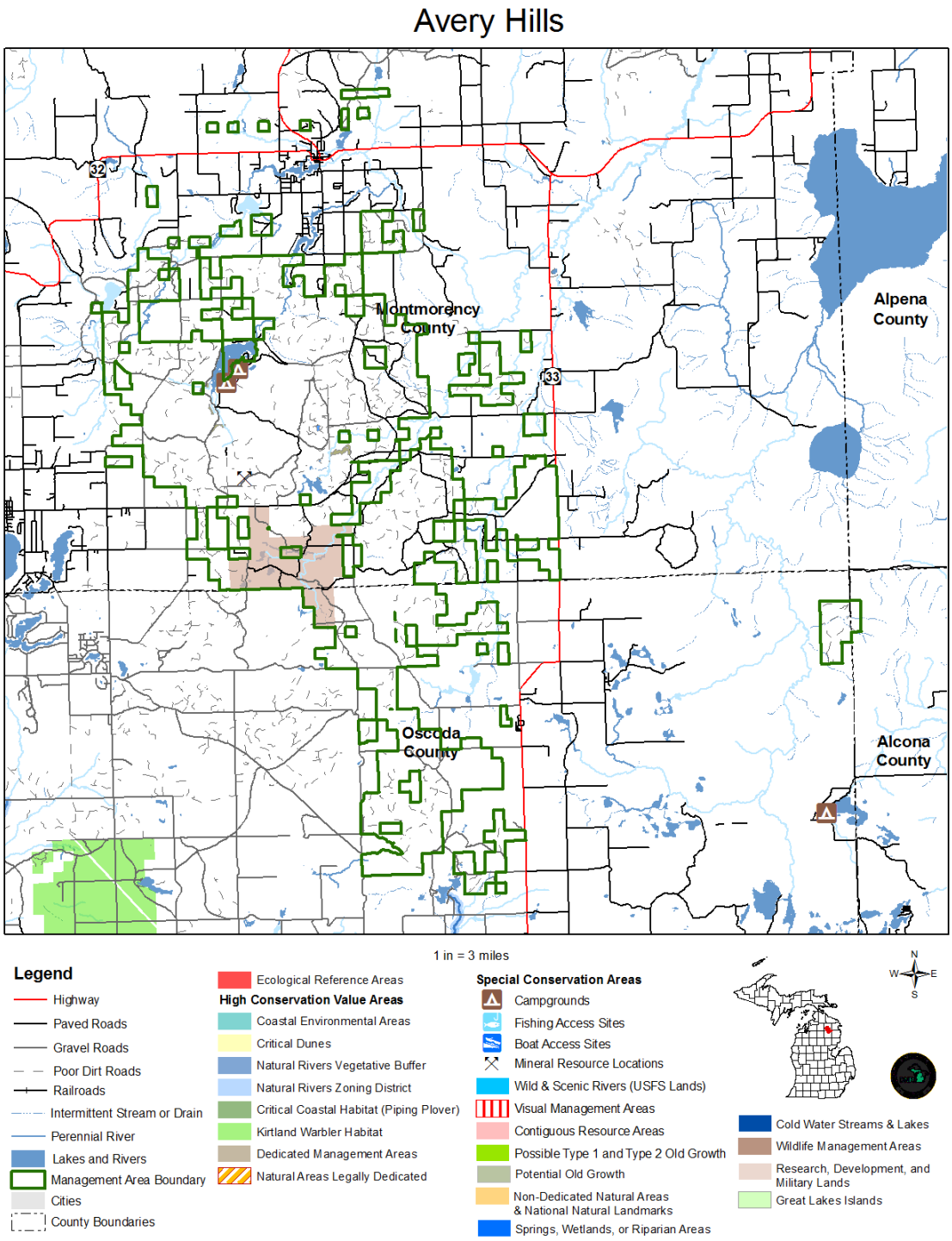

Figure 4.16.5. A map of the Avery Hills management area showing the special resource areas.

4.16.4 Forest Health Management

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

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

- Oak wilt is prevalent in this area. Epicenters need to be identified and treated. Timber sale restrictions which prevent wounding of oaks from April 15 to July 15 need to be enforced.
- Other management activities that can lead to damage of residual red oak trees (oil and gas development, recreational trail improvement, etc.) should be not be conducted during this high-risk period.

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five-mile buffer of the management area are summarized in the Table 4.16.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.16.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Avery Hills - FMD Management Areas	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	2	2	1

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Japanese Knotweed *Fallopia japonica*	2

4.16.5 Aquatic Resources

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

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

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams for this management area are shown in Figure 4.16.1 and listed in Appendix F.

4.16.6 Fire Management

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

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

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

- Consider opportunities to reintroduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition; and
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings.

4.16.7 Public Access and Recreation

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

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

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts. There are two state forest campgrounds adjacent to this management area as shown in Figure 4.16.5.

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

4.16.8 Oil, Gas and Mineral Development

Surface sediments consist of coarse-textured till, glacial outwash sand and gravel and postglacial alluvium, an end moraine of medium-textured till and ice-contact outwash sand and gravel. The glacial drift thickness varies between 200 and 800 feet. Sand and gravel pits are located in this management area and there is good potential for additional pits.

The Mississippian Coldwater and Sunbury Shales and Devonian Berea Sandstone and Bedford and Antrim Shales subcrop below the glacial drift. The Antrim is quarried for cement products elsewhere in the state.

Most of this management area has been developed for gas production from the Antrim Shale. Well spacing is currently 80 acres and most of the area of Antrim potential has already been drilled. The Collingwood Formation may also have oil and gas potential in this area and probably will have a well spacing of 320-640 acres per well (or possibly larger). Only the areas drilled for the Antrim are currently leased and these areas would also be where the Collingwood could be developed, possibly using existing well sites and facilities.

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

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

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

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