4.13 MA 13 – Grayling Outwash Management Area

Summary of Use and Management

Management in the Grayling Outwash 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 jack pine and regenerating the aging swamp hardwood and conifer resource where possible. Management will strive to sustainably produce various timber products, enhance game and non-game wildlife habitat, protect areas of unique character, such as the historic Deward Tract and provide for forest-based recreational uses, including the Wetzel Lake Day Use Area leased to Antrim County. Management activities are constrained by poor access in the swampy (16% lowland) portions of this area, some of which fall in the riparian zone of the Manistee River, a dedicated natural river. Expected trends within this 10-year planning period are increased recreational pressure, introduced pests and diseases and the difficulty in regenerating swamp types.

Introduction

This management area is located in east central Lower Peninsula in Kalkaska, Otsego and Crawford counties and contains 65,160 acres of state forest (Figure 4.13.1). The primary attributes which identify the Grayling Outwash management area include:

- The management area falls mostly within Albert's Grayling Outwash Plain sub-region (Albert, 1995).
- Historically fires were very frequent in this management area and were important in determining species composition. Jack pine and northern pin oak dominated the outwash, while vegetation varied on the ridges – some dominated by northern hardwoods and others dominated by red oak, hemlock and white pine. Currently areas of aspen, red pine and upland hardwoods with isolated pockets of lowland types cover the majority of the state forest land. In the past, a number of harvests and plantings were done in a checkerboard pattern, now there is interest in consolidating types and reducing cover type fragmentation.
- This management area lies at the northwestern edge of the Grayling Outwash Plain sub-region where there are two narrow end-moraine ridges separated by an outwash channel which is eight miles wide at its widest point. The Manistee River, a dedicated natural river runs through this management area.
- The Grayling Outwash management area is a popular destination for game hunting, hiking, mushroom hunting, etc. for the nearby communities of Gaylord, Grayling and Mancelona. Due to the proximity of this management area to the populated areas, the forest resources contribute social and economic values to the area.
- Department of Natural Resources recreation facilities in or near this management area include nearby Otsego Lake State Park, Lake Marjory state forest campground, Pickerel Lake Rustic campground, Goose Creek Trail Camp and Pine Barren pathway. Various snowmobile trails and the North Country Trail cross the area.
- Much of the topography in this management area was sculpted by melting glaciers that dissected some of the ice-contact ridges into steep ridges with flat sandy outwash plains between.

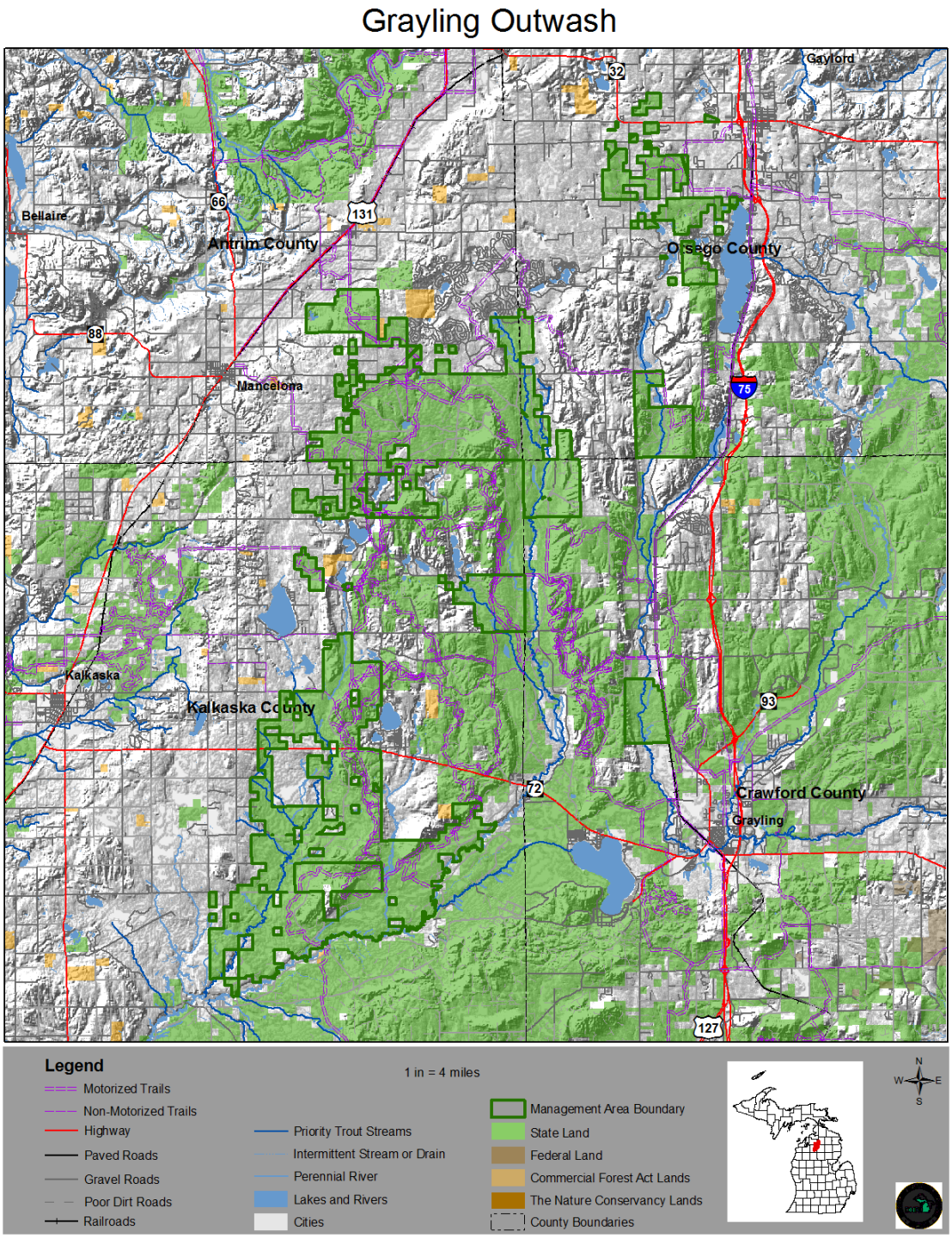

Figure 4.13.1. A map of the Grayling Outwash management area (dark green boundary) in relation to surrounding state forest and other lands in Kalkaska, Otsego and Crawford counties, Michigan.

Table 4.13.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Grayling Outwash management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	27%	17,896	1,143	16,753	2,986		17,896	2,792	
Red Pine	18%	11,708	100	11608	3,253	6,361	11,708	1,290	6,623
Northern Hardwood	17%	10,781	419	10362		4,685	10,781		4,685
Lowland Conifers	5%	3,055	2,444	611	68		3,055	68	
Cedar	3%	1,870	1,870				1,870		
Lowland Deciduous	3%	1,754	1,229	525	58		1,754	58	
White Pine	3%	1,651	114	1537	350	658	1,651	140	658
Jack Pine	2%	1,288	49	1239			1,288	207	
Upland Open/Semi-Open Lands	11%	6,850		6850			6,850		
Lowland Open/Semi-Open Lands	5%	3,511		3511			3,511		
Misc Other (Water, Local, Urban)	1%	640		640			640		
Others	6%	4,156	1,275	2881	436	536	4,156	364	696
Total		65,160	8,643	56,517	7,151	12,240	65,160	4,919	12,662

4.13.1 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.

4.13.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 17,896 acres or 27% of the management area (Table 4.13.1). 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 management area on AFO/AFOCa and PARVVb/AFO habitat classes (see Appendix E). Accessible aspen has been consistently harvested over the last 60 years. There are 1,143 acres of aspen have met harvest criteria (Figure 4.13.2), but have site conditions that limit harvest (hard factor limited acres). There are 1,941 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

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

10-Year Management Objectives

- Conduct regeneration harvests on a projected 2,986 acres beginning with the oldest age classes; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

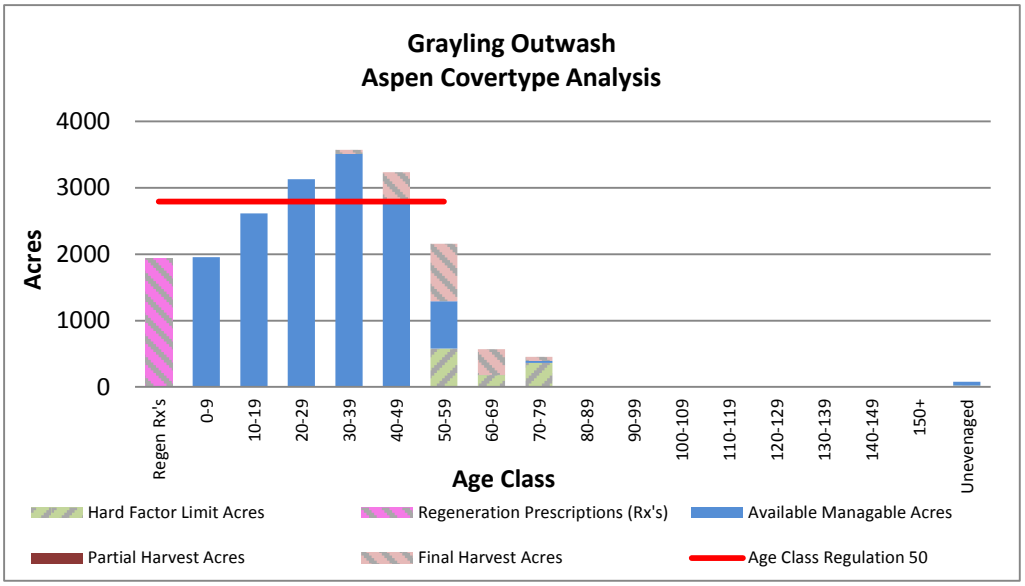

Figure 4.13.2. Age-class distribution for aspen in the Grayling Outwash management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue to manage through regeneration harvests to balance the age-class distribution; and
- Desired future harvest levels are projected at 2,792 acres of final harvest per 10-year period.

4.13.1.2 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 11,708 or 18% of the management area (Table 4.13.1), with most being 40 to 59 years old. Nearly all of the pine is of planted origin on AFO/AFOCa and PArVHa/PArVVb habitat classes. The acreage of red pine on very dry sites (PArVHa/PArVVb) may decrease as managers decide to convert them to jack pine. Red pine in this management area is commercially valued for pulp, saw logs and utility poles. Natural regeneration is occurring, particularly in jack pine plantings and underneath oak. There are 100 acres of red pine have met harvest criteria (Figure 4.13.3), but have site conditions that limit harvest (hard factor limited acres).

There are 233 acres of stands that have regeneration harvest pending and these acres are included in the regeneration prescription class. There are 1,533 acres with a partial harvest pending and these acres are included in their current age class. Figure 4.13.3 includes the projected number of acres converted to the cover type as a result of treatments and planting to red pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine on dry-mesic sites (habitat classes: AFO/AFOCa, PArVVb/AFO) 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 continual harvest, wildlife habitat and recreational opportunity.

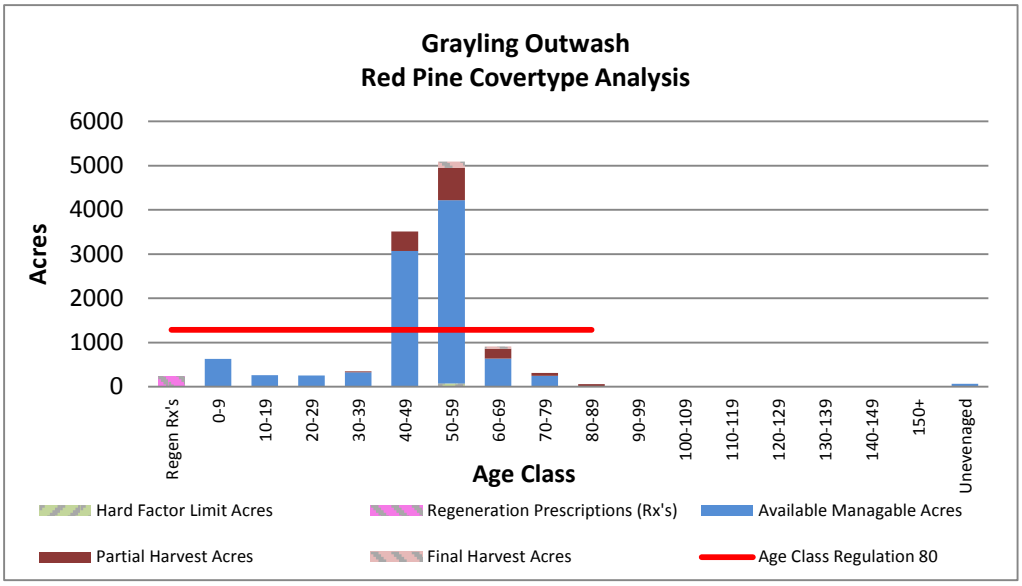

Figure 4.13.3. Age-class distribution for red pine in the Grayling Outwash management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct partial harvests on a projected 6,361 acres, concentrating on stands of better-quality red pine that have the potential for a higher product value in larger size classes; and
- Conduct regeneration harvests on a projected 3,253 acres of red pine beginning with the oldest age-classes and with a concentration on stands with less potential for a higher product value.

Long-Term Management Objectives

- Over the next several planning periods, continue thinning red pine that are currently in the 40-69 year age classes. For most stands at age 80, conduct stand-replacement harvests for either natural or planted regeneration; and
- Desired future harvest levels are projected at 1,290 acres of final harvest and 6,623 acres of partial harvest per 10-year period.

4.13.1.3 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 10,781 acres or 17% of the management area (Table 4.13.1). Forest communities dominated by northern hardwoods 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. There are 419 acres of upland hardwood have met harvest criteria (Figure 4.13.4) but have site conditions that limit harvest. There are 897 acres of stands that have a partial harvest pending and these acres are shown in their current basal area ranges.

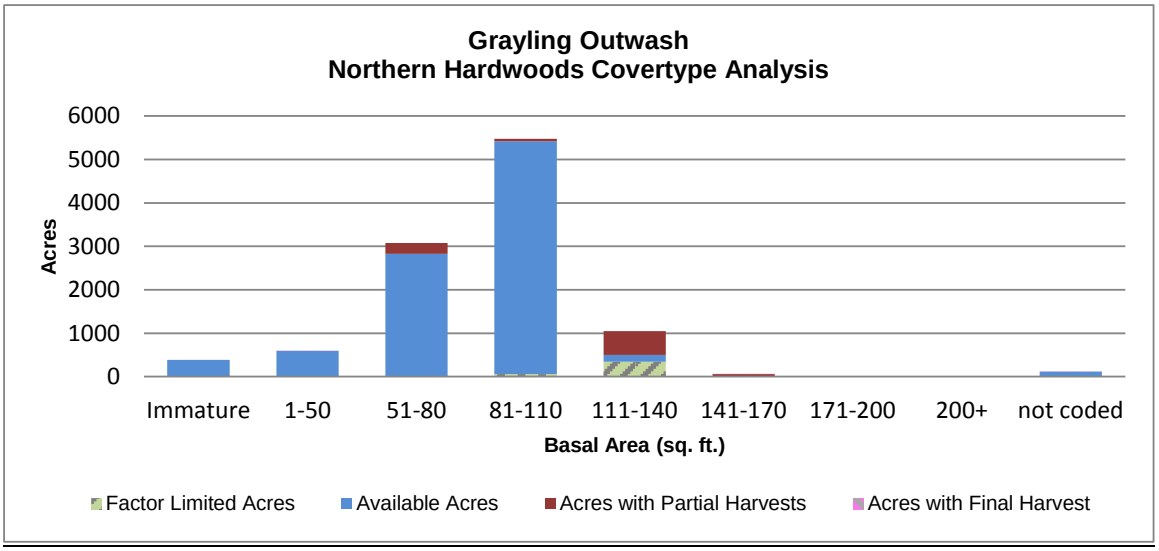

Figure 4.13.4. Basal area distribution for northern hardwood in the Grayling Outwash management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Northern hardwood stands will be maintained and managed through selection harvests on better-quality hardwood sites and through regeneration harvests on poorer-quality hardwood sites to provide a sustainable timber supply, wildlife habitat and recreational opportunity.

10-Year Management Objectives

- On better quality hardwood sites a projected 4,685 acres will be harvested through selection harvests to produce uneven aged stands; and
- There are 8 acres with a final harvest and these acres are shown in the current basal area range.

Long-Term Management Objectives

- Continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer, in northern hardwood stands, using Beech Bark Disease Management Guidelines and Emerald Ash Borer Guidelines;
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands;
- As beech and ash decrease in the northern hardwood stands, consider introducing oak for mast in stands without oak;
- Continue to manage for stands with an uneven-age class on better-quality hardwood sites; and
- Consider managing poorer quality sites through final (regeneration) harvests.

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

Current Condition

Lowland open/semi-open lands (lowland shrub, marsh, treed bog, bog) communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife. Lowland open/semi-open acres total 3,511 acres or 5% of the management area (Table 4.13.1).

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.

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

Current Condition

Upland open/semi-open acres total 6,850 acres or 11% of the management area (Table 4.13.1). This category is a combination of the following non-forested land cover types: herbaceous open land, upland shrub, low-density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas. These communities are valued ecologically as sources of open land habitat for numerous species of wildlife.

Desired Future Condition

- The amount of upland open/semi-open lands will be at or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

- Consider management to maintain upland open/semi-open lands.

Long-Term Management Objectives

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

4.13.1.6 Forest Cover Type Management – Other Types

Individual cover types which may cover less than 5% of the management area include: lowland conifers, 3,055 acres (5% of the management area), cedar, 1,870 acres (3%), white pine, 1,651 acres (3%) and jack pine, 1,288 acres (2%). Other forest communities total 5,910 acres (9%) and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These communities will be managed on operable sites, contributing to the compositional diversity of the landscape while providing for continual harvest and to contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal 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: lowland conifers 68 acres, lowland deciduous 58 acres, white pine 350 acres, oak 288 acres, upland mixed forest 71 acres, 18 acres of lowland aspen/balsam poplar, 43 acres of natural mixed pines and lowland mixed forest 78 acres;
- Partial harvests are projected for 658 acres of white pine, 264 acres of natural mixed pines, 58 acres of oak, 143 acres of mixed upland deciduous and 55 acres of upland mixed forest;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years-of-entry; and

- Consider methods to ensure adequate regeneration lowland types.

Long-Term Management Objectives

- The age-class structure of most of the other types will remain unbalanced for several decades; and
- Desired future harvest levels are projected as final harvests at 268 acres of lowland conifer and 181 acres of lowland deciduous per 10-year period.

4.13.2 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 are during this 10-year planning period:

- Eastern massasauga rattlesnake
- Pileated woodpecker
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Grayling Outwash management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest 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.

Eastern Massasauga Rattlesnake

The goal for eastern massasauga rattlesnake in the management area is to maintain available habitat and provide for the long-term persistence of the rattlesnake population. Eastern massasauga rattlesnakes inhabit open wetlands for over-wintering as well as adjacent upland open cover types that support gestation and parturition. Populations in northern Michigan will often use lowland coniferous forests, such as cedar swamps, as well as open wetlands. Upland sites may range from forest openings to old fields, agricultural lands and prairies. State forest management for the species should focus on maintaining suitable habitat on dedicated managed lands in accordance with the approved Candidate Conservation Agreement with Assurances. As of August 2013, the Candidate Conservation Agreement is in the initial stages of approval and as a result is subject to change. Refer to approved Candidate Conservation Agreement for final managed land boundaries and habitat management guidelines. Approximately 6,300 acres of state forest land in the Rattlesnake Hills management area are proposed for designated as eastern massasauga rattlesnake managed lands per the raft Candidate Conservation Agreement.

Wildlife Habitat Specifications:

- At occupied sites maintain ≤50% canopy from trees and shrubs in wetland and upland vegetation types, maintain patches of suitable habitat at greater than 250 acres, restrict mowing and burning to November to March when eastern massasauga rattlesnake are in hibernation, and refrain from manipulating water levels between November and March at sites where eastern massasauga rattlesnake are known to occur.
    - Implementation of eastern massasauga rattlesnake Candidate Conservation Agreement in appropriate management areas will be sufficient to meet eastern massasauga rattlesnake wildlife habitat specifications in this management area.

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 (>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.

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.

Snowshoe Hare

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

Wildlife Habitat Specifications:

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

Wild Turkey

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

Wildlife Habitat Specifications:

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

White-tailed Deer

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

Wildlife Habitat Specifications:

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

4.13.3 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 nine listed species and one natural communities of note occurring in the management area as listed in Table 4.13.2. 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.

As shown in Figure 4.13.5, there is one potential Type 2 old growth area (292 acres) known as the Watson Swamp representing the rich conifer swamp natural community type.

Table 4.13.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Grayling Outwash management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Comminity								
Rich conifer swamp		S3/G4	Confirmed				Tamarack	Late
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
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
Fish								
Cisco (lake herring)	*Coregonus artedi*	T/G5/S3	Confirmed	MV	Low	Great Lakes	Aquatic	N/A
						Inland lake	Aquatic	N/A
						Rivers	Aquatic	N/A
Butterfly								
Dusted skipper	*Atrytonopsis hianna*	Sc/G4G5/S2S3	Confirmed	MV	Low	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
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
Eastern Massassauga rattlesnake	*Sistrurus catenatus catenatus*	C/SC/G3G4T3T4Q/S3S4	Confirmed	HV	High	Coastal fen	Lowland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Dry sand prairie	Upland open/semi-open	N/A
						Poor conifer swamp	Tamarack	Late
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Intermittent wetland	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Northern fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						Mesic northern forest	Northern Hardwood	Late
						Dry northern forest	Jack Pine, Red Pine	Early
						Oak-pine barrens	Oak	Mid
						Pine barrens	Jack Pine	Early
						Mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
Plant								
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

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

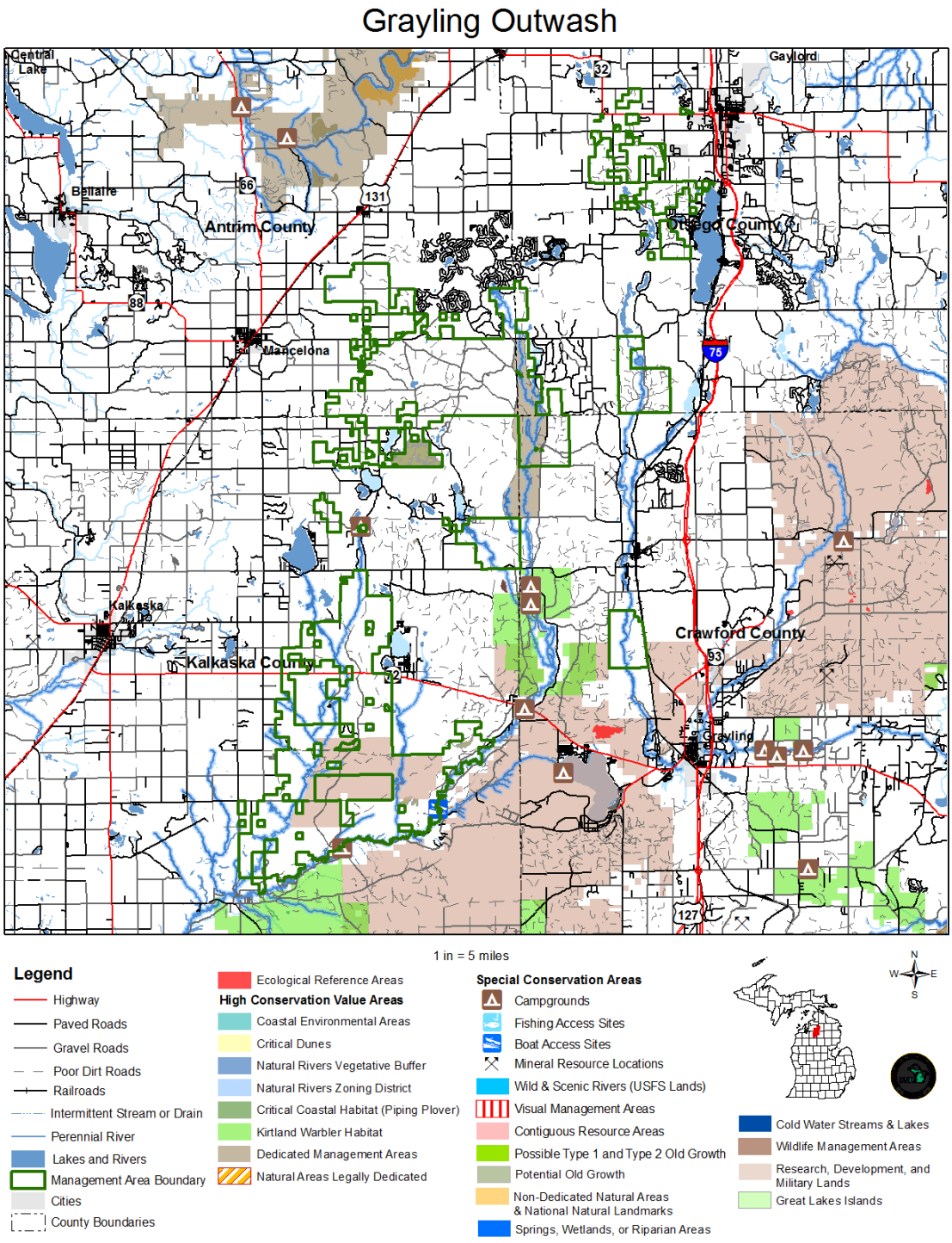

Figure 4.13.5. A map of the Grayling Outwash management area showing the special resource areas.

The Upper Manistee River and its tributaries have been identified as a natural river and along with its corridor are also designated as a high conservation value area as shown in Figure 4.13.5.

There are no ecological reference areas identified for the Grayling Outwash management area.

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.

4.13.4 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 emerald ash borer, beech bark disease, oak decline and branch mortality of seedling and sapling white pine 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.
- Full site use (e.g., stocking, desired species and low species diversity) on high-quality northern hardwood sites heavily impacted by beech bark disease and/or emerald ash borer is important.
- Consider planting red or white oaks, white or red pines, black cherry, white spruce, etc. as site conditions and quality allow.
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.
- Monitor for branch mortality of seedling and sapling white pine along and adjacent to river corridors.
- Causal agent(s) responsible for this problem may include pine spittlebug feeding and various fungal pathogens.
- Until management guidelines can be developed, continue reporting incidence of this problem to the forest health specialist.

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 4.13.3 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 4.13.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Grayling Outwash - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	0	1	1	1

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
-	-	Garlic Mustard *Alliaria petiolata*	1

4.13.5 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 4.13.1 and listed in Appendix F.

4.13.6 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:

- Reintroduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition, particularly from red maple; and
- Incorporate fire as a tool to restore or maintain managed openings.

4.13.7 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.

Existing recreational opportunities vary across this management area. Pickerel Lake state forest campground (Figure 4.13.3) provides a rustic camping experience and a boat launch into Pickerel Lake. This campground is conveniently located near the Leetsville to Kalkaska Michigan Cross Country Cycle Trail and the non-motorized North Country Pathway. Trails are shown in Figure 4.13.1. Boating access sites in this management area are located on larger lakes in the area, offering excellent boating and fishing opportunities. This management area is located within Michigan's "snow belt" area, which contributes to the popularity of snowmobiling in the area. Equestrian users have the Shore-to-Shore Trail to ride, while non-motorized recreational enthusiasts can trek the Pine Baron Pathway and North Country Trail. Due to the proximity of this management area to population centers such as Gaylord, Grayling and Mancelona recreational activities will likely increase in the future. Existing recreational facilities within this management area are listed below:

Campgrounds

- Pickerel Lake State Forest Campground

Boating Access Sites (BSAs)

- Starvation Lake BAS
- Pickerel Lake BAS
- Cranberry Lake BAS

Off-Road Vehicle Trails

- Leetsville to Kalkaska Missaukee & Michigan Cycle Conservation Club Trail
- Kalkaska Trail and Route
- Kalkaska to Tomahawk Missaukee & Michigan Cycle Conservation Club Trail

Snowmobile Trails

- Various

Non-Motorized Trails

- Shore-to-Shore
- Pine Baron Pathway
- North Country Trail

Where it is necessary to remove trees adjacent to trails, stumps should be cut as low as possible.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts.

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

4.13.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium, ice-contact outwash sand and gravel and an end moraine of coarse-textured till. The glacial drift thickness varies between 200 and 1,000 feet. Sand and gravel pits are located in this management area, and there is good potential for additional pits.

The Mississippian Michigan Formation, Marshall Sandstone and Coldwater and Sunbury Shales and Devonian Berea Sandstone and Bedford, Antrim and Ellsworth Shales subcrop below the glacial drift. The Michigan is quarried for gypsum and the Antim for cement products elsewhere in the state.

Most of this management area has been developed for gas production from the Antrim Shale and some oil and gas production from Guelph (former Niagaran) reefs. 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 to 640 acres per well (or possibly larger). The southern parts of Crawford and Kalkaska Counties, that have not been drilled yet, are leased for the Collingwood and drilling, if sucessful could expand into the rest of 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, 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.