4.18 MA 18 – Benzie Moraines Management Area

Summary of Use and Management

Vegetative management in the Benzie Moraines management area (MA) will produce various forest products; maintain or enhance biodiversity conservation and wildlife habitat; protect areas of unique character and threatened, endangered and special concern species; provide for forest-based recreational uses; and Native American non-commercial use of forest products. Timber management for this 10-year planning period includes improving the age-class structure of aspen and red pine and continued selection harvesting in high-quality northern hardwoods to achieve an all-age structure. Wildlife management objectives include increasing the structural complexity of northern hardwood communities for interior forest species and perpetuating early-successional communities for species adapted to young forests. Expected trends within this 10-year planning period are forest pest issues, particularly beech bark disease and emerald ash borer and an increase in recreational trail use.

Introduction

This management area is located just east of Frankfort, Michigan and west of Traverse City in Benzie, Leelanau, Grand Traverse and Wexford counties and contains 25,118 acres of state forest (Figure 4.18.1). The primary attributes which identify the Benzie Moraines management area include:

- The moraines, moraine ridges or till landforms which account for 53% of the management area.
- Historic forest communities of northern hardwoods on the well-drained loamy sand to sandy loam soils and one extensive area of hemlock on richer soils.
- Current cover types which are dominated by northern hardwoods, aspen and red pine.
- The management area positioning on the Manistee and Newaygo Outwash Plain sub-regions of the northern Lower Peninsula.
- The proximity of this management area to the population centers, the forest resources contribute social and economic values to the area.
- Dispersed recreation in the form of hunting and mushroom picking as well as concentrated recreation on the Shore-to-Shore Riding/Hiking trail and the Platte River and Maple City snowmobile trails.
- There has been limited development of oil/gas resources.
- Surveys have confirmed the presence of threatened, endangered or special concern species red-shouldered hawk, Michigan monkey flower and ginseng.
- A history of white tailed deer, ruffed grouse, woodcock and other game species harvest.

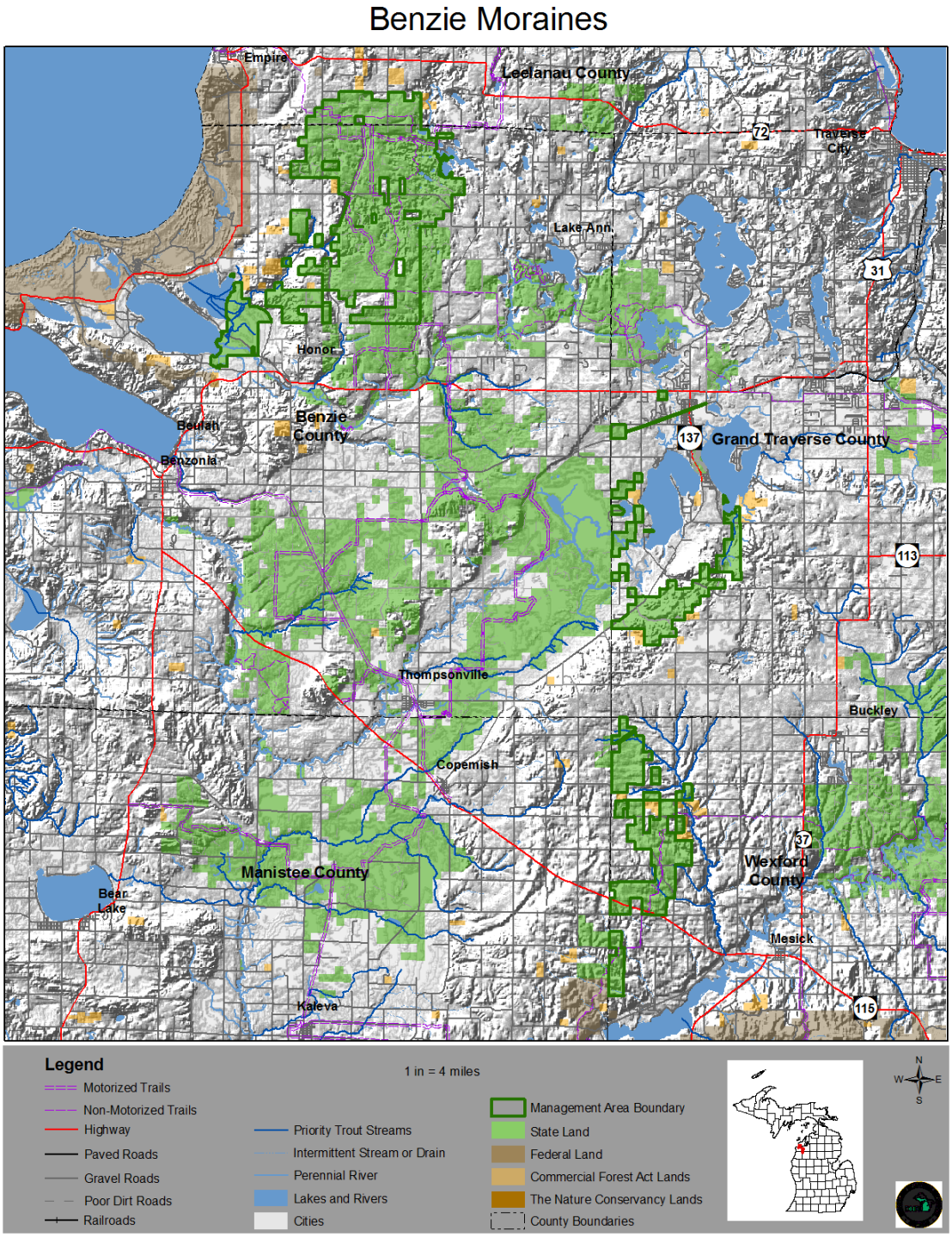

Figure 4.18.1. A map of the Benzie Moraines management area (dark green boundary) in relation to surrounding state forest and other lands in Benzie, Leelanau, Grand Traverse and Wexford counties, Michigan.

Table 4.18.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Benzie Moraines 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 Net Change (Acres)	Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest			Final Harvest	Partial Harvest
Northern Hardwood	40%	10,130	1,412	8,718	1,300	2,730		10,130		4,030
Aspen	18%	4,434	300	4134	1,165			4,434	689	
Red Pine	13%	3,186	57	3129	912	1,744	113	3,299	360	1,872
White Pine	3%	844	54	790	225	376		844	72	376
Mixed Upland Deciduous	3%	841	102	739	330	271		841	106	328
Lowland Conifers	3%	721	577	144	16			721	16	
Oak	2%	563	284	279	85	134		563	25	134
Tamarack	2%	538	430	108	15			538	15	
Jack Pine	1%	211		211			-113	98	14	
Upland Open/Semi-Open Lands	6%	1,532		1532				1,532		
Lowland Open/Semi-Open Lands	2%	424		424				424		
Misc Other (Water, Local, Urban)	1%	172		172				172		
Others	6%	1,522	838	684	147	146		1,522	76	146
Total		25,118	4,054	21,064	4,195	5,401		25,118	1,373	6,886

4.18.1 Forest Cover Type Management

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

4.18.1.1 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres total 10,130 acres (40%) of the management area (Table 4.18.1) on moraine ridges, moraines or till areas Since hardwood stands have trees of varying ages, stand density (described as basal area) is a more appropriate measure of stand condition for northern hardwood stands. The majority of the acres are in stands of moderate density represented by a basal area between 81-110 square feet per acre. Past treatments have had a variety of outcomes depending on soil type, topography and amount of aspen in the species mix, degree of canopy opening and potential for beech regeneration. Future harvest prescriptions need to consider these factors to favor desirable outcomes. There are 1,412 acres of northern hardwoods have met harvest criteria (Figure 4.18.2), but have site conditions that limit harvest (hard factor limit acres).

There are 2,034 acres with a partial harvest pending and these acres are included in their current basal area range.

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; and
- A significant portion of this cover type will be managed on an even-aged basis, including some stands with a significant aspen component which will be reclassified as aspen types after regeneration harvests.

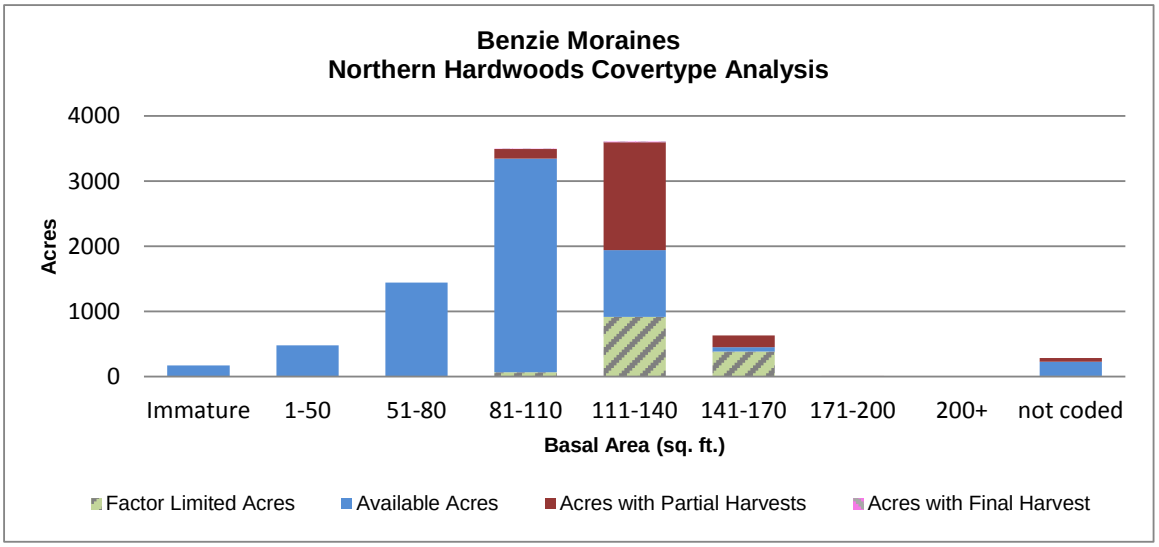

Figure 4.18.2. Basal area distribution for northern hardwood in the Benzie Moraines management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct partial harvests on a projected 2,730 acres concentrating on better quality AFO and AFOCa habitat class sites (see Appendix E) and stands with high basal area while attempting good spatial distribution of harvests over time to minimize wildlife impacts;
- Conduct final harvests to restart northern hardwood stands on a projected 1,300 acres with a concentration on stands located on excessively drained soil types;
- Consider opportunities to spatially separate harvests to minimize wildlife impacts;
- Consider opportunities to harvest stands in lower basal area ranges to expedite balancing of basal area ranges;
- Where present, retain hemlock and white pine for within-stand diversity; and
- Additional areas may be nominated to inclusion in special conservation areas, which could reduce the overall acres of this type available for active management.

Long-Term Management Objectives

- Stands with a significant aspen component will be re-classified as aspen types after regeneration harvests. These stands may also have a significant component of cherry with other hardwoods developing over time. These diverse stands will provide a variety of options for long-term timber and habitat management;
- Continue to manage high-quality hardwood sites (AFOCa and better AFO sites) through partial harvests to develop an uneven-aged structure;
- Continue to manage lower quality hardwood sites (PArVVb and poorer AFO sites) through final harvests for even-aged management. It is acceptable that stands will initially be mixed with aspen and cherry and through management will eventually become dominated by sugar maple;
- Long-term management of northern hardwoods in draws and depressions, influenced by cold air drainage and initially composed of quaking aspen, low-quality cherry and other hardwoods, will target an eventual red maple, sugar maple composition;
- Consider opportunities to promote mast producing species to mitigate the loss of ash and beech due to insect and disease infestations; and
- A desired future harvest levels is projected at 4,030 acres for per 10-year period through a mix of final and partial harvests.

4.18.1.2 Forest Cover Type Management - Aspen

Current Condition

Aspen acres total 4,434 acres or 18% of the management area (Table 4.18.1). Aspen is distributed throughout the management area and there is a large spike of acres in the 30-39 year-old age class. 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. In addition, aspen is often a significant component of northern hardwood stands; suitable portions of such stands may be final harvested and converted to aspen-dominated stands.

There are 300 acres of aspen have met harvest criteria (Figure 4.18.3), but have site conditions that limit harvest (hard factor limit acres).

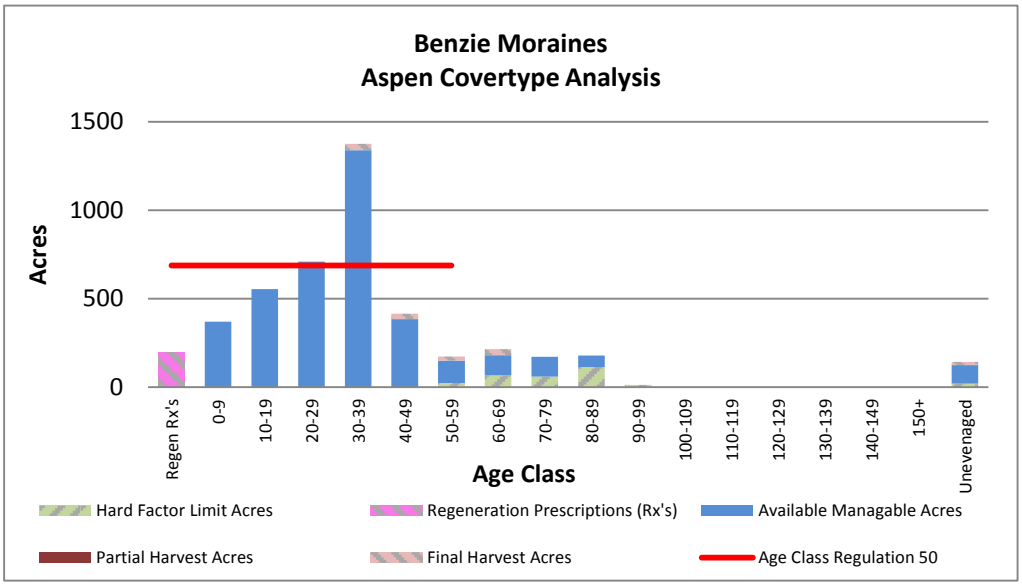

Figure 4.18.3. Age-class distribution for aspen in the Benzie Moraines management area (2012 Department of Natural Resources inventory data).

There are 1,071 acres of stands that have a regeneration harvest pending and these acres are included in the regeneration prescription class. The graph includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species resulting in release of aspen. These acres are included in the 0-9 year-old age 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 a sustainable harvest, wildlife habitat and recreation opportunity.

10-Year Management Objectives

- Conduct stand regeneration harvests on a projected 1,165 acres per decade; and
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions.

Long-Term Management Objectives

- Continue treatments to balance the age-class distribution. It is projected that this will take at least three 10-year inventory (or planning) cycles to complete;
- A desired future harvest level is projected at 689 acres for final harvest per 10-year period; and
- Stands converted from northern hardwoods to aspen may have a significant component of cherry, with other hardwoods developing over time. Within-stand diversity offers a variety of options for long-term timber and habitat management in these stands.

4.18.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 3,186 acres or 13% of the management area (Table 4.18.1). Red pine is located on high-quality moraines including habitat classes PArVVb and AFO. It should be noted that a habitat classification has not been completed for Manistee and Benzie Counties. Only Wexford County, which is a small percentage of the management area, has had habitat classification completed.

There are 57 acres of northern hardwoods have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres).

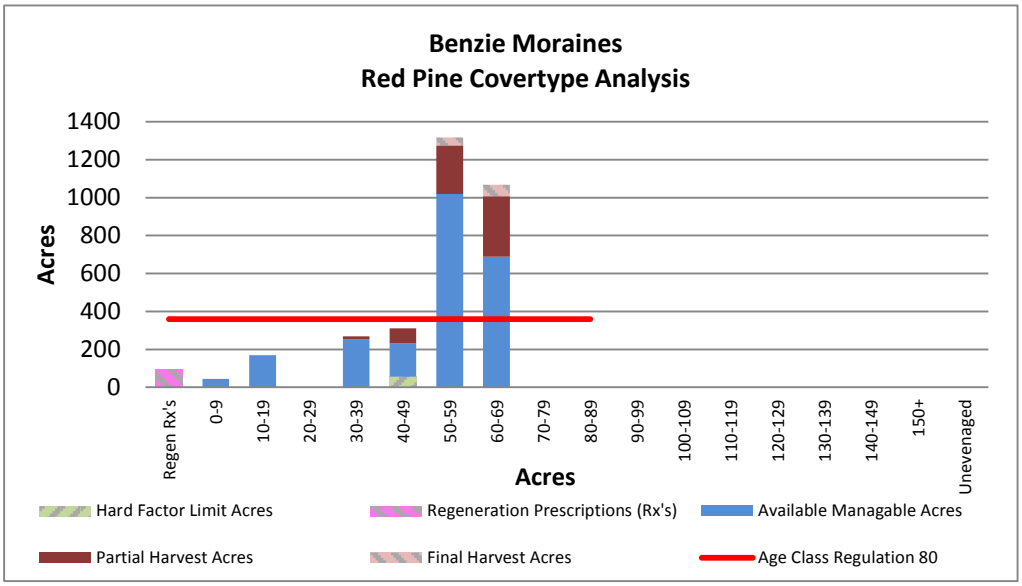

Figure 4.18.4. Age-class distribution for red pine in the Benzie Moraines management area (2012 Department of Natural Resources inventory data).

As shown in Figure 4.18.4, there is a pronounced spike in the 50-69 year-old age classes which represents an era of active planting.

There are 96 acres of stands that have a regeneration harvest pending and these acres are shown in the regeneration prescription class. There are 670 acres with a partial harvest pending and these acres are included in their current age class.

Figure 4.18.4 includes the projected number of acres converted to the cover type as a result of treatments that remove an overstory species (jack pine) and planting of red pine which is more suitable for this management area. These acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine 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.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing age-class distribution;
- If a well-established understory of desirable upland hardwood seedlings and saplings exists below older red pine, usually on AFO sites, use seed tree or shelterwood harvests to release the hardwoods while keeping some red pine as a component to improve stand diversity;
- Conduct partial harvests on a projected 1,744 acres, concentrating on stands of better quality red pine that has the potential for a higher product value in larger size classes; and
- Conduct regeneration harvests, on a projected 912 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

- Achieve a more balanced 0-89 year-old age-class distribution for red pine over the next several decades;
- In identified special conservation areas, especially those with natural red pine, consider management of red pine to a biological rotation of 200+years; and
- A desired future harvest level is projected at 360 acres for final harvest and 1,872 acres for partial harvest per 10-year period.

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

Current Condition

Upland open/semi-open acres total 1,532 acres or 6% of the management area (Table 4.18.1). 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

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

10-Year Management Objectives

- If necessary and feasible, consider maintaining upland open/semi-open lands through possible use of prescribed fire, woody brush removal, herbicide and planting.

Long-Term Management Objectives

- Continue to maintain upland open/semi-open lands at 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.

4.6.1.5 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 424 acres or 2% of the management area (Table 4.18.1).

Desired Future Condition

- Lowland open/semi-open lands sites will be maintained at 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 to protect stands from illegal off-road vehicle use; and
- Where feasible and necessary, use control methods on invasive non-native species.

4.18.1.6 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: white pine, 844 acres (3%), mixed upland deciduous, 841 acres (3%), lowland conifers, 721 acres (3%), oak, 563 acres (2%), tamarack, 538 acres (2%) and upland mixed forest, 421 acres (2%). Other forest communities total 1,132 acres (5%) and are spread across the management area. All of the timbered and non-timbered communities have important ecological values and are important habitat for numerous wildlife species.

Desired Future Condition

- These cover types will contribute to the compositional diversity of the landscape in addition to providing wood products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Seek opportunities to harvest, where appropriate, the scattered acreages of upland and lowland minor types where access and operability will not adversely impact sensitive areas;
- Consider methods to ensure lowland conifer and cedar regeneration;
- Conduct regeneration harvests on a projected 16 acres of lowland conifers;
- Consider methods to ensure adequate regeneration of lowland types;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issue) of normal years of entry;
- Conduct regeneration harvests on a projected 225 acres of white pine, 85 acres of oak and 330 acres of mixed upland deciduous, 15 acres of tamarack and 101 acres of upland mixed forest;
- Conduct partial harvests on a projected 376 acres of white pine, 271 acres of mixed upland deciduous, 134 acres of oak and 107 acres of upland mixed forest;
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration in other cover types;
- White pine, which is predominantly in plantations, should be managed long-term on an even-aged basis, using partial harvests to gradually remove low-quality trees and steer these stands toward pine-hardwood mixed types.; and
- Opportunities for harvesting and regeneration of lowland types should be considered on a case-by-case basis. Much of the lowland acreage in this management area is in the Deadstream Swamp near Platte Lake, which is listed as a high-quality rich conifer swamp and should be managed passively.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible;
- Continue management of these other types to provide wood products, wildlife habitat and recreational opportunities; and
- A desired future harvest level is projected at 15 acres of tamarack, 16 acres of lowland conifer and 12 acres of lowland deciduous for final harvest per 10-year period.

4.18.2 Featured Wildlife Species

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

The following have been identified as featured species for this management area during this 0-year planning period:

- American marten
- Black bear
- Black-throated blue warbler
- Pileated woodpecker
- Red-shouldered hawk
- Ruffed grouse
- Wild turkey
- White-tailed deer
- Wood thrush

The primary focus of wildlife habitat management in the Benzie Moraines 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 the maintenance of young forest, extensive mature forest, large open grassland complexes and marsh/grassland complexes, the retention of large, over-mature trees and snags and the maintenance and expansion of hard mast, understory shrub and mesic conifer components.

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

American Marten

The goal for American marten in the northern Lower Peninsula is to increase available habitat. American marten needs mature mixed forest stands or old conifer-dominated stands, with dead and down material for maintaining a stable and sufficient supply of small mammals as prey. American marten are rarely found outside the forest canopy. This species depends upon live-tree dens, snags and coarse woody debris for loafing (resting) and denning sites. State forest management should address the maintenance and improvement of extensive and mature forest tracts, corridors, dead wood and conifer components in priority landscapes.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore large forested tracts and forested corridors.
- In even-aged management systems, within-stand retention should focus on large diameter (greater than15 inches in diameter at breast-height) trees, known cavity trees and/or mesic conifers to maintain/increase denning and loafing sites.
- Where possible, increase both standing-dead and downed-dead wood by:
    - Applying at least the minimum level of within-stand retention to all stands in management area;
    - Writing harvest specifications to leave slash at the stump or to minimize the removal of slash; and
    - Limiting or prohibiting firewood permits at marten-occupied sites.

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.

Black-throated Blue Warbler

The goal for black-throated blue warbler in the northern Lower Peninsula is to maintain available habitat. Black-throated blue warbler is an area-sensitive species (e.g., densities increase exponentially with increasing patch size) mainly occurring in mesic deciduous forest tracts >50 years in age and >250 acres in size, with a dense understory layer for nesting and foraging. State forest management for the species should focus on maintaining mature, large (>50 years old and >250 acres) mesic deciduous forest tracts with a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

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 than 12 inches in diameter at breast height) at the landscape scale.

Wildlife Habitat Specifications:

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

Red-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 aspen/mixed hardwood cover types 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.

Wild Turkey

The goal for turkey in the northern Lower Peninsula is to 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 on suitable sites.

Wildlife Habitat Specifications:

- Maintain and increase the number of brood-rearing openings (forest openings, savannas, barrens, hayfields, etc.).
- Large contiguous patches of mature deciduous forest are the priority in this management area, but existing openings on old fields/orchards and semi-open habitats in frost-prone low areas provide opportunities for brood-rearing openings.
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Through opening maintenance, planting and pruning, provide sources of winter food that are accessible above the snow (food plots, annual grains, fruit-bearing trees or shrubs).
  - Implementation of 10-year management direction for upland open land will be sufficient to meet this turkey habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this turkey habitat specification.

White-tailed Deer

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

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

Wood Thrush

The goal for wood thrush in the northern Lower Peninsula is to maintain available habitat. Wood thrush occur primarily in upland, mesic deciduous and mixed forests with large trees, diverse tree communities, moderate undergrowth and a well-developed litter layer. They are highly susceptible to nest predation and brood parasitism, which increases with forest fragmentation. State forest management for the species should focus on maintaining large (>250 acres) forest tracts, minimizing edge and promoting a dense understory layer for nesting and foraging.

Wildlife Habitat Specifications:

- Identify, maintain, develop or restore mesic-deciduous tracts >50 years old and >250 acres in size;
- Maximize forest interior (of northern hardwood stands) within the management area by increasing the portion of forest over 250 acres, minimizing edges (concentrating openings, oil and gas development, roads and pipelines along the forest or stand edge) and providing canopy gaps through single tree and group selection harvest practices; and
- Conduct silvicultural practices to maintain or promote a well-developed shrub understory.

4.18.3 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 four listed species and no natural communities of note occurring in the management area as listed in Table 4.18.2. Any established management guidelines will be followed. Further surveys for special species and natural communities will be carried out as a matter of course during the inventory process and opportunistically for special more focused surveys.

Table 4.18.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Benzie Moraines 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
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
Plants								
Michigan monkey flower	*Mimulus glabratus michiganensis*	LE/E/G5T1/S1	Confirmed			Rich conifer swamp	Tamarack	Late
Ginseng	*Panax quinquefolius*	T/G3G4/S2S3	Confirmed			Floodplain forest	Lowland mixed	Mid
						Mesic northern forest	Northern Hardwood	Late

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

There are no high conservation value areas or ecological reference areas identified for the Benzie Moraines management area as illustrated in Figure 4.18.5.

There are two goals and three objectives related to rare species and special resource areas.

Management goals during this planning period:

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

Future development and recreational pressure associated with expected population growth in the vicinity of this management area will be the primary challenge to successful management for special resource areas.

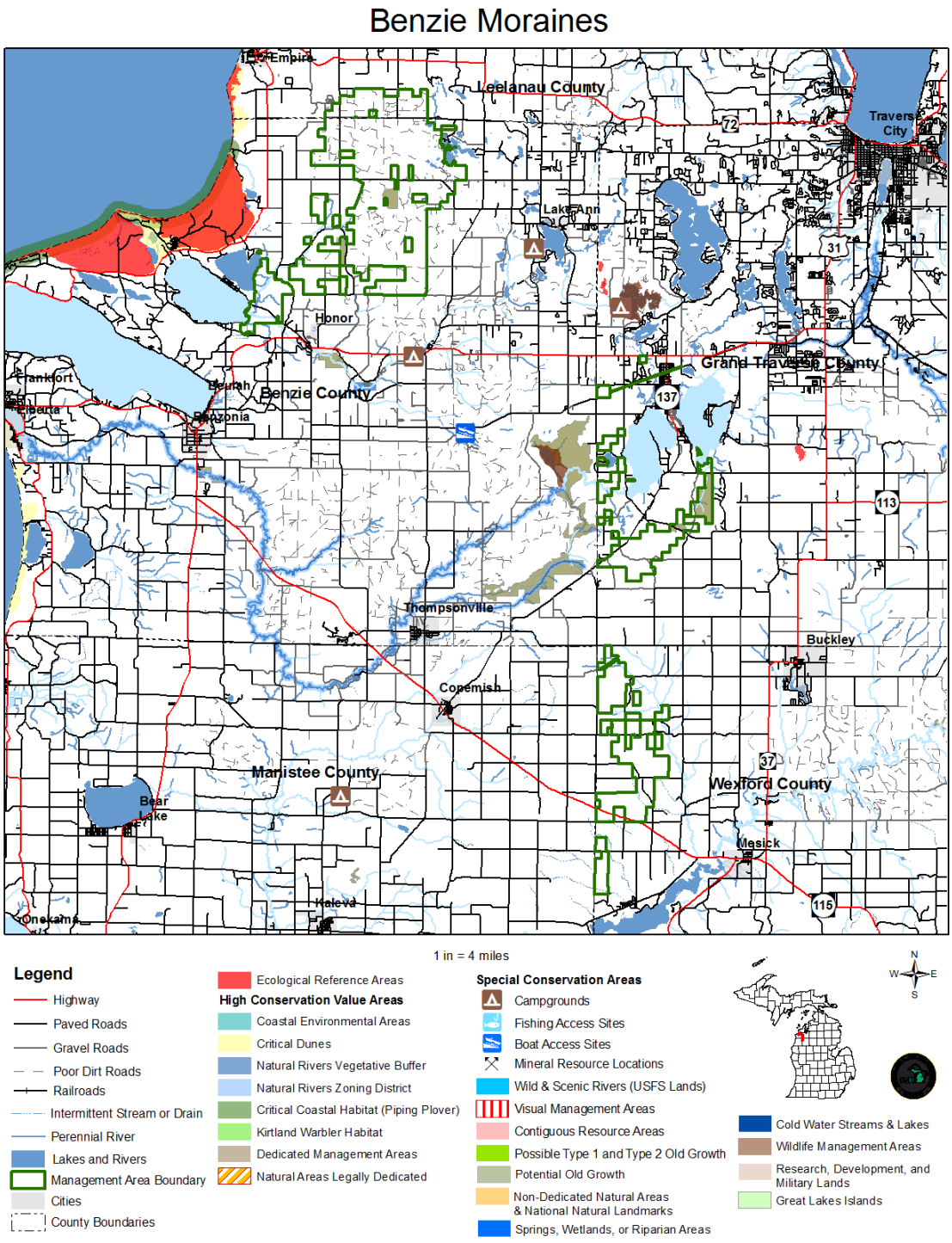

Figure 4.18.5. A map of the Benzie Moraines management area showing the special resource areas.

4.18.4 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 issues in this management area may include emerald ash borer and beech bark disease and management should be adapted as follows:

- 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; and
- Herbicides may be needed to control competing vegetation and/or to reduce density of ash and beech regeneration.

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 4.18.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. Local staff has noted the presence of garlic mustard and *Phragmites* on the edges of lakes and wetlands within this management area. In the management area and some areas have been treated, infestations may be small enough in many cases to have confidence in the efficacy of further treatments. 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 4.18.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Benzie Moraines - FMD MA	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	4	10	14	2

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
Glossy Buckthorn *Rhamnus frangula*	4	Glossy Buckthorn *Rhamnus frangula*	9
-	-	Japanese Barberry *Berberis thunbergii*	1

4.18.5 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 4.18.1 and listed in Appendix F.

4.18.6 Fire Management

Northern hardwoods which have historically been a major component of this management area are rarely impacted by natural fire regimes. However, disturbance through fire has played an important role in the initial propagation and maintenance of 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 incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.18.7 Public Access and Recreation

Access for management and/or recreation is generally very good throughout this management area as there is very little lowland and a well-developed road/trail system which includes the Platte River and Maple City snowmobile trails. In accordance with the department's *Sustainable Soil and Water Quality Practices on Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

Recreational opportunities within this management area include the popular Garey Lake Trail camp, which provides a critical resting spot along the equestrian-oriented Shore-to-Shore Trail. A vital north/south snowmobile trail dissects this management area and the nationally recognized non-motorized North Country Trail is found in the southern portion of this management area. Trails are shown in Figure 4.18.1. Due to the proximity of this management area to heavily populated Traverse City area, coupled with favorable upland soils, future expansion of recreational amenities may occur. There are no state forest campgrounds within the management area, but one is nearby as shown in Figure 4.18.5. Listed below are the recreational facilities within this management area:

Campgrounds
- Garey Lake Trail Camp

Boating Access Sites (BSAs)
- Garey Lake BAS

Off-Road Vehicle Trails---N/A

Snowmobile Trails
- Various

Non-Motorized Trails
- Shore-To-Shore Trail
- North Country Trail

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

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.

4.18.8 Oil, Gas and Mineral Development

Surface sediments consist of an end moraine of coarse-textured till, coarse-textured till, glacial outwash sand and gravel and postglacial alluvium and lacustrine (lake) sand and gravel. The glacial drift thickness varies between 200 and 1,100 feet. Sand and gravel pits are located in this management area and there is very good potential for additional pits.

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

Part of the Grand Traverse and Wexord county lands in this management area have been developed for oil and gas production from the Guelph (former Niagaran) reefs. Well spacing is currently 80 acres and most of the area of Guelph production is still under lease. The Collingwood Formation does not appear to have potential in this 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.