4.28 Peavy End Moraines Management Area

Summary of Use and Management

Vegetative management in the Peavy End Moraines management area (MA) (Figure 4.28.1) will provide a variety of forest products; maintain or enhance wildlife habitat; protect areas with unique characteristics; and provide for forest based recreational uses. Timber management objectives for the 10-year planning period include improving the age-class distribution of aspen; maintaining the conifer component in northern hardwood stands; maintaining the presence of minor cover types on the landscape; and maintaining non-forest vegetation types. Wildlife management objectives include addressing the habitat requirements identified for the following featured species: American woodcock, black bear, eastern bluebird, white-tailed and wood duck. Management activities may be constrained by site conditions and the skewed age-class distributions. Balancing age classes and potential insect (spruce budworm) and disease (oak wilt) infestations will be issues for this 10-year planning period.

Introduction

The Peavy End Moraine management area is on an end moraine in southeastern Iron County. The state forest covers 11,596 acres and is somewhat scattered blocks. The major ownership in this vicinity is non-industrial private. The management area is dominated by the aspen, northern hardwood and oak cover types. Other attributes that played a role in the definition of this management area include:

- Dominated by two natural communities: mesic northern forest and dry mesic northern forest;
- Mid-range in site quality;
- Provides multiple benefits including forest products and dispersed recreational activities; and
- Provides a variety of fish and wildlife habitats.

The management priority in this area is to continue to provide these multiple benefits while minimizing user conflicts.

The predominant cover types, composition and projected harvest areas for the Peavy End Moraine management are shown in Table 4.28.1.

Table 4.28.1. Summary of cover types, composition, limited factor area, manageable area and projected harvest area for the Peavy End Moraines management area (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	52%	5,996	586	5,410	1,388	0	5,996	902	0
Northern Hardwood	16%	1,880	0	1880	0	940	1,880	0	940
Oak	6%	639	276	363	23	81	639	23	81
Lowland Conifers	5%	549	465	84	32	0	549	9	0
Red Pine	4%	432	54	378	143	195	432	42	250
Upland Spruce/Fir	4%	409	147	262	0	0	409	37	0
Upland Open/Semi-Open Lands	2%	203	0	203	0	0	203	0	0
Lowland Open/Semi-Open Lands	2%	285	0	285	0	0	285	0	0
Misc Other (Water, Local, Urban)	1%	104	0	104	0	0	104	0	0
Others	9%	1,099	276	823	260	48	1,099	86	112
Total		11,596	1,803	9,793	1,846	1,264	11,596	1,099	1,383

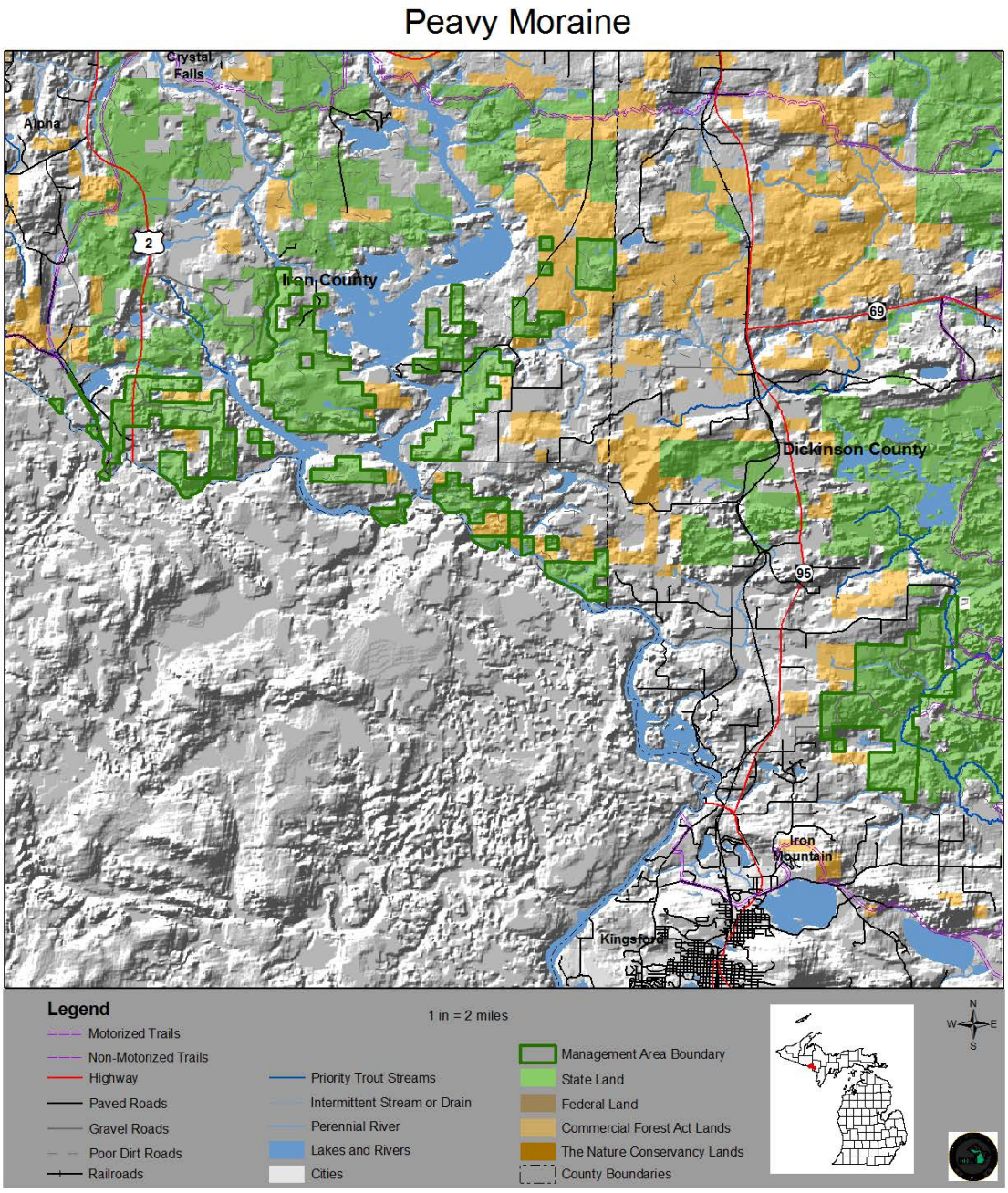

Figure 4.28.1. A map of the Peavy End Moraines management area (dark green boundary) in relation to surrounding state forest and other lands in Iron County, Michigan.

4.28.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management for each of the major cover types, a grouping of minor cover types and important non-forested vegetation types for the Peavy End Moraines management area in the form of Desired Future Condition, 10-Year Management Objectives and Long-Term Management Objectives. 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, the natural processes of succession and disturbance will provide ecological benefits. While most stands have a variety of tree species and other vegetation, they are classified by the species with dominant canopy coverage.

The following cover types are valued commercially for their timber products; ecologically as sources of habitat for numerous wildlife species; and for the variety of recreational opportunities they provide. Harvesting and regenerating these cover types will provide for a continuous flow of forest products and will help to ensure (or provide) wildlife habitat.

Aspen Cover Type

Current Condition

The aspen cover type covers 5,996 acres (52%) of state forest land in this management area (Table 4.28.1). There is a lack of aspen acreage in the 10-19, 50-59 and 60-69 year-old age classes and there are spikes in the 0-9, 20-29 and the 30-39 year-old age classes (Figure 4.28.2). Hard factor limits occur on 586 acres and have been removed from the total number of manageable acres available for harvest calculations. Many of these acres will succeed to upland spruce/fir.

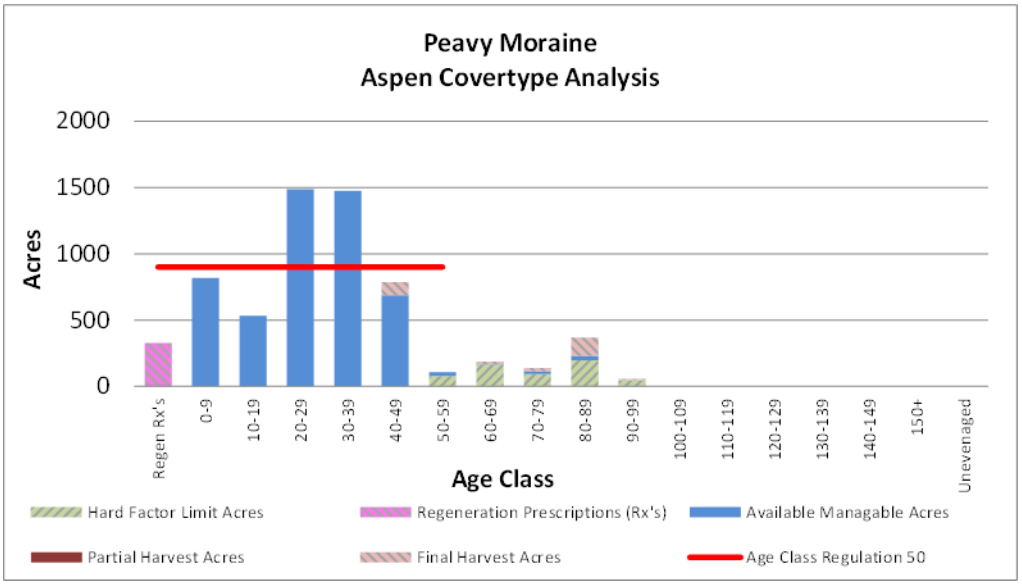

Figure 4.28.2. Graph of the age-class distribution for the aspen cover type on the Peavy End Moraine management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Balanced acres in each age class over a 50-year rotation;
- Provide an even supply of forest products;
- Provide for a balanced mix of habitat conditions for a variety of wildlife; and
- Provide for a variety of hunting-type opportunities.

Long-Term Management Objective

- Once age classes are better distributed, harvest and regenerate approximately 902 acres each decade.

10-Year Management Objectives

- Harvest 1,388 acres during this 10-year planning period;
- Two-aged stands with mature aspen over younger stands should be identified and scheduled for harvest; and
- Identify some of the 40-49 and 50-59 year-old aspen on better sites that could be available for early harvest.

Northern Hardwoods Cover Type

Current Condition

Northern hardwood stands make up about 1,880 acres (16%) of state forest land in this area (Table 4.28.1). They occur on medium-quality sugar maple sites. Most stands have been managed on an uneven-aged system using the selection method of harvesting, which uses basal area criteria for a harvest decision rather than rotation age (Figure 4.28.3). Regeneration of trees, shrubs and herbaceous plant communities has been limited because of well-established sedge competition.

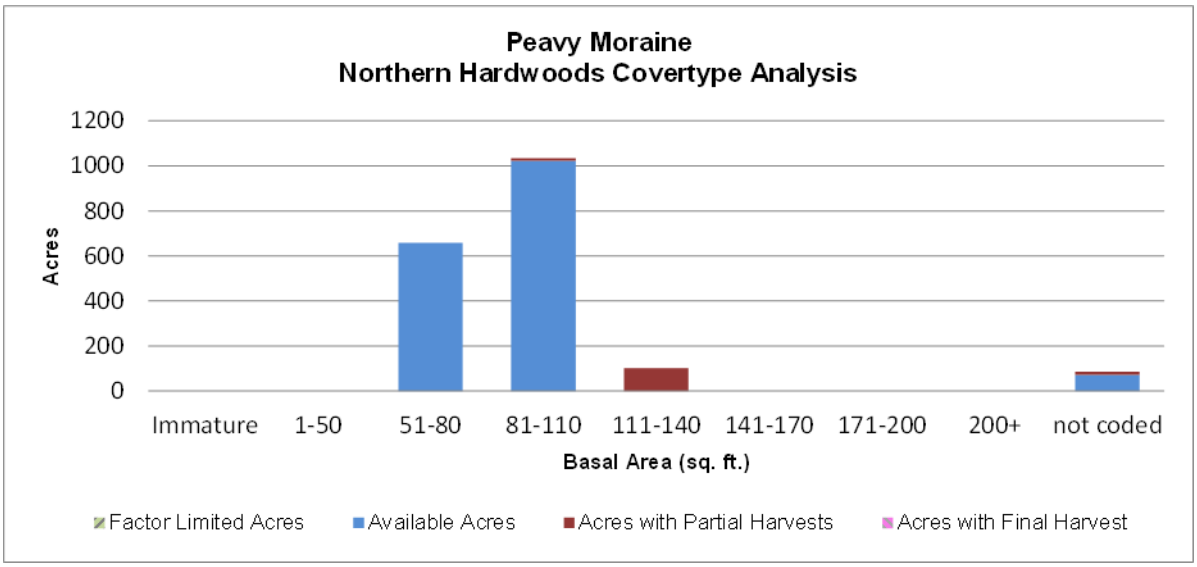

Figure 4.28.3. Graph of the basal area distribution for the northern hardwood cover type on the Peavy End Moraine management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Uneven-aged northern hardwood stand structure promoting high-value sugar maple sawlogs;
- Provide for a full complement of tree seedlings recruiting into the overstory; and
- Provide for well-developed shrub and herbaceous layers.

Long-Term Management Objectives

- Using an uneven-aged system, selectively harvest northern hardwood stands on a 20-year cycle resulting in an estimated 940 acres harvested each decade; and
- Work to increase hardwood regeneration and reduce the sedge component.

10-Year Management Objectives

- Approximately 940 acres will be selectively cut in this planning period (Table 4.28.1);
- Maintain white pine, hemlock, oak and upland cedar where they occur in stands that are cut;
- Experiment with mechanical and chemical treatments of the sedge understories to establish northern hardwood tree regeneration and improve understory diversity; and
- Monitor hardwood regeneration.

Oak Cover Type

Current Condition

The oak cover type is present on 639 acres (6%) in this management area (Table 4.28.1). It is an important species to wildlife for mast production. Most of the oak is over 80 years old and historical harvesting has been sporadic, producing acres in only three of eight age classes below 80 years old (Figure 4.28.4). There are hard factor limits on 276 acres and over 100 acres classified as uneven-aged. The red oak is of fair-quality.

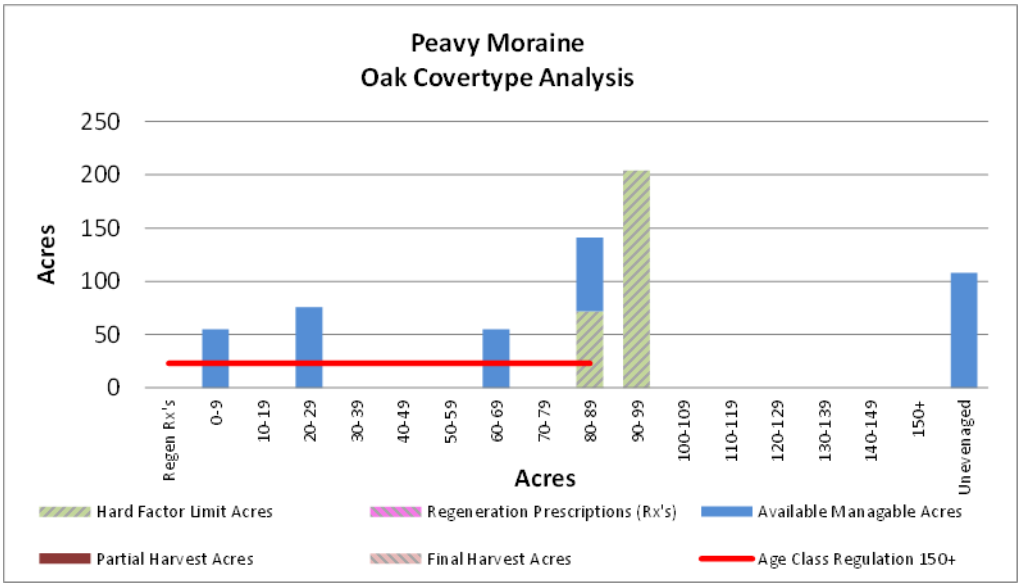

Figure 4.28.4. Graph of the age-class distribution for the oak cover type on the Peavy End Moraine management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Maintain a component of oak in mixture with natural red and white pine.

Long-Term Management Objectives

- Maintain oak as a component of mixed upland types;
- Red oak stands will be regenerated on a 150-year rotation resulting in 23 acres of final harvest and 81 acres of thinning each decade; and
- Monitor oak stands for oak wilt.

10-Year Management Objectives

- Thin about 81 acres of oak stands to increase hard mast production;
- Harvest and regenerate 23 acres of red oak; and
- In oak stands affected by oak wilt, convert to a pine type or oak barrens.

Lowland Conifers Cover Type

Current Condition

The lowland conifer cover type covers 549 acres (5%) of the state forest land in this management area (Table 4.28.1). These stands grow on poorly drained sites and support mixed stands of cedar, black spruce, hemlock, tamarack, balsam fir, white birch and balsam poplar. Due to the wet site conditions, they are more susceptible to rutting damage from logging equipment and present difficult operating conditions for harvesting. There are 465 acres of hard factor limited acres and they have been removed from the total number of manageable acres available for harvest Lowland conifers are poorly distributed across age classes, spiking in the 80-89 year-old age class (Figure 4.28.4). Little harvesting has been done in this type over the past 80 years.

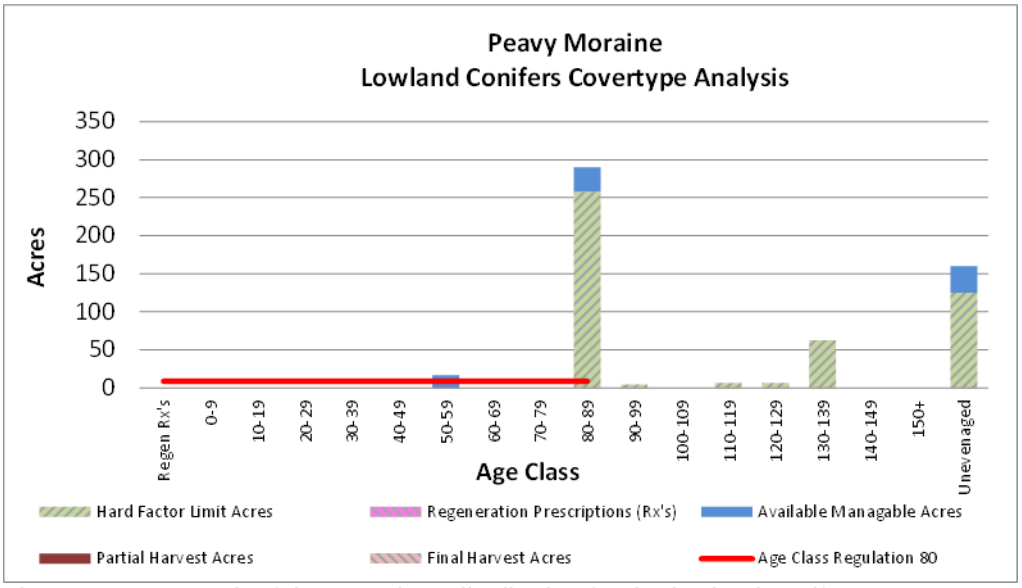

Figure 4.28.4. Graph of the age-class distribution for the lowland conifers cover type on the Peavy End Moraine management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Closed canopy stands interspersed with patches of all age classes;
- Sustainable regeneration and recruitment of seedlings and saplings;
- Mixed lowland conifer stands provide important winter habitat for deer and it is necessary to maintain the closed canopy (>70%) structure in many stands for that purpose; and
- Harvesting will be planned to regenerate stands before widespread mortality occurs.

Long-Term Management Objectives

- Manage stands on an 80-year rotation providing 9 acres of final harvest each decade.
- Regenerate stands to a species-mix similar to the pre-harvest conditions favoring cedar, hemlock black spruce and balsam fir are preferred; and
- Harvesting will be done using small clearcuts or strips with clumped retention.

10-Year Management Objectives

- Harvest 32 acres over the next decade focusing on the use of “low impact” harvesting systems and successful, reliable regeneration techniques;
- Use appropriate silvicultural techniques to assure adequate regeneration; and
- Monitor harvested sites.

Red Pine Cover Type

Current Condition

The red pine cover type covers 432 acres (4%) of the state forest in this management area (Table 4.28.1). Red pine is poorly distributed across age classes spiking in the 40-49 year-old age class (Figure 4.28.5). About 75% of the red pine is of plantation origin, with the remaining stands being of natural origin. There also are a large number of acres classified as uneven-aged.

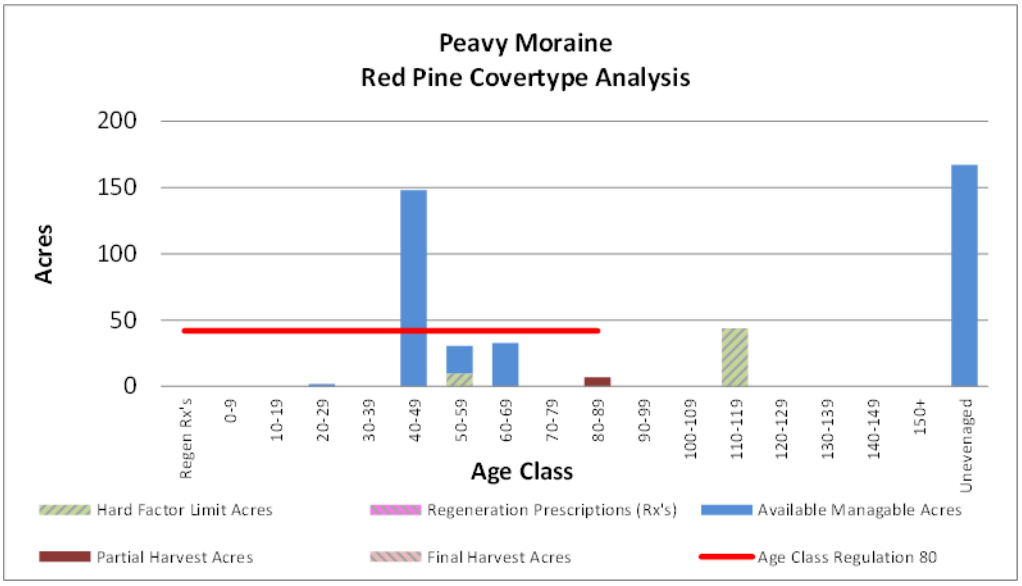

Figure 4.28.4. Graph of the age-class distribution for the red pine cover type on the Peavy End Moraine management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Maintain the current level of red pine cover type, both naturally occurring and red pine plantation; and
- Maintain the current ratio of red pine plantation acres (75%) to naturally occurring red pine acres (25%).

Long-Term Management Objectives

- Plantation stands will be managed on an 80-year rotation with intermediate harvests (thinning) resulting in 42 acres of final harvests and 250 acres of partial harvests each decade (Table 4.28.1);
- Manage natural origin stands on a 150 year rotation using natural regeneration techniques with shelterwood or patch clearcuts and scarification as needed; and
- Thin stands as necessary.

10-Year Management Objectives

- Begin working on the age-class spike in the 40-49 year-old age class to try and create a better age-class distribution (Figure 4.28.1);
- Thin about 195 acres of red pine stands during this 10-year planning period; and
- Final harvest and regenerate 143 acres of red pine in this 10-year planning period.

Other Forested Cover Types

Current Condition

Other forested types make up 1,508 acres and are made up of upland spruce/fir (409 acres), lowland deciduous (251 acres), mixed upland deciduous (246 acres), white pine (117 acres), natural mixed pines (93 acres), hemlock (78 acres), upland mixed forest (68 acres), cedar (65 acres), lowland spruce/fir (61 acres), upland conifer (40 acres), lowland poplar (38 acres), lowland mixed forest (21 acres), paper birch (15 acres) and jack pine (six acres). Together these types make up about 9% of the management area.

Desired Future Condition

- Maintain the presence of the minor cover types within the management area.

Long-Term Management Objectives

- Manage minor cover types to maintain representation using appropriate silvicultural methods;
- Monitor to assure adequate regeneration of desired species;
- Featured species habitat requirements will be taken in to consideration; and
- Maintain hemlock as it occurs.

10-Year Management Objectives

- Harvest those stands without harvest limitations adjacent to other planned harvest activities and where stand and habitat conditions indicate that harvesting is appropriate; and
- Expected harvests in these types will be less than 308 acres during this 10-year planning period.

Other Non-forested Cover Types

Current Condition

The following non-forested cover types are found on this management area: upland open/semi- open lands (203 acres – 2%), lowland open/semi-open lands (285 acres – 2%) and miscellaneous other (water, local, urban) (104 acres – 1%).

Desired Future Condition

- These areas will be maintained in the current condition.

Long-Term Management Objective

- Grass (open/semi-open lands) will be burned or mowed to prevent forest encroachment.

10-Year Management Objective

- Grass-types will be treated for opening maintenance as needed.

4.28.2 – Featured Wildlife Species Management

The Peavy End Moraine management area has some of the highest quality oak and large-tooth aspen in the Crystal Falls forest management unit. It provides excellent habitat for multiple species and should be managed to ensure maximum mast production and the aspen cover types should be divided into a minimum of six age classes. The lowland conifer stands should be managed as deer winter range. White pine and hemlock should be encouraged in the uplands to protect and enhance the viability of the wintering complexes contained here. The primary focus of wildlife habitat management in the Peavy End Moraine management area will be to address the habitat requirements identified for the following featured species: American woodcock, black bear, eastern bluebird, white-tailed deer and wood duck. Based on the selected featured species, some of the most significant wildlife management issues in the management area are: mast (hard and soft); large open land complexes (with snags in open lands); deer wintering habitat; mature forest (especially near water); and retain or develop large living and dead standing trees (for cavities, especially near water). During this 10-year planning period, additional analyses to better define the spatial extent of priority areas for featured species will be performed.

American Woodcock

The western Upper Peninsula goal for woodcock is to maintain or increase woodcock habitat. In priority areas, management should focus on balancing the age-class distribution and provision of display, feeding, nesting and brood-rearing habitat via upland brush, opening and poorly stocked stand management.

Wildlife habitat specifications:

- Maintain aspen cover types within the management area, especially where associated with alder, riparian zones, or forested wetlands;
- Balance aspen age-class distribution within the management area;
- Use silvicultural practices that encourage the aspen component in mixed stands associated with alder, riparian zones or forested wetlands; and

- Maintain or create rough openings associated with alder, riparian zones, regenerating aspen or forested wetlands within the management area.

Black Bear

The western Upper Peninsula black bear goal is to maintain or improve habitat. Management for bear should focus on improving existing habitat (e.g., maintaining corridors, mast and refuge trees) in this management area.

Wildlife habitat specifications:

- Maintain or increase the oak cover type and within stand oak component of hardwood forests within the management area;
- Maintain or increase mast by providing forest clearings that promote food sources such as pin cherry, juneberry/serviceberry, hazel, raspberry, blackberry and blueberry;
- Minimize herbicide use that would be detrimental to mast production;
- Maintain lowland conifer and hardwoods along and around drainages, vernal pools and forested wetlands; and
- Maintain refuge tree species with rough bark for cubs to escape (e.g., white pine and hemlock).

Eastern Bluebird

The western Upper Peninsula goal for bluebirds is to maintain or improve habitat. State forest management efforts during this planning period will focus on maintaining or expanding open land conditions, protection of snags or dying standing trees associated with openings and managing opening complexes/savanna with prescribed fire.

Wildlife habitat specifications:

- Maintain herbaceous open-land complexes within the management area using prescribed burns or mowing and consider the spatial arrangement.
- Protect snags or dying standing trees within the open-lands. If nest cavities are not present consider: leaving standing live trees (e.g., aspen) trees in final harvest timber sales and/or planting scattered oak
- Leave a ½-chain buffer around openings to limit aspen encroachment following aspen timber harvests.

White-tailed Deer

The western Upper Peninsula goals for white-tailed deer are to: 1) Maintain existing deer wintering complexes and 2) Expand the extent of areas suitable as winter deer habitat, especially in the medium and high snowfall zones. Management should focus on maintaining habitat quality in priority wintering complexes. DNR department procedure 32.22-07 states “Coniferous swamps are important as winter deeryards and shall be managed primarily for deer. The objective shall be to maintain them for this purpose and through commercial cuttings and silvicultural practices, improve these areas to provide winter cover and food for deer.” There is a complex relationship between deer abundance; available summer and winter habitat; timber management; and regeneration tree species, particularly white cedar and hemlock. It is recognized that meeting both timber management and deer goals presents challenges for the department and our stakeholders. Information on deer wintering complexes is currently being updated and new management guidelines are being developed. When completed, these will provide additional direction for managing these critical areas for white-tailed deer.

Wildlife habitat specifications for deer wintering complexes:

- Strive to maintain > 50% of the land area within deer wintering complexes in mixed or pure stands of cedar, hemlock, white and black spruce, white and natural red pine, balsam fir, mixed swamp conifer and mixed upland conifer-hardwood.
- In northern white cedar and hemlock cover types that are commonly occupied by deer during severe winters, especially in medium and high snowfall zones, maintain canopy closure of >65%.
- In deer wintering complexes in low snowfall areas, and within ¼-mile of severe-winter cover in the higher snowfall zones, write prescriptions that strive to maintain canopy closure of 40-65%, favoring cedar, hemlock, white spruce, black spruce, balsam fir and white pine.
- Provide winter forage in deer wintering complexes through stands of regenerating hardwood or brush, including preferred species of red maple, sugar maple, aspen, yellow birch, ashes, oaks, dogwood, crabapple, elderberry, high-bush cranberry, sumac and hazel.

- Enhance accessibility to winter browse within deer wintering complexes by maintaining mature mesic conifer components within upland hardwood stands or by maintaining or enhancing sheltered travel corridors between areas of conifer cover and browse.
- Provide spring break out areas by maintaining open hardwood stands on southern exposures and herbaceous openings adjacent to deer wintering complexes.
- When possible, timber harvests within deer wintering complexes should be carried out only during winter months and tops should be left. Chipping of non-bole wood and whole-tree harvesting in the deer wintering complexes should be avoided, but will be discussed on a case-by-case basis through the compartment review process.
- Harvests of cedar and hemlock may only be conducted when:
    - There is reasonable confidence of successful recruitment/regeneration of the cover types; or
    - There is a forest health issue (e.g., hemlock wooly adelgid); or
    - Part of an approved research project; or
    - Removal of selected trees will facilitate a reduction of harvest trails, landings, etc. to minimize soil sedimentation and possible soil compaction issues.
- Provide fall foods in the form of hard and soft mast, and provide dense escape cover or bedding areas in the form of early successional forests, brush and warm-season grasses that will encourage fall deer use in areas open to public hunting. Where habitat types are appropriate, increase diversity of hard mast by planting oak.

Wood Duck

The western Upper Peninsula goal for wood duck is to maintain or increase suitable habitat. Management should focus on the protection of forest wetland, riparian corridors, providing large cavity trees, mast and the management of priority wildlife management areas with suitable habitat.

Wildlife habitat specifications:

- In landscapes that contain streams, beaver ponds and other potential habitat for wood ducks, provide potential nesting sites by providing mature forest (possibly special conservation area designations) and/or big-tree silviculture near water.
- Retain all large diameter over-mature cavity trees within 300 feet of water bodies for cavities in lowland and upland hardwoods. Where adjacent forest is young or cavities limited, nest trees should be promoted.
- Where appropriate, manage for mast in riparian areas.
- Increase potential riparian buffers to 300+ feet, where desired, instead of the standard 100 foot best management practice.

4.28.3 – 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, when past surveys have indicated a possibility of their presence, or when appropriate habitat is available and the species is known to occur in the general region.

Past surveys have noted and confirmed three listed species and no natural communities of note occurring in the management area as listed in Table 4.28.2. 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.

There are no high conservation value areas or ecological reference areas identified in this management area as in Figure 4.28.5.

Table 4.28.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Peavy End 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								
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
Bald eagle	*Haliaeetus leucocephalus*	SC/G5/S4	Confirmed	IL	Moderate	Bog	Lowland open/semi-open	N/A
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Poor conifer swamp	Tamarack	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Early
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Reptile								
Wood turtle	*Glyptemys insculpta*	SC/G4/S2S3	Confirmed	MV	Moderate	Northern wet meadow	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern shrub thicket	Upland open/semi-open	N/A
						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

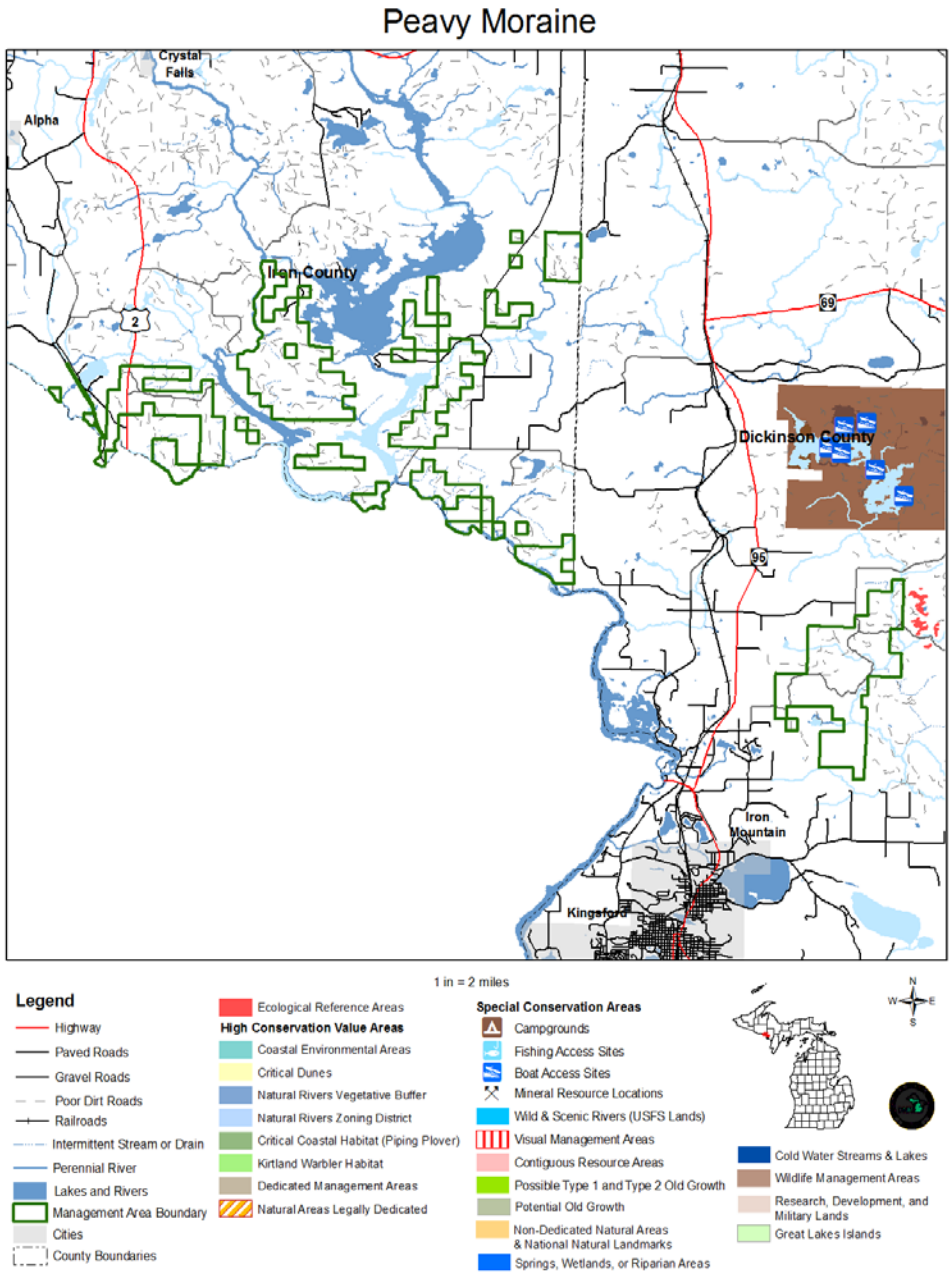

Figure 4.28.5. A map of the Peavy End Moraine management area showing the special resource areas.

Management goals during this planning period:

Goal 1: To develop and maintain a list of rare, threatened, endangered and special concern species and natural communities for the management area through a continuous inventory and through opportunistic focused inventory surveys.

Objective 1-1: Field staff should be trained and aware of the identification characteristics and natural history of rare, threatened, endangered and special concern species.

Objective 1-2: Occurrences of rare, threatened, endangered and special concern species noted during the inventory process by inventory staff should be verified and added to the body of knowledge for the management area.

4.28.4 – 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 area include:

- White trunk rot of aspen
- *Hypoxylon* canker
- Emerald ash borer
- Two-lined chestnut borer
- Oak wilt

When forest pests are detected, they are to be reported to the forest health specialist for treatment recommendations. The treatment of large outbreaks of forest pests will be coordinated on a state and regional level.

Several invasive exotic species of plants are thought to be located in the vicinity. When invasive species are detected, they will be reported to the forest health specialist and treatment options will be reviewed. Priority for treatment should be given to those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled. Following is a list of species of concern that been documented in or near this management area.

- Common buckthorn
- Garlic mustard
- Glossy buckthorn
- Japanese barberry
- Japanese knotweed

4.28.5 – Aquatic Resource Management

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

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

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Designated high priority trout streams are identified in the Integrated Forest Monitoring Assessment and Prescription Geographic Decision Support Environment. Remove or discourage beaver populations on designated high priority trout streams.

High priority trout streams in this management area as shown in Figure 4.28.1.

4.28.6 – Fire Management

Largely mesic forest communities, fire interval was probably very long. Area at the west end along the river may have been subject to pre-settlement management fire and area adjacent to the Groveland management area probably supported pine communities with somewhat shorter fire regimes.

- Portions of this area on the west side falls are within the Panola-Lake Mary Plains Zone Dispatch area. In that portion, initial attack is pre-planned, based on fire danger level, calling for elevated readiness and aggressive response to reported wildfires during periods of VERY HIGH and EXTREME fire danger.
- In the remainder of the area, all wildfires are subject to appropriate initial attack response.

4.28.7 – Public Access and Recreation

This area has fair public and management access. Some tracts have limited access across private ownerships. No recreational facilities are located in this area.

- Work to expand public access and recreation facilities as opportunities arise.

4.28.8 – Oil, Gas and Mineral Resources

Exploration and development for oil and gas has been limited to a few wells drilled in the eastern Upper Peninsula. No economic oil and gas production has been found in the Upper Peninsula.

Surface sediments consist of an end moraine of coarse-textured till and glacial outwash sand and gravel and postglacial alluvium in places thin to discontinuous. The glacial drift thickness varies between 10 and 100 feet. Sand and gravel pits are located in the management area and there should be potential for additional pits.

The Precambrian Badwater Greenstone, the Dunn Creek, Michigamme and Hemlock Formations, Menominee and Chocolay Groups, Archean Granite/Gneiss, Volcanics and Sedimentary Rocks and Intrusives subcrop below the glacial drift. These rocks do not have a current economic use.

Metallic mineral exploration has occurred in the management area in the past and there could be additional potential.