4.30 MA 30 – Lake County Moraines Management Area

Summary of Use and Management

Vegetation management in the Lake county Moraines management area (MA) (Figure 4.30.1) will provide forest products; maintain or enhance wildlife habitat; protect areas of unique threatened, endangered and special concern species and provide for forest-based recreational uses. Timber management for this 10-year planning period will focus on balancing the age class distributions of aspen and regenerating red pine and oak. Wildlife habitat management objectives include perpetuating early-successional communities for species adapted to young forests for hunting and other wildlife-related recreation opportunity. Expected trends within this 10-year planning period are increased recreational pressure (including illegal off-road vehicle impacts) and the need to successfully regenerate and establish oak.

Introduction

The Lake County Moraines management area contains 20,533 acres of state forest land located in eastern Lake County with parcels to the north and south of the town of Luther, Michigan. The primary attributes which identify this management area include:

- Predominance of moraine ridges, moraines or till which account for 83% of the landforms.
- The management area falls almost entirely within Albert's High Plains sub-region (Albert, 1995).
- Due to the popularity of this area for dispersed recreation and the quantity and availability of wood fiber the forest resources contribute significant social and economic values to the area.
- This management area contains one or more of the northern Lower Peninsula Grouse Enhanced Management Systems areas. This area plan will emphasize balanced age classes of aspen for timber production which will have habitat benefits for a number of the featured species including ruffed grouse. The boundaries of Grouse Enhanced Management Systems areas will be delineated and an operational plan will be developed during this planning period by the local biologist in collaboration with the Forest Resources Division unit manager and integrated into the plan through the revision process.
- Sandborn Creek, a tributary of the Pere Marquette River and a designated natural river, originates in the management area.
- In addition to dispersed recreation in the form of hunting and mushroom picking, the Silver Creek Pathway is used for hiking and biking and the Lincoln Hills Route is used for off-road vehicles and snowmobiling. The Lincoln Hills Motorcycle Trail crosses the northern portion of the management area and the Tin Cup Spring Motorcycle Trail is located in the central portion. The Lincoln Creek and Silver Creek Campgrounds are also located in the management area.
- Surveys have located great blue heron colonies on the edge of the management area.

The current predominant cover types, acreages and projected harvest acres in the management area are shown in Table 4.30.1.

Table 4.30.1. Current cover types, acreages, projected harvests and projected acreages at the end of this ten-year planning period for the Lake county 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 Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest		Final Harvest	Partial Harvest
Aspen	45%	9,157	108	9,049	2,598		9,157	1,508	
Oak	29%	6,015	1,283	4732		1,072	6,015	526	1,072
Red Pine	5%	1,127		1127	350	145	1,127	125	634
White Pine	4%	832		832	33	182	832	76	182
Northern Hardwood	4%	732	1	731		146	732		146
Mixed Upland Deciduous	3%	620		620	159	195	620	89	195
Jack Pine	2%	428		428	0		428	61	
Upland Open/Semi-Open Lands	2%	453		453			453		
Lowland Open/Semi-Open Lands	0%	83		83			83		
Misc Other (Water, Local, Urban)	0%	20		20			20		
Others	5%	1,066	484	582	62	100	1,066	61	117
Total		20,533	1,876	18,657	3,202	1,840	20,533	2,446	2,346

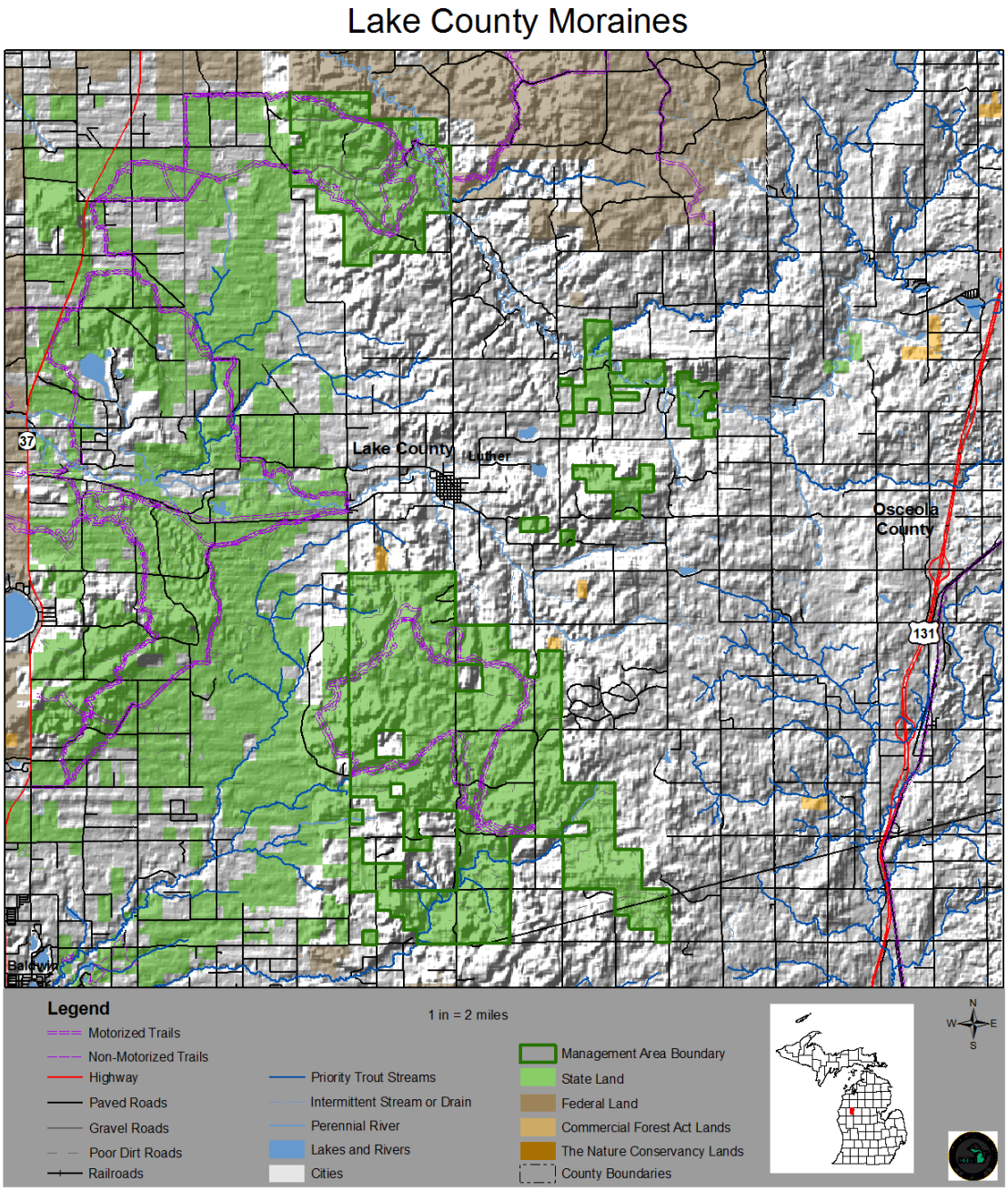

Figure 4.30.1. Location of the Lake county Moraines management area (dark green boundary) in relation to surrounding state forest and other lands in Lake County, MI.

4.30.1 Forest Cover Type Management Direction

The following sections contain information on vegetation management direction in the form of Current Conditions, 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, passive management resulting in natural succession will achieve ecological objectives. While most stands have a variety of trees species and other vegetation, they are classified by the predominant species.

Section 4.30.1.1 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 9,157 or 45% of the management area (Table 4.30.1). Aspen is distributed throughout the management area including the moraine ridges, moraines and till areas on habitat class PArVHa, PArVVb and AFO sites. The age classes of aspen have slight spikes in the 20-29 and 30-39 year-old age classes (Figure 4.30.2). There are 108 acres of aspen have met harvest criteria, but have site conditions limiting harvest (hard factor limit acres). Currently, 665 acres have a final harvest pending and these acres are included in the regeneration prescription class.

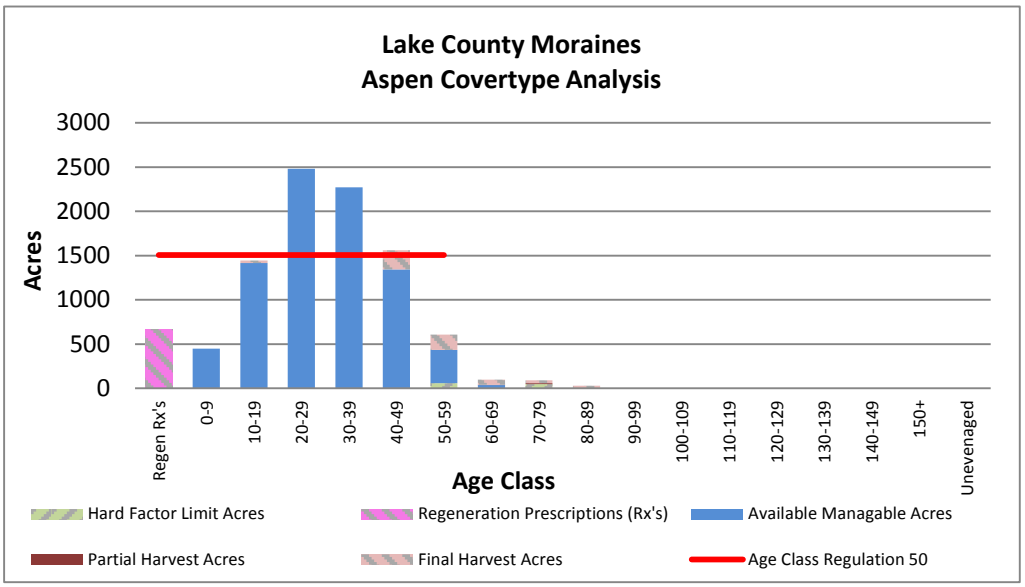

Figure 4.30.2. Age class distribution for aspen in the Lake county Moraines management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Aspen will be located on suitable sites with acres balanced between 0-59 years of age; and
- Aspen acres will be maintained on currently operable sites to provide early successional habitat for wildlife species viability, while also providing a sustainable level of wood fiber.

10-Year Management Objectives

- Conduct regeneration harvests on a projected 2,598 acres;
- Concentrate harvests on the oldest age classes first;
- Where necessary and feasible, consider harvesting stands below the rotation age to expedite the balancing of age-class distributions; and
- Aspen within the identified Grouse Enhanced Management Systems area may be managed differently than the rest of the aspen within the management area, with a shorter rotation age**,** small patch cuts and carefully considered stand adjacency.

Long-Term Management Objectives

- Continue to manage aspen through final harvests at a projected level of 1,508 acres per 10-year period for a balanced age-class distribution, sustainable fiber production and habitat; and
- A desired future harvest level is projected a 1,508 acres for final harvest per 10-year period.

Section 4.30.1.2 – Forest Cover Type Management – Oak

Current Condition

Oak acres total 6,015 or 29% of the management area (Table 4.30.1) on moraine ridges, moraines or till areas (habitat classes: PArVHA, PArVVb and AFO). The age classes are heavily skewed towards the age classes older than 70-years of age (Figure 4.30 3). Forest communities dominated primarily by oak in this management area are valued ecologically as sources of habitat and mast for numerous species of wildlife including bear, deer, squirrels and various birds and commercially for firewood and industrial lumber. There are 1,283 acres of oak that have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres). Currently, 1,005 acres have a final harvest pending and these acres are included in the regeneration prescriptions (Rx's) classes. There are 482 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to oak as a result of treatments that remove an overstory species resulting in release of oak. These acres are included in the regeneration prescriptions class.

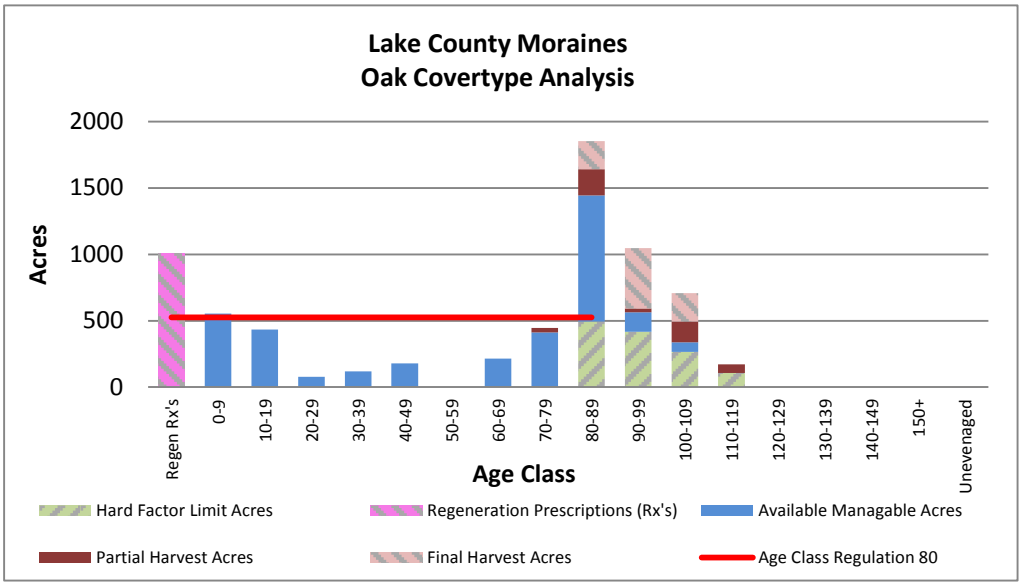

Figure 4.30.3. Age class distribution for oak in the Lake County Moraines management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Oak in stands and as a component in stands throughout the management area will be maintained through management with acres balanced in the 0-89 year age classes to provide for timber products, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- Conduct partial harvests on a projected 1,072 acres with a concentration on stands have not been previously harvested or those stands have a sufficient basal area for a partial harvest;
- Maintain or expand oak as a component in stands throughout the management area through retention and management for natural regeneration in other cover types; and
- Consider opportunities to selectively remove the conifer cover to release understory oak on mesic/poor sites.

Long-Term Management Objectives

- Continue aggressive management efforts outlined above to regenerate and establish oak on rich nutrient sites (AFO) and mesic/poor (PArVVb) sites;
- Continue work towards maintaining oak as the predominant species in selected stands through restarting harvests;
- It is acceptable some oak stands may become mixed stands through partial removal of an oak over story, planting pine in oak stands or through natural regeneration of other species;
- Continue to seek opportunities to maintain or expand oak as a component of stands throughout the management area; and
- A desired future harvest level is projected at 526 acres for final harvest and 1,072 acres for partial harvest per 10-year period.

Section 4.30.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine acres total 1,127 acres or 6% of the management area (Table 4.30.1) and are located on outwash plains, coarse textured moraines and moraine complexes (coarse textured end moraines, ground moraines, outwash plains, till plains and undifferentiated end moraine). These sites range from very dry/poor-nutrient (habitat class PArVHa) and dry to dry-mesic/poor- to medium-nutrient (habitat class PArVVb) and mesic/medium to rich-nutrient (habitat class AFO) sites. There is a pronounced spike in the 40-59 year age classes (which represents a previous era of active planting) (Figure 4.30.4) and almost no recent regeneration. There are 63 acres that have regeneration harvest pending and these acres are included in the regeneration prescription class. There are 502 acres with a partial harvest pending and these acres are included in their current age class. The graph includes the projected number of acres converted to the cover type as a result of final harvests and planting of a red pine. These acres are included in the regeneration prescription class.

Desired Future Condition

- Red pine will be located on suitable sites with acres balanced in the 0-89 year age classes to provide a sustainable yield of forest products.

10-Year Management Objectives

- Follow the Red Pine Management Guidelines, which recommends growing red pine on suitable sites and balancing the age-class distribution;
- Conduct partial harvests on a projected 145 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, based on projections, on 350 acres of red pine beginning with the oldest age classes and with a concentration on stands with less potential for a higher product value.

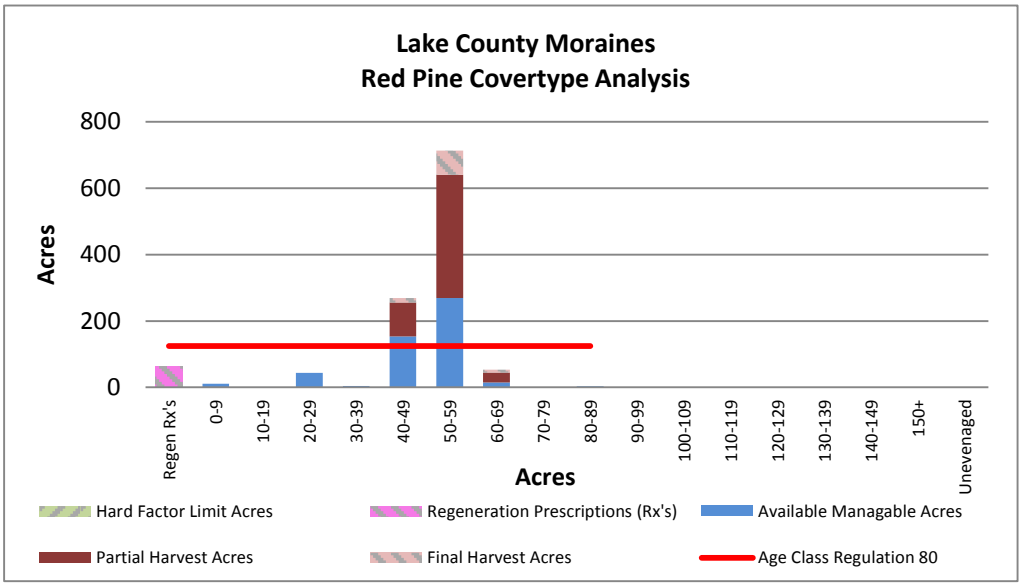

Figure 4.30.4. Age class distribution for red pine in the Lake County Moraines management area (2012 Department of Natural Resources inventory data).

Long-Term Management Objectives

- Continue to thin younger stands until the stands are replaced by seed tree harvests or final harvests at economic maturity (80 years); and
- A desired future harvest level is projected at 125 acres for final harvest and 634 acres for partial harvest per 10-year period.

Section 4.30.1.4 Forest Cover Type Management – Upland Open/Semi-Open Lands

Current Condition

Upland open/semi-open land acres total 453 or 2% of the management area (Table 4.30.1). Upland open/semi-open lands communities in this management area are valued ecologically as sources of habitat for numerous species of wildlife and recreationally for hunting, wildlife viewing and camping. This category is a combination of the following non-forested land cover types: herbaceous openland, upland shrub, low density trees and bare/sparsely vegetated. These non-forested areas are a result of natural processes of fire, frost or other disturbances which create openings in the forest canopy along with the past management practices to maintain these areas.

Desired Future Condition

- Upland open/semi-open lands will be maintained at or above current levels on sites that are natural openings due to frost or low soil fertility/moisture and on sites that have been historically been maintained as openings to provide habitat for species that use openings.

10-Year Management Objectives

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

Long-Term Management Objectives

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

Section 4.30.1.5 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: white pine 832 acres or 4% of the management area, northern hardwood 732 acres (4%), mixed upland deciduous 620 acres (3%) and jack pine 428 acres (2%). Other forested and non-forested communities total 1,066 acres or 5% of the management area 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 be maintained on suitable sites and contribute to the compositional species diversity of the landscape.

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;
- Final or regeneration harvests are projected for: mixed upland deciduous 159 acres, upland conifers 37 acres and upland mixed forest 25 acres;
- Consider methods to ensure 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; and
- Partial harvests are projected for: 182 acres of white pine, 146 acres of northern hardwood, 195 acres of mixed upland deciduous, 38 acres of natural mixed pines and 45 acres of upland mixed forest.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- Continue to manage these other types to provide forest products, wildlife habitat and recreational opportunities.

4.30.2 Featured Wildlife Species

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

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

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

- American marten
- American woodcock
- Beaver
- Black bear
- Pileated woodpecker
- Red-headed woodpecker
- Ruffed grouse
- Snowshoe hare
- Wild turkey
- White-tailed deer

The primary focus of wildlife habitat management in the Lake County Moraines management area will be to address the habitat requirements identified for the listed featured species. Based on 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.

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 (>15 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.

American Woodcock

The goal for American woodcock in the northern Lower Peninsula is to maintain or increase available habitat. The American woodcock use young aspen stands having stem densities ranging from 6,000-20,000 stems per acre for feeding, nesting and brood-rearing. State forest management should address the maintenance of adequate early successional habitat to provide feeding, nesting and brood-rearing habitat and opportunity for hunting.

Wildlife Habitat Specifications:

- Maintain the aspen cover type and 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 woodcock 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 and lowland deciduous will be sufficient to meet this woodcock habitat specification.
- Identify commercial and non-commercial treatment opportunities in aspen and alder stands associated with non-high priority trout stream riparian zones or forested wetlands.

Beaver

The goal for beaver in the northern Lower Peninsula is to maintain available habitat. Consideration will be given to best management practices, trout stream management and trends in beaver nuisance permits issued. State forest management for the species should focus on providing favorable food within 100 feet of streams not designated high priority trout streams.

Wildlife Habitat Specifications:

- Maintain or promote alder, aspen, birch, maple or willow cover types within 100 feet of non-high priority trout streams with gradients of less that 15% and other inland bodies of water.
  - Implementation of the 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this habitat specification.

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 connecting 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 maintaining or increase oak-dominated stands and the oak component of mixed stands.
  - Implementation of the 10-year management direction for oak will be sufficient to meet black bear habitat specifications.

Pileated woodpecker

The goal for pileated woodpecker in the northern Lower Peninsula is to maintain available habitat. Pileated woodpeckers prefer stands greater than 40 years old for foraging and greater than 70 years old for nesting and roosting and abundance is positively related to the density of trees greater than 12 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.

Red-headed woodpecker

The goal for red-headed woodpecker in the northern Lower Peninsula is to maintain or increase available habitat. Red-headed woodpecker are limited by the availability of snags for nesting, roosting and feeding and prefer areas with groupings of snags caused by beaver girdling, flooding, fire, disease or insect outbreaks. Preferred sites are greater than 5 acres in size with a savannah-like dispersion of large trees (<50% canopy cover) with open under story and include tall trees or snags of large (>12 inches) diameter at breast height. State forest management for the species should focus on the maintenance of snags in timber sales and salvage in priority landscapes.

Wildlife Habitat Specifications:

- Retain patches of dead wood left by beaver floodings, fire, disease and insect outbreaks by minimizing salvage cuts within the management area with preference for snags greater than 12 inches in diameter at breast height.
  - Implementation of beaver wildlife habitat specifications, Within-Stand Retention Guidance, factor-limited acres, and continued mortality from insect and disease will be sufficient to meet the red-headed woodpecker habitat specifications for snags 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 per 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 ten 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 and oak will be sufficient to meet this 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 and oak will be sufficient to meet this grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.
- Manage the aspen cover type for smaller patch size, a shorter rotation and a more deliberate habitat configuration within the designated Grouse Enhanced Management Systems areas where appropriate.

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 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 restricting 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 openland 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 directions for upland openland 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 directions 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 openland and upland shrub will be sufficient to meet this deer habitat specification.
- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this deer habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this deer habitat specification.
- Conduct silvicultural practices that conserve the oak component in forest stands and promote oak regeneration.
  - Implementation of 10-year management direction for oak will be sufficient to meet this deer habitat specification.
- Manage cedar and hemlock with the main objectives of regeneration and providing future functional cover.
  - Implementation of 10-year management direction for cedar and lowland conifer will be sufficient to meet this deer habitat specification.
- Promote hemlock on appropriate sites using silviculture to increase within-stand hemlock components.

4.30.3 Rare Fish, Wildlife and Plant 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 no listed species or natural communities of note occurring in the management area. 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.

The Pere Marquette River and its tributaries have been identified as a natural river and along with their corridors it has also been designated as high conservation value areas. Although the Pere Marquette River does not flow through this management area, the Sandborn Creek is a tributary and does flow through the management are as shown in Figure 4.30.5 and hence is a high conservation value area.

There have been no ecological reference areas identified in the Lake County Moraines management unit.

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.

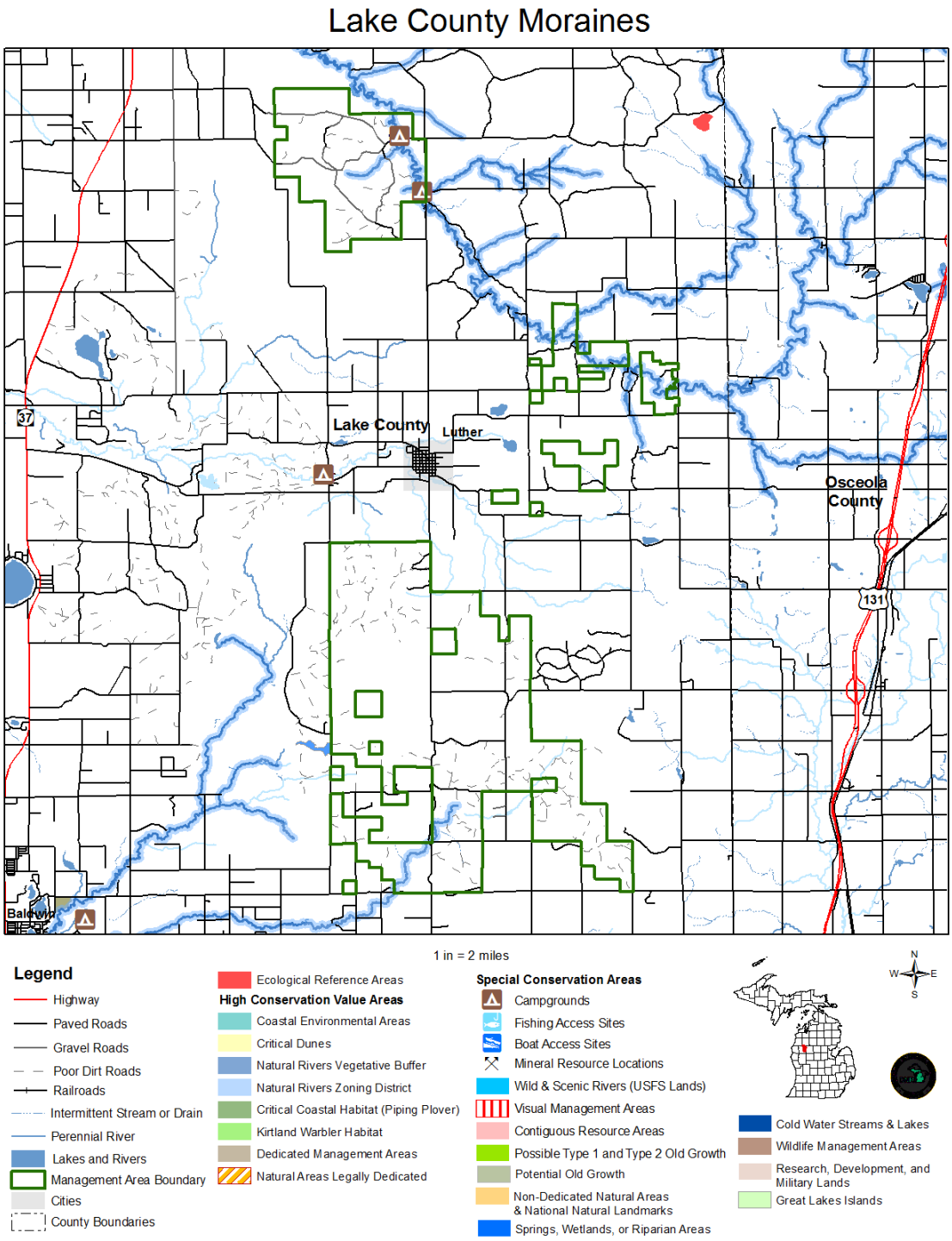

Figure 4.30.5. A map of the Lake County Moraines management area showing the special resource areas.

4.30.4 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. Forest health issues in this management area include oak decline and oak wilt and management should be adapted as follows:

- Oak decline on frost-prone, nutrient poor outwash plains is always a risk due to the cyclic nature of drought and insect defoliation (e.g., gypsy moth and forest tent caterpillar). Economic losses can be reduced by managing these sites on a shorter rotation. See oak management guidelines for more information.

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

Invasive Species

Invasive species pose a major threat to forest resources. They impact timber production, wildlife habitat and recreational access. Locations of invasive species mapped in and within a five mile buffer of the management area are summarized in the Table 4.30.3. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information and other sources that show the extent and location of invasives should be used to inform of the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species threatening sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Invasive exotic species (specifically plants) also pose a significant health threat to forested and non-forested areas throughout the management area. Although there exists no list of species that pose the greatest threat currently exists and surveys of invasive species are generally incomplete. Populations of invasive species detected through regular forest inventory or other means that are determined to merit control measures should be addressed on a case-by-case basis.

Table 4.30.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Lake County Moraines - FRD Management Areas	Cases within FRD 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
-	-	Phragmites (Common Reed) *Phragmites australis*	1

4.30.5 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 4.30.1 and listed in Appendix F.

4.30.6 Fire Management

Fire disturbance has played an important historical role in the initial propagation and maintenance of oak and natural oak/pine types, small inclusions of aspen and grass/upland brush types. Wildfire risk and fuel loading is increased in young, dense conifer plantations and mature jack pine affected by jack pine budworm.

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 dependant 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 re-introduce fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Consider opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize increased urbanization in close proximity to the management area will present more wildland/urban interface challenges to wildfire suppression.

4.30.7 – Public Access and Recreation

Access for management and/or recreation is generally very good throughout this management area, with very little lowland and a well-developed road/trail system. In accordance with the DNR's *Sustainable Soil and Water Quality Practices of Forest Land*, upon completion of harvesting, temporary spur and seasonal roads will be closed and stabilized.

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

Recreational opportunities within this management area are diverse, as this area includes the water type recreation activities associated with the scenic Pine River, along with motorized recreation associated with dry upland soils. Rustic camping is popular at Silver Creek and Lincoln Bridge campgrounds, both of which sit on the edge of the Pine River (Figure 4.30.5). The Silver Creek pathway (Figure 4.30.1) provides non-motorized users with a scenic hike along the Pine River. Boating access sites are common, as using the Pine River is a favored form of recreation in this management area. Both the Tin Cup and Lincoln Hills off-road vehicle trail systems (Figure 4.30.1) are popular recreation activities as they use the undulating terrain associated with this management area. The recreation features provided in this management area are listed below:

Campgrounds
- Silver Creek State Forest Campground
- Lincoln Bridge State Forest Campground

Boating Access Sites (BASs)
- Lincoln Bridge BAS
- Silver Creek BAS
- Coe Creek BAS
- Edgett's Bridge BAS
- Meadowbrook Bridge BAS

Off-Road Vehicle Trails
- Tin Cup Trail and Route
- Lincoln Hills Trail and Route

Snowmobile Trails – N/A

Non-Motorized Trails
- Silver Creek Pathway

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 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 vegetation 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 DNR's timber management policies may be considered. Specifications and Guidance for management around trails may include, but is not limited to: vegetation management system Sections 5.2.39, 5.2.40, 5.2.41 and 5.2.42 and the DNR Within Stand Retention Guidelines.

4.30.8 Oil, Gas and Mineral Development

Surface sediments consist of glacial outwash sand and gravel and postglacial alluvium and an end moraine of coarse-textured till. The glacial drift thickness varies between 400 and 800 feet. Sand and gravel pits are located in this management area, including state leased pits and there is excellant potential for additional pits.

The Pennsylvanian Saginaw Formation, Mississippian Bayport limestone and Michigan Formation subcrop below the glacial drift. The Saginaw is quarried for clay in brick making, the Bayport for Limestone and the Michigan for gypsum elsewhere in the state.

Exploration and development for oil and gas has been sparse in this management area. There is potential for several formations to be developed with well spacing ranging from 40-acres up to 640-acres for the deeper formations. The Collingwood Formation does not appear to have potential in this management area and very little of the state lands are currently leased.

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/Gas Lease Classification Procedure No. 27.23-15. Contained within each DNR Oil/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, 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, 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. In 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. 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.