4.7 MA 7 – Chandler Hills Management Area

Summary of Use and Management

Management in the Chandler Hills management area (MA) will emphasize the selective management of the northern hardwood resource, balancing the age class of aspen and starting the conversion of red pine to hardwood where suited. Management will strive to sustainably produce various forest products, enhance game and non-game wildlife habitat, protect areas of unique character and provide for forest-based recreational uses. Management activities may be constrained by poor access on the steep slopes and areas of seeps and springs. Expected trends within this 10-year planning period are increased recreational pressure; introduced pests and diseases, especially beech bark disease and emerald ash borer (beech and ash are significant species in northern hardwood stands); and the conversion of red pine stands currently located on hardwoods sites to northern hardwoods.

Introduction

This management area is located in the high plains of southern Cheboygan County and eastern Charlevoix counties in northern Lower Peninsula and contains 67,110 acres of state forest (Figure 4.1). The primary attributes which identify the Chandler Hills management area include:

- The management area falls mostly within Albert's Vanderbilt Moraines sub-region (Albert, 1995). State forest ownership does include several outlying parcels and ownership connectivity within the main block is impacted by numerous private in holdings.
- Prior to European settlement, the uplands in this landscape were predominantly northern mesic forest dominated by sugar maple and hemlock. Much of the hemlock was removed for tannins in the bark around the turn of the 20th century. The current cover types are dominated by northern hardwoods species including beech, sugar maple, hemlock, basswood, ironwood and yellow birch. Red pine, a minor component circa-1800, was planted on cleared hardwood sites. Aspen occurs on 14% of the management area.
- The Department of Natural Resources hardwood nursery was located in this management area, now not in use.
- The dominant landforms consist of sandy, well-drained moraine ridges surrounded by poorly drained outwash channels and plains.
- Due to the proximity of this management area to the communities of Petoskey, Wolverine, Vanderbilt and Boyne Falls, the forest resources contribute social and economic values to the area. Off-road vehicle or snowmobile trails are located on all but one of the state forest compartments in this management area. The Annual National Morel Mushroom Festival in Boyne City draws hundreds of people, many of whom participate in mushroom hunts in the area.
- Snowmobile and hiking trails cross the area, including a portion of the North Country Trail.
- Surveys have located the several threatened, endangered or special concern species including red-shouldered hawk, loon, osprey, grasshopper sparrow, northern goshawk and limestone oak fern. Communities of special concern include mesic northern forest, emergent marsh and rich conifer swamp.
- The topography of this management area is some of the steepest in Lower Michigan where elevation can change more than 200 feet over distances of less than a mile.

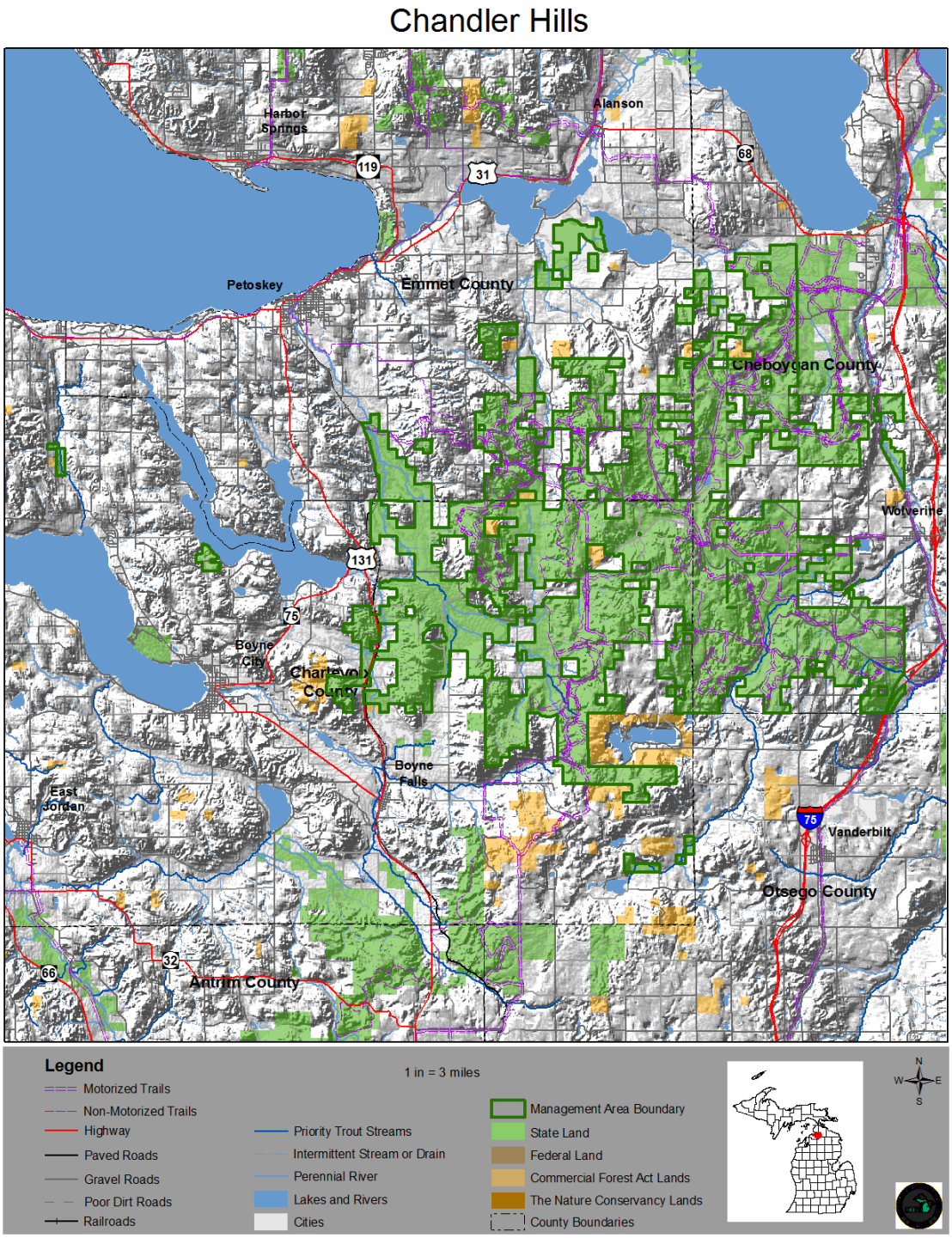

Figure 4.7.1. A map of the Chandler Hills management area (dark green boundary) in relation to surrounding state forest and other lands in Charlevoix, Cheboygan, Emmet and Otsego counties, Michigan.

Table 4.7.1. Current cover types, acreages, projected harvests and projected acreages at the end of the ten-year planning period for the Chandler Hills management area, northern Lower Peninsula ecoregion (2012 Department of Natural Resources inventory data).

Cover Type	Cover %	Current Acreage	Hard Factor Limited Acres	Manageable Acres	10 Year Projected Harvest (Acres)		Projected Net Change (Acres)	Projected Acreage in 10 Years	Desired Future Harvest (Acres)	
					Final Harvest	Partial Harvest			Final Harvest	Partial Harvest
Northern Hardwood	57%	38,226	2,030	36,196		3,692	600	38,826		16,527
Aspen	14%	9,347	671	8676	774			9,347	1,240	
Red Pine	7%	4,529	138	4391	1,800	1,393	-1200	3,329	355	2,220
Cedar	6%	3,861	3,861		0			3,861	1	
Lowland Conifers	4%	2,615	2,092	523	58			2,615	58	
Lowland Deciduous	2%	1,361	953	408	45			1,361	45	
Upland Mixed Forest	0%	70		70	252		600	670	74	21
Upland Open/Semi-Open Lands	5%	3,161		3161				3,161		
Lowland Open/Semi-Open Lands	2%	1,117		1117				1,117		
Misc Other (Water, Local, Urban)	1%	350	0	350				350		
Others	4%	2,473	769	1704	423	429		2,473	214	454
Total		67,110	10,514	56,596	3,352	5,514		67,110	1,987	19,222

4.7.1 Forest Cover Type Management Direction

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

4.7.1.1 Forest Cover Type Management – Northern Hardwoods

Current Condition

Northern hardwood acres (Figure 4.7.2) total 38,226 or 57% of the management area (Table 4.7.1). Northern hardwoods may vary significantly in quality and are found throughout the management area on coarse textured end moraines, ground moraines, outwash plains, till plains and undifferentiated end moraine-ground moraine complexes and drumlins (habitat classes: AFO and AFOCa (see Appendix E)). Forest communities dominated by northern hardwoods in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, marten and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation.

Many of the stands have portions that are located on steep slopes or have seeps that limit treatment options. During the past ten years, 8,500 acres were treated in the management area. The inventory shows 2,030 acres factor-limited as unavailable for harvest due to either inaccessibility or classified as potential old growth (hard factor limited). Extensive salvage harvests are currently being conducted in stands with a high basal area of ash and American beech species due to the presence of the emerald ash borer and beech bark disease in the management area. There are 3,088 acres of stands that have a partial harvest pending and these acres are included in the same basal area range.

Desired Future Condition

- Northern hardwoods-dominated forest communities will be maintained on operable sites through small patch clearcuts on poorer sites and selective harvesting on better sites to provide for a continuous supply of timber products, wildlife habitat and recreation opportunity.

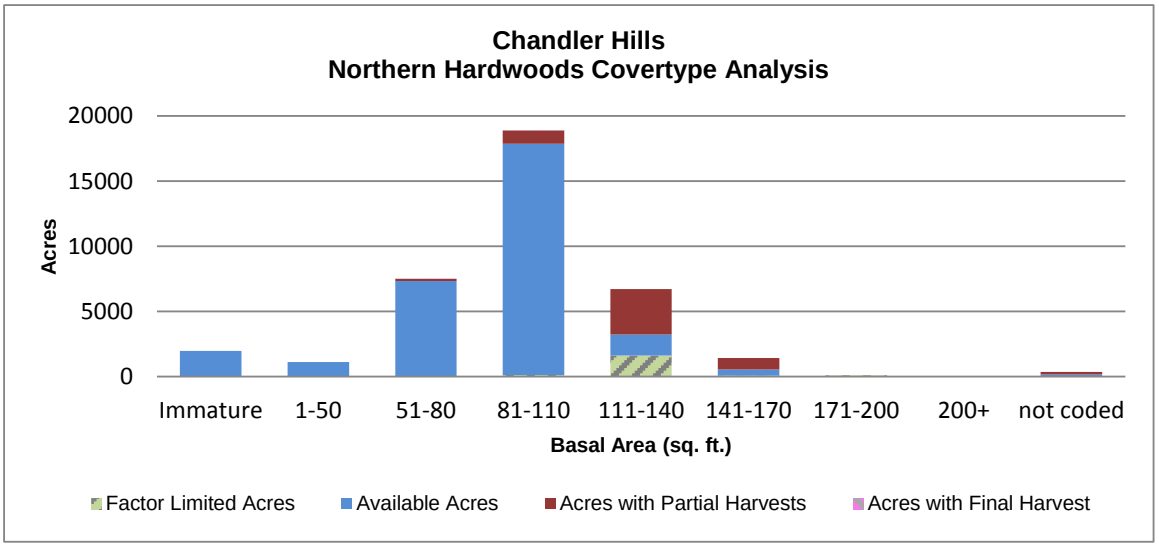

Figure 4.7.2. Basal area distribution for northern hardwood in the Chandler Hills management area (2012 Department of Natural Resources inventory data).

10-Year Management Objectives

- Conduct partial harvests on a projected 3,692 acres of northern hardwood characterized as a having a basal area of 111 square feet per acre or greater; and
- This will primarily be for stands without a significant amount of ash or beech which is currently targeted for salvage harvest due to emerald ash borer and beech bark disease.

Long-Term Management Objectives

- Emerald ash borer and beech bark disease will change the stand composition of the northern hardwoods in this management area. As these species lessen in the upland hardwood stands, consider introducing oak for mast in stands without oak;
- Continue to conduct salvage harvests of beech affected by beech bark disease and ash where present and affected by emerald ash borer, in northern hardwood stands, using Beech Bark Disease Management Guidelines and Emerald Ash Borer Guidelines; and
- Consider the need to delay further selection harvesting due to resultant lower than normal residual basal area in post-salvage harvest stands.

4.7.1.2 Forest Cover Type Management – Aspen

Current Condition

Aspen acres total 9,347 acres or 14% of the management area (Figure 4.7.1). Aspen is located throughout the management area on habitat classes: AFO and AFOCa. Forest communities dominated primarily by aspen in this management area are valued ecologically as sources of habitat for numerous species of wildlife including ruffed grouse, hare, woodcock, bear, white-tailed deer and various song birds; commercially for pulp and saw logs; and for a wide range of forest recreation. Aspen occurs throughout the area. Most of the aspen in this management area is younger than the 60-year rotation age as accessible aspen has been consistently harvested over the last 40 years. There are 671 acres of aspen (Figure 4.7.3) have met harvest criteria, but have site conditions that limit harvest (hard factor limit acres).

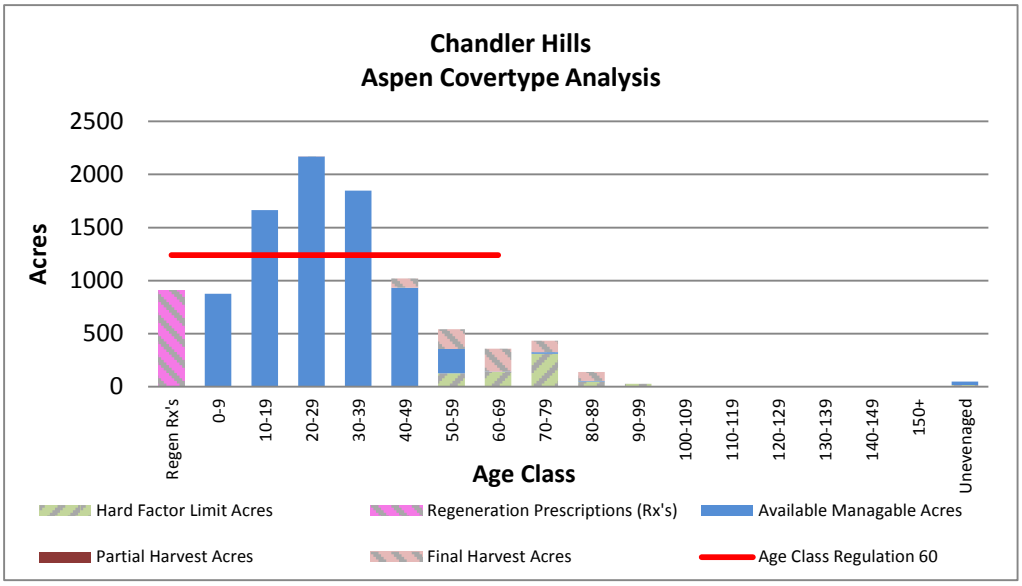

Figure 4.7.3. Age-class distribution for aspen in the Chandler Hills management area (2012 Department of Natural Resources inventory data).

There are 903 acres of stands that have a regenerating harvest pending and these acres are included in the regeneration prescription class.

Desired Future Condition

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

10-Year Management Objectives

- Conduct regeneration harvests on a projected 774 acres by concentrating on the oldest age classes; 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 to work towards balancing age-classes to provide a continual harvest, wildlife habitat and recreational opportunities; and
- Desired future harvest levels are projected at 1,240 acres for final harvest per 10-year period.

4.7.1.3 Forest Cover Type Management – Red Pine

Current Condition

Red pine communities occur on approximately 4,529 acres (7%) of the management area, with most being 70-79 and 40-59 years old.

Red pine is located throughout the management area on coarse textured end moraines, ground moraines, outwash plains, till plains and undifferentiated end moraine-ground moraine complexes and drumlins (habitat classes: AFO and AFOCa).

Red pine plantations in this management area are commercially valued for pulp, saw logs and utility poles. Nearly all of the pine is of planted origin. There are 138 acres of red pine that have met harvest criteria, but have site conditions that limit harvest. There are 467 acres with a partial harvest pending are included in their current age classes (Figure 4.7.4).

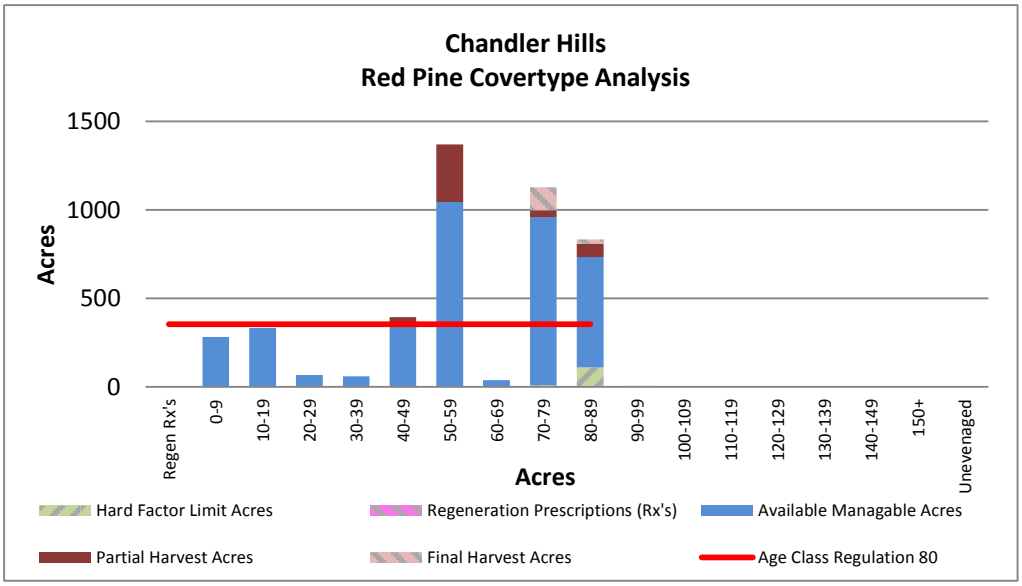

Figure 4.7.4. Age-class distribution for red pine in the Chandler Hills management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Red pine will be on sites most suitable for red pine (habitat classes PArVVb and AFO) and may be mixed with other species to provide a continuous flow of timber products, wildlife habitat and opportunities for recreation. Red pine harvested from sites more suitable for northern hardwoods (habitat class AFOCa and some AFO sites) will be allowed to regenerate as upland mixed forest or northern hardwoods (Table 4.7.1).

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 final harvests on a projected 1,800 acres targeting stands above 70 years of age;
- Some of the harvested sites (habitat class: PArVVB, AFO) will be converted to a pine/oak mix while allowing other species to regenerate to provide for timber products along with a diverse wildlife habitat;
- Some of the harvested sites more suitable for northern hardwoods (habitat class: AFOCa and some AFO) will be regenerated to upland mixed forest/northern hardwood stands;
- Some red pine sites will be replanted to red pine where understory hardwood is sparse or lacking; and
- Conduct partial harvests on a projected 1,393 acres.

Long-Term Management Objectives

- In identified special conservation areas, consider management of red pine to a biological rotation of 200+years;
- Continue work toward a sustainable balanced age-class distribution of red pine through final regeneration harvests above 80 years of age and thinning red pine in the younger age classes; and
- Desired future harvest levels are projected at 355 acres for final harvest and 2,220 for partial harvest per 10-year period.

4.7.1.4 Forest Cover Type Management – Cedar

Current Condition

Cedar (Figure 4.7.5) occurs on approximately 3,861 acres (6%) of the management area and is primarily located on unclassified lowlands (lowlands have not been assessed for habitat classification) throughout the management area. All 3,861 acres of cedar are hard factor limited and cedar may offer only limited opportunities for management.

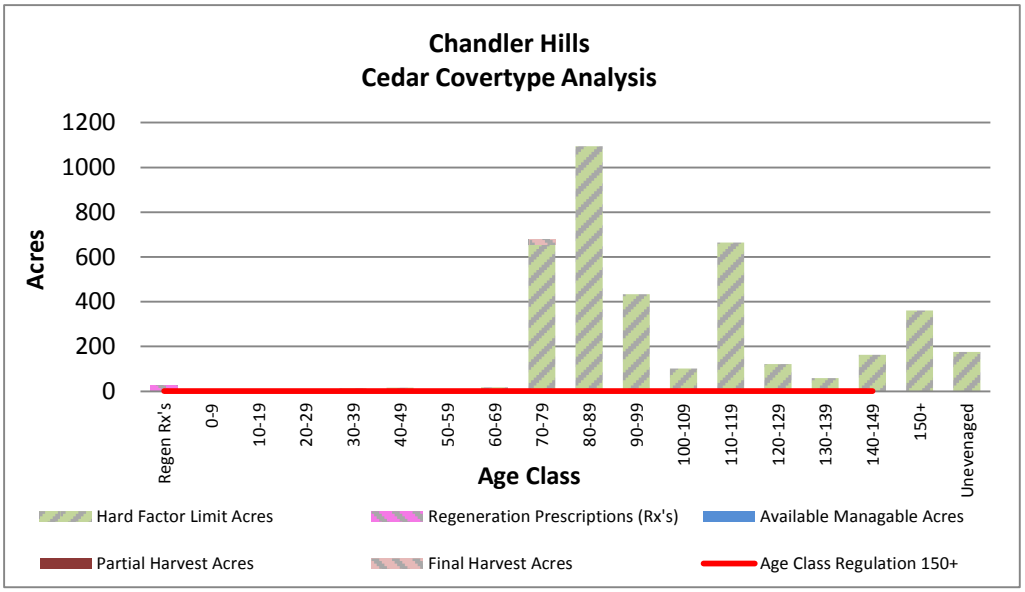

Figure 4.7.5. Age-class distribution for cedar in the Chandler Hills management area (2012 Department of Natural Resources inventory data).

Forest cover types dominated primarily by cedar in this management area are valued ecologically as sources of habitat for numerous species of wildlife including bear, white-tailed deer, hare and various song birds, and commercially for pulp.

The age-class distribution is heavily skewed toward the older age classes (70 and above) and there has been virtually no regeneration.

Desired Future Condition

- Cedar will contribute to the preservation of regional biodiversity by providing habitat for a unique suite of plants and wide variety of animal species. By storing high levels of sequestered carbon and serving as carbon sinks, cedar swamps will play an important role in global geochemical cycles.

10-Year Management Objectives

- Opportunities to increase harvest prescriptions in cedar and other lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years of entry.

Long-Term Management Objectives

- Over the next several decades, the older lowland conifer and cedar stands, much of it inaccessible for harvest, will continue to experience natural processes (fire, windthrow, insect defoliation and beaver flooding) resulting in the formation of a range of successional stages.

4.7.1.5 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 1,117 acres or 2% of the management area (Table 4.7.1).

Desired Future Condition

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

10-Year Management Objectives

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

Long-Term Management Objectives

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

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

Current Condition

Upland open/semi-open lands acres total 3,161 acres or 5% of the management area (Table 4.7.1). 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 or above the current level to provide habitat for species which use openings.

10-Year Management Objectives

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

Long-Term Management Objectives

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

4.7.1.7 Forest Cover Type Management – Other Types

Current Condition

Individual cover types which may cover less than 5% of the management area include: lowland conifers, 2,615 acres (4% of the management area), lowland deciduous, 1,361 acres (2%), lowland aspen/balsam poplar, 627 acres (1%), oak, 614 acres (1%), white pine, 382 acres (1%), lowland mixed forest, 356 acres (1%), mixed upland deciduous, 132 acres (<1%), upland spruce/fir, 114 acres (<1%) and upland mixed forest, 70 acres (<1%). Other small-scattered species comprise the balance of the other types. 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;
- Conduct regeneration harvests on a projected 58 acres of lowland conifer and 45 acres of lowland deciduous;
- Additional opportunities to increase harvest prescriptions in lowland forest types will be assessed, both in and outside (due to forest health issues) of normal years-of-entry;
- Consider methods to protect ensure regeneration of lowland types;

- Conduct final harvests on a projected 49 acres of lowland aspen/balsam poplar, 244 acres of oak, 86 acres of white pine, 44 acres of upland spruce/fir and 252 acres of upland mixed forest; and
- Conduct partial harvests on a projected 260 acres of oak and 161 acres of white pine.

Long-Term Management Objectives

- Continue efforts to regenerate lowland types where feasible; and
- Desired future harvest levels for lowland conifer (58 acres) and lowland deciduous (45 acres) for final harvest per 10-year period are projected to remain steady.

4.7.2 Featured Wildlife Species

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

The following have been identified as featured species for this management are during this cycle of state forest planning:

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

The primary focus of wildlife habitat management in the Chandler Hills management area will be to address the habitat requirements identified for the listed featured species. Based on the selected featured species, some of the most significant wildlife management issues in the management area are the maintenance of young forest; extensive mature forest; 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 (>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.
    - 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.

Golden-winged Warbler

The goal for golden-winged warbler in the northern Lower Peninsula is to maintain or increase available habitat. Golden-winged warbler nest in a variety of shrubby and early-successional forest sites including moist woodlands, willow and alder thickets and young forests of sapling aspen and fire cherry. Habitat tracts of 25-125 acres can support several pairs and are preferred over both smaller and larger areas. State forest management should focus on the maintenance of young aspen (0-10 years old) in association with lowland shrub and grasslands in priority landscapes.

Wildlife Habitat Specifications:

- Identify commercial and non-commercial treatment opportunities in aspen and alder adjacent to or within lowland shrub and grassland. Treatment areas 25-125 acres are preferred.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this golden-winged warbler habitat specification.
- Within management area, maintain 20% of aspen associated with lowland shrub and grasslands in the 0-10 year age class.

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 >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-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 *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 System when there is an expected operational impact. For red-shouldered hawk, the wildlife habitat specifications contained within Michigan DNR's *Interim Management Guidelines for Red-Shouldered Hawks and Northern Goshawk on State Forest Lands* (August 2012) will be followed.

Ruffed Grouse

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

Wildlife Habitat Specifications:

- Maintain the aspen cover type and the aspen component in mixed stands within the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen and lowland deciduous will be sufficient to meet this ruffed grouse habitat specification.
- Move to balance the age-class distribution of aspen and continue management to regenerate oak to maintain young forests across the management area.
  - Implementation of 10-year management direction for aspen, lowland aspen, lowland deciduous and oak will be sufficient to meet this ruffed grouse habitat specification.
- Maintain the upland shrub cover type specifically juneberry, hawthorn, cherry and other mast producing shrub components.
  - Implementation of 10-year management direction for upland brush will be sufficient to meet this grouse habitat specification.

Wild Turkey

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

management should focus on providing natural winter food, maintaining and regenerating oak and maintaining brood-rearing openings to improve brood-production and winter survival.

Wildlife Habitat Specifications:

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

White-tailed Deer

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

Wildlife Habitat Specifications:

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

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.

Wood thrush is 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.

4.7.3 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 seven listed species as well as three natural communities of note occurring in the management area as listed in Table 4.7.2. 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 is one potential Type 2 old growth area at Walloon Lake. It is a 32-acre site representing the mesic northern forest natural community type as shown in Figure 4.7.6.

There are no high conservation value areas or ecological reference areas identified for the Chandler Hills MA as illustrated in Figure 4.7.6.

Management goals during this planning period:

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

Table 4.7.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Chandler Hills management area.

Common Name	Scientific Name	Status	Status in Management Area	Climate Change Vulnerability Index (CCVI)	Confidence	Natural Community Association	Probable Cover Types	Successional Stage
Natural Communities								
Emergent marsh		S4/GU	Confirmed				Lowland open/semi-open	N/A
Mesic northern forest		S3/G4	Confirmed				Northern Hardwood	Late
Rich conifer swamp		S3/G4	Confirmed				Tamarack	Late
Birds								
Northern goshawk	*Accipiter gentilis*	SC/G5/S3	Confirmed	PS	Very High	Mesic northern Forest	Northern Hardwood	Late
						Hardwood-conifer swamp	Lowland Mixed	Mid
						Northern hardwood swamp	Black Ash	Late
						Floodplain forest	Lowland mixed	Mid
						Dry northern forest	Jack Pine, Red Pine	Late
						Dry-mesic northern forest	White Pine	Late
						Boreal forest	Upland & Lowland Sp/F	Mid
Grasshopper sparrow	*Ammodramus savannarum*	SC/G5/S3S4	Confirmed	PS	Moderate	Dry sand prairie	Upland open/semi-open	N/A
						Mesic prairie	Upland open/semi-open	N/A
						Lakeplain wet prairie	Lowland open/semi-open	N/A
						Lakeplain wet-mesic prairie	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Hillside prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
Red-shouldered hawk	*Buteo lineatus*	T/G5/S3-4	Confirmed	PS	Very High	Floodplain forest	Lowland mixed	Mid
						Dry-mesic northern forest	White Pine	Late
						Mesic northern Forest	Northern Hardwood	Late
Common loon	*Gavia immer*	T/G5/S3-4	Confirmed	HV	Very High	Emergent Marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
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								
Blanding's turtle	*Emydoidea blandingii*	SC/G4/S3	Confirmed	HV	Very High	Mesic prairie	Upland open/semi-open	N/A
						Dry-mesic prairie	Upland open/semi-open	N/A
						Mesic sand prairie	Upland open/semi-open	N/A
						Coastal fen	Lowland open/semi-open	N/A
						Rich conifer swamp	Tamarack	Late
						Northern fen	Lowland open/semi-open	N/A
						Submergent marsh	Lowland open/semi-open	N/A
						Bog	Lowland open/semi-open	N/A
						Emergent marsh	Lowland open/semi-open	N/A
						Wet prairie	Lowland open/semi-open	N/A
						Prairie fen	Lowland open/semi-open	N/A
						Great Lakes marsh	Lowland open/semi-open	N/A
						Northern wet meadow	Lowland open/semi-open	N/A
						Coastal plain marsh	Lowland open/semi-open	N/A
						Wet-mesic sand prairie	Lowland open/semi-open	N/A
						Floodplain forest	Lowland mixed	Mid
						Inundated shrub swamp	Lowland open/semi-open	N/A
Plants								Late
Limestone oak fern	*Gymnocarpium robertianum*	T/G5/S2	Confirmed			Rich conifer swamp	Tamarack	Late
						Limestone bedrock glade	Upland open/semi-open	N/A
						Limestone lakeshore cliff	Upland open/semi-open	N/A

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

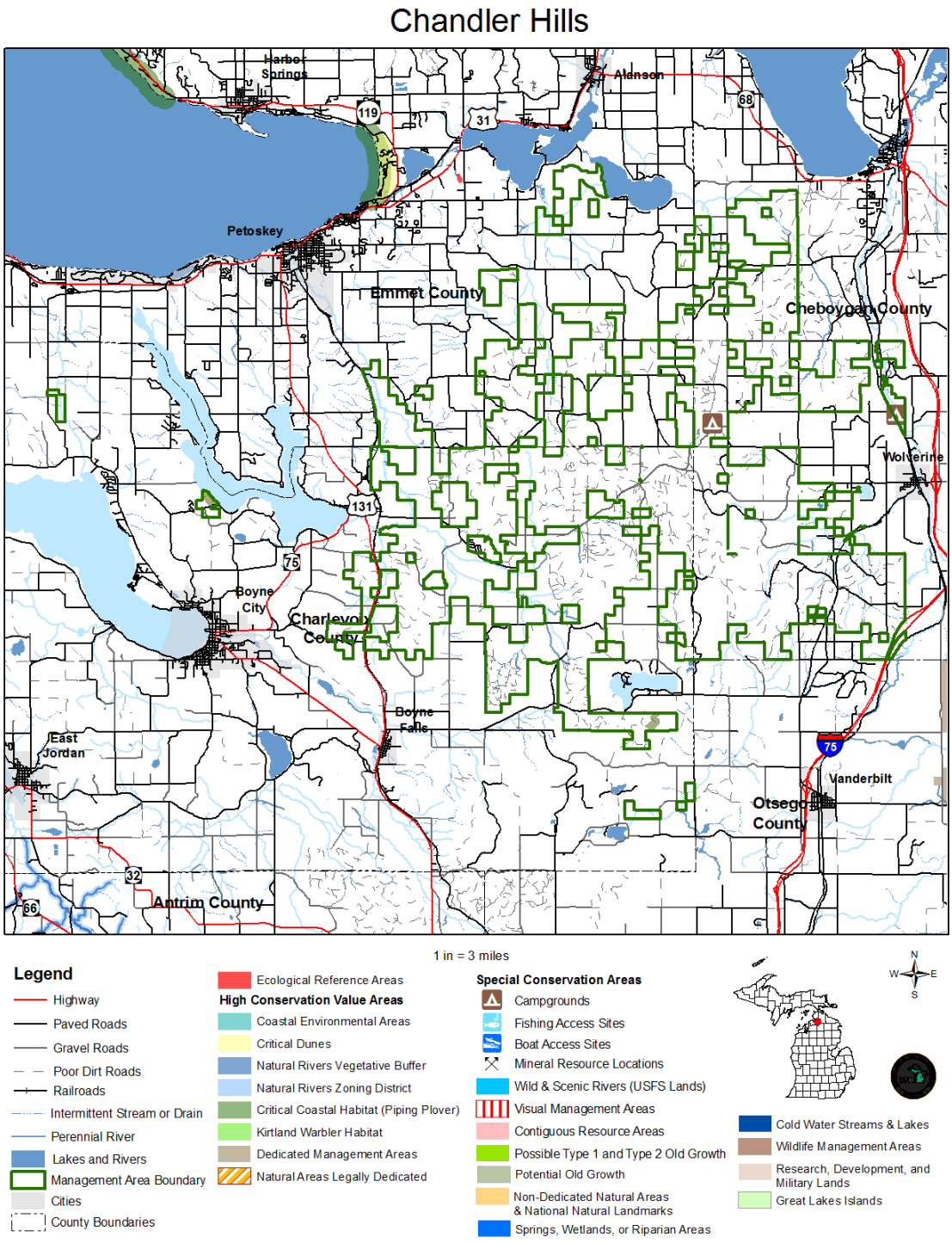

Figure 4.7.6. A map of the Chandler Hills management area showing the special resource areas.

4.7.4 Forest Health Management

Although forest health issues span the entire landscape, some specific threats are more important in this management area due to the species composition, site quality or other factors. Some of the more important forest health pests in this management area include emerald as borer, beech bark disease and oak decline 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. 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 4.7.3 below. This information was compiled from the Midwest Invasive Species Information Network database, but it should not be considered complete. This information, and other sources that show the extent and location of invasives, will be used to inform the potential for additional sightings that should be documented. Invasives that merit eradication efforts are those species that threaten sensitive sites due to their location or growth characteristics and have population levels that may be successfully controlled.

Table 4.7.3. Locations of invasive species mapped in and within a five-mile buffer of the management area (Midwest Invasive Species Information Network database).

Chandler Hills - FMD MAs	Cases within FMD Areas	Cases within 5-Mile Buffer	Total number of cases	Total number of different Invasive Species
	2	17	19	8

Invasive Species within FMD Areas	Occurrences	Invasive Species within 5-Mile Buffer	Occurrences
Tatarian Honeysuckle *Lonicera tatarica*	2	Black Swallow-worts *Vincetoxicum nigrum*	2
-	-	Garlic Mustard *Alliaria petiolata*	1
-	-	Japanese Knotweed *Fallopia japonica*	1
-	-	Phragmites (Common Reed) *Phragmites australis*	1
-	-	Purple Loosestrife *Lythrum salicaria*	2
-	-	Spotted Knapweed *Centaurea stoebe*	2
-	-	Tatarian Honeysuckle *Lonicera tatarica*	6
-	-	Wild Parsnip *Pastinaca sativa*	2

4.7.5 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 4.7.1 and listed in Appendix F.

4.7.6 Fire Management

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

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

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

- Where feasible, seek opportunities to use fire in the oak/pine areas to encourage pine and oak regeneration and to discourage competition;
- Where feasible, seek opportunities to incorporate fire as a tool to restore or maintain managed openings; and
- Recognize that increased urbanization in close proximity and within the management area will present more wildland/urban interface challenges to wildfire suppression.

4.7.7 Public Access and Recreation

Where access is limited on state forest land, the DNR will continue to seek access across adjacent private property. In accordance with the 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.

Although managing recreational opportunities is the primary responsibility of Parks and Recreation Division, timber management activities may impact the quality of recreational opportunities and management modifications will be considered to minimize these impacts. There are two state forest campgrounds in or immediately adjacent to the management area as shown in Figure 4.7.6.

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.

4.7.8 Oil and Gas Development

Surface sediments consist of coarse-textured till, ice-contact outwash sand and gravel, an end moraine of coarse-textured till, lacustrine (lake) sand and gravel, glacial outwash sand and gravel and postglacial alluvium. The glacial drift thickness varies between 10 and 1,000 feet. Sand and gravel pits are located in this management area and there is good potential for additional gravel pits.

The Devonian Antrim Shale and Traverse Group subcrop below the glacial drift. The Traverse Formation has limestone/dolomite potential, especially in areas of thin glacial till.

Gas production from the Antrim Shale is located in the southern part of this management area. The Collingwood Formation may also have oil and gas potential in this area and most of the management area is currently leased. If drilling is sucessful for the Collingwood Formation, additional leasing and drilling in the management area could occur.

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 reforested areas, as determined by the vegetation plan contained in the lease agreement or as subsequently decided in compartment review.