4.31 MA 31 – Two Hearted Headwaters Management Area

Summary of Use and Management

Vegetative management in the Two Hearted Headwaters management area (MA) will emphasize forest and riverine based recreational opportunities, wildlife habitat and timber production. The Pretty Lakes Complex area offers a unique recreational experience through both a traditional state forest campground and a wilderness-like camping opportunity. Recreational users may enter the backcountry by paddling, portaging or by hiking the Pretty Lakes trail system. Expected issues in this 10-year planning period include: increased recreational demand and introduced pests and diseases.

Introduction

The Two Hearted Headwaters management area is located in the central portion of the eastern Upper Peninsula, in Luce County. It has 17,923 acres of state-owned land. The primary attributes of this management area are the recreational opportunities. Additional attributes which were important in identifying this management area include:

- The management area falls within the Luce subsection 8.2 of the eastern Upper Peninsula ecoregion (Albert, 1995).
- Landforms in this management area are moraine ridges and pitted outwash plains. Kettles within the pitted outwash and moraines contain small lakes and bogs with thick deposits of peat.
- The landscape is dominated by the Two Hearted River which is a state designated natural river. The river valley creates its own distinctive vegetation when compared to surrounding landscapes. Most of the headwaters of the Two-Hearted River originate within this management area.
- Kettle Hole Lake and bog areas include: the Two-Hearted Lakes, Beavertown Lakes, the North Branch Lakes and the Pretty Lakes Complex.
- A hardwood swamp conifer ecological reference area is within the management area.
- Recreational opportunities include: trout fishing, berry picking, snowmobiling, off-road vehicle (ORV) riding, camping, kayaking, canoeing, hunting and wildlife viewing.

The state owned land in this management area covers a large portion of the Two Hearted River watershed and is interspersed with private parcels. A large portion of the private land owned in proximity to this management area is part of The Nature Conservancy Two-Hearted River Forest Reserve. The management area is within the Newberry Forest Management Unit. The current predominant cover types, acreages and projected harvest acres for the management area are shown in Table 4.31.1.

Table 4.31.1. Current cover types, acreages, projected harvest acres and projected ten-year cover type acreage for the Two Hearted Headwaters management area, eastern Upper 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
Lowland Open/Semi-Open Lands	35%	6,356	0	6,356	0	0	6,356	0	0
White Pine	12%	2,166	958	1,208	374	414	2,166	110	511
Lowland Conifers	14%	2,520	832	1,688	658	0	2,520	188	0
Northern Hardwood	8%	1,503	25	1,478	0	561	1,503	0	561
Lowland Spruce/Fir	8%	1,406	621	785	221	0	1,406	87	0
Red Pine	4%	796	319	477	108	243	796	53	269
Cedar	4%	642	0	642	40	0	642	40	0
Upland Open/Semi-Open Lands	0%	2	0	2	0	0	2	0	0
Misc Other (Water, Local, Urban)	4%	716	0	716	0	0	716	0	0
Others	10%	1,816	40	1,776	157	296	1,816	165	421
Total	100%	17,923	2,794	15,129	1,558	1,514	17,923	643	1,762

Others include: jack pine, natural mixed pines, hemlock, upland conifers, aspen, upland mixed forest, lowland deciduous, planted mixed pines, tamarack, paper birch, and lowland aspen/balsam poplar.

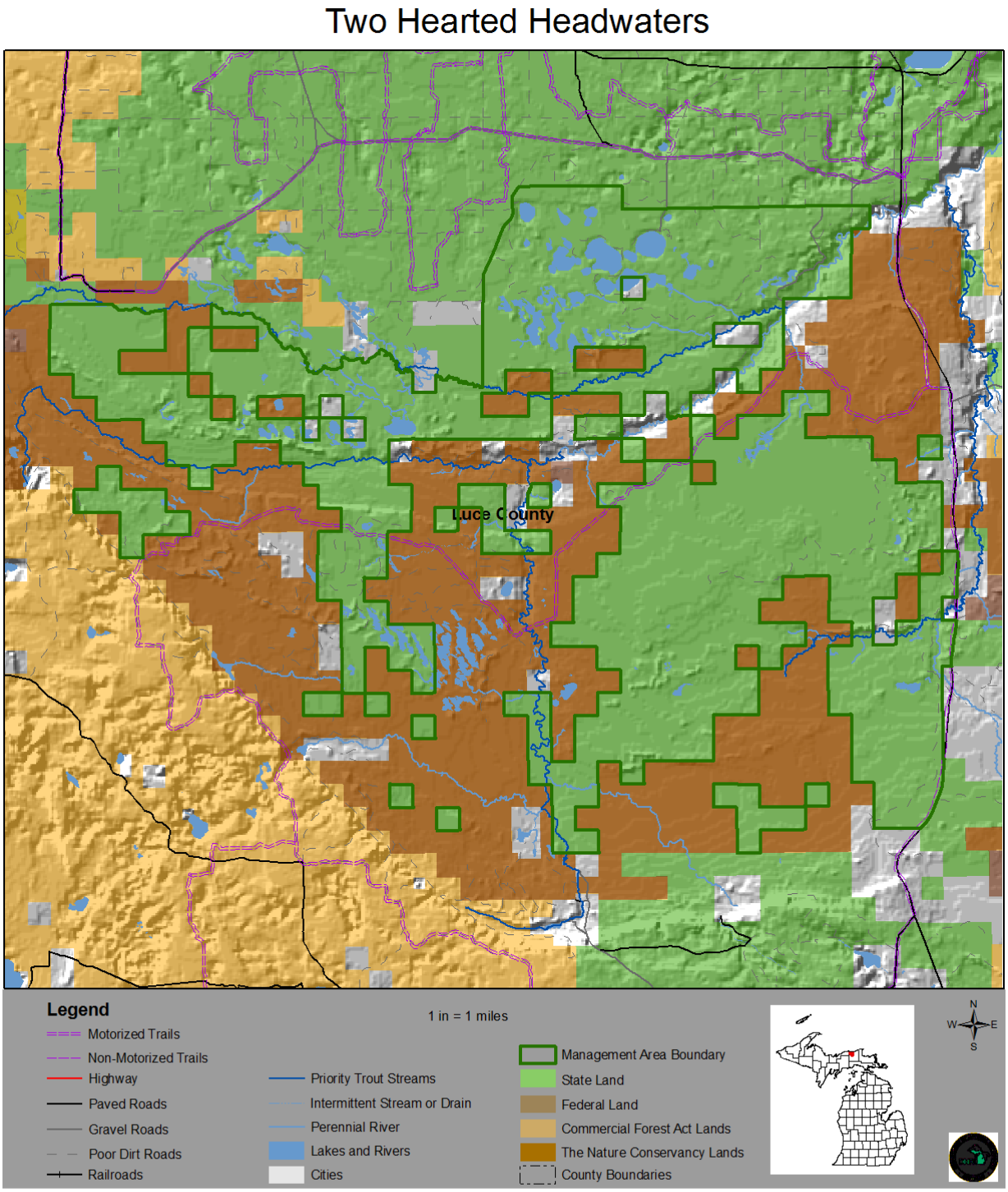

Figure 4.31.1. Location of the Two Hearted Headwaters management area (dark green boundary) in relation to surrounding state forest lands and other ownerships.

4.31.1 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 (i.e., timber harvest, prescribed fire, planting and 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 tree species and other vegetation, they are classified by the predominant species.

All of the following cover types are valued commercially for their timber products; ecologically as sources of habitat for numerous species; and for the variety of recreational opportunities they provide. Harvesting these cover types will provide for a continuous flow of forest products and values.

Section 4.31.1.1 Forest Cover Type Management – Lowland Open/Semi-Open Lands

Current Condition

This management area contains a large amount of lowland open/semi-open lands totaling approximately 6,356 acres (35%) (Table 4.31.1). This category is a combination of treed bog (3,286 acres), marsh (2,482 acres), lowland shrub (387 acres) and bog (201 acres). These wetland communities are valued ecologically as sources of habitat for numerous species of wildlife. Some of these stands are within riparian corridors, ecological reference area and high conservation value area designations.

Desired Future Condition

- Lowland open/semi-open lands will be retained to ensure an adequate level of wildlife habitat and recreational opportunity while protecting special conservation values found in these cover types.

Long-Term Management Objectives

- In general, these stands will be maintained without active management to protect their ecological values; and
- Follow best management practice guidelines to protect these areas from harvest operations in adjacent stands.

Section 4.31.1.2 Forest Cover Type Management – White Pine

Current Condition

White pine stands occur on 2,166 acres (12%) of the management area (Table 4.31.1). The majority of the white pine stands in this area are of natural origin. White pine stands in this management area are found on dunes, outwash plains and lake plains with Kotar habitat types of PVE, PArV and PArVAa (see appendix E). White pine in this area grows in association with red pine, hemlock and hardwood and is often found around lakes, rivers or bogs. White pine is being regenerated using natural regeneration primarily through shelterwood harvesting. Thinning followed by shelterwood harvesting has resulted in some of the white pine stands being classified as uneven-aged stands having trees of various sizes and ages (Figure 4.31.2). Some older white pine stands form riparian buffers for lakes and creeks and may not ever be harvested.

Currently, 214 acres of white pine are scheduled for partial harvest. There are 958 acres of white pine that have site conditions limiting their harvest this entry period. These hard factor limited acres have been removed from the total number of manageable acres available for harvest calculations.

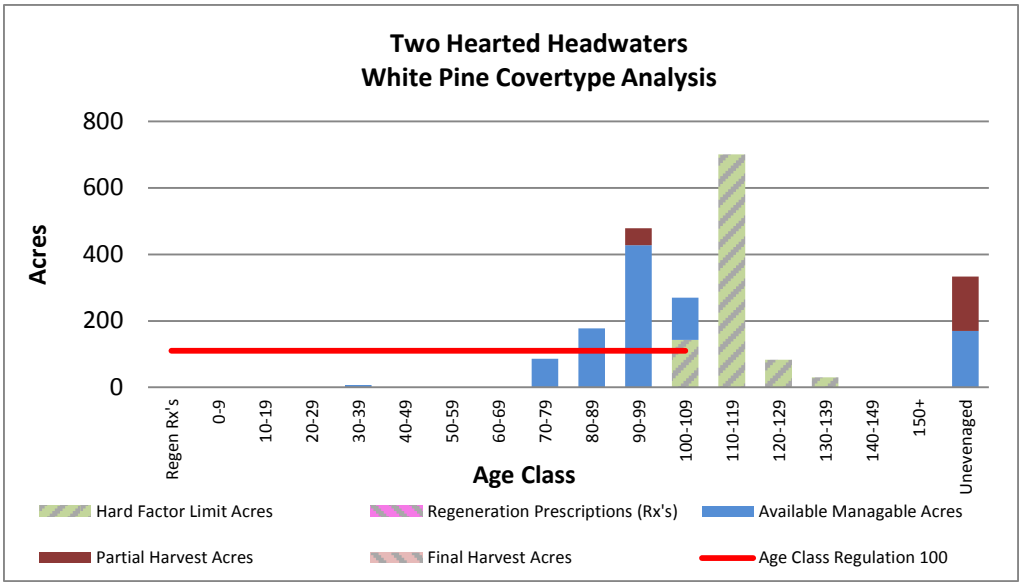

Figure 4.31.2. Age class distribution of white pine in the Two Hearted Headwaters management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- White pine stands will be maintained on operable sites with acres balanced between 0-109 years of age to provide for continual harvesting, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- The 10-year projected final harvest of white pine is for 374 acres. The increase from the regulated amount is due to the current age-class structure; and
- The 10-year projected partial harvest of white pine is 414 acres.

Long-Term Management Objectives

- A regulated harvest would allow approximately 110 acres for final harvest per decade.
- Periodically thin stands with high basal area prior to final harvest at rotation age.

Section 4.31.1.3 Forest Cover Type Management – Lowland Conifer

Current Condition

Lowland conifers occur on 2,520 acres (14%) of the management area (Table 4.31.1). Access is very limited in this management area due to the rivers, lakes, marshes and bogs. Some of the lowland conifer stands fall within the vegetative buffer of the Two-Hearted Natural River. Almost 25% of the lowland conifer stands have been classified as uneven aged having trees of varying ages and sizes as a result of natural processes (Figure 4.31.3). While there has been no recent harvesting in this cover type in this management area, lowland conifer stands in nearby areas have been successfully regenerated using natural regeneration.

Currently there are not any acres of lowland conifers prescribed for final harvest. There are 832 acres of lowland conifers that have site conditions limiting their harvest at this time. These hard factor limited acres have been removed from the total number of manageable acres available for harvest calculations. Lowland conifer stands in areas that are inaccessible for harvest will be subject to natural processes, resulting in a range of successional stages.

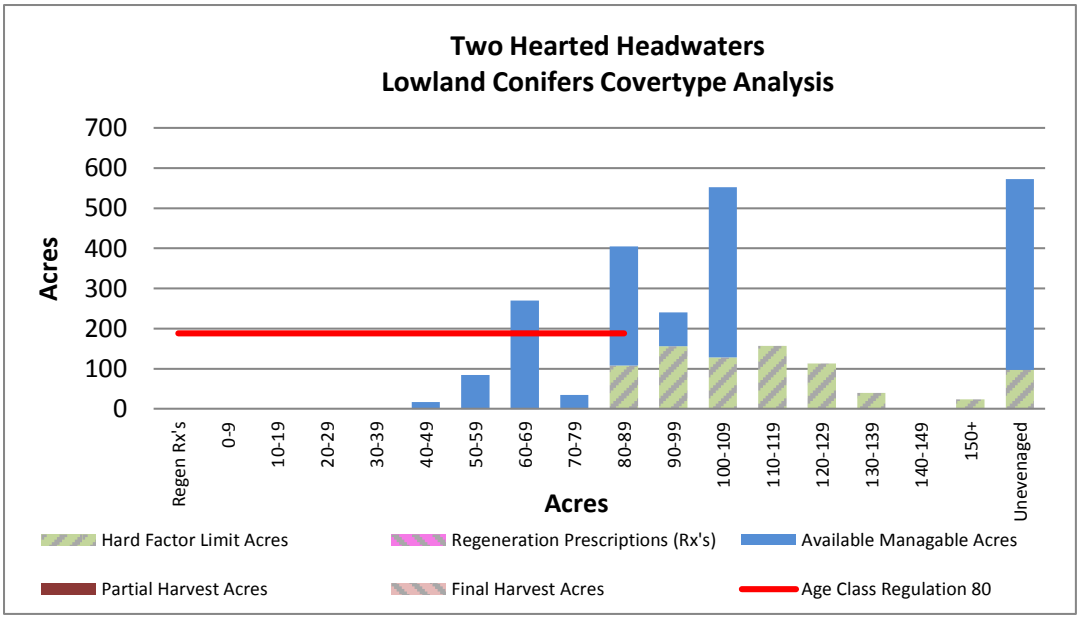

Figure 4.31.3. Age-class distribution of lowland conifers in the Two Hearted Headwaters management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Lowland conifer stands will be maintained on operable sites through even-aged management using an 80-year rotation to provide for continual harvest, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- The 10-year projected final harvest of lowland conifers is 658 acres. The increase from the regulated amount is due to the current age-class structure where none of the stands are in younger age classes.

Long-Term Management Objectives

- Balance the age-class structure of available stands providing for a regulated harvest of about 188 acres of lowland conifers per decade.

Section 4.31.1.4 Forest Cover Type Management – Northern Hardwood

Current Condition

Northern hardwood occurs on 1,503 acres (8%) of the management area (Table 4.31.1). Northern hardwoods are distributed throughout the management area on lake plains, outwash plains, dunes and stream terrace with habitat classes of AFPo, ATFD, PArVAa and PArV (see appendix E). These sandy soils range from dry-poor nutrient to mesic-medium nutrient sites. The better sites have potential to grow quality stems and single tree selection harvesting is used in stands with a basal area over 120 square feet per acre to decreasing stocking levels. In general, this will allow most hardwood stands to be selectively harvested every 20 years. Where site quality is poor shelterwood and other even-aged harvesting systems will be considered. Recent harvests using even-aged systems are shown in the immature column in Figure 4.31.4.

Beech bark disease is found throughout the management area and salvage of affected beech is ongoing. Northern hardwood stands that had a component of beech now have decreased stocking levels due to beech bark disease mortality and salvage harvesting. Further selection harvesting will be delayed due to resultant lower than normal residual basal area.

Currently there are 321 acres of northern hardwood with a partial harvest assigned. There are 25 acres of northern hardwoods that have site conditions limiting their harvest at this time. These hard factor limited acres have been removed from the total number of manageable acres available for harvest calculations.

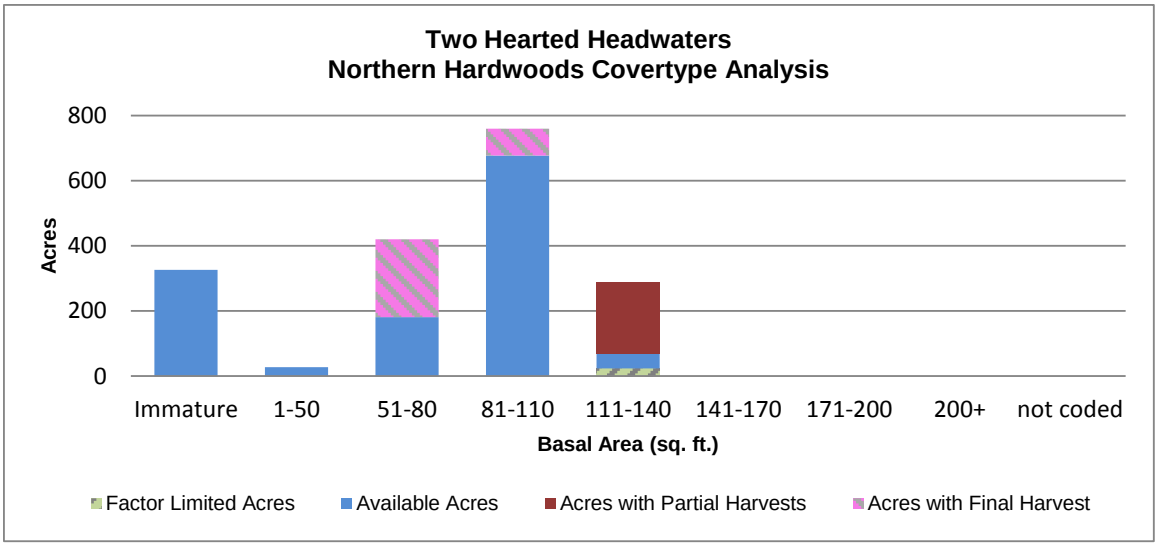

Figure 4.31.4. Basal area distribution of northern hardwood in the Two Hearted Headwaters management area (2012 Department of Natural Resources inventory data).

Desired Future Condition

- Northern hardwood stands will be maintained on operable sites by using individual tree selection harvesting to provide uneven-aged composition and structurally diverse stands; and
- Harvesting will provide for a continuous flow of timber products and a variety of wildlife habitat and recreational opportunities.

10-Year Management Objectives

- The 10 year projected partial or selection harvest of northern hardwood is 561 acres;
- Evaluate stands previously dominated by beech to determine the impact of beech bark disease on regeneration;
- Track beech regeneration in these stands;
- To favor regeneration of hardwood other than beech, consider herbicide application on beech regeneration to promote regeneration of other species; and
- In areas that are losing beech to beech bark disease, consider planting disease resistant beech or oak after harvesting to increase the availability of hard mast.

Long-Term Management Objectives

- Select harvest northern hardwood stands on a 20-year cycle.

Section 4.31.1.5 Forest Cover Type Management – Lowland Spruce/Fir

Current Condition

Lowland spruce/fir stands are found on 1,406 acres (8%) of the management area (Table 4.31.1). While there has been some recent harvest and regeneration of lowland/spruce fir, the majority of stands are in older age classes (Figure 4.31.5). Approximately half of the stands are sparsely stocked with less than 50 square feet per acre of basal area and have low site indexes. As with lowland conifer stands access is often limited and some lowland spruce/fir stands fall within the vegetative buffer of the Two Hearted Natural River. Even aged management using clearcutting followed by natural regeneration is an effective way to regenerate lowland spruce/fir stands in this area.

Currently there are 84 acres of lowland spruce/fir with a final harvest prescribed. There are 621 acres of lowland spruce/fir that have site conditions limiting their harvest. These hard factor limited acres have been removed from the total number of manageable acres available for harvest calculations. Inaccessible stands will undergo natural processes, resulting in a range of successional stages.

Desired Future Condition

- Lowland spruce/fir stands will be maintained on operable sites through even-aged management with acres balanced between 0-89 years of age to provide for continual harvesting, wildlife habitat and recreational opportunities.

10-Year Management Objectives

- The 10-year projected final harvest of lowland spruce/fir is 221 acres. The increase from the regulated amount is due to the current age-class structure.

Long-Term Management Objectives

- Balance the age classes of accessible lowland spruce/fir stands providing for a regulated harvest of approximately 87 acres per decade.

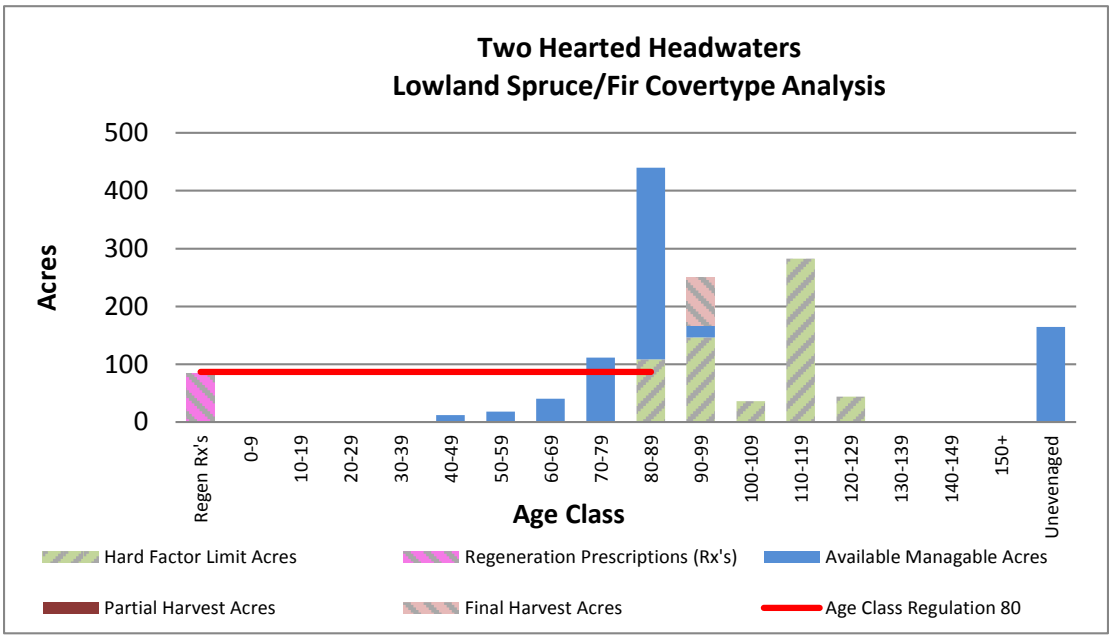

Figure 4.31.5. Age-class distribution of lowland spruce/fir in the Two Hearted Headwaters management area (2012 Department of Natural Resources inventory data).

Section 4.31.1.6 Forest Cover Type Management – Other Types

Current Condition

There are many other cover types spread across the management area that have less than 5% of the total management area acres (Table 4.31.1). Red pine (796 acres) and cedar (642 acres) each have 4% of the total management area acres. The “other types” category (1,816 acres or 10%) is a combination of cover types with 3% or less of the total acres and is made up of: jack pine (504 acres), natural mixed pines (452 acres), hemlock (419 acres), upland conifers (156 acres), aspen (137 acres) and upland mixed forest, lowland deciduous, planted mixed pines, tamarack, paper birch and lowland mixed forest each with less than 100 acres.

The majority of these forested cover types are managed using even-aged harvesting systems and will be reforested by natural regeneration. For even-aged management types attempt to balance the acres using standard rotation ages. Red pine, white pine, mixed pines and other mixed cover types with high basal area may be thinned prior to final harvest depending on the species composition.

There are 359 acres of these other minor cover types that have site conditions limiting their harvest this entry. These hard factor limited acres have been removed from the total number of manageable acres available for harvest calculations. Where stands are inaccessible early successional cover types will be changed through natural succession, thus slightly changing the cover type distribution.

Miscellaneous other stands include 716 acres (4%) and include water, roads and sand/soil.

Desired Future Condition

- These cover types will be managed on operable sites contributing to the compositional diversity of the landscape while providing for continual harvest, wildlife habitat and recreation opportunities.

10-Year Management Objectives

- The projected 10-year final harvest is 108 acres of red pine, 40 acres of cedar and 157 acres of other types.
- The projected 10-year partial harvest is 243 acres of red pine and 296 acres of other types.

Long-Term Management Objectives

- Continue management of these other cover types to provide a sustainable yield of forest products and wildlife habitat.

4.31.2 – Featured Species

The Two-Hearted Headwaters management area exhibits high biodiversity values due to the spatial arrangement of lowland habitats intermingled with upland habitats. In forested stands the primary wildlife values include mature forest conditions the retention of coarse woody debris and large diameter soft hardwoods and mesic conifers, especially large diameter white pine and hemlock. The loss of beech mast due to beech bark disease severely impacts wildlife values; it is therefore desirable to plant either disease resistant beech or oak.

American Marten

The goal for marten in the eastern Upper Peninsula is to maintain or increase suitable habitat and strive to identify, maintain and connect known populations to facilitate genetic exchange. Management should address the maintenance and improvement of corridors, dead wood and conifer components in priority landscapes.

Wildlife Habitat Specifications:

- Maintain a minimum of 30% canopy cover in key even-aged managed stands of northern hardwood and conifer stands as marten tend to avoid stands with less canopy cover. Write prescriptions to minimize potential blowdown.
- Discourage land transactions and management activities that facilitate further fragmenting of marten habitat within the management area by identifying and maintaining corridors between large forested tracts.
- Provide older forest conditions in this management area.
- Retain and limit disturbance to existing downed coarse woody debris and exceed Within-Stand Retention Guidance for its maintenance. Where coarse woody debris is lacking, increase both standing dead and down dead wood by leaving at least three secure large diameter (>14 inches in diameter at breast height) live trees to serve as future den trees, snags and coarse woody debris (logs) on the ground per acre in harvested stands.
- Increase the within-stand component of mesic conifers in mixed stands and expand mesic conifer forest types by group or gap selective harvest. Consider underplanting on suitable sites where a seed source is absent.
- Limit firewood permits, biomass harvesting and whole tree harvesting considering retaining the maximum residues in the Woody Biomass Harvesting Guidelines.

Blackburnian Warbler

The goal for blackburnian warbler is to maintain suitable breeding habitat. Management for the species should focus on within stand diversity, habitat fragmentation and conifer components in this management area.

Wildlife habitat specifications:

- Increase the mesic conifer (e.g. hemlock, white pine, red pine and upland spruce-fir) component on state forests by: a) Retaining a larger percentage of mesic conifer during harvests; b) Using silvicultural practices that encourage the regeneration of mesic conifer; and c) Where desired/feasible, underplanting hemlock, white pine and white spruce in hardwood-dominated stands on suitable sites without a seed source.

- Provide more older mesic conifers, particularly hemlock, in the landscape by: a) Allowing some actively managed stands of mesic conifer to grow beyond standard rotation ages; b) Including mature mesic conifers as within-stand structure retained during harvests by following Within-Stand Retention Guidance during harvests; and c) Maintaining mature mesic conifer stands within travel corridor and riparian zone or Type 1 or Type 2 old growth special conservation areas
- Only allow harvest in hemlock stands, or where hemlock is a component in other cover types, where successful hemlock recruitment has been clearly demonstrated.

Black Bear

The goal for black bear in the eastern Upper Peninsula is to maintain or improve habitat. Management for the species should focus on improving existing habitat (minimizing fragmentation and maintaining hard and soft mast) to offset potential population declines due to changes in land-use.

Wildlife habitat specifications:

- Maintain or increase tree species that provide mast including beech, oak, black cherry and ironwood.
- Beech trees with bear claw scars on the bark are generally good mast producers and should be retained wherever possible.
- Retain some large diameter white pine or hemlock as refuge trees.
- Plant disease resistant beech and red oak where appropriate.
- Maintain or increase mast by providing forest clearings that promote food sources such as pin cherry, juneberry/serviceberry, hazel, raspberry, blackberry and blueberry. Minimize herbicide use that would be detrimental to this resource.
- Discourage land transactions and management activities that facilitate further fragmenting state lands within the management area.

Pileated Woodpecker

The goal for pileated woodpecker is to maintain or improve habitat. Management should focus on maintaining large diameter deciduous trees in timber sales in priority areas.

Wildlife habitat specifications:

- Identify and retain as many existing large (>15 inches in diameter at breast height) snags and cavity trees, coarse woody debris and reserve trees, as possible to ensure a sustainable supply of future cavity and foraging trees and associated coarse woody debris. Poorly formed trees and those damaged by natural disturbance or earlier harvests, particularly deciduous trees, are good candidates for future snags and cavity trees; trees damaged by beech bark disease that were not salvaged are contributing towards this goal. Large diameter aspen and other soft hardwoods are preferred.
- Even-aged managed stands: Leave scattered retention patches around some 18 inches in diameter at breast height or greater secure trees as a nucleus, using the upper end of the Within Stand Retention Guidance.
- Uneven-aged managed stands: Retain a minimum of three secure cavity or snags per acre with one exceeding 18 inches in diameter at breast height. If snags or cavity trees are lacking, leave trees with defects of the maximum available size that will likely develop cavities.
- Salvage harvests deemed necessary due to insect, disease, or fire will be offset within the same cover type and age class (within the compartment, management area or ecoregion), to minimize impacts on pileated woodpecker habitat. Total allowable harvest in these situations will be evaluated on a case-by-case basis.

4.31.3 – Rare Species and Special Conservation Area Management

All forest operations must be reviewed for potential conflicts with rare species following the guidance in "*DNR's Approach to the Protection of Rare Species on State Forest Lands*" (IC4172). This is especially important when listed species are present or past surveys have indicated a possibility of their presence.

Past surveys have noted and confirmed four listed species as well as six natural communities of note occurring in the management area as listed in Table 4.31.2. 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.

Special conservation areas in this management area include cold water lakes and streams and high priority trout streams (Figure 4.31.1). Concentrated recreation area special conservation areas (boat access sites and state forest campgrounds) are listed in the Recreation section 4.29.6 below.

Within the Two Hearted Headwaters management area there are several areas identified as potential Type 1 or Type 2 old growth. They are dry-mesic northern forest (194 acres and 848 acres), hardwood-conifer swamp (37 acres) and three areas of rich conifer swamp (444 acres, 207 acres and 334 acres). These are all shown is Figure 4.31.6.

The Two-Hearted River system is a state designated natural river and along with its corridor is a high conservation value area (Figure 4.31.6). The Two-Hearted River Natural River Plan (DNR, Dec. 1973) contains specific requirements for management in this area.

There is one ecological reference area in this management area representing the hardwood-conifer swamp natural community (37 acres) shown in Figure 4.31.6. This ecological reference area will be managed to protect and enhance its natural vegetative and wildlife communities as directed by an ecological reference area -specific management plan.

Table 4.31.2. Occurrence information for special concern, rare, threatened and endangered communities and species for the Two Hearted Headwaters 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								
Dry-mesic northern forest		S3/G4	Confirmed				White Pine	Late
Hardwood-conifer swamp		S3/G4	Confirmed				Lowland open/semi-open	N/A
Intermittent wetland		S3/G2	Confirmed				Lowland open/semi-open	N/A
Muskeg		S3/G4G5	Confirmed				Lowland open/semi-open	N/A
Patterned fen		S2/GU	Confirmed				Lowland open/semi-open	N/A
Rich conifer swamp		S3/G4	Confirmed				Tamarack	Late
Birds								
Spruce grouse	*Falcipennis canadensis*	SC/G5/S2-3	Confirmed	MV	Very High	Bog	Lowland open/semi-open	N/A
						Boreal forest	Upland & Lowland Sp/F	Mid
						Poor conifer swamp	Tamarack	Late
						Dry northern forest	Jack Pine, Red Pine	Late
Merlin	*Falco columbarius*	T/G5/S1S2	Confirmed	PS	Very High	Boreal forest	Upland & Lowland Sp/F	Mid
						Great Lakes barrens	Upland open/semi-open	N/A
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
Plants								
Alga pondweed	*Potamogeton confervoides*	SC/G4/S3	Confirmed			Submergent marsh	Lowland open/semi-open	N/A
						Emergent marsh	Lowland 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.

Management goals during this planning period are:

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

4.31.4 – 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 by major cover type include:

- Northern hardwoods: beech bark disease;
- Red and jack pine: jack pine budworm, white grubs, red-headed pine sawfly, pine engraver and *Scleroderris* canker;
- White pine: white pine blister rust; and
- Lowland conifers and lowland spruce/fir: spruce budworm, eastern larch beetle and larch casebearer.

For further information on forest health refer to Section 3.

Invasive Species

Invasive exotic species, specifically plants, may pose a significant forest health threat to forested and non-forested areas throughout the management area. The statewide database of invasive plant species does not yet document any known species or locations within or surrounding the management area. Absence of data is likely due to lack of surveys, and it should not be assumed there are no species present. Monitoring efforts should specifically look for new populations of the 10 priority invasive plant species identified in Section 3 of this plan. Prescribe eradication treatments to any new populations of priority invasive plant species found in the management area.

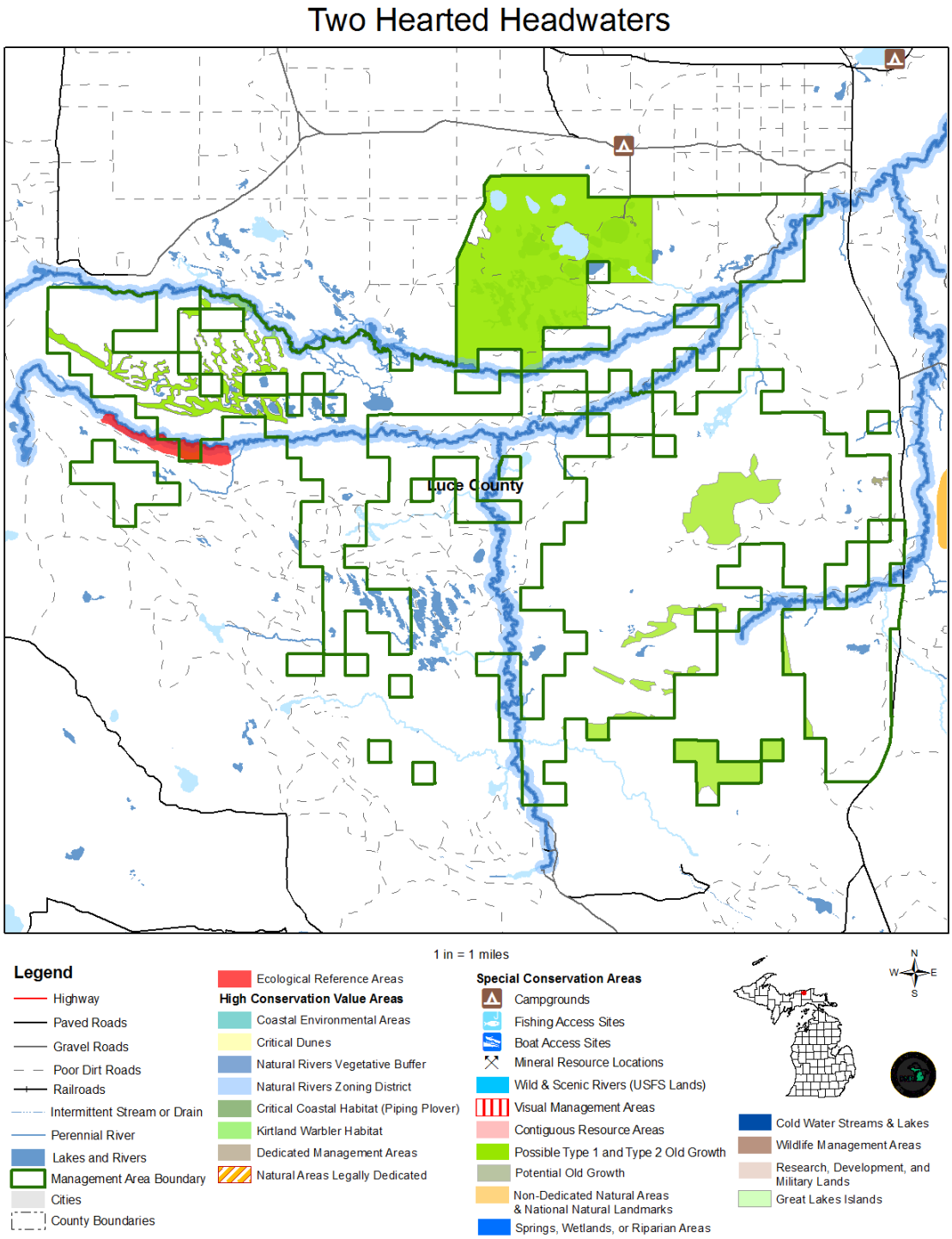

Figure 4.31.6. A map of the Two Hearted Headwaters management area showing the special resource areas.

4.31.5 – Fire Management

This area has a mixture of hardwood and pine types and lowland conifer ridges scattered in marsh complexes. Most of the management area has a fire return interval of 35-200 years. There is no record of prescribed fire activity in this management area.

- The Blind Sucker and Two-Hearted Zone Dispatch areas are part of this management area. Those plans call for aggressive initial attack based upon current fire danger.
- Prescribed fire may be used in this management area to promote natural pine regeneration.

4.31.6 – Public Access and Recreation

The east portions of the management area are accessed by county roads and forest trails. The CCI road (Burma Grade) is a public thoroughfare, but not a county maintained road. This road accesses a significant portion of the management area. The western portion of the management area has fewer roads.

A joint planning effort between The Nature Conservancy and the DNR was begun in the fall of 2009 to identify expected issues. Management activities should be coordinated with The Nature Conservancy, where lands are interspersed with their reserve. There is an effort underway to trade parcels so that both the DNR and The Nature Conservancy can block in ownership.

Trail facilities in this management area include snowmobile trails (Figure 4.31.1) and the Pretty Lakes Pathway. The Pretty Lakes State Forest Campground provides camping opportunities. Boat motors are not allowed on Pretty Lake or the other Lakes in the Pretty Lake Complex.

Additional recreational opportunities include: trout fishing, berry picking, hunting (especially bear) and wildlife viewing. Many of the small lakes within this watershed are used recreationally for fishing, kayaking/canoeing and bird watching.

4.31.7 - Aquatic Resource Management

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

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

Forested stands adjacent to designated high priority trout streams will specifically be managed to discourage beaver use in accordance with both DNR Policy and Procedure 39.21-20 Beaver Management and IC 4011. Part of the Two-Hearted River watershed is designated as high priority trout stream in this management area and details are shown in the Integrated Forest Monitoring Assessment and Prescription Geographic Decision Support Environment and in Figure 4.31.1.

4.31.8 – Minerals

Surface sediments consist of peat and muck, lacustrine (lake) sand, gravel and minor end moraine of coarse-textured till. There is insufficient data to determine the glacial drift thickness. Sand and gravel pits are not located in the area, but there is potential for additional pits on the uplands.

The Ordovician Black River Formation and Prairie du Chien Group and Cambrian Trempealeau Formation and Munising Group subcrop below the glacial drift. The Black River is quarried for stone/dolostone in the Upper Peninsula.

Exploration and development for oil and gas has been limited to a few wells drilled in the Upper Peninsula (two wells in Luce County). No economic oil and gas production has been found in the Upper Peninsula.

Metallic mineral production is not supported by the geology given the depth to known metallic bearing formations.