Environmental Assessment

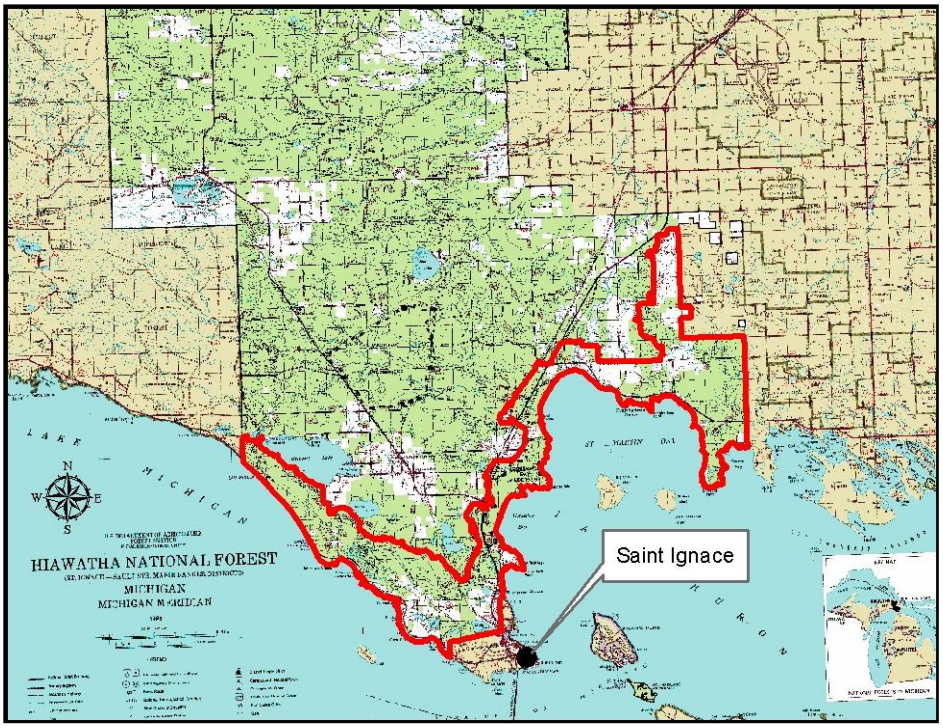
Shores

United States Department of Agriculture

Forest Service Eastern Region

Hiawatha National Forest

St. Ignace District



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Cover picture: Shores vicinity map. The Shores area is approximately 54,500 acres and is located in the south shores of the Eastside of the Hiawatha National Forest on Lakes Michigan and Huron in Mackinac County, Michigan.

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Document Structure

The Forest Service has prepared this environmental assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EA discloses the direct, indirect, and cumulative environmental impacts that would result from the Proposed Action and alternatives. The document is organized into four parts:

Chapter 1: Purpose and Need: This chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2: Alternatives: This chapter provides a more detailed description of the agency's Proposed Action as well as alternative methods for achieving the stated purpose. The alternatives considered were developed based on relevant issues raised by the public and other agencies. Finally, this chapter provides a summary table of the environmental consequences associated with each alternative.

Chapter 3: Environmental Consequences: This chapter describes the environmental effects of implementing the Proposed Action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the no action alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.

Chapter 4: Agencies and Persons Consulted: This chapter provides a list of preparers and agencies consulted during the development of the EA.

Appendices: The appendices provide more detailed information to support the analyses presented in the EA.

This EA is tiered to the 2006 *Hiawatha National Forest Land and Resource Management Plan* (Forest Plan)

Additional documentation may be found in the project record located at the St. Ignace Ranger District Office in St. Ignace, Michigan.

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1. PURPOSE AND NEED

1.1 BACKGROUND

In 2007 and 2008, two midscale assessments (MSA) were completed for the Shores project. They are the Huron Complex MSA and the South Shores MSA. The MSAs identified the existing condition and the desired condition (DC) for various resources within the analysis boundary. Opportunities and possible management practices which would move the resource conditions from the existing condition toward the DC of the Hiawatha National Forest 2006 Forest Plan (Forest Plan or FP) were then identified (USDA 2007b; USDA 2008). Many of those possible management practices were carried forward in this EA.

1.2 RELATION TO FOREST PLAN

The Forest Plan provides objectives, management direction, and desired conditions for large areas called management areas (MA). The Shores project area lies within nine MAs: MA 1.2, 4.2, 4.5, 5.1, 6.2, 6.4, 7.1, 8.1, 8.4.2 (Table 1-1), but activities are only being proposed in MAs 1.2, 6.4 and 7.1. Applicable Forest-wide and MA direction is in Chapters 2 and 3 of the Forest Plan, respectively. Some of these directions were used to design the specific activities so they meet Forest Plan direction (See Appendix B – Site-Specific Activities and Design Criteria).

Table 1- 1. Management Areas within Shores

MA	Emphasis Summary of MA	Approximate National Forest Acres	Activities Proposed
1.2	Aspen management for fiber production and deer and grouse habitat. Dispersed recreation.	3,034	Yes
4.2	Conifer management for sawlog production and non-game wildlife.	13	No
4.5	Older forest management for conifer sawlogs, wetland plant communities, deeryards and upland and lowland wildlife habitat. Dispersed recreation.	114	No
5.1	Congressionally-designated Wilderness	3,925	No
6.2	Semi-primitive motorized (SPM) recreation and access to fishing and canoeing areas. Even and uneven-aged timber management and game and non-game wildlife habitats.	2,446	No
6.4	Game and non-game wildlife habitat; waterfowl and wetland habitat. SPM recreation and access to hunting and fishing areas. Even and uneven-aged timber management.	39,191	Yes
7.1	Developed recreation areas	88	Yes
8.1	Candidate and Research Natural Areas (protected areas of significant biological, geological, or cultural features).	5,163	No
8.4.2	Even and uneven-aged timber management, wetland plant communities, secluded wildlife habitat, and dispersed recreation.	528	No

1.3 PURPOSE OF AND NEED FOR ACTION

The Huron Complex (HC) and South Shores (SS) MSAs identified gaps between the existing condition on the ground and the desired condition identified in the Forest Plan. These gaps represent the need for action and, in turn, the rationale for the proposed action. The needs identified for vegetation changes, transportation changes, recreation changes, and aquatic habitat and watershed restoration changes are listed below.

1.3.1 Vegetation Including Timber Management, Wildlife Habitat, and Fuels

Need 1. Manage both vegetation composition and vegetation structure to meet the vegetation composition goals of MA 1.2 and 6.4. The Forest Plan establishes vegetation composition and size goals for these MAs by ecological landtype (ELT). Within this framework, minimum and maximum percentages are provided by species group and tree size classes for each ELT within the HC and SS MSAs. ELTs and stand data were used to determine the seral group and size class currently found in MA 1.2 and 6.4. Seral classes are defined in Appendix D, page D-1 of the Forest Plan. Size classes from the Forest Plan are listed as follows:

SIZE CLASS:
0: Open lands
1: Less than 4.5 feet in height
2: From 4.5 feet to 4.9” diameter at breast height (DBH)
3: From 5” to 8.9” DBH
4: From 9” to 17.9” DBH
5: Greater than 18” DBH

These current seral groups and size classes were compared to the desired ranges identified in each MA composition goal (FP, pp. 3-5 and 3-31). As a result, three major changes to the current vegetation composition and size class are needed to move toward the desired vegetation composition and size class goals:

Management Area 1.2

ELT 40/50/90

Aspen: The aspen seral class (including paper birch) in ELT 40/50/90 contains too many acres in size class 4 and not enough acres in size class 1 (HC MSA, p. 40).

Management Area 6.4

ELT 10/20

Aspen: The aspen seral class (including paper birch) in ELT 10/20 contains too many acres in size class 4 and not enough acres in size class 1 (SS MSA, p. 58).

There are too many aspen seral class acres in ELT 10/20; therefore, there is a need to convert some aspen types to other forest types (SS MSA, p. 58).

Jack Pine: The jack pine seral class in ELT 10/20 contains too many acres in size class 4 and not enough acres in size class 1. There are too many jack pine seral class acres in ELT 10/20, and not enough acres in the late seral classes; therefore, there is a need to convert some jack pine types to late seral forest types (SS MSA, p. 58).

ELT 40/50/90

Aspen: There is a need to decrease the amount of old aspen and increase the amount of young aspen (HC MSA, p. 35; SS MSA, p. 59).

Mid Seral: There is a need to decrease the amount of acres in size class 4 and to increase the amount of acres in size class 1. There is also a need to decrease the amount of acres in the mid seral class, and push them towards late seral uneven-aged stands were possible (HC MSA, p. 35; SS MSA, p. 59).

Late Seral: Mid seral and late seral classes in ELT 40/50/90 (primarily northern hardwoods), contain too many acres in smaller size classes (size classes 3 and 4) and not enough in size class 5. In areas where the DC is uneven-aged forests, there is a need to push stands toward a later seral setting (HC MSA, p. 35; SS MSA, p. 59).

ELT 60

Aspen: There is a need to increase the amount of aspen acres in size class 1 (HC MSA, p. 36-36; SS MSA, p. 59).

Mid Seral: Mid seral classes in ELT 60 contain too many acres in larger size classes 3 and 4 and not enough in size class 1. There is a need to decrease the amount of mid seral species in ELT 60. In areas appropriate for uneven-aged hardwood stands push them towards late seral. In areas appropriate for aspen push them towards aspen (HC MSA, p. 36; SS MSA, p. 59).

Late Seral: There are not enough late seral class acres in ELT 60. Existing areas should be focused on achieving size class 5 in the future (HC MSA, p. 36; SS MSA, p. 60).

ELT 70B

Aspen: The aspen seral class (including birch) in ELT 70B contains too many acres in size classes 4 and not enough acres in size classes 1, 2, or 3. There is a need to decrease the amount of aspen acres in size classes 4 and a need to increase the amount of aspen acres in size classes 1, 2, and 3 (HC MSA, p. 36-7; SS MSA, p. 60).

Mid Seral: The is a need to convert some mid seral classes to young aspen classes or late seral classes (HC MSA, p. 36-7; SS MSA, p. 60).

ELT 80B

Mid Seral: There is a need to increase the amount of acres in size class 1 (HC MSA, p. 37).

Need 2. Reduce the risks of potential wildfire by managing vegetation in areas of concern such as the Brevoort Lake Campground, underground pipelines, and a utility line (SS MSA, p. 38).

Need 3. Improve wildlife habitat conditions adjacent to or within managed stands by:

a. Retaining or regenerating hemlock and white pine in suitable ELTs (HC MSA, p. 42; SS MSA, p. 62).
b. Enhancing diversity of mast species (HC MSA, p. 42; SS MSA, p. 62).

Need 4. Improve stands to reduce the impacts from insects and diseases such as spruce budworm, jack pine budworm, beech bark disease (BBD), and emerald ash borer (EAB) (HC MSA, p. 23 and 49).

Need 5. Control the spread of Scotch pine, an invasive species, along the dune areas of US 2 (SS MSA, p. 67).

Need 6. Manage an efficient transportation system through construction, reconstruction, and decommissioning of roads, especially related to vegetation MAs.

Need 7. Provide fiber and timber products to the regional economy, as identified in the Forest Plan (pp. 3-5 and 3-31).

1.4 PROPOSED ACTION

In order to meet the purpose and need described in Section 1.3, the Deputy District Ranger of the St. Ignace and Sault Ste. Marie Ranger Districts proposes to undertake the following activities in the Shores project area of the HNF within the next 10 years (See Appendix G – Proposed Action Maps). A detailed description of the Proposed Action is in Chapter 2, Section 2.2.2 and Appendices B and C.

- Harvest approximately 1,577 acres using clearcut, shelterwood, partial removal, thinning, and selection harvest (Needs 1 through 4 and 7).
- Use site preparation for planting, seeding, and natural regeneration on approximately 1,537 acres by using mechanical methods and hand tools (Needs 1 through 4).
- Plant approximately 583 acres (Needs 1 through 4).
- Cut up to 2,000 scattered Scotch pine trees along US 2 (Need 5).

In addition, the following connected actions are proposed:

- Construct approximately 6.4 miles of permanent and 2 miles of temporary roads (Need 6).
- Decommission approximately 11 miles of road (Need 6).
- Construct 20 log landings (Need 6).

1.4.1 Modifications to the Proposed Action

Stands Proposed for Harvest – Dropped. After further field review, it was determined that two stands, Compartment (C) 129, Stand (S) 18 and C133, S9, were inaccessible due to the need to cross wetlands. These two stands total 48 acres. In addition, the temporary road proposed for new construction to access the stands (0.4 miles) was also dropped. These changes are incorporated into the Proposed Action in Chapter 2, Section 2.2.2.

Seasonal closure of snowmobile trail. A seasonal closure of the snowmobile trail between Forest Road (FR) 3387 and County Road (CR) 222 (Nunns Creek Road) has been added to the Proposed Action. This would be done by installation of gates. The gates would be closed from March 31 until December 1 annually, even after the proposed harvests under this proposal are completed. This would prevent ATV damage to the trail in wet areas.

1.5 DECISION FRAMEWORK

The Deputy District Ranger is the deciding official. Given the purpose and need, the deciding official reviews the Proposed Action and the other alternatives in order to make the following determinations:

- Is an environmental impact statement (EIS) needed? If an EIS is not needed, the responsible official will issue a decision notice and finding of no significant impact. The decision notice will describe the selected alternative and the rationale for that alternative.
- Should the Proposed Action, portions of the Proposed Action (modified), or the No Action Alternative be selected?
- Do the proposed activities respond to the issues, implement Forest Plan direction, and meet the purpose and need for the project?

- If the Proposed Action is selected, what, if any mitigation measure(s) or monitoring will be required?

1.6 PUBLIC INVOLVEMENT

The Shores project was first identified in the July 2009 Schedule of Proposed Actions (SOPA), and in each subsequent SOPA since then. In October 2009, the Eastside Administrative Unit Interdisciplinary Team (IDT) conducted public scoping to identify issues. On October 19, 2009 approximately 1,200 letters were mailed to adjacent landowners, and to individuals and organizations on the HNF mailing list that have expressed an interest in receiving information pertaining to this or similar projects. A notice appeared in the Sault Ste. Marie *The Evening News* newspaper on October 22, 2009 and a notice also appeared in the *St. Ignace News* on October 29, 2009. The scoping package was posted on the HNF website. Twenty three responses were received.

1.7 ISSUE IDENTIFICATION

Public comments were used to identify issues related to the proposed activies. The IDT separated the issues into two groups: relevant and non-relevant issues. Relevant issues were defined as those directly or indirectly caused by implementing the Proposed Action. Non-relevant issues, while still important, were identified as those: 1) outside the scope of the Proposed Action; 2) already decided by law, regulation, Forest Plan, or other higher-level decision; 3) not part of the decision to be made; or 4) not supported by scientific or factual evidence. A list of non-relevant issues and reasons regarding their categorization as non-relevant is in Appendix A – Response to Scoping Comments.

As for relevant issues, the IDT identified three topic areas with two issues. These include:

1.7.1 Access

1.7.1.1 Motorized Access

Closing roads would restrict motorized and non-motorized access to HNF for hunting, berry picking, and enjoyment by the elderly and people with disabilities. The effects analysis in Chapter 3 addresses this issue by using the measurement indicators described here:

Units of Measure

i) Road density (miles of road/square mile)
ii) Miles of roads by category:
    a) New construction proposed to remain open following use
    b) New construction proposed to be closed following use
iii) Is the road open or closed?
    a) Road I188C
    b) Road 3193
    c) Road 3105E

1.7.1.2 Non-Motorized Access

Units of Measure

i) Road miles proposed for decommissioning
ii) Method of closure for maintenance level (ML)1 (closed system) roads following harvest.
    a) Gates
    b) Earthen/slash
    c) Fence
    d) Transplanted clumps of woody vegetation

1.7.2 Visual Quality

Clearcutting and cutting Scotch pine would create a larger visual impact than the acres treated. The effects analysis in Chapter 3 addresses this issue by using the measurement indicator described here:

Units of Measure: Visual quality objectives (VQOS)

2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives considered for the Shores project. The HNF did not develop any additional alternatives based on public comments. The Proposed Action was modified to address resource concerns not generally known when the proposal was developed. The modifications are in Section 1.4.

2.1 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

One alternative was considered, but not fully developed.

2.1.1 Leaving Roads I188C, 3193, and 3105 Open

These roads are located near the Brevoort Lake Road (CR H57). Forest Roads I188C and 3105C intersect with Brevoort Lake Road and FR3193 intersects with US Highway 2 near the intersection with Brevoort Lake Road. These roads are proposed for decommissioning (FR I188C at the candidate Research Natural Area boundary) and were included in the public scoping proposal.

Public comments about keeping roads open in the area south of Brevoort Lake for berry picking, and road closures in general, were discussed in the comment analysis part of the project. Forest Roads I188C and 3193 cross into MA 8.1 – cRNA. It is determined leaving these roads open would not comply with the Forest Plan guideline for the MA which states, “Existing roads should be decommissioned and obliterated where not contributing to management objectives or where other feasible alternatives exist.” (FP p. 3-37) Leaving the roads open into the cRNA would not be in compliance with the Forest Plan.

Forest Road 3105C intersects with a natural gas pipeline right-of-way and the proposal to close this road is needed to prevent illegal ATV entry into the area from the Brevoort Lake Road.

For the reasons described above, this alternative was not considered for further analysis.

2.2 ALTERNATIVES CONSIDERED, INCLUDING THE PROPOSED ACTION

The alternatives are displayed in different ways to help aid in understanding the differences between them:

2.2.1 No Action

This alternative fulfills Council of Environmental Quality (CEQ) requirements for a no action alternative and serves as a baseline for comparison to the action alternatives. Under the No Action, the current Forest Plan would continue to guide management of the project area. Activities that would not require an analysis, such as dispersed recreation use, annual road maintenance, and snowmobile trail use and maintenance. Wildfire suppression would continue.

No vegetation management, wildlife and fisheries projects, transportation management, or recreation projects would be implemented to accomplish the purpose and need in Chapter 1.

This alternative proposes no new ground disturbing activities. This alternative does not preclude future NEPA decisions.

2.2.2 Proposed Action

The Proposed Action was developed to meet the purpose and need for action in Section 1.3 (see map in Appendix G). This section also presents a comparison of the proposed action and no action alternative to provide a clear basis for by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative and some of the information is based upon the environmental, social, and economic effects of implementing the action. More information on the specifics of the proposal is provided in appendices B, C and G.

The following table is a summary of the design criteria developed for the action alternatives. For a complete description, see Appendix B and C.

2.2.2.1 Vegetation treatments

To meet the purpose and need, the HNF proposes to clearcut approximately 847 acres, shelterwood cut with reserves approximately 463 acres, seed-tree cut with reserves approximately 28 acres, single-tree selection cut approximately 199 acres and commercially thin approximately 40 acres. Eradication of up to 2,000 Scotch pine trees would be done by a hand-cut and leave procedure (Table 2-1).

Twenty permanent and temporary landings would be constructed. In association with this vegetation management, the HNF proposes to complete site preparation for natural regeneration on approximately 775 acres, mechanical site preparation for natural regeneration on approximately 179 acres, and mechanical site preparation for planting and plant on 583 acres.

The following vegetation treatments, along with the associated roadwork to access harvest units, are proposed to meet the needs described in Section 1.3.

This alternative would provide a mixture of wildlife habitat ranging from areas of younger forest and temporary openings to older forests.

To meet the purpose and need, the IDT reviewed information on current stand conditions. For example, whether or not individual stands would be able to support some type of timber harvest activity. This data was modeled with the best-available geographic information system information. The following actions were identified.

- Clearcutting treatments would be designed to harvest mature and over-mature stands to regenerate young stands.
- Shelterwood, seed tree, and overstory removal treatments would be designed to harvest mature and over-mature stands to regenerate young stands while retaining some trees to begin moving the stands toward mid and late seral classes.
- Single-tree selection harvests in northern hardwoods would change the stand structure by creating canopy gaps to generate small patches of young, healthy trees; removing other trees to increase growth rates and concentrate growth on high quality trees; and creating a multiple-aged stand condition.

- Commercial thinnings would be primarily in red pine plantations, mixed aspen, and even-aged northern hardwood stands to remove some trees to increase growth rates and concentrate growth on remaining trees, to maintain and increase size class, and to move aspen to mid and late seral classes.
- Manual site preparation for natural regeneration would be performed in canopy gaps and some of the regeneration treatments to cut or remove unmerchantable stems (one to four inches in diameter) to allow for the natural establishment of healthy, vigorous young trees. Also, areas may be hand scalped if natural regeneration fails, and planting is needed.
- Mechanical site preparation would involve the use of a skidder or dozer to expose bare mineral soil and remove competing vegetation in order to create conditions favorable for the regeneration of paper birch in seed tree regeneration cuts and hemlock in upland and lowland hardwood selection cuts and thinning.
- Eradication of Scotch pine would be done with either chainsaws or hand saws and left on site. Treatments would be repeated if the trees resprout.

Table 2- 1. Proposed Vegetation Management Actions

Activity	Proposed Action (approximate acres)
Clearcut and regenerate (while reserving some trees)	847 acres
Two-aged shelterwood establishment and removal cut	463 acres
Seed tree removal cut	28 acres
Commercial thin	40 acres
Single-tree selection cut	199 acres
Scotch pine removal (non-native species treatment)	<2,000 trees
Mechanical site preparation for natural regeneration	179 acres
Manual site preparation for natural regeneration	775 acres
Mechanical site preparation for planting	583 acres
Planting	583 acres

2.2.2.2 Design Criteria Developed for the Proposed Action.

In order to reduce or avoid impacts to some of the resources within the proposed activity areas, the following design criteria would apply to all applicable areas:

- Implement current HNF Management Recommendations for Addressing Beech Bark Disease (Perkins 10/17/06), when and if necessary.
- Management practices to increase tree species diversity and decrease the ash and beech component would be implemented. This would be done if either or both species combined exceed 10-25 percent of the basal area (BA) within the stand, but would also depend on the tree size and within-stand distribution. Harvesting should also reduce, but not necessarily eliminate the amount of ash. Where canopy gaps are planned as part of harvest, canopy gaps would be located where there are concentrated pockets of ash trees, if possible.

- In stands to be commercially thinned or selectively harvested, most trees adjacent to permanent roads would be retained unless they need to be cut for road construction, maintenance, or safety standards. Most trees along access roads to these types of harvest units would also be retained where access roads are outside of the cutting units. This is to maintain shade over the road to reduce the establishment of non-native invasive plants.
- Implement current goshawk and red-shouldered hawk conservation measures (Piehler 2006) and bald eagle management guidelines (USDI 2007) when and if necessary.
- In accordance with the Forest Plan goals for heritage resources (pp. 2-7 and 2-8), all heritage sites located within the Shores project area that have been determined eligible to the National Register of Historic Places (NRHP), or whose NRHP status remains unevaluated, would be avoided and protected through the establishment of protection zones within which no earth disturbing activities would be permitted.
- Protect caves and sinkholes by establishing a reserve area 200 feet from the edge of the feature in all directions. No roadwork, logging activities, or other earth disturbance would take place within the established reserve area. Reserve areas would be established prior to implementation of project activities with the assistance of the district hydrologist, geologist, or botanist. Caves and sinkholes are defined as follows.

  Cave – Any naturally occurring void, cavity, recess, or system of interconnected passages beneath the surface of the earth or within a cliff or ledge and which is large enough to permit a person to enter, whether the entrance is excavated or naturally formed. (FCRPA 1988; FSM 2880.05)

  Sinkhole/Sink – Depressions in the surface of a karst area created when limestone or other soluble rock is partially dissolved by groundwater. Sinkholes are often bowl-shaped and can be a few to hundreds of feet in diameter and more than 100 feet deep. Drainage into a sinkhole flows directly into the subsurface, typically an underground stream.
- To protect potential occurrences of threatened, endangered, and sensitive (TES) plants, boulders occurring naturally in forested habitats of the project area would not be moved for road maintenance, decommissioning, or for placement in road closures without the approval of the district botanist. Large, mossy boulders would be avoided if possible during road construction.
- To protect regional forester sensitive species (RFSS) ferns that are known to occur in the project area, a reserve area that is a 200-foot radius from the outside edge of the population would be established. If the stand is proposed for even-aged regeneration cuts, the reserve area would be increased to 400 feet. No roadwork, logging activities, or other earth disturbance would take place within the established reserve area. Reserve areas would be established prior to implementation of project activities with the assistance of the district botanist. Fern species include:

Walking fern	*Asplenium rhizophyllum*
Green spleenwort	*Asplenium trichomanes-ramosum*
Slender cliff brake fern	*Cryptogramma stelleri*
Male fern	*Dryopteris filix-mas*

- Winter logging operations would be required in the following stands to protect known RFSS northern wild comfrey (*Cynoglossum virginianum* var. *boreale*) populations: Compartment 94 S54, C94 S52, C126 S7, C126 S8, C128 S26, C130 S18, C130 S22, C130 S26, and C130 S27.
- New TES species locations that may be found during project implementation would be protected using appropriate reserve areas. Protection measures for TES plants would be reviewed on a case-by-case basis (2008 Draft RFSS Plant Protection Measures. Piehler, Huebner, LeBlanc 12/12/2008 –cited as Huebner 2008a).
- Winter logging operations would be required in C133 S1 to protect historic occurrences of calypso orchid (*Calypso bulbosa*) and its habitat. Also, the edge of the cedar swamp on the west side and wetland on the north boundary of this stand would be buffered by 200 feet. No roadwork, logging activities, or other earth disturbance would take place within the established buffer. Buffers would be established prior to implementation of project activities with the assistance of the district botanist or hydrologist.
- To protect wetlands found in the wooded dune and swale native plant community, winter logging operations would be required in the following stands: C166 S23, C186 S17, and C186 S19. These stands are in addition to those identified for winter logging under soils requirements.
- Equipment operation (except in emergency operations) would only occur when soils are capable of supporting equipment without incurring detrimental compaction, puddling, or rutting.
- Scotch pine treatments in the dunes area along US 2 would conform to the conservation strategy of the piping plover in terms of any seasonal or distance restrictions, as well as the best available science for any RFSS species within the proposed treatment areas. (UDSI 2003)
- Individual Pitcher's thistle plants would be marked appropriately on the ground during Scotch pine treatments along the US 2 dunes to avoid trampling, uprooting, or covering individual plants. If they are not marked, then qualified botany personnel must be present during treatments to assist in avoiding the plants. Treatments would be designed to limit soil disturbance as much as possible.

North Country Trail (NCT)

- Post safety signs identifying harvest activity in stands the NCT passes through.
- The NCT would be clearly marked by the standard trail markings before sale area preparation begins to adequately protect the trail tread during harvest activities, and can be relocated after harvest activities.
- If logging equipment must cross the NCT, those crossings would be minimized and designated by the timber sale administrator. Crossings would be rehabilitated after harvest.
- No log decking would occur along the NCT unless the trail is also a system road.
- Timber marking prescriptions along the NCT would retain a slightly higher stocking level for 30 feet on either side to discourage the establishment of brush along the trail, as brush increases maintenance and may introduce non-native invasive plants.
- For those roads being decommissioned that cross the NCT, the tread of the NCT would remain intact.

Snowmobile Trail

- Where winter access to a timber sale is along the snowmobile trail, the trail would not be used as a landing or skid trail. Where the road is too narrow for dual use (snowmobile trail and winter hauling), the snowmobile trail will be temporarily relocated for the duration of the sale to avoid having snowmobiles and commercial logging trucks sharing the plowed, snowy road surface.
- Where winter timber hauling requires the use of the snowmobile trail, reduce conflict between logging trucks and snowmobilers by plowing a separate haul lane.
- Timber sale contracts would require loggers using the snowmobile trail during the winter to place warning signs as defined in the traffic control plan (i.e. "Plowed Road Ahead" and "Logging Ahead") to alert snowmobilers to the presence of these activities. Operators are also required to slope snowbanks, where a designated snowmobile trail crosses a plowed road, to allow snowmobilers safe access to the plowed portion of the road. The sale administrator would remind loggers of snowmobile presence and the need for safe speeds and extra awareness on roads.

Campgrounds

- Harvest activities would not occur in stands adjacent to Brevoort Lake Campground between May 15 and September 30, which is when the highest recreation visitation occurs, to reduce the number of visitors impacted by the harvest activities.
- Educational signs would be posted in Brevoort Lake Campground post-harvest so campground visitors can learn about the harvest activities.

2.2.2.3 Transportation System

- Approximately 11 miles of roads would be decommissioned. This is primarily an administrative action that would update information in the transportation system database. Roads that are in the GIS database are either not actually on the ground or have been out of use long enough that they are no longer driveable and are not planned to be used again in the forseeable future.
- Approximately 6.3 miles of new road would be constructed to accomplish the proposed vegetation actions. Some of these are new roads and others are existing road that are not presently listed in the database. All new roads would be kept in the road system, but closed following use.
- Approximately 2 miles of temporary roads would be constructed in order to accomplish the proposed vegetation actions. These roads would be obliterated following use.
- Twenty log landings would be constructed to remove timber from harvest areas. These would be loading areas up to 300 feet in length located at the edge of system roads. Following use, the landings would be revegetated but due to potential disturbance and compaction, these generally would not produce timber at the level of adjacent lands.
- Gates would be installed at the east and west sections of the snowmobile trail east of Nunns Creek Road to the trailhead on FR3387. The gates would be closed from March 31 until December 1 annually to protect the trail from ATV impacts.

Table 2- 2. Proposed Transportation Management Actions

Activity	Proposed Action Approximate Length
Decommission	11 miles
New system road construction	6.3 miles
Temporary road construction	2 miles
Construct logging landing (≤ 300 feet long) (Shown as "Back Ins (log landings)" on maps)	20 landings
Gate installation for summer closure of snowmobile trail	3.4 miles

2.3 COMPARISON OF ALTERNATIVES

Tables 2-1 through 2-5 provide a summary of activities by alternative.

Table 2- 3. Proposed Vegetation comparison to No Action

Activity	Proposed Action (approximate acres)	No Action
Clearcut and regenerate (while reserving some trees)	830 acres	0
Two-aged shelterwood establishment and removal cut	428 acres	0
Seed tree removal cut	26 acres	0
Commercial thin	64 acres	0
Single-tree selection cut	174 acres	0
Scotch pine removal (non-native species treatment)	<2,000 trees	0
Mechanical site preparation for natural regeneration	162 acres	0
Manual site preparation for natural regeneration	738 acres	0
Mechanical site preparation for planting	558 acres	0
Planting	558 acres	0

Table 2- 4. Proposed Transportation Management comparison to No Action

Activity	Proposed Action Approximate Length	No Action
Decommission	11 miles	0
New system road construction	6.3 miles	0
Temporary road construction	2 miles	0
Construct logging landing (≤ 300 feet long) (Shown as "Back Ins (log landings)" on maps)	20 landings	0
Gate installation for summer closure of snowmobile trail	3.4 miles	0

Table 2- 5. Comparison of Alternatives by Unit of Measure

Issue *	Indicator	Proposed Action	No Action
Motorized Access #1(i)	Road Density measured by miles of road per Square mile of land area within the project area. a) MA 6.4 b) MA 8.1	2.4 1.0	2.3 1.0
Motorized Access #1(ii)	Approximate change in miles of roads by category: a) New construction proposed open following use. b) New roads proposed closed following use.	0 6.3	0 0
Motorized Access #1(iii)	Road closing of three specific roads: Units of measure, whether individual road is opened or closed (open/closed): 1) Road I188C 2) Road 3193 3) Road 3105E	Closed Closed Closed	Open Open Open
Non-Motoized Access #2	i) Road miles proposed for decommissioning ii) A) MA 6.2 iii) B) MA 8.1 iv) Method of decommissioning for ML1 (closed system) roads (by technique). a) Gates b) Earthen/slash c) Re-ditch Driveway	10.96 10.83 0.13 3 7 10	0 0 0 0 0 0
Visual Quality #3	Meeting the VQOs.	Meets the VQO	Meets the VQO

* See section 1.7 for explanation of issues

3. ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

Chapter 3 discloses the direct, indirect, and cumulative environmental effects to the physical, biological, social, and economic resources from the Proposed Action and No Action alternatives described in Chapter 2. Each resource section contains a description of the affected environment (i.e. existing condition) for that resource and then discloses the environmental effects for both the No Action and the Proposed Action.

3.2 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

The Council on Environmental Quality has defined cumulative impact as "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions" (40 CFR 1508.7). In determining cumulative effects, the following list of past, present, and future actions were added to the direct and indirect effects of the Proposed Action and alternatives.

Table 3- 1. Past, Present, and reasonably Foreseeable Actions Contributing to Cumulative Effects*

Project	Road Const.	Road Oblit	Timber Harvest Acreage	Other Resource Activities	Timeframe
IW Project EIS	4.3 mi.	17.0 mi.	JP cc 233 ac; salvage 1,516 ac; removal 6 ac; Aspen CC49 ac; salvage 65 ac; removal 104 ac; BF/aspen/PB CC 139 ac; removal 16 ac; NH/PB CC 13 ac; removal 25 ac; improvement 55 ac; thin 37 ac; BS CC 52 ac; Cedar removal 34 ac.	Wildlife management, fisheries management	Record of Decision (ROD) signed 7/03 Being implemented
Construction of Spawning Gravel Habitat Lumpson Creek, Bear Creek, and Pine River Seep	None	None	None	Create 6 spawning riffles in Lumpson Creek, 5 spawning riffles in Bear Creek and 100 linear ft. of spawning habitat in pine river Seep	DM signed 9/94 Implemented
US 2 Dune Maintenance and Management Project EA	None	None		Excavate a V-bottom ditch, plant native dune grass, erect sand fence along US-2 (from 1 mi. east of CR 526, and southeasterly approx. 5 miles to Point aux Chenes)	DN signed 11/07 Implemented
Limited Timber Harvest Near Brevoort Lake	None	None	Hardwoods selection 59 ac.		DM signed 10/06 Being implemented
St. Ignace Gravel Pits EA	None	None	None	Expand Taylor Creek Gravel Pit and the Bissel Road Sand Pit, & develop the Barrett Road Gravel Pit and the Akrigg West Pit	DN signed 10/06 Being implemented
Edison Opening Maintenance Project	None	None	None	Maintain 20 ac. of 3 existing wildlife openings	DM signed 9/04 Implemented
Burma Grade Hazardous Fuels Reduction Project	None	None		Reduce hazardous fuels on 230 ac. of non-forested openings. A tractor with brushhog will remove natural ground fuels and ladder fuels and bring stands back to an opening status. Deciduous shrub species i.e. pin cherry, sand cherry, etc. will be left for wildlife habitat.	DM signed 6/04 Being Implemented
Cloverland Electric East Lake Distribution Line	None	None	None	1.4 miles of new line overhead/underground	DM signed 10/03 Implemented
Relocation of the Red Creek Snowmobile Trail EA	None	None	None	Relocate approx. 3 mi. of snowmobile trail, construct trail bridge across I-75, & 1.7 mi. of old rd. designated mountain bike trail.	DN signed 8/03 Implemented
US Highway 2 Dune Stabilization	None	None	None	Intermittent snow fence along 5,000 ft. of beach, plant native beach grass.	DM signed 9/01 Implemented

Project	Road Const.	Road Oblit	Timber Harvest Acreage	Other Resource Activities	Timeframe
Great Lakes Gas Transmission Limited Partnership Sault Looping Project EA	None		None	SUP for 11.3 mi. of pipeline loop on HNF.	DN signed 4/00 Implemented
Lamprey Weir Site Rehabilitation	None	200 ft.	None	Remove weir. Remove road, parking lot, abutments, railroad ties, junction boxes, fences, posts, and logs from site. Retain or place rock rip rap along approx. 160 ft. of stream banks to stabilize them. Recontour the stream banks above the rip rap. Stabilize and revegetate disturbed areas.	DM signed 5/00 Implemented
Foley Creek to Horseshoe Bay Hiking Trail	None	None	None	Replace 600-700 ft. of trail surface with wood chips/puncheon	DM signed 7/98 Implemented
Carp National Wild and Scenic River EA	None	None	None	A Plan in place with standards and guides to protect/manage the W & S river.	DN signed 2/98 Implemented
North Country National Scenic Hiking Trail, (Lakeshore Boardwalk Little Bear Creek Low Water Crossing), Brevoort River Bridge	None	None	None	Lake Superior shore: Construct approx. 250 ft. of boardwalk. Little Bear Creek Crossing: Remove culvert and road fill from creek crossing and replace with a low water crossing. Brevoort River Bridge: repair current bridge by re-jetting the pilings.	DM signed 7/97 Implemented
Horseshoe Bay Research Natural Area EA	None	None	None	Establish cRNA as a RNA.	DN signed 1/97 Implemented
St. Ignace Administrative Site EA	None		None	Construct a new District office on NF system land.	DN signed 8/96 Implemented
Sugarbush/Popular/Bissel Creek Timber Sales EA	None	None	NH thin 139 ac; Aspen removal 42 ac; Patch CC 23 ac; RP thin 70 ac.		DN signed 5/96 Implemented
Kenneth/Hazelkill Timber Sales EA	None	None	Aspen/PB/BF removal 390 ac; Improvement 78 ac;		DN signed 2/96 Implemented
South Burma Timber Sale	¼ mi.	None	Thin 86 acres of immature planted red pine.		DM signed 9/95 Implemented
Circle Pond timber Sale			Thin 44 acres of red pine		DM signed 9/95 Implemented
Whatta Pine timber Sale	None	None	Thin 70 ac. of red pine		DM signed 9/95 Implemented
27 Mile Timber Sale	None	None	Thin 70 acres of immature planted red pine.		DM signed 9/95 Implemented

Project	Road Const.	Road Oblit	Timber Harvest Acreage	Other Resource Activities	Timeframe
Christensen SUP EA	None	None	None	Approx 0.75 mi. of existing road to use for access of private inholding.	DN signed 7/95 Implemented
Tyner Private Road Easement	1,320 ft.	None	None	Access across National Forest land to private inholding is 1,320 ft. long	DM signed 6/95 Implemented
Akrigg Area Timber Sale EA	None	None	CC 66 ac; Aspen/BF removal 93 ac; Aspen removal 150 ac; Aspen/BF/PB removal 200 ac; Selection 52 ac.		DN signed 5/95 Implemented
Sinkhole Timber Sale EA	0.5 mi of winter road and 0.9 mi. of temp road		Overstory removal cut of aspen, balsam fir, balsam poplar, paper birch from 104 acres. Underplant 32 ac. with white pine and hemlock. A selection cut on 41 ac. of northern hardwoods.		DN signed 3/95 Implemented
Crooked Creek Culvert Replacement	None	None	None	Replace existing culvert	DM signed 10/94 Implemented
Worth/Schaffer Road Timber Sale EA					DN signed 8/94 Implemented
Lamprey Management in Carp River SUP US Fish & Wildlife Service	200 ft.	None	None	Install weir in Carp River to capture male lamprey.	DM signed 7/94 Implemented
Martineau Creek Timber Sale EA	0.8 mi.	None	Clearcut 312 ac.	Establishment of snowmobile trail	DN signed 5/94 Implemented
McCloud Creek Snowmobile Bridge Replacement	None	None	None	MDNR & snowmobile club build a new snowmobile bridge across McCloud Creek to mitigate bank degradation.	DM signed 9/06 Implemented
Eastside Permanent Openings	None	None	None	Approximately 5,900 acres of existing permanent openings will be maintained by prescribed fire, mechanical opening maintenance, hand tools; and site prep and planting of native grasses and forbs. These activities These openings provide wildlife habitat and fuel breaks.	DM signed 6/08 Being Implemented

Project	Road Const.	Road Oblit	Timber Harvest Acreage	Other Resource Activities	Timeframe
Sprinkler Project EA	3.0 mi.	25.0 mi.	Aspen salvage CC 1,066 ac; Aspen salvage shelterwood 1,161 ac; BF/aspen/PB salvage CC 1,156 ac; Cedar/aspen/PB salvage 512 ac; PB salvage 149 ac; PB CC 76 ac; BS shelterwood 59 ac; JP CC 22 ac; WS thin 27 ac; WP/hemlock thin 30 ac; WP thin 4 ac; NH thin 285 ac; NH selection 182 ac; Lowland hardwood shelterwood 122 ac; Salvage CC 45ac; Salvage shelterwood 15 ac.	Wildlife activities, fish activities	DN signed 6/07 Being Implemented
Pine River System Spawning Habitat Maintenance	None	None	None	Install 40 – 80 cubic yds. of gravel & cobblestone at each of 4 treatment sites and redistribute remaining rock to provide substrate, water depths, and current velocities conducive to successful spawning by steelhead and salmon.	DM signed 6/07 Implemented
East Red Pine 2 EA	2.0 mi.	5.0 mi.	Thin 4,594 ac. of red pine.	Maintain wildlife openings.	DN signed 1/05 Being implemented
SBC Underground Fiber Optic Cable	None	None	None	Authorize SBC to bury a fiber optic cable on approx. 17 ½ miles of National Forest system lands with a crawler tractor/plow to trench, lay & bury cable at a depth of 30 in. and project limited to summer/fall.	DM signed 9/04 Implemented
Rudyard Project EA	5.5 mi.		Aspen/BF Salvage 2,652 ac; Aspen/PB/RM/BF CC 101 ac;	Wildlife/Fish/Recreation management	DN signed 1/02 Being implemented
5 Year Red Pine Thinning EA	2.2 mi.	None	RP thin 1,864 ac.	Fisheries projects	DN signed 6/00 Being implemented
Sand Clay Project EA	15 mi.	10 mi.	CC 609 ac; CC (w/reserve some trees); shelterwood 569 ac; Overstory removal (79 ac; Partial removal 612 ac; Selection harvest 280 ac; Thin 892 ac; Intermediate harvest WS 64 ac.	Construct non-motorized recreation trail; fisheries projects	DN signed 7/08

Project	Road Const.	Road Oblit	Timber Harvest Acreage	Other Resource Activities	Timeframe
Hiawatha National Forest Forest-wide Non-native Invasive Plant EA				A forest-wide strategic NNIP management program using a combination of control methods on roughly 130 known sites and at any new sites found through monitoring within HNF boundaries.	DN signed 6/07
Silver Creek Fish Habitat Project CE	None	None		Install 18 wood structures along 1,000 ft. of Silver Creek. Each structure would be 3-5 logs with root wads.	DM signed 06/07
Silver Creek NCT, Trail and Bridge Reconstruction CE	None	None		On NCT north of FR3740 replace board walk and bridge with pressure treated lumber. Establish a small parking area near north end of the sand pit.	DM signed 07/07
Boedne Bay Hazardous Fuels Reduction Project CE	None	None	Use mechanical & prescribed fire to reduce hazardous fuels on 25 acres around Boedne Bay Education Camp. Remove live jack pine and dead & down snags of jack pine & red pine.		DM signed 01/07
Brevoort Lake Log Cribs CE	None	None		Install 150 log cribs (8 ft. x 8 ft. x 5 ft) in Brevoort Lake to improve fish habitat.	DM signed 02/06
Walker Access Road CE				Access to private land at the end of the North Service Road across National Forest land for ½ mi.	DM signed 09/04
Cloverland Underground Electric Powerline CE				Bury 2 ½ mi. (7 ½ ac.) of National Forest land within powerline ROW that parallels CR H-57 (T41N, R5W, Sec. 11)	DM signed 07/04
Brevoort Lake Log Cribs CE				Install 40 cribs (8 ft. x 8 ft. x 5 ft) in Brevoort Lake to improve fish habitat.	DM signed 01/03
Brevoort Lake Reef Modification CE				Modify existing rock reef off Black Point to provide more rock habitat for fish and other aquatic life.	DM signed 10/01
Nunn's Creek Snowmobile Bridge CE					DM signed 08/99
Boedne Bay Dock Replacement CE					DM signed 07/99
Stream Sediment Basin Maintenance CE					DM signed 03/99
Riparian and Peck & Rye Area Planting CE	None	None		Planting of long-lived conifers in areas on Brevoort River and headwaters of N. Pine River	DM signed 05/10

Project	Road Const.	Road Oblit	Timber Harvest Acreage	Other Resource Activities	Timeframe
East AOP CE	None	None		Replace 17 culverts throughout the Eastside of the HNF	DM signed 03/10
Niagara EIS	10 mi. 2 mi add to system	18 mi. decom. 2 mi. close	CC and CC – salvage 605 ac.; shelter-wood w/reserves 650 ac.; Seedtree cut w/reserves 62 ac.; Overstory removal w/reserves 219 ac.; Single-tree selection (full karst protection) 1,621 ac.; Single-tree selection cut (reduced karst protection – high shade retention) 1,790 ac.; Single-tree selection cut (Reduced Karst Protection (normal shade retention) 743 ac.; Com. Thin (Full karst protection) 23 ac.; Com thin (reduced karst protection – high shade retention) 73 ac.; Com. Thin (reduced karst protection – normal shade retention) 782 ac.;		ROD signed 12/09
Peninsula Fiber Network – Fiber Optic Cable Installation CE				Install cable parallel to H-63 from St. Ignace to Chippewa County line.	DM signed 08/10
Sand Dunes Ski Trail BBD Salvage Timber Harvest CE				Salvage timber harvest to remove hazardous trees along the ski trail infested with BBD	DM signed 09/10
Great Lakes Gas Transmission SUP Reissuance				Renewal of existing SUP of pipeline	DM signed 09/10
Current Proposed Projects being Analyzed					
ATC 6904/6905 Powerline Rebuild EA (Line from St. Ignace to south of Rudyard)				Activities would be to rebuild the transmission line to support existing and anticipated future power requirements for the Eastern Upper Peninsula and to operate and maintain the line in a manner consistent with present Forest Plan direction. The anticipated time frame for construction would be 12-15 months beginning in the fall of 2012. In order to upgrade the line, ATC would construct a new line offset generally about 30 feet west of the existing line, except in areas of sensitive habitat where the routing would be located east of the existing line.	Analysis in process

Project	Road Const.	Road Oblit	Timber Harvest Acreage	Other Resource Activities	Timeframe
East Unit Spawning Habitat CE				Install spawning habitat in Bear Creek, biscuit Creek, and Creek Number Nine.	Analysis in process

*This table is a summary of these projects; for more information see the actual decisions.

3.3 AIR QUALITY

3.3.1 Introduction

The effects to this resource have already been disclosed in the FP FEIS (pp. 80-81).

Air quality monitoring is coordinated and results disseminated by the Michigan Department of Environmental Quality (MDEQ). Monitoring stations are located in Seney National Wildlife Refuge, Sault Ste. Marie, and Gladstone, Michigan.

3.3.2 Analysis Methods

The analysis of the project area's air quality will be based on the MDEQ's annual air quality report for the State of Michigan and the current Michigan Smoke Management Plan developed by the Michigan DNR in accordance with Clean Air Act regulations (MDEQ 2006).

3.3.3 Analysis Area

The geographic boundary for this effects analysis is the Eastern Upper Peninsula (UP) of Michigan as that is the reporting unit used by the MDEQ.

The wilderness area within Seney National Wildlife Refuge is the nearest Class I attainment area and is located approximately 50 miles west of the project area. The prevailing winds are from the west. To monitor Class I Attainment Standards, the Midwest Regional Planning Organization assisted by the Air Quality Division of MDEQ has established a visibility quality monitoring site at the Seney National Wildlife Refuge for continuous monitoring for ozone, fine particulates, and meteorological measurements. This site, along with others in the Midwest, can be accessed via the Internet at http://www.michigan.gov/deq/0,1607,7-135-3310---,00.html (MDEQ 2006).

The analysis area is more precisely defined as anything that could affect the Class I area at Seney.

3.3.4 Affected Environment

Geographic regions of the country are given air quality classifications that designate the level of protection areas receive. The classification denotes the level of air quality deterioration that would be regarded as significant and consequently, not allowed. Class I allows the least deterioration. Class II is much less restrictive than Class I and Class III is the least restrictive (Sams 2002).

The HNF (including the Shores project area) is considered by the State of Michigan to be a Class II attainment area under the Clean Air Act (PL 88206) as amended (Forest Plan 2006).

According to the State of Michigan, all areas of the UP are currently in compliance with the criteria pollutant health standards (MDEQ 2006).

The project area is currently subject to air pollutants from mobile sources such as vehicles, equipment, snowmobiles, and chainsaws. Due to dissipation by wind, pollutants from these sources do not attain high enough concentrations to warrant measurement or to result in degradation to sensitive resources. Wildland fires occur in the area, but are usually contained when they are only a few acres in size. Historical wildfires would range in size from less than an acre to several thousand acres (Cleland, 2004). Wildfires occur throughout the spring, summer, and fall. Spring typically has the highest fire danger. In the spring, summer, and fall, private landowners occasionally burn brush piles.

3.3.5 Proposed Action

3.3.5.1 Direct and Indirect Effects

Prescribed burning may be used in the project area to achieve desired site conditions for reforestation or wildlife habitat.

All management ignitions/prescribed burns require thorough planning before implementing the action. Part of the planning process for these burns is a smoke management plan. The actual conditions (weather, moisture, personnel, equipment) must be within ranges described in the burn plan before a management ignition is implemented. Smoke from a prescribed burn is termed a short-term effect (MDNR 2007) and would be specifically addressed with mitigation measures in the burn plan developed for the individual site and associated smoke sensitive areas.

The major pollutants from wildland burning are particulate, carbon monoxide, and volatile organics. Nitrogen oxides are emitted at rates from 1 to 4 g/kg burned, depending on combustion temperatures. Emissions of sulfur oxides are negligible (EPA 1995). Prescribed fire could have a temporary effect on air quality, as particulates are released by burning. This smoky condition could last 1 to 2 days depending on weather conditions, fuel loading and fuel moisture.

There would be effects to air quality from the harvest activities and log hauling which would produce emissions of hydrocarbon, carbon monoxide, nitrogen oxides, sulfur oxides, and particulate matter. However, it is expected that these emissions would not be in high enough concentrations to measure.

3.3.5.2 Cumulative Effects

Given the distance and prevailing winds, it is unlikely that timber harvesting activities would affect the Class I attainment area of the wilderness area at the Seney National Wildlife Refuge; therefore, there would be no cumulative effects to air quality by these proposed activities.

3.3.6 No Action

3.3.6.1 Direct/Indirect Effects

Under the No Action, there would be no new activities, so there would be no direct or indirect effects to air quality.

3.3.6.2 Cumulative Effects

As there are no direct or indirect effects, there would be no cumulative effects.

3.4 FIRE ECOLOGY AND FUELS

3.4.1 Introduction

Fire is a natural component of the 10/20 ELT (xeric ecosystems composed primarily of jack pine and red pine). Historically, very large acreages burned during fire events. Pre-settlement vegetation maps indicate that 100 to well over 1,000 acres were not uncommon (Cleland 2004).

The natural process within jack pine ecosystems is for wildfire to burn it and create a new stand of young jack pine. Estimates of fire return intervals in jack pine forests are usually less than 50 years. Jack pine forests that burn more frequently than every 5 to 10 years become Pine Barrens (Snyder 1993). In part, timber management has replaced this natural fire regime by reducing fuel loads and the potential for large wildfires.

One of the objectives of fire management is to reduce the amount of fuel available so that if a fire does occur it will burn with less intensity as compared to doing nothing. Strategic placement of fuel breaks around and near settlements and other developments can reduce the risk of wildfire to people and investments (Scott 2003).

Identified needs from Chapter 1 that relate to fire ecology, Fire Regime Condition Class, and fuels are as follows: Needs 1, 4, and 5 contribute to change the current Fire Regime Condition Class. Need 2 addresses wildland fire risk of a fire dependent ecosystem and the safety of people using facilities in the area.

3.4.2 Analysis Method

The Fire Regime Condition Class (FRCC), which is a classification system of the amount of departure from the Historical Range of Variability or reference condition, will be used to analyze the effect of alternatives on general forest conditions (Hann, 2001). The Forest Plan used FRCC to analyze long-term changes to the forest overall condition (USDA, 2005). By applying this tool to the Shores project area, a determination can be made about how the alternatives change the current condition compared to the reference condition. Achieving the desired condition of the forest described by the Forest Plan will not return the forest to the reference condition, although many similarities exist between the desired condition and reference condition. Fire dependent ecosystems (Need 2) and their associated risks to human health and safety will be analyzed using FRCC and expected changes to potential fire behavior related to the alternatives.

Section 3.6 (Vegetation) analyzes the relationship of proposed treatments to the Forest Plan desired condition. That analysis documents changes to size classes and seral conditions on a forest-wide basis and documents only minor changes to overall forest composition. Therefore, FRCC analysis will examine the local effects of alternative treatments on individual stand health, species composition, age class diversity, and non-native species. Vegetation is part of the FRCC system and is included along with fire to determine condition class (Hann, 2001)

3.4.3 Analysis Areas

Of primary concern to fire ecology and fuels are the fire dependent ecosystems contained in ELT 10/20 in the Shores area. The majority of the fire ecology and fuels analysis will be focused in this area. In jack pine, fuel reduction treatments (best described in this project as clearcuts and shelterwoods – for example; J4 to J1; J4 to L1; J4 to M2) are effective in reducing potential fire behavior for approximately 15 years (Scott, 2003).

The spatial boundary for direct, indirect, and cumulative effects for fire ecology and fuels is the ELT 10/20 boundary within and adjacent to the project area. This boundary is chosen because non 10/20 ELTs surrounding these areas are of lower frequency fire regimes and, in effect, act as a fire break between ELT 10/20 areas outside of this boundary. (FP FEIS, App. H) Thus, the effects analysis areas fire ecology characteristics are not directly influenced or dependent on surrounding fire regimes.

The temporal boundary for direct, indirect, and cumulative effects will be 15 years, because this is the time span proposed treatments would have the greatest change to expected fire behavior.

FRCC will be the tool to indicate changed conditions in fuels and expected fire behavior.

3.4.4 Affected Environment

From 1982 through 2009, 39 wildfires have occurred in the Shores project area for a total of 135 acres. The average size was 3.5 acres and the average acres burned per year was 4.8 acres (Hiawatha Fire History, 2009). Of these, 15 ignitions (102.3 acres) were associated with smelt dipping activities in April (13 fires at the mouth of the Carp River, 2 at Nunn's Creek), 7 were caused by lightning, and the remaining by other human actions. The largest lightning-caused fire was 4 acres. The total area burned by lightning fires during this period was 7.5 acres. The largest fire in the area was 40 acres (Carp River area). Fire suppression resources were successful in keeping 28 of these fires to 1 acre or less in size (Hiawatha Fire History, 2009).

The west end of the Shores project area, in the vicinity of Brevoort Lake, is largely jack pine forest. Historically, this area was a mix of red, jack, and white pine along with some hemlock (GAO survey notes). Fire is an integral component of these forest types. Management actions can reduce potential fire behavior and frequency (Snyder, 1993). Thus, it is not a question of whether these areas will burn, but when will it happen.

Private properties, many with residential structures, are located throughout the project area along with developed and dispersed Forest Service recreation sites. The fuels of concern in the western part of the project area are the overmature jack pine.

Aspen, balsam fir, and black spruce are also disturbance-related species and are the fuels of concern in the eastern portion of the project area. Fire, along with wind, insects and ice are the disturbance factors. These species in the Shores area are generally associated with wetter sites than the jack pine. These site conditions reduce the frequency of fires, but during drought conditions they can burn with high enough intensity to regenerate the area. Fire return intervals in these wet sites have been determined to be about 170 years (Cleland 2004).

Adequate transportation to access the area for fire suppression needs is currently present.

3.4.5 Proposed Action

The following table compares proposed activities by alternative and the expected change to FRCC. All areas with activities proposed are currently classed as FRCC 2, except for the Scotch pine area along US 2. Since Scotch pine is a non-native species, its presence is a high departure from reference - FRCC 3. The aspen and jack pine are FRCC 2, because the number of acres by age class is a moderate departure from reference condition. Also, jack pine would have occupied fewer acres than the current conditions in the areas where conversion to later seral vegetation is proposed.

Table 3-2. Change in FRCC and Acres Treated for the Proposed Action (PA) and No Action (NA)

Activity	Proposed Action (acres)	No Action (acres)	FRCC		
			Current Condition	Post Treatment	
				PA	NA
Aspen regeneration (includes aspen/white spruce/paper birch)	307	0	2	1	2
Aspen hardwood mix to hardwood	24	0	2	1	2
Aspen/paper birch shelterwood underplant white pine	77	0	2	1	2
Jack pine regeneration	80	0	2	1	2
Jack pine convert to red pine (Brevoort Lake, utility line, and pipeline area)	117	0	2	1	2
Jack pine shelterwood under plant white pine	236	0	2	1	2
Balsam fir/aspen/paper birch regeneration	184	0	2	1	1
Two-aged shelterwood (convert jack pine to white pine and hemlock)	96	0	2	1	2
Northern hardwood selection	175	0	2	2	2
Scotch pine removal	20	0	3	1	3

3.4.5.1 Direct and Indirect Effects

In general, mature jack pine contains more fuel than young vigorous jack pine due to the size of the trees and the amount of coarse woody debris. A crown fire in a mature jack pine stand will burn hotter, have higher flame lengths, release more smoke, and be harder to control than a fire in grass or young jack pine. (Carey, 1993. Pinus banksiana). Therefore, reduction of mature jack pine fuels through timber sales and post sale treatment would tend to reduce fire intensity if a fire were to occur. Potential fire behavior would be reduced from crown fires to surface fires for at least a decade and control options would be expanded as mature jack pine is replaced by

young pine and openings. For example, firefighters would be able to directly attack a fire like this and have a much greater chance of controlling it.

Clearcut and salvage treatments would provide temporary firebreaks and reduce long-range spotting potential by removing a large percentage of the available fuels and placing the remaining fuel (slash) on the ground. Subsequent treatments for reforestation and opening creation would compact or remove this remaining fuel resulting in greatly reduced potential fire behavior. Long range spotting is a characteristic of extreme wildland fire behavior and makes wildfires difficult to control. During the first decade following harvest and regeneration, wildfires would be primarily surface fires due to the young jack pine tops being separated from each other. For the next 10 to 15 years the crowns are touching and crown fire potential would exist, although the potential for long range spotting would be reduced from that of a mature stand since less fuel is available. From age 20 to 50, the crowns would be separated from the surface fuels due to lower limb pruning and reduced ground fuels through shading reducing the potential for crown fires (Scott, 2003).

Activities in the Proposed Action would reduce fuel loading in potentially high fire hazard areas. While these actions do not replicate wildfire effects completely, they do to some extent mimic the effects of fire. Clearcutting resembles a stand replacement event and reduces the amount of available fuels for wildfire and reforestation activities produce a new age class. These changes mimic those associated with wildfire by producing temporary openings and fuel breaks and developing a new age class.

Thinning mimics the effects of low to moderate intensity understory burning by removing scattered overstory trees, reducing understory (ladder fuel) vegetation and preparing a seedbed for regeneration. These understory burns are often associated with mid and late seral vegetation such as red and white pine and hemlock. (Snyder, 1993).

The removal of mature jack pine damaged by the jack pine budworm would reduce the hazardous fuels present. Clearcut/salvage treatments would provide temporary firebreaks and reduce long-range spotting potential by removing much of the potential fuel and placing the remaining fuel on the ground. Long range spotting is a characteristic of extreme wildland fire behavior and makes wildfires difficult to control. Although young jack pine stands are also flammable, especially in spring, long range spotting and extreme fire behavior would be reduced. During the first decade following harvest, wildfires would primarily be surface fires due to the young jack pine tops being separated from each other. For the next 10 to 15 years the crowns are touching and crown fire potential would exist although the potential for long range spotting would be reduced from that of a mature stand since the trees are shorter and available fuel loads are less.

3.4.5.2 Cumulative Effects

Table 3- 3. Past, Present, and Reasonably Foreseeable Activities in the Shores Area

Environmental Assessment (EA)	Year Decision Signed	Treated Affected Acres
5 Year Red Pine Thinning EA	2000	100
East Red Pine 2 EA	2005	700
Burma Grade Fuels Reduction	2004	230
Boedne Bay Hazardous Fuels Project	2007	25

Past actions such as timber thinning, understory brush management and openland construction and maintenance have contributed to reducing the potential of large, intense wildland fires by reducing available fuels and providing breaks in fuel continuity. In addition, age class and species diversity contribute to provide a forest condition which mimics the results of wildfire activity. The Proposed Action would continue these efforts in reducing the wildfire potential and restoring components of the natural/historic role of fire in this ecosystem. Cumulatively, these actions are moving the area towards the Forest Plan desired future condition of age class and forest type diversity.

Past, Present and Future Activities on Other Ownership within the Project Area. Michigan Department Natural Resources harvest for the Sault Ste. Marie and Newberry Forest Management Units in Chippewa and Mackinac counties are approximately 4,200 to 7,100 acres per year based on proposed treatments in 2007 and 2009 timber harvest reports (MDNR). These harvest activities include clearcuts, clearcuts with reserve trees, shelterwood cuts, thinning, and selection cuts in all Lake States forest types.

There are no identified activities on private land that would contribute to cumulative effects. In the past, the HNF has distributed Firewise brochures that explain how to reduce the fuels around buildings in order to protect them in the event of wildfire. Along with the brochure was a letter from the Forest Service offering assistance to help in designingtheir landscape to help reduce fuels. No responses were received from the private landowners in relation to this, it is assumed that no past, present, or reasonably foreseeable activities have occurred.

Industrial forested lands in Mackinac and Chippewa counties are dominated by Plum Creek. Several of their stands are managed predominately for red pine pulpwood. Many of their northern hardwood stands are dominated by beech that is heavily infested with BBD. Plum Creek salvaged most of these stands in the past five years. This management direction on private and industrial forested lands will most likely continue in the future.

3.4.6 No Action

3.4.6.1 Direct and Indirect Effects

High-hazard fuels would continue to develop, increasing the risk of extreme wildfire events. Natural processes would be the only management applied to the Shores project area under this alternative. Ecosystem restoration and reduction of the FRCC would not occur in a controlled condition, although it may occur through wildfire at the risk of public and fire fighter health and safety. Standing dead and down fuels in jack pine budworm infested stands would continue to accumulate. Current FRCC for all ecosystems would remain at the current level.

Conversions to later seral class vegetation (white pine and hemlock) may eventually occur with the passage of enough time. Development of additional canopy layers would also occur in the northern hardwoods sometime in the future resulting in a shift of FRCC towards natural conditions.

No fuels reduction or change in other seral stage FRCC would occur.

3.4.6.2 Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects.

3.5 SOILS

Table 3- 4. Summary of Soils Resource Effects

Activity or Measure	Proposed Action	No Action
Acres of compaction	35.6 acres	0 acres

3.5.1 Introduction

Regional soil quality standards require that no more than 15% of a site be impacted by the combination of compaction, rutting, displacement, erosion, mass movement, detrimental burning, or detrimental loss of ground cover. The remaining 85% of the activity area is to be maintained in a non-detrimentally disturbed condition. Rutting, an extreme form of detrimental puddling, should be prevented and should be confined to less than 5% of the activity area (FSH R9RO 2509.18-2005-1, 2005).

Monitoring has shown that when design criteria are implemented, these standards are met or exceeded (Corner and Gries 2007, Gries and Corner 2008, Trudell 2005, Landwehr 2005).

Detailed analysis, soils information, Best Management Practices (BMPs) and references are located in the project record (Range 2009).

3.5.2 Analysis Methods

Several methods were used as part of the soils analysis. Published soil survey information was reviewed (Whitney 1997). For the proposed treatment area, an intersection of GIS stand and soil survey data resulted in a list of soil mapping units which would be expected within harvest areas. The list was reviewed for potential limitations (drainage class, preferred operating season, equipment limitations) and design criteria assigned by stand. These limitations are included as design criteria and listed by stand in Appendix B.

Twenty-four stands planned for treatment were surveyed (about 40% of proposed treatment areas, by area) specifically for this project. Areas outside the proposed treatment areas were reviewed as well. Other data reviewed included landform mapping, ecological classification (landtype association (LTA), ELT, ecological landtype phase (ELTP)), and regional landscape classification. Documentation of the field visits, including photo points, photo point maps, and field notes are included in the project record. Field data for analysis were collected during the summer of 2007-2009 and will continue until the decision is signed. Field observations are done with the objective of identifying disturbed areas; verifying generally whether National Wetlands Inventory (NWI), soils, and ELT mapping are accurate and identifying transportation system conditions. The global positioning system (GPS) locations and photo points were included in data collection, but not all field observations were recorded (Range 2009).

Published literature was also reviewed and will be cited in the analysis sections below. This analysis assumes that BMPs and the Forest Plan are being followed, that R9 Soil Quality

Standards (SQS) are being met, and that all design criteria, including seasonal harvest restrictions, are adhered to. These assumptions have been verified by BMP and soil disturbance monitoring conducted during the past several years on the HNF.

Research in the lake states has identified loss of soil macroporosity and site organic matter as two factors common to sites where productivity has declined (Powers et al. 1990, pp. 49, 59-65, 71; Stone et al. 1998, pp. 119-120). Considering the soils in the project area,which are not considered low productivity soils, the most likely cause of disturbance from harvest in this assessment would be rutting, where fine sands and muck occur on wet areas.

3.5.3 Analysis Areas

The spatial effects boundary for direct and indirect effects analysis used is a 100 meters beyond the boundary on all treatment stands. This boundary is reasonable given that most soil impacts occur only over limited spatial extent (point impacts). Impacts such as compaction, rutting, displacement, loss of ground cover, and decreases in site productivity are confined to the soil directly beneath where the disturbance occurs, such as machinery operations or skidding of logs. The use of 100 meter distance is adequate because although a single point impact may not be significant, a series of these in close proximity may be significant even if it occurs immediately adjacent treatment stands. (Emmons and Olivier. 2001)

The temporal boundary used for direct and indirect effects analysis is two years. Some of these units would be winter harvest and this allows two seasons for the purchaser to complete the unit in case weather conditions limit operability.

Cumulative Effects Boundary. The timeframe for cumulative effects is five years after implementation of this project. Five years to the future is roughly the time it would take soils to stabilize. The spatial boundary is 100 meters from the edge of treatment stands. This area represents a natural boundary where effects may contribute to watershed cumulative effects beyond which wetland effects are diluted to the point of not reasonably detectable. Activities which have and will occur within the watershed cumulative effects analysis area include road maintenance, decommission, and construction on federal and private lands, timber harvest and planting, wildlife projects including maintenance of open areas. (Emmons and Olivier. 2001)

Need to add the spatial and temporal boundary for cumulative effects along with rationale.

3.5.4 Affected Environment

The project area is primarily MA 6.4 (FP p. 3-31) and includes the seven landtype associations (LTAs) listed in Table 3-5. All ELTs occur within the project area. These ELTs are described in Table 3-6 and Appendix I of the FP FEIS.

Table 3- 5. Landtype Associations in the Shores Project Area

Landtype Associations	Name
Hj03	Huron Lake Beds
Hj05	Huron Outcrop
Hj07	St. Martin Bay Wetlands
Hj08	Mackinac Breccia
Hj09	Brevoort-Pte. au Chenes
Hj11	Niagara Escarpment 3
Hj27	Moran Complex

Organic wetlands occupy about 20% of the project area occurring on swales, drainageways, and depressions (ELT 80). About 30% of the area is classified as moderately well drained and dryer, with 57% classified as poorly drained and wetter. About 20% of the area is classified as complex soil units, with intermingling of drainage classes. The NWI classifies about 54% of the project area as wetland (this includes lakes).

Table 3- 6. Summary of Ecological Landtypes within the Project Area

ELT Group	Acres	Percent	Description
10,20	8,363	15.3%	Sandy outwash plains; xeric ecosystems.
30	937	1.7%	Sandy outwash plains and morainal areas with a slightly higher productivity than ELT group 10, 20.
40,50,90	11,359	20.8%	Glacial moraines, pitted outwash, bedrock controlled moraines and areas where bedrock is close to the surface.
60	7,786	14.3%	A transition zone between dry uplands to true wetlands, often occurs at the edge of the outwash plains, but includes the somewhat poorly drained soils on the clay plain landform. Vegetation is highly variable.
70A	93.7	0.2%	Mineral soil wetlands.
70B	11,748	21.6%	Mineral soil wetlands supporting vegetation indicative of higher pH (>5.5) or basic soil conditions.
80A	2,019	3.7%	Organic soil wetlands with more than 12 inches of wet, acidic (pH<5.5) soil.
80B	10,903	20.0%	Organic soil wetlands with more than 12 inches of wet, basic (pH > 5.5) soil.
Water	747	1.4%	Lakes and streams
Pit	543	1 %	Pits

There are 84 soil mapping units within the project area boundary. Within the proposed treatment areas (Proposed Action), there are 29 mapping units. A soil map for the project area is located in the project record. Appendix B - Soils and Stream Protection Guidelines, lists the soils where harvest is proposed by SMU, name, preferred operating season, and drainage class.

Soils proposed for harvest and related transportation management have a range of restrictions for management. These are primarily related to the drainage class of the soil and the impact of concern is compaction. In general, soils classified as "somewhat poorly drained" and wetter are recommended for winter harvest or when the water table is more than 15 inches below the surface. On weak soils, such as mucks and peats, the restriction is for winter harvest only. The following table summarizes soils within the proposed harvest areas.

Table 3- 7. Soil Drainage Class within Proposed Harvest Areas

Class	Acres	Percent of Harvest Areas
Excessively drained to moderately well drained	1,095	63%
Somewhat poorly drained	113	6%
Poorly drained to very poorly drained	531	30%

About 70% of the areas where harvest is proposed are rated as "slight" erosion hazard, 28% are rated as moderate, and the other 2% as severe or very severe (GIS data). About 10% of treatment areas are considered a compaction hazard risk; these are generally located in somewhat poorly drained and wetter areas and include both organic soils, and primarily loamy texture mineral soils (Mackinac and Chippewa counties soils survey data). Ecological landtypes have been mapped within the project area, based primarily on soils information, and are used to summarize soil textures with relation to drainage class in the following table (ELT 70A and 80B are wetlands types).

Table 3- 8. Summary of Soil Texture by Ecological Landtypes

ELT Group	Treatment Acres	General Description	Vegetation
10, 20	775	Weakly developed, and poorly developed nutrient poor soils; upland.	Poor, mostly pine with scattered hardwoods, sparse herbs.
30	55.4	Moderately rich sites, moderately developed soils; upland.	Moderately rich, mixed conifer and hardwood with woodsfern
40, 50, 90	493	This group includes productive sites and well developed soils, and areas sandstone bedrock within 80 inches; and areas with limestone bedrock within 80 inches; upland.	Rich, northern hardwoods with woodsfern. And rich, hardwood or aspen-conifer, moderately rich herbs
60	287	Water table is 12 to 40 inches below surface transition between upland and lowland.	Variable, transition between upland and wetland
70B	89.8	Water table less than 12 inches and less than 12 inches of organic matter (peat or muck)	Cedar, mixed swamp conifers, tamarack, and balsam fir are typical of the vegetation on this land-type.
80B	43	Water table less than 12 inches and more than 12 inches of organic matter.	ELT typically supports northern white cedar stands, mixed swamp conifer stands and to a lesser extent tamarack and black ash stands.

Shallow soils over bedrock are also a management concern. About 260 acres (15%) within proposed harvest units are rated "Severe" rock outcrop or depth to bedrock. This rating is primarily due to windthrow hazard, but on 13% (34 acres) of these areas, there is a severe rating for seedling and equipment maneuverability; the latter occurring on St. Ignace Silt loam (Soil Management Unit 70B-70D). These areas are mapped and identified in Appendix B, and would be avoided during sale layout and sale operations. Equipment maneuverability in this

case would be the challenge of operating around boulders and rock outcrops, and the hazard of machinery loss of traction due to soil slippage under wet conditions. Soils with this hazard are limited to either winter operation or during dry summer periods when soils can support equipment use. Soil protection measures are listed by stand in Appendix B of this document.

Soils proposed for treatment are supporting either aspen or upland hardwoods and soil productivity is not an issue for the prescribed treatments (aspen clearcut, or hardwood thinning, or shelterwood treatment).

3.5.5 Proposed Action

3.5.5.1 Direct and indirect effects

Under this alternative, there would not be a decrease in long-term soil productivity or disruption of nutrient cycling as a result of implementing the activities. And no long-term direct or indirect effects would be expected relative to soil productivity. Short-term effects could occur as a result of soil compaction and erosion due to surface disturbance.

Some compaction would occur in harvest areas, but compaction would be within the standards outlined in the introduction to this section. Monitoring on HNF has found that temporary roads and primary wheel tracks are two activities that typically cause some level of soil compaction. Landwehr (2005) provided a summary of soil quality monitoring during 2003 and 2004. Typical tertiary and secondary skid trails did not cause detrimental compaction beyond standards on sandy soils, frozen organic soils or frozen clayey soils. From the report, compaction is estimated for skid trails in the alternatives. In addition to skid trails, the amount of system and temporary roads is also added to the calculation. These measures, in addition to follow-up routine monitoring, ensure compliance with state water quality laws (State of Michigan 2009). The calculation assumptions and details are in the project file (Range 2008). The results are shown in the following table.

Table 3- 9. Estimated Compaction above National Soil Standards

Impact Area	Acres of Compaction Proposed Action	Acres of Compaction No Action
Skid trails	12.8	0
Roads and back-ins	22.8	0
Total	**35.6**	**0**

3.5.5.2 Cumulative effects

Since the hazard for soil erosion is slight to moderate in virtually all harvest areas, the cumulative effects to soils are limited to on-site because they would not move and only affect on-site resources, such as tree growth. Compaction would occur in stands where skid trails were being established for the first time. Further compaction would not occur in stands where skid trails were already established because they would be reused. Since the treatments would not affect long term soil productivity, and the expectation that treatments in the future would also be in compliance with present federal, SQS guidelines, soil productivity cumulative effects would not occur.

3.5.6 No Action

3.5.6.1 Direct and Indirect Effects

The potential for soil compaction and rutting is very low since no activities involving operation of heavy equipment in the forest are proposed. Existing compaction from previous harvest entries would gradually be mitigated through natural soil forming processes, plant root development, and freeze-thaw cycles (NCASI 2004, pp. 38-44, 61-62). The No Action would have no direct or indirect effects on soil resources from soil compaction or rutting.

3.5.6.2 Cumulative Effects

There would be no cumulative effects to the soils resource since there are no direct or indirect effects.

3.6 WATER QUALITY AND QUANTITY

3.6.1 Introduction

No comments in response to the project scoping notice were received specific to surface water or groundwater quality or hydrology. Caves and sink holes are karst features which have a potential to impact ground water quality and are assigned a 200 foot protection buffer. This 200 foot buffer is double the 100 foot buffer typically assigned to surface water bodies and is considered adequate to protect ground water quality (Peterson and Vondracek 2006, pp. 1-5; Binkley and Brown 1993; LeDoux and Wilkerson 2008, pp. 193-209; Belt and Laughlin 1992). Potential impacts to ground water are; therefore, not considered in the hydrology section. Discussion of the potential impacts on karst features is included in the project record.

3.6.2 Analysis Methods

Published state water quality reports and internal monitoring and inventory reports were used to determine existing water quality and watershed conditions. Past monitoring and existing GIS information and additional information gathered during field review were used to develop design criteria and model impacts.

3.6.3 Analysis Areas

The spatial and temporal boundaries for direct and indirect effects are streams adjacent to the project activity areas and ¼ mile downstream with a duration of 5-10 years after completion of an activity. This is a reasonable area to expect that sediment could be delivered and the time for disturbed areas to re-stabilize (Ohmann et al. 1978, p. 4).

Twenty-four stands planned for treatment were surveyed specifically for this project; other areas in the project area and outside the proposed treatment areas were reviewed as well. Documentation of the field visits, including photo points, photo point maps, and field notes are included in project record (Range 2009).

The spatial boundary for cumulative effects is the nine - 6th level hydrologic unit code (HUC) watersheds where proposed activities are planned. This area represents a natural boundary where effects may occur. The temporal boundary for cumulative effects is fifteen years after

implementation of this project. Fifteen years to the future includes the next entry of timber management. This area represents a natural boundary where effects may occur. Activities which have and will occur within the watershed cumulative effects analysis area include road maintenance, decommission and construction on federal and private lands, timber harvest and planting, wildlife projects including maintenance of open areas.

3.6.4 Affected Environment

Sixteen United States Geological Survey 6th field hydrologic unit code (USGS HUC 6) watersheds intersect with the project area. Of these, 11 have activities proposed within the boundaries and were included in the analysis of project activities. The 11 affected watersheds are listed in Table 3-10.

Table 3- 10. Affected Watersheds, Hydrology, and Wetland Cumulative Effects Area

HUC6 Name	Watershed Acres
Cut River-Frontal Lake Michigan	1,223
Point Aux Chenes River	10,641
Cut River-Frontal Lake Michigan	8,679
Little Brevoort River	11,210
Brevoort River	27,431
Cut River-Frontal Lake Michigan	12,778
Pine River	14,116
Nunns Creek at mouth	13,145
Law Creek-Frontal Lake Huron	3,297
Rabbit Back Creek-Frontal Lake Huron	19,923
Law Creek-Frontal Lake Huron	25,465

Numerous lakes and streams occur within the project area. Streams and rivers within the project area include Brevoort, Carp, and Pine rivers, and Foley, Hoban, Martineau, Rabbitback, and Red creeks. Streams on the HNF have been classified by temperature. The following table lists the total length of streams within the watershed areas and project area by temperature class.

Table 3- 11. Stream Temperature Classes within the Project Area

Temperature Class	Stream Miles
Cold	2.0
Cool	39.1
Warm	14.7
Total	**55.8**

About 150 lakes are identified in GIS data within the project area. Very few are named. They range in size from 4,300 acres (Brevoort Lake – on the project boundary), to 1/20 of an acre. Approximately 83% (127) of these are less than five acres (state GIS data). The following table lists the major named lakes within the project area (from state GIS data).

PCBs and mercury found in the water column on some streams in the Carp-Pine River watershed (HUC 04070002) (State of Michigan 2010). Since this project's proposed activities do not have an effect on these parameters, it will not be discussed. Sources of sediment include soil erosion from roads and ditches, stream banks, and natural (geologic) erosion. The state of Michigan conducted water quality in the eastern Upper Peninsula during 2004. The monitoring included both chemical and biological monitoring. In 2004, macroinvertebrate and habitat surveys were performed at 17 sites in the Carp River watershed and 3 sites in the Pine River watershed.

Table 3- 12. Major Lakes within Project Area

Name	Acres
Brevoort Lake	4,314
Chain Lake	327
Freschette Lake	76.1
Gamble Lake	70.0
Lant Lake	10.6
Martin Lake	111
Massey Lake	25.8
Paquin Lake	22.3
Platz Lake	8.8
Silver Lake	44.0

Water quality within the project area is good with exception of PCBs and mercury found in the water column on some streams in the Carp-Pine River watershed (HUC 04070002) (State of Michigan 2010). All sites were meeting Michigan water quality standards with exception of the PCB and mercury issue previously cited. Another 2004 assessment found that Brevort and Pt. Aux Chenes rivers were meeting water quality standards with all sites reported as having good to excellent water quality. Hoban and Martineau creeks were part of a biological study in 1999 and found to have 'excellent' and 'fair' habitat conditions, respectively.

3.6.5 Proposed Action

3.6.5.1 Direct and Indirect Effects

Some additional delivery of sediment to stream systems is expected in the short-term at culverts due to increased hauling and necessary maintenance activity for timber sales. Timber harvest activities would result in elevated erosion rates in the short-term and would decrease as sites recover. Compaction from timber harvest would be within acceptable limits as defined in the soils section and would not greatly affect hydrologic characteristics and, therefore, water quality. This would be minimized by following the BMPs as described in the state's publication, "Sustainable Soil and Water Quality Practices on Forest Land" (MDEQ 2009). The manual describes the specifications and techniques to properly apply voluntary BMPs and supersedes the 1994 booklet, "Water Quality Practices on Forest Land." Impacts are considered minor and short-term in nature and would not affect the state's designated beneficial uses of water, identified in Section 3.7 – Water Quality. This is in compliance with state and federal water quality laws.

Harvest and road actions would result in changes in vegetative cover and soil compaction and may cause an increase in runoff locally. Some additional short-term sediment would be delivered to stream channels, but this would not measurably alter the stream channels' capacity

to carry water. Ground water flow regime may be altered locally due to changes in timing of snowmelt due to removal of trees, but would not be measurable at the (HUC 6) watershed level. Water yield would increase and, depending on the percentage of watershed cut, a measurable increase in annual water yield may result. There would be no detectable change in stream flow regime at the HUC 6 level watershed. These impacts would be limited by prescribing site-specific design criteria (see Appendix B). The overall effect to groundwater and surface hydrology would not be measurable at the (HUC 6) watershed level.

3.6.5.2 Cumulative Effects

Due to concerns for stream instability resulting from cumulative impacts due to increased annual peak flow a Standard was added to the Forest Plan. Included in the Forest Plan is the requirement that "management actions on National Forest System land will not increase the total combined acreage of upland young forest (younger than 16 years) and upland openings to exceed 60 percent of the total area (all ownership) of any sixth-level HUC watershed." (FP p. 2-29) None of the affected watersheds would reach this threshold. The highest (temporary) opening percentage would be 12.3% for Point Aux Chenes River (Range 2009). There is not expected to be any measurable change in water yield nor streamflow peaks due to project activity at the 6th level hydrologic unit. The largest change in open area is 1.5% in the Law Creek-Frontal Lake Huron watershed (St. Martins Point area). None of the changes would be large enough to cause stream destabilzation resulting as a cumulative effect due to additional short-term sediment or peak flow changes (Range 2009).

Cumulative effects due to reaching a watershed threshold would not be expected as a result of implementing any of the action alternatives.

3.7 WETLANDS

3.7.1 Introduction

Wetlands are defined as "those areas that are inundated or saturated by surface water or ground water with a duration sufficient to support, and under normal circumstances, do support a prevalence of vegetation typically adapted to life in saturated soil conditions." (40 CFR 230.41 (a)(1)). Wetlands have been recognized as important ecosystem components for their functions as filters for sediment and pollutants, nutrient cycling, water storage, flood control, and wildlife habitat.

Under Section 404, the U.S. Army Corps of Engineers has been given responsibility to regulate the discharge of dredged and fill material into waters of the United States, including wetlands (33 CFR 323.3). Normal silvicultural activities, including harvesting for the production of forest products or upland soil and water conservation practices, are exempt from Section 404 permits (33 CFR 323.4). Construction and maintenance of forest roads for normal silviculture are also exempt provided BMPs are applied (33 CFR 323.4; Michigan's Water Quality Management Practices on Forest Land). Where a Section 404 permit is required, a Section 401 water quality certification from the State of Michigan may be required (33 CFR 325.2; NR 103 Water Quality Standards for Wetlands). Appropriate federal and state permits would be obtained prior to implementation of projects involving wetlands.

3.7.2 Analysis Methods

Several published datasets were reviewed for the presence of wetlands within the project area of the proposed treatment stands. The datasets include stand vegetation data, soil survey data (hydric soil list), U.S. Fish and Wildlife Service NWI maps, and ELT mapping. Additionally, field survey information is used to verify the general accuracy of the published data. Twenty-four proposed treatment stands were visited. Documentation of the field visits, including pictures and field notes are located in the project record (Range 2009).

Monitoring on the HNF has found that temporary roads and primary wheel tracks are two activities that typically cause some level of soil compaction. And, in general, typical tertiary and secondary skid trails did not cause detrimental compaction on sandy soils, frozen organic soils or frozen clayey soils. Landwehr (2005) provided a summary of soil quality monitoring during 2003 and 2004. Soil compaction calculations in this report are based on this monitoring.

Harvest compaction analysis on wetlands is done using ELT mapping data for delineation of wetlands. Ecological landtype data is correlated to soils survey information and groups wetland soils by the type of soil - mineral or organic, and the depth of the organic layer (Table 3-6 in the soils section). Soil textures within these wetland ELTs were used to estimate the extent of compaction using Landwehr's monitoring results. Assumptions and calculations are in the project record (Range 2008).

Winter harvest on ELTs 80A and 80B, which are deep organic soils (>12"), would generally not result in exceedance of soil compaction standards. The risk to wetland function when operating on these ELTs is primarily displacement by rutting and puddling. Monitoring on the HNF in past years has supported this (Landwehr 2005). Where deep rutting has occurred on deep peat soils, it did not reach the compaction standard. Rather, displacement, puddling, and rutting are the likely detrimental disturbance condition of concern from logging (Range 2007). Where deep rutting occurs on deep peat soils, productivity impacts would be limited to the impact areas (Groot 1998). Compaction of organic soils may be altered but the level of compaction would not be expected to alter the productivity of the site in the long-term (Verry 1986). Although excessive rutting would be minor, some compaction would occur, and compaction may alter soil hydraulic properties (Grace et al. 2006, pp. 503, 505-509). This could result in a diversion of subsurface flow, as has been found during field surveys for this project and other projects on the Eastside of the HNF where roads in wetlands have been rutted by traffic. This may result in some draining of upland wetland areas due to a lowered resistance to flow during high water periods. The precise impact of this is difficult to assess, but would generally be when water tables are high, since the flow would decrease as the water level decreases.

3.7.3 Analysis Areas

Direct and Indirect Effects Boundaries. The spatial effects boundary is a 100 meter buffer on all treatment stands. The temporal boundary for direct and indirect effects is of 5-10 years after completion of an activity. This is a reasonable area to expect that sediment could be delivered and the time for disturbed areas to re-stabilize.

Cumulative Effects Boundary. The timeframe for cumulative effects is five years after implementation of this project. Five years to the future is roughly the time it would take soils to stabilize. The spatial boundary is 100 meters from the edge of treatment stands. This area represents a natural boundary where effects may contribute to watershed cumulative effects beyond which wetland effects are diluted to the point of not reasonably detectable. Activities

which have and will occur within the watershed cumulative effects analysis area include road maintenance, decommission, and construction on federal and private lands, timber harvest and planting, wildlife projects including maintenance of open areas. (Emmons and Olivier. 2001)

3.7.4 Affected Environment

Wetlands occupy about 61 percent of National Forest System lands and about 53 percent the project area (NWI data). The following table summarizes wetlands within the project area by wetland type.

Table 3-13. Summary of NWI Wetlands within Project Area

Wetlands Type	All Lands	National Forest System Lands
Lacustrine	847	287
Palustrine Emergent	1,491	759
Palustrine Forested	23,417	19,452
Palustrine Open Water	265	237
Palustrine Scrub-Shrub	3,095	2,634
Riverine	43	0
Total Wetlands	**29,158**	**23,369**

Roads and abandoned railroad grades traverse wetlands such as near the Castle Rock pit, as an example, and have led to changes in wetland hydrology and ponding and effectively limit surface water and shallow groundwater movement in some wetlands. Another example of wetland loss is the area occupied near M 134 and Interstate 75 (I-75). The construction of gas and oil pipelines has also filled wetlands within the project area. An example of this is the east-west pipeline between Brevoort Lake and US Highway 2 that connects to St. Ignace.

Silvicultural treatments impacts to wetlands are probably most accurately done at the project scale using ELT data, since NWI information does not include soils information. Ecological landtype data is correlated to soils survey information and groups wetland soils by the type of soil - mineral or organic, and the depth of the organic layer (Table 3-6 in the Soils section). Treatment areas within wetland ELTs are as follows (acres are for any type of treatment using logging equipment).

Table 3-14. Proposed Harvest on Wetland Harvest Areas by Wetland ELT Type

Ecological Landtypes	Acres
70A	0
70B	89.7
80A	0.02
80B	43.3

One-third of the proposed harvest on wetlands harvest areas under the Proposed Action are organic soils (appr. 67%). Shallow organic soils (in general ELT 70A and 70B), generally less than 14 inches in depth, freeze down faster and hold traffic better than frozen, thicker organics (pers. comm. J. Carrick, 02/22/2006). When rutting occurs, compaction is not the primary detrimental disturbance of concern (Range 2007). Excessive compaction of thinner organic soils is also not expected (as with deeper organics). If the organic layer is shallow, compaction

of subsoil may occur, but is not likely since most sub-soils in this project are loams and sands. Monitoring on HNF has found that compaction of mineral soils within ELT 70 would be within quality standards are not exceeded when operating on these soil types during winter (Landwehr 2005).

3.7.5 Proposed Action

3.7.5.1 Direct and Indirect Effects

Compaction from harvest excluding road actions. Approximately 28 acres (21% of the harvest area) would be impacted by skid trails and with some level of compaction resulting. It is expected that about 6.7 acres of compaction would result as a result of skid trails on 133 acres of harvest. This amount would be within regional soil quality standards (see "Soils" section introduction).

Logging on wetlands would be done either during winter or when the ground is dry enough to support equipment. (Specific requirements are identified by site in Appendix B, Soils and Stream Protection Guidelines.) Any winter logging, regardless of soil type, is done with the same precaution (FP p. 2-15). If rutting occurs, operations are shut down until measures are taken to prevent rutting or conditions will enable logging without rutting.

Road Actions on Wetlands. New roads, temporary roads, and "back-ins" (landings) would be constructed on about 5.7 acres by NWI data. Road closures or decommissioning would occur on about 22.3 acres with a net result of 16.6 acres eventually being returned to a natural state (Table 3-15). The estimate for actions on wetlands by ELT vary from the NWI data, but still show a net gain (Table 3-16).

Both databases, NWI and ELT, mapping were used for this assessment and are provided for comparison of alternatives. Due to imprecise preliminary proposed roads location and NWI mapping, these values will vary from on-the ground impacts. (An analysis of likely errors between different databases is discussed in the project record (Range 2008)). Although exact road locations are not known, monitoring has shown that during sale layout, impacts to wetlands were minimized and did not exceeded planning estimates (Range 2005).

Table 3- 15. Roads Action Effects on NWI Wetlands by Type for the Proposed Action, in Acres*. Negative numbers are in parentheses.

Wetlands Type:	Palustrine Forested	Palustrine Open Water	Palustrine Scrub-Shrub	Total Acres
Roads				
New System	(3.39)	0.0	(0.14)	(3.53)
Temporary	(1.66)	0.0	(0.01)	(1.67)
Decommission	21.5	0.05	0.73	22.3
Back ins (3 @ 0.15 ac.)	(0.45)	0.0	0.0	(0.45)
Total (gain or loss)	**16.0**	**(0.05)**	**0.58**	**16.6**

* Roads acreage calculated by using a 20 ft. road width.

Table 3- 16. Proposed Action Roads on Wetland ELTs, in Acres

Wetlands Type:	ELT 70	ELT 80	Total
Roads			
New System	(0.83)	(0.32)	(1.15)
Temporary	0.0	0.0	0.0
Decommission	4.9	14.3	19.2
Back ins	0.0	0.0	0.0
Total (gain or loss)	**4.07**	**13.98**	**18.05**

The preceding tables tabulated the area wetlands affected by actions under the Proposed Action. Where wetland crossings are unavoidable, they would be constructed in a way that would not block cross flow in compliance with Forest Plan requirements and state and federal regulations.

Six new system (permanent) road segments are planned in NWI wetland areas and would be closed (ML1) following use. These road segments access C 94, S 58; C 129, S 3; C 130 S 18; C 197 S 30; and C 133 S 7. The proposed new roads would cross about 1.5 miles of wetland (3.53 acres) (NWI data). All other new roads proposed on wetlands are temporary and would be obliterated following the related timber sales and site preparations. While construction of roads on wetlands is allowed for silvicultural activities without a permit, if fill is part of the action, a wetlands permit is required.

Where new and temporary roads are constructed, compaction would occur, but fill typically is not done. Winter use only, new permanent and temporary roads, are not typically constructed using road base fill or gravel for hardening. On the HNF, roads are located during sale layout to avoid wetland crossings. This has been found to be effective in reducing impacts to wetland crossings (Range 2005). Fill is added only when necessary to cross wet areas that would not freeze adequately to support equipment. Where cross flow may be affected by compaction and rutting, rubber mats are used to aide in freeze-down. Where this method does not work, a culvert may be installed. When it is necessary to install a culvert, fill would be used to cover the culvert. Following harvest, culverts and mats would be removed and the crossing restored to its original dimensions. These measures ensure that road management impacts to wetlands are minimized.

Water Table Changes. Following harvest, a rise in the local water table would be expected and water table fluctuations would be less moderated following rainfall events (Verry 1997). This results from reduced evapotranspiration and altered surface soil properties from traffic after vegetation removal. This effect is most pronounced during the growing season and generally returns to baseline conditions within several years. Water table elevation is not expected to affect downstream water quality due to the low slopes and erosion potential of the areas designated for harvest. (The Forest Plan acknowledges that clearcutting will increase water yield peaks during snowmelt and has set vegetation age class related open area limits based on maintaining stream stability (FP pp. 2-14)). The ‘wetting up’ of a site is recognized as a transient effect, although full recovery to pre-harvest conditions may take many years. Re-establishment of the forest stand is the main driver that restores hydric balance (Dube et al. 1995, Verry 1986).

3.7.5.2 Cumulative Effects

There would be no cumulative effects to wetlands. It is not anticipated, neither are there any known projects proposed within the wetland cumulative effects area. There would be a net gain in wetland areas to be managed in as wetlands rather than transportation system.

Within the project area, private land management such as agriculture would continue on in the Pine River watershed near Rudyard.

3.7.6 No Action

3.7.6.1 Direct and Indirect Effects

The existing condition and trends described under purpose and need and affected environment section would persist. Without implementation of Proposed Action, the conditions, risk to vegetation and habitat conditions described in the purpose and need section of chapter 2 would persist. Road management opportunities identified in the roads analysis would not be implemented and conditions described in the analysis would continue.

3.7.6.2 Cumulative Effects

There would be no cumulative effects to the wetlands, since there are no direct or indirect effects.

3.8 VEGETATION

Table 3- 17. Summary of Resource Effects Table.

Activity or Measure *	Proposed Action	No Action
Acres of aspen moved to mid and late seral classes	212	0
Acres of jack pine moved to mid and late seral classes	562	0
Acres of mid seral moved to aspen and late seral classes	217	0
Acres of A3 or A4 to A1	45	0
Acres of J3 or J4 to J1	80	0
Acres of L3 or L4 to L5 or L4	97	0
Acres of M4 to M1	247	0
Total acres changing either seral class or size class	**1,460**	**0**

* See Glossary and Acronyms section for symbol meanings.

3.8.1 Introduction

This section refers to the forest stands that make up the Shores project area. The analysis will discuss how silvicultural treatments would affect the forest health of stands proposed for treatment. The analysis will also discuss how treatments would affect vegetation composition regarding the Forest Plan's desired conditions (DC). The HNF received no specific comments in response to the project scoping process regarding impacts to the vegetation resources (Issues section 1.7).

Needs identified in chapter 1, section 1.3 that relate to vegetation are:

- Need 1. Move the vegetation within the project area towards Forest Plan vegetation composition goals
- Need 2. Reduce the risks of potential wildfire by managing vegetation in areas of concern
- Need 3. Retain or regenerate hemlock, white pine, and mast species (red oak)
- Need 4. Manage stands to reduce impacts from insects and disease
- Need 7. Produce timber products

3.8.2 Analysis Methods

Analysis of forest vegetation requires data analysis, followed by on-the-ground confirmation. Data used for this analysis is from HNF Forest Service Vegetation (FSVeg) database, and walk-through exams. FSVeg stores data that has been collected through field examination of individual stands. Within the Shores project area, approximately 78% of the stands were inventoried using a quick plot examination method between 2000 and 2008. A determined number of plots were taken for each stand. Species, diameters, and number of trees were recorded for each plot, along with field observations such as stand health. The data was summarized by stand and an initial list of potential stands was drafted. Stands where vegetative management is not permitted under the Forest Plan were not included on the list. Also, young stands and poorly stocked stands were not included on this list.

The stands on the initial list then received walk-through exams in 2008-2009. This type of examination relies on field observations of the viability of harvesting, special management concerns, and possible treatments. Based on the walk-through observations and the Shores analysis purpose and need statement, a final list of stands and proposed treatments were created and can be found in Appendix B and C.

The Forest Plan Implementation Simulation Tool (ForIST) breaks the HNF down by ELT and MA. It then classifies stands by seral class and by size class. The tool then compares the current condition of stands in the project area to Forest Plan DC for vegetation composition. This supports the purpose and need, by highlighting where vegetation composition is outside of the DC. The model also compares results of Proposed Action activities to Forest Plan DC showing if activities move vegetation composition closer, within the range of, or further from the DC. The model makes this comparison and displays results for the project area, as well as forest-wide (see model outputs, project record). This helps determine if Need 1 of the purpose and need statement is being met.

As the list for proposed silvicultural activities was being developed, IDT members provided input regarding other resources within or near the stands. This resulted in two stands being dropped due to accessibility, and four stand boundaries were redefined to avoid TES habitat. This input also resulted in some of the design criteria for beech bark disease (BBD) and emerald ash borer (EAB) (EA section 2.4).

3.8.3 Analysis Areas

The spatial boundary for direct and indirect effects, as well as the cumulative effects analysis, for the Forest Plan vegetation composition goals is the HNF boundaries for MA 6.4. The rationale is based on Forest Plan direction that vegetation composition goals are forest wide. There are no vegetation composition goals for lands other than HNF. MA 6.4 is exclusively on the Eastside of HNF. The Proposed Action includes one stand of 29 acres in MA 1.2. This EA

discusses the effects of treating this stand, but not how treating this stand would affect the Forest vegetation composition goals for MA 1.2 since only 29 acres would be affected.

The temporal boundary for Forest Plan vegetation composition goals is from when the Forest Plan was initiated until the present. Therefore, cumulative effects for vegetation composition goals will only be on HNF system lands from March 29, 2006 to present.

The spatial boundary for all other vegetation direct, indirect, and cumulative effects is Mackinac and Chippewa counties. The rationale is based on the existence of EAB, spruce budworm, and BBD. There are three major insect and disease concerns within the project area. EAB's hosts are ash and there are known EAB infestations in the western part of the project area. Also, there are infestations just north and south of the project area near the towns of Moran and St. Ignace. BBD is a complex of beech bark scale and beech bark fungus, which infest American beech. Just about all of the American beech in the project area have BBD. Spruce budworm's main hosts are balsam fir and spruce. A spruce budworm outbreak is starting in the far eastern portion of the project area. There is potential for all three of these to spread as their hosts are scattered throughout the project area.

The temporal boundary for other vegetation direct, indirect, and cumulative effects analysis is estimated at 1996-2026 since this is approximately the time new even-aged regeneration cuts would be temporary openings, and the approximate time the project area would be ready for future harvest.

3.8.4 Affected Environment

Approximately 49% (18,850 acres) of the Shores project area is considered suitable for timber production. Approximately 93% (17,508 acres) of the suited acres are in MA 6.4. The focus of the vegetation analysis will be based on the forest-wide desired vegetation composition goals for MA 6.4 (Forest Plan p. 3-33).

The existing conditions used in describing the affected environment for Shores project area were obtained from Huron Complex and the South Shores MSAs and ForIST (August, 2009, project record). Figure 3-1 shows the existing seral class percentages in MA 6.4 for Shores project area.

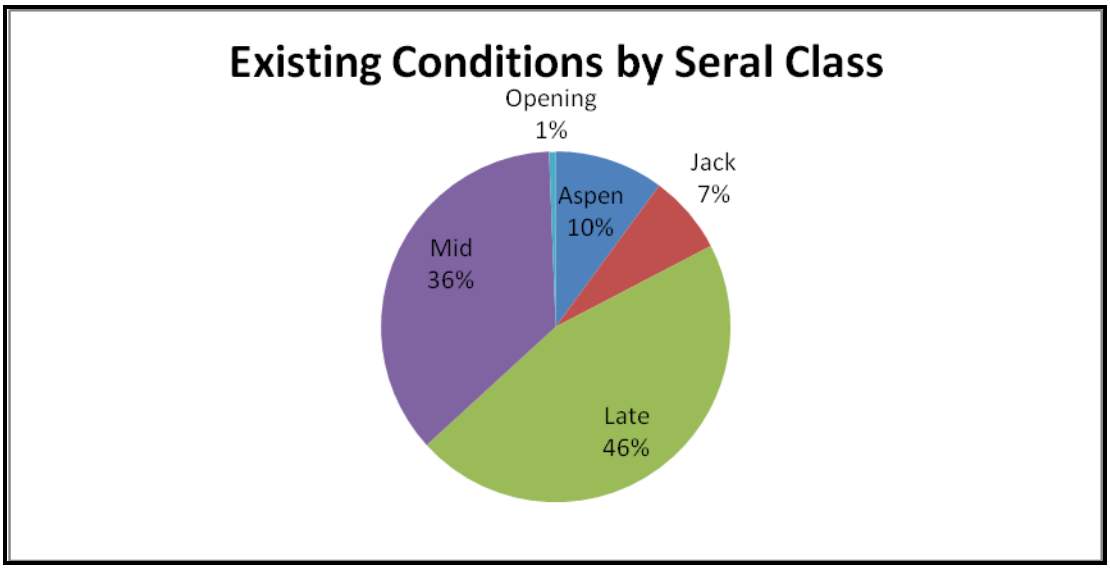

Figure 3-1. Existing Seral Classes in Shores Project Area for MA 6.4

Aspen Seral. Aspen seral class accounts for approximately 10% in MA 6.4. The aspen seral class is comprised of the following forest types: quaking aspen, paper birch, bigtooth aspen, and balsam poplar. Aspen/white spruce/balsam fir is in the aspen seral class for ELTs 10/20, 30 and 40/50/90, and mid seral for all other ELTs. In general, the HNF contains too many acres in size class 4 and not enough in size class 1. See table C-1 in Appendix C for details.

Jack Pine Seral. The jack pine seral class accounts for approximately 7% of the suited lands in MA 6.4. The jack pine seral class is comprised of stands dominated by jack pine. Outside of Kirkland warbler habitat areas, the only ELT with forest-wide goals is ELT 10/20. In general, the HNF contains too many acres in size classes 3 and 4. See table C-2 in Appendix C for details.

Mid Seral. The mid seral class accounts for approximately 36% of the suited lands in MA 6.4. The mid seral class is comprised of a variety of forest types ranging from spruce/fir to red pine to mixed swamp conifer. In general, the HNF contains too many acres in size classes 3 and 4 and not enough in size class 1. See table C-3 in Appendix C for details.

Late seral. The late seral class accounts for approximately 46% of the suited lands in MA 6.4. The seral class is comprised of long-lived species such as white pine, hemlock, lowland hardwoods, and northern hardwoods. In general, there is a need to increase L5 in ELTs 40/50/90 and 60. See table C-4 in Appendix C for details.

<u>Definition of symbols</u>:

In the following section of this document, the seral class and size class are annotated with a letter-number designation, e.g. J1 means Jack Pine - size class 1, A3 is Aspen - size class 3, M3 would be “Mid” seral - size class 3. Following are the possible designations for the discussion. For further explanation, refer to the Forest Plan.

SIZE CLASS:
0: Open lands
1: Less than 4.5 feet in height
2: From 4.5 feet to 4.9” diameter at breast height (DBH)
3: From 5” to 8.9” DBH
4: From 9” to 17.9” DBH
5: Greater than 18” DBH

Seral Class*:
A: Aspen
J: Jack Pine
M: Mid Seral
L: late Seral

* Seral classes are defined in Appendix D, page D-1 of the Forest Plan.

3.8.5 Proposed Action

3.8.5.1 Direct and indirect effects

Almost all of the stand boundaries proposed for harvest, and adjacent stands were redrawn for the several reasons. The old stand boundary did not reflect current natural stand boundaries. Forests are dynamic and stand boundaries can change due to natural or human disturbances. Some of the stands could not be treated in their entirety for a variety of reasons (larger than the allowable temporary opening size, TES, VQO objectives).

The effects of the Proposed Action would include use of overstocked, disease and insect infested and mature trees as wood fiber. Single tree selection and commercial thin harvests would result in improved stand quality and tree vigor, allowing residual trees to increase in size and value due to increased availability of soil nutrients, moisture, and sunlight (Smith 1962). Shelterwood with reserve trees and seed tree with reserve trees harvests would result in ideal growing conditions for white pine, hemlock, and red oak. These species are considered highly desirable in the Forest Plan (2-10) and would increase forest diversity throughout the project area (Need 3). Clearcut harvests would result in ideal growing conditions for aspen, jack pine, and red pine (Needs 1, 3, and 7). Natural regeneration is the preferred method of regeneration; however, when a good seed source is not available, planting would occur. Additional planting may occur if National Forest Management Act (NFMA) standards are not achieved due to failed natural regeneration. Conversion of jack pine stands to long-lived tree species near and around recreation sites would provide for safer, healthier vegetation (Need 2). Proactive treatment of hardwood stands that include ash could minimize damaging effects of EAB. Removal of beech trees in hardwood stands could provide growing space for other more desirable tree species such as hemlock, yellow birch, and red oak (Needs 3, 4, and 7).

Aspen seral

Clearcut (Needs 1 and 7). Even-aged regeneration cuts such as clearcuts would regenerate mature stands to healthy, vigorous young stands (Jones, 1976). Follow-up hand site preparation would occur to remove cull trees to promote aspen sprouting.

Approximately 69 acres of mature aspen would be clearcut and naturally regenerated to aspen, moving stands of larger size class aspen (A4, A3) to smaller size class (A1). Approximately 210 acres of aspen-white spruce-balsam fir would be clearcut and naturally regenerated to aspen,

moving stands of larger size class aspen-white spruce-balsam fir (M4 and M3) to smaller size class aspen (A1).

Jack seral

Stand clearcutting with leave trees (Needs 1 and 7). An even-aged regeneration or harvest method that removes most trees in the stand producing an exposed microclimate for the development of a new age class in one entry. A minor (less than 10% of full stocking) live component is retained for reasons other than regeneration. These leave trees would be arranged as reserve islands and would serve three purposes. The first purpose is to meet VQOs (FP, pp. 3-57), thus, they would be placed to make the clearcuts look smaller. The second purpose is to meet Forest Plan wildlife structural guidelines (p. 2-16). The third reason is to provide a seed source (Smith 1962). Approximately 73 acres would be clearcut with reserve islands and mechanically site prepared. Approximately 34 acres would rely on natural regeneration and 34 acres planted with jack pine. These 73 acres would move from larger size class jack pine (J4 or J3) to smaller size class (J1).

Mid seral

Stand clearcutting with leave trees (Needs 1 and 7). An even-aged regeneration or harvest method that removes most trees in the stand producing an exposed microclimate for the development of a new age class in one entry. A minor (less than approximately 10% of full stocking) live component is retained for reasons other than regeneration. These leave trees would be arranged as reserve islands, and would serve three purposes. The first purpose is to meet VQOs, thus, they would be placed to make the clearcuts look smaller. The second purpose is to meet Forest Plan wildlife structural guidelines. The third reason is to provide a seed source.

Approximately 212 acres of balsam fir-aspen-paper birch would be clearcut. While the amount of balsam fir would be reduced, balsam fir would continue to be a significant component of these stands, thus they would move to smaller size M1. Within these stands a spruce budworm infestation is beginning to build, but balsam fir regeneration would not be adversely affected.

Approximately 22 acres of aspen, with pockets of balsam fir and spruce, would be clearcut with reserve islands of spruce left to naturally regenerate balsam fir-aspen-paper birch. While there is currently a spruce budworm outbreak occurring in this area, it rarely kills spruce. This should move these 22 acres from A1 towards M1.

Two-aged shelterwood establishment and removal cut with reserves (Needs 1, 2, 3. and 7). These shelterwood cuts would retain a residual overstory of approximately 40-50% crown cover of well-spaced leave trees to limit damage from white pine weevil (Hamid et al. 1995). Any white pine, red oak, and hemlock would be retained as leave trees. No overstory removal would be planned. White pine and red oak are more desirable in these areas as they are longer lived species with rotation age up to 160 years, as opposed to jack pine's maximum rotation age of 70 years (FP p. 2-12).

Approximately 96 acres of jack pine would be converted to M1/M2. Approximately 42 acres would be mechanically site prepared and planted with white pine and red oak moving these acres to M1. Approximately 34 acres should naturally regenerate to white pine and red oak moving these acres to M1. There are 20 acres that have some advanced regeneration of red oak and would be mechanically site prepared planted with white pine moving these acres to M2.

Seed-tree removal cut with leave trees (Needs 1 and 7). Approximately 26 acres of mature aspen stands would receive seed tree regeneration cuts and mechanical site preparation to regenerate white pine and red oak. While this stand is primarily aspen, there are some old remnant white pine and red oak, which could provide seed for natural regeneration. Thus, reserve trees would be primarily white pine and red oak. Seed trees would not be harvested after the stand has been regenerated. This treatment would create a stand dominated by red oak and white pine seedling (M1), and reduce the number of aspen acres in ELT 10/20.

Commercial Thin (Needs 4 and 7). Approximately 40 acres would be thinned to about 70 square feet BA, favoring white pine, black spruce, white spruce, and northern white cedar as leave trees. This would result in improved stand quality as tree vigor, allowing residual trees to increase in size and value due to increased availability of soil nutrients, moisture, and sunlight. This stand is mostly balsam fir, and would remain M4. The remaining balsam fir should have increased vigor and should be able to survive an infestation of the spruce budworm.

Late seral

Stand clearcutting with leave trees (Needs 1, 2, and 7). An even-aged regeneration or harvest method that removes most trees in the stand producing an exposed microclimate for the development of a new age class in one entry. A minor (less than approximately 10% of full stocking) live component is retained for reasons other than regeneration. Even-aged regeneration cuts such as clearcuts would regenerate mature stands to healthy, vigorous, young stands. Approximately 117 acres that are near Brevoort Lake Campground and the gas pipeline would be clearcut, mechanically site prepared, and planted with red pine (J3/4 to L1). Red pine is more desirable in these areas as it is a long lived conifer. Its rotation age is up to 160 years, as opposed to jack pine's maximum rotation age of 70 years (FP p. 2-12). An additional 127 acres of Jack pine would be clearcut, mechanically site prepared, and planted with a mixture of species.

Commercial thinning (Needs 1 and 7). Approximately 24 acres of mature aspen would be removed from an aspen hardwood mixed stand. Other species may be cut as needed to create growing space. This would move the seral class from A4 to L3.

Shelterwood with reserves (Needs 1, 3, and 7). Shelterwood cuts would retain a residual overstory of approximately 40-50% crown cover of well-spaced leave trees to limit damage from white pine weevil (Hamid et al. 1995). Any white pine or hemlock would be retained as leave trees. No overstory removal would be planned.

Approximately 217 acres of jack pine would receive shelterwood with reserves regeneration cut, and mechanical site preparation. These stands would be planted with white pine and hemlock moving them from J4/J3 to L1. This would also meet Need 2.

Approximately 114 acres of mature aspen and paper birch would receive a shelterwood regeneration cut to release some existing white pine, and regenerate paper birch. If sufficient amount of advanced white pine regeneration does not survive, these acres may be mechanically site prepared and planted with white pine. This proposed treatment would create L2 if sufficient advanced regeneration survives or L1 if white pine is planted. Also, the number of aspen acres in ELT 10/20 would be reduced.

Single-tree selection cut (Needs 1, 3, 4, and 7). Approximately 175 acres of northern hardwood stands would receive single-tree selection harvests. This harvest method would change the management of approximately 77 acres from even-aged management system to the

uneven-aged management system, and continue the uneven-aged management system on the other 98 acres. Canopy gaps would favor the establishment of northern hardwood species such as sugar maple, yellow birch, and hemlock; depending on site conditions and existing species composition. The canopy gaps would mimic the natural windthrow, gap-phase disturbance. Approximately three canopy gaps 50-75 feet in diameter would be created per acre, although stands with high infestations of BBD may have more. The canopy gaps may need to be site prepared with handtools to discourage sprout origin beech.

Table 3-18 shows the forestwide percentage and Forest Plan desired percentage of vegetation, for ELT and Size Class, by Seral class. The table displays the Forestwide (FW) percentage before and after the project, and the Forest Plan (FP) percentage goals (Min/Max - minimum/maximum). The table shows Proposed Action changes to vegetative composition as it relates to FP vegetation goals (Need 1.). The primary method to increase percentages in size classes 2-5 to allow stands to grow into them.

Table 3- 18. Forestwide desired vegetation composition for MA 6.4.

		Aspen		Jack Pine		Late Seral		Mid Seral	
ELT	Size Class	FW % Before/ After	FP Goals Min/Max %	FW % Before/ After	FP Goals Min/Max %	FW % Before/ After	FP Goals Min/Max %	FW % Before/ After	FP Goals Min/Max %
10/20	1	0/0	0/1	0/1	0/2	0/8		0/2	
	2	0/0	0/3	0/0	0/6	0/0		0/0	
	3	3/2	0/3	8/5	0/6	3/3		4/4	
	4	10/9	0/1	12/7	0/2	29/29	10/30	19/19	
	5	0/0		0/0		0/0	10/30	0/0	
40/50/90	1	0/3	2/5	0/0		0/0		0/4	
	2	4/4	3/8	0/0		0/0		0/0	1/5
	3	5/5	3/8	0/0		5/5		11/11	3/10
	4	10/8	2/5	0/0		25/24	10/20	33/27	7/15
	5	1/1		0/0		0/2	10/20	0/0	
60	1	0/1	2/5	0/1		0/1		0/1	1/5
	2	4/4	8/12	0/0		0/0		6/6	3/8
	3	4/4	10/15	4/2		4/4		14/13	6/12
	4	10/10	3/8	3/2		11/11	10/20	30/28	10/20
	5	0/0		0/0		0/0	10/20	3/3	
70B	1	0/1	1/5	0/0		0/0		0/1	
	2	4/4	5/10	0/0		0/0		7/7	
	3	3/3	6/12	0/0		7/7		17/17	
	4	7/7	1/5	0/0		18/18	15/20	32/31	
	5	0/0		0/0		0/0	5/10	0/0	

The shaded cells are the areas where a particular seral class moved closer to the forest wide vegetation composition goals.

In ELT 10/20, both aspen and jack pine were identified as needing treatment. While not enough A1 would be created to have an impact on forest-wide vegetation composition, enough A4 would be cut. Approximately 115 acres of aspen would be treated to create L1 and 26 acres of

M1. The size class distribution was improved within the jack pine seral class. Most of the jack pine cut would be regenerated to late seral species due to Need 2.

In ELT 40/50/90, there are needs statements for aspen, mid seral, and late seral classes. The amount of A4 would be decreased, but not enough to fall within the forest-wide goals. On the other hand, enough A1 would be created to do so. M4 was decreased and M1 increased. Also, 58 acres were cut to create A1. L5 is showing a 2% increase due to the removal of enough small trees to increase the average diameter enough to qualify as A5. What Table 3-18 does not show is that 361 acres of L3 and L4 would be treated, eventually resulting in L4 and L5 due to increased availability of soil nutrients, moisture, and sunlight.

ELT 60 also has aspen, mid seral, and late seral class needs. A1 would be increased to 1%, which is still short of the 2% minimum goal. Both M3 and M4 were decreased, and M1 increased (see table 3-18 for percentages). There are 83 acres of mid seral that would be converted to A1 and 7 acres to L1.

Aspen and mid seral classes were identified in ELT 70B as needing treatment in Need 1. As Table 3-18 shows A1 would be increased, but none of the other size classes would be affected in the short-term. Forty eight acres of M4 would be converted to A1.

In ELT 80B, 27 acres of M1 would be created. While this would not be enough to meet the forest-wide goal, it does move it in the correct direction.

Need 3 calls for increased diversity in mast species, white pine, and hemlock. This would be met by regenerating red oak, a mast species, on 147 acres, hemlock on 236 acres, and white pine on 438 acres.

3.8.5.2 Cumulative Effects

Vegetation Composition Cumulative Effects. Appendix F is a table that lists past and current projects that have occurred, are occurring, or soon to occur on Forest Service land within Shores project area, and on the Eastside of the HNF. Sprinkler EA (Spout Timber Sale (TS), Nozzle TS, Irrigation TS, Duct TS, and Cask TS) is the only current project in MA 6.4. The cumulative effect of these vegetation treatments along with the Proposed Action would be movement towards the Forest Plan vegetation composition goals. The new Rudyard EA project area will include MA 6.4, but there are no proposed treatments within MA 6.4.

General Vegetation Cumulative Effects. There have been several timber sales in and around the project area over the past 15 years and there will continue to be timber sales proposed in the future. Timber management will also occur on private landholdings. Based on past management activities, it is presumed that even-aged management for aspen and uneven-aged management for northern hardwoods will continue to occur in the future on private landholdings. This will result in a continuation of healthy young aspen on non-federal lands, and promote larger size trees in northern hardwoods.

Michigan Department Natural Resources harvest for the Sault Ste. Marie and Newberry Forest Management Units in Chippewa and Mackinac counties are approximately 4,200 to 7,100 acres per year based on proposed treatments in 2007 and 2009 timber harvest reports (MDNR). These harvest activities include clearcuts, clearcuts with reserve trees, shelterwood cuts, thinning, and selection cuts in all Lake States forest types. This will result in a wide variety of seral classes and size classes throughout the state lands.

Private lands within the project area are predominately small tracts less than 40 acres in size. While some harvesting activities have taken place and will continue to take place on private lands, the activities play a minor part in the cumulative effects of harvesting in the area.

Industrial forested lands in Mackinac and Chippewa counties are dominated by Plum Creek. Several of their stands are managed predominately for red pine pulpwood. Many of their northern hardwood stands are dominated by beech that is heavily infested with BBD. Plum Creek salvaged most of these stands in the past five years. This management direction on private and industrial forested lands will most likely continue in the future.

Thinning and selection cuts on all lands containing ash species would reduce the risk of EAB infestations. Also, thinning and selection cuts would maintain or improve stand vigor, allowing the stands to be more resistant to other insect and disease outbreaks (Perkins 10/17/06 and Perkins 04/03/09). Harvesting in mature and over mature stands would continue to address forest health concerns. The long-term trend would be a continued improvement in forest health conditions as management moves toward desired vegetation goals.

3.8.6 No Action

3.8.6.1 Direct and Indirect Effects

The No Action would involve no new management activities in the project area. Aging aspen, paper birch, and mixed stands would follow natural successional pathways and would likely convert to understocked stands of M1, M2, A1, or A2 depending on site conditions and existing species composition.

Northern hardwoods and lowland hardwoods would continue to be overstocked. There would be an increased susceptibility to insect and disease infestations. The BBD and EAB hazard would not be reduced (Perkins 10/17/06 and Perkins 04/03/09). Gaps would form where BBD and EAB kill trees, and within the rest of the stands tree growth would stagnate as trees compete for available light, nutrients, and water. Stands with low beech and ash components would slowly move into L5. Stands with high components of beech and ash would convert to L1. Beech thickets would result from no management of the regeneration, and these stands would probably not move past L3 before succumbing to BBD again.

Forest types with large percentage of balsam fir, such as forest type 11 and white spruce-balsam fir-Norway spruce would continue to be impacted by spruce budworm. Balsam fir mortality in mature stands historically ranges from 70% to 100%, and in immature stands 30% to 70% (Flexner et al. 1983). These stands would regenerate depending upon ELT and forest type (FP FEIS p. 3-61). The most likely result is M1.

The merchantable potential of the majority of the timber would decline due to interior degradation of wood fiber. Gradually declining stocking levels would further limit marketability, as scattered timber and low volumes in timber sales impact a timber producer's profitability. The stands around Brevoort Lake Campground would continue to be jack pine stands. Need 1 would be partially met, but No Action would fail to fully meet Need 1. Needs 2, 3, 4, & 7 would not be met at all. Some late seral stands would grow into L5. Eventually some of the jack pine stands would burn and reproduce to J1.

3.8.6.2 Cumulative Effects

Cumulative effects only occur when a project's direct and indirect effects are added to other past, present, and reasonably foreseeable future actions. Since the No Action does not have any vegetation projects planned, there are no cumulative effects that would result from the implementation of this alternative.

3.9 NON-NATIVE INVASIVE PLANTS

Table 3- 19. Non-native Invasive Species Summary of Effects

Activity or Measure	Proposed Action Effects	No Action Effects
Canopy removal activities	Increases open, sunny conditions favorable to NNIP establishment by approximately 1,577 acres.	No change
Mechanical site preparation	Disturbs soil and creates ground for NNIP to establish in approximately 762 acres.	No change
Road construction	Creates approximately 8 miles susceptible to NNIP spread.	No change
Road decommissioning	Stops vehicular NNIP seed spread on up to approximately 10 miles.	No change
Construction and use of log landings or "back-ins"	Creates 20 areas susceptible to NNIP spread.	No change
Install seasonal gate closures at two snowmobile trail entry points	Reduces soil disturbance and NNIP seed spread by OHVs on approximately 3 miles	Illegal OHV use continues on ungated snowmobile trails during growing season
Scotch pine removal on dunes (up to 2,000 trees)	Reduces seed source and NNIP spread	Spread and growth of Scotch pine continues on US 2 dunes

3.9.1 Introduction

Based on comments received from the public during scoping, non-native invasive plants (NNIP) were not identified as a significant issue.

Several plants from the HNF NNIP list are known to occur within the project area. It is likely that over time, NNIP have been intentionally and unintentionally introduced into the area. Because they lack pathogens and predators, some plants have become persistent, aggressive invaders of disturbed habitats and native plant communities. They may become the dominant component of vegetation, thus reducing native plant diversity and impacting ecosystem habitat. NNIP can displace native plants and alter habitat conditions to reduce capacity to support healthy ecosystems (Mack et al. 2000). Once introduced, NNIP can spread rapidly under certain conditions, sometimes into undisturbed habitat. The effects on the native habitat may not be evident until decades after weeds are introduced. Invasive plant control methods are available on the HNF, but prevention is the most effective.

Overall, the risk of NNIP infestation resulting from the project is moderate. Although several occurrences of high priority species exist in the area, they are typically found in disturbed settings and along roadsides. Species that are present would be prevented from spreading into

new areas by preventative measures such as cleaning of off-road timber harvest equipment and control of invasive plants within gravel pits used for road maintenance. Additionally, ongoing and future control measures would be implemented on forest lands under the HNF NNIP Control Project (USDA 2007a) and the current Forest-wide NNIP Treatment Project currently being analyzed. The Forest Plan provides NNIS direction and management guidelines (reference).

The risk (high, moderate, or low) that each project activity poses to the introduction and spread of NNIP is analyzed in section 3.7.5.1 below and summarized in Table 3-20. Low risk activities do not cause much ground disturbance or overstory habitat alteration. As a result, low risk activities are less likely to alter the resiliency of the landscape to resist NNIP invasion. Conversely, high risk activities are those that are generally both ground disturbing and result in open habitats through overstory vegetation alteration. High risk activities provide a combination of prepping the soil for seeds to establish while also providing high quantities of available light that most NNIP thrive in. Moderate risk treatments are those that either lack one facet of ground disturbance or vegetation alteration, or that have both facets in a low magnitude.

Table 3- 20. Summary of Risk of Non-native Spread

Factors Contributing to the Spread of NNIP	Proposed Action	No Action
Timber harvest (includes site prep)	High	None
Road construction	Moderate	None
Road decommissioning	Low	Low
Log landings	High	None
Recreation (includes OHV use and snowmobile trail gates)	Moderate	Low
Scotch pine removal	Low	Moderate

3.9.2 Analysis Methods

NNIP inventories were conducted throughout the proposed activity areas in 2008 and 2009, concurrently with rare plant surveys. Known locations were mapped in the Forest Service Natural Resources Information Systems (NRIS) Invasives database, which houses the most current location information about NNIP infestations. Survey results and NNIP maps are included in the project record. Survey information for NNIP infestation can never be considered complete, because it is not practical to inventory every acre, and because NNIP conditions frequently change based on their rate of spread, the suitability of their habitat, and the results of treatment. Updated NNIP maps would be used during the implementation phase of the Shores project.

The project record contains references that reflect the best available science for NNIP analysis. These include papers, literature reviews, and results of ground-based observations. The Forest-wide NNIP Control Project EA (USDA 2007a, pgs 30-31) also provides documentation of NNIP conditions on the HNF.

Activities which lead to physical transport and introduction of NNIP seeds and plants were analyzed and used as indicators of the potential changes in the number of NNIP infestations. These activities include timber harvest activities, road construction, road decommissioning, log landings, and recreational use. The risk (high, moderate, or low) that each activity poses to the introduction and spread of NNIP is analyzed by each alternative below, and summarized in Table 3.20 above. The proposed treatment of Scotch pine is also analyzed, not because it poses a risk of spread like the other activities, but because it provides a reduction of infestation.

3.9.3 Analysis Areas

Project effects will be analyzed for all proposed activity areas that result in ground disturbance. Effects of NNIP spread on the native landscape would occur within areas proposed for harvest, road construction, road closure, and log landing construction. Additionally, effects of NNIP spread from recreation use are also considered, as well as proposed reduction of spread from Scotch pine removal. In considering access roads to project activity areas, increased traffic and potential increase in recreational use would occur on a larger scale; therefore, the spatial boundary of the direct and indirect effects analysis is the entire project area. This also includes areas that would most readily be reached by NNIP seeds via natural and human vectors. Weed seeds can be transported on equipment, but this scale is unpredictable and cannot be readily limited. Transport of seeds and plant parts is most likely near the source.

The spatial boundary for cumulative effects for NNIP is Mackinac County. This area was chosen as the area most likely to have past, present, and reasonably foreseeable future projects contributing to NNIP establishment or spread in the project area because of proximity. The Great Lakes form natural barriers to terrestrial invasion on the entire south side of the cumulative effect boundary. Activities on state and private lands outside of the HNF boundary within Mackinac County are expected to contribute to cumulative effects.

The temporal boundary used for the cumulative effects analysis is 15 years from the signing of the decision notice for the Shores project. This is when all project activities are expected to be complete. This is an approximation of when direct and indirect effects of the proposed activities on soils and native landscape would result in cumulative effects. The time frame for NNIP continued presence varies widely between species. The process of invasion of new areas by NNIP would not stop at 15 years, but predictions about effects become increasingly speculative in longer time frames. Also, after 15 years, succession would change habitats, and eventually some infestations of sun tolerant invasive plants would be shaded out. Projects that have been implemented over the past 15 years are considered and any reasonably foreseeable projects (applicable projects currently on the Schedule of Proposed Action) that are expected to contribute to cumulative effects over the next 15 years are also considered (Appendix F).

Photo 2. Spotted knapweed growing along the lakeshore.

3.9.4 Affected Environment

Areas of recent soil disturbance or areas that are kept permanently in an early seral condition provide suitable habitat for most NNIP species. Areas where NNIP commonly occur are gravel pits, powerline and pipeline corridors, parking areas, campsites, and trails. The vast majority of NNIP populations on the HNF occur on roadsides, in skid trails, at landings, on temporary roads, and other disturbed areas. Few NNIP occur in undisturbed native plant communities and infestations of NNIP are typically not in the interior of heavily forested stands.

Photo 3. A group of volunteers with bags of weeds they have pulled.

The HNF has developed a list of NNIP species to be inventoried and controlled which can be found in Appendix G (HNF Non-native Invasive Plant List – 4/14/2008). The list represents the most threatening NNIP to ecological systems. No systematic Forest-wide inventory for NNIP occurrences has been completed.

Species known to occur in the project area include spotted knapweed, wild parsnip, Canada thistle, common St. John's-wort, common tansy, leafy spurge, marsh thistle, smooth brome, and sweetclover. These species are typically found on roadsides of major roads and highways in the project area. Highway 134, U.S. Highway 2, Mackinac Trail, and I-75 are all major roadways within the project boundary that have numerous populations of NNIPs and also provide a corridor for the transport of weed seeds and plant material. Open sand or gravel beaches and shorelines are also typical areas for weeds to become established and spread. Horseshoe Bay Wilderness and Point Aux Chenes cRNA have populations of spotted knapweed along the open sand beaches. Gravel beaches harbor white sweetclover, common St. John's-wort, common tansy, and marsh thistle (Cantway 2007). A program of hand-pulling weed removal in Pointe Aux Chenes cRNA has taken place in 2007-2009 to improve dune habitat.

Purple loosestrife, an aggressive wetland invader, occurs in limited amounts on private lands in the project area. One small infestation on the HNF, occurring at the mouth of the Carp River fishing access site, has been successfully eradicated by several years of hand-pulling. One small infestation of Japanese knotweed occurs on Brevoort Lake Road in the project area. This site has been treated in 2008 and 2009, and is not near any proposed activities that would contribute to the spread of this species. There are no activities proposed in the Shores project that would affect the spread of NNIP that colonize aquatic ecosystems, such as Eurasian water-milfoil; therefore, there will be no further analysis of this species.

3.9.5 Proposed Action

3.9.5.1 Direct and Indirect Effects

Invasive species have been identified as the second greatest threat to rare species after habitat destruction (Wilcove et al. 1998). NNIP can lead to habitat changes that are harmful to native

plants including TES plant species. As NNIP become established and are spread, they impact native plant species and ecosystems by introducing competition for sunlight, nutrients, moisture, and growing space (Mack et al. 2000). Some NNIP impact native plant species by allelopathic interactions; that is, the production and release of plant compounds that inhibit the growth of other plants (Inderjit et al. 2008). Once established, NNIP could also indirectly impact TES plant species by changing the fire regime (Brooks et al. 2004). Subsequent NNIP control efforts such as hand-pulling, mowing, or herbicide application could also impact TES plants.

The overall impacts to ecosystems include: displacing native plants and animals; reducing plant diversity; changing the structure of native terrestrial and aquatic plant communities; disrupting aquatic food webs; disrupting hydrologic processes of wetlands; increasing erosion; impacting recreational use of lakes and rivers; altering fuel loads for wildland fire potential; and altering soils and soil processes. These impacts are considered in each type of activity addressed below.

NNIP infestations are directly correlated with the amount of soil disturbing activities, as disturbed soil provides a place for weed seeds to germinate and new populations to become established (Hansen and Clevenger 2005). Additionally, removal of forest canopy results in open conditions favorable by many NNIP species. Because existing NNIS populations are already established, accidental further spread is possible.

Prevention measures, including off-road equipment cleaning and project design criteria, are expected to mitigate the spread of NNIP and are taken into account when analyzing anticipated effects. Implementation of Forest Plan guidelines for NNIS and the National Forest Service NNIS Strategy would also help minimize the spread of many species (FP, p. 2-22; USDA 2004). As new occurrences of NNIS are found, actions would be designed to eradicate, suppress, contain, or monitor new populations, as appropriate.

Timber Harvest Activities. Timber harvest activities in the Proposed Action have the potential to transport seeds and plant parts into and throughout the timber sale area by vehicles and equipment. Canopy removal activities also create soil and light conditions conducive to establishing and spreading NNIP. Soil disturbance and removal of competition from other native plants provides an opportunity for NNIP to establish. The level of soil disturbance from timber harvest is directly related to the amount of timber removed, what equipment is used, and the time of year the timber is harvested. Winter logging would be required for some stands with a high water table and stands with wetland swales (Appendix B). The use of equipment during snow-on conditions would reduce soil disturbance and subsequent NNIP invasion in approximately 456 acres in the Proposed Action.

Clearcutting leads to the highest risk for NNIP spread because of the amount of traffic over the land and the high level of soil disturbance associated with mechanical site preparation. Soil disturbance associated with canopy removal may create conditions that favor the establishment of early seral (i.e. pioneer) species (Meier et al. 1995). Shelterwood and seed-tree removal harvests create the next highest risk, while selection and thinning harvests contribute the lowest risk of NNIP spread. Uneven-aged management risks introduction of NNIP into areas time after time, but the disturbance level of this management exposes less soil than even-age regeneration harvest. The canopy reduction caused by thinning is transient (about five years). In a thinned stand, the remaining trees provide some shade continuously, and shade increases as the canopy fills in.

Approximately 85% of the treatments in the Proposed Action are clearcutting and shelterwood/seed tree harvests. Approximately 48% of the treatments would have subsequent mechanical site preparation. For the Proposed Action, the resulting risk of NNIP spread from timber harvest activities and site preparation is considered high.

Road Construction. Road construction provides a vector for NNIP spread through transport by equipment and vehicles onto newly disturbed soil. Roads provide dispersal of invasive plants via three mechanisms: providing habitat by altering conditions, making invasion more likely by stressing or removing native species, and allowing easier movement by natural or human vectors (Hansen and Clevenger 2005). The resulting increased vehicle traffic also creates a vector for the spread of NNIP. The approximate eight miles disturbed by road construction is used to measure the effect of the project on NNIP spread; however, the actual acreage is much less because all roads do not become infested with NNIP.

Project design criteria require that trees adjacent to roadsides would be retained in selection and thinning harvests to maintain shade and reduce establishment of NNIP. In the short-term (0-5 years), there would be a likely temporary increase in NNIP effects along roadsides in response to disturbance of native plant communities. New and temporary roads built on or near wetlands would result in a potential area for wetland NNIP such as reed canary grass, common reed, marsh thistle, and purple loosestrife to establish. Temporary roads would be closed when the sale is completed, and the risk of weed introduction then decreases in proportion to the reduction in disturbance from traffic. In the long-term (5-15 years), shaded conditions would return, thereby reducing the suitable conditions for sun-loving NNIP species, specifically spotted knapweed, wild parsnip, common St. John's-wort, and sweetclover.

Construction supplies such as sand and gravel provide a source for transport of NNIP plant parts and seeds. Forest Plan guidelines require the use of gravel from stored gravel piles that have programs for invasive species management. Therefore, construction that requires addition of gravel or other pit materials to the site poses a low risk of NNIP introduction. One HNF gravel pit occurs in the project area (Castle Rock pit) but is currently inactive. Material would be obtained from other HNF pits outside the project area, but with active NNIP control programs in place. Non-native invasive plants in the eastside of HNF pits were treated with herbicides in 2008 and 2009. Overall, because of design criteria and HNF Forest Plan guidelines, the Proposed Action would result in a moderate risk of NNIP introduction and spread from road construction.

Road Decommissioning. Road decommissioning is an indicator of reduced NNIP spread, because traffic is removed as a vector, and rehabilitation to a forested condition over time is less conducive to NNIP proliferation. In general, roads closed would gradually revegetate and convert back to native plant community types. Approximately 11 miles of roads are proposed for decommissioning in the Proposed Action. The net effect from these actions would be a decrease in the amount of disturbed habitat for NNIS to occupy. It also reduces opportunity for vehicle traffic or OHV use along these corridors to spread NNIS to other locations. These effects would lower the risk of future NNIP impacts. Therefore road closures pose a low risk of NNIP spread.

Log Landings. The development and use of log landings can increase NNIP populations by providing disturbed soil and open conditions for plants to establish. This activity is considered a high risk for weed invasion, considering that log landings would most likely be in previously undisturbed areas.

Photo 4. An illegal OHV Trail

Recreation Activities. Ongoing recreation activities such as hiking, camping, fishing, and hunting result in a low risk of disturbance and spread of NNIP. Dispersed recreation throughout the area is likely to have effects that are small in magnitude and short in duration.

Areas with high recreation use are more prone to establishment of invasive plants due to transport by people and their recreational equipment, such as OHVs (Rooney 2005). There are no proposed increases in recreation facilities or trails in the Shores project. However, the increase of temporary timber harvest roads may lead to temporary unauthorized motorized vehicle use (see section 3.11, Recreation). Off-highway vehicle impacts could include erosion of steep slopes, dislodging vegetation, compaction and displacement of soils, and transferring NNIP seeds. Although the HNF Forest Plan provides OHV direction, continued unregulated OHV use in some parts of the project area would likely continue despite control efforts and regardless of project activities. However, installation of gate closures at two snowmobile trail entry points is proposed to keep the snowmobile trail closed to vehicle use during non-winter months. This action would decrease soil disturbance and NNIP seed transport by OHVs on approximately 3 miles. Overall, unregulated OHV use poses a moderate risk of NNIP spread.

Scotch Pine Removal. This proposed treatment is an indicator of reduced NNIP spread, because seed source would be removed and rehabilitation to natural dune conditions over time would occur. These effects would lower the risk of future NNIP impacts in the project area. Therefore Scotch pine removal poses a low risk of NNIP spread.

3.9.5.2 Cumulative Effects

Because the cumulative effects spatial boundary is Mackinac County, several past, present, and reasonably foreseeable Forest Service projects have potential to affect the spread of NNIP. These projects are listed in Appendix F. The most recent timber management projects include East Red Pine 2, Sprinkler, and Rudyard EAs. Timber harvest, road construction, and road maintenance are sources of disturbance that can alter vulnerability to NNIP invasion. These activities affect the spread of invasive plants by removing forest canopy and creating exposed soil and disturbed sites which are favorable for establishment. Vulnerability to NNIP invasion and establishment is greatly influenced by existing plant cover, soil cover, and overstory shade. These factors vary widely across the cumulative effects boundary.

Non-federal ownership may contribute cumulative effects to NNIP spread because private owners are not required to follow the protective measures developed for Forest Service activities. Non-native invasive plant populations are expected to increase on non-federal lands unless control measures are implemented. On private lands in the cumulative effects area, new roads, soil disturbance, and increased recreational use may be expected to accompany population growth. Road maintenance on federal and non-federal lands is an activity that would likely continue indefinitely. Non-federal gravel sources likely do not have weed treatment programs. Overall, conditions favorable for the establishment of NNIP have probably increased in the cumulative effects area and probably would continue to increase into the future.

Some NNIP species are still expanding their ranges into the cumulative effects area. In the project area, there would be a continuing risk over the next 15 years that weed species new to the local area would be introduced. Species such as buckthorns, Japanese barberry, and garlic mustard are not currently known to occur in the project area. These species may be introduced either by long distance transport by equipment of all kinds or by gradual expansion of established populations by natural means. The Proposed Action would contribute to this cumulative effect by the creation of conditions favorable for establishment and transport. This risk would increase in proportion to the use of recreational, road building, or logging equipment in the area that may carry soil, plant parts, or seeds from an infested area. Consequences of introduction and spread of new species could include loss of habitat for native plant species and other species dependant on these plants.

Off-road equipment cleaning is required for all Forest Service timber harvest, which would be implemented on all present and reasonably foreseeable future projects (Moore 2004). These actions combined with equipment cleaning for Shores timber sale units would continue to mitigate the spread of NNIP from timber harvest activities in the project area.

The HNF Non-native Invasive Plant Control Project EA (USDA 2007a, pgs 30-31) describes mechanical, chemical, and biological treatment methods and protocol approved for Forest-wide use over the next several years. Ongoing NNIP treatments under that DN would reduce the spread of invasive plants throughout the project area. Also, a site-specific NNIP Treatment Plan is currently being analyzed to control additional acres in Mackinac County. Invasive species treatment will likely continue on the HNF indefinitely.

Regardless of project activities, infestations of NNIP would continue to exist at various densities and population sizes. Non-native invasive plants would continue to spread in the project area as a result of present and reasonably foreseeable actions of HNF and private lands. The effects of NNIP would continue to be concentrated in developed or disturbed areas, as opposed to undeveloped forest lands. Most invasive plants occupy disturbed sites; therefore projects that create soil disturbance can facilitate their spread. As NNIP spread through the forest, infestation at formerly uninfested sites becomes more likely, and control becomes more difficult and expensive. Therefore, maintenance of infestations at their current levels is expected to require increasing effort in the future as NNIP spread elsewhere. The cumulative effects of current conditions and ongoing activities result in a moderate vulnerability to NNIP invasion.

3.9.6 No Action

3.9.6.1 Direct and Indirect Effects

Under the No Action, timber harvest would not occur and no roads would be constructed as a result of the project. No road decommissioning would occur, which would result in a low risk of NNIP spread considering these roads would be left open. Road maintenance and control of NNIP would continue at its present level. Weed infestations would likely remain at approximately their current levels, since no new areas would be disturbed. Non-native invasive plants spread would still likely continue at the current rate along roads, OHV trails, recreation sites, and disturbed openings despite control efforts. Therefore recreation activities in the No Action alternative would still pose a low risk to NNIP spread. Scotch pine removal on the US 2 dunes would not take place and spread of this species would continue, resulting in a moderate risk of NNIP spread. Although it proposes no Scotch pine treatment or road decommissioning, the No Action alternative presents the least risk of NNIP spread in the project area.

3.9.6.2 Cumulative Effects

There are no activities in this alternative that would contribute to cumulative effects because there are no direct or indirect effects from project activities.

3.10 THREATENED, ENDANGERED, AND SENSITIVE (TES) PLANTS

Table 3- 21. TES Plant Summary of Effects

Activity or Measure	Proposed Action Effects	No Action Effects
Canopy removal activities	Changes light and moisture regimes, alters habitat in approximately 1,577 acres.	No change
Mechanical site preparation	Disturbs soil, duff and/or moss layer; disrupts mycorrhizae in soil: approximately 762 acres.	No change
Road construction	Reduces habitat, some of which may be suitable, by approximately 8 miles (approximately 19 acres).[1]	No change
Road decommissioning	Potential recovery of habitat on approximately 11 miles.	No change
Construction and use of log landings or "back-ins"	Creates 20 areas with soil disturbance and potential reduction of habitat	No change
Install seasonal gate closures at two snowmobile trail entry points	Reduces potential habitat disturbance and NNIP seed spread by OHVs on approximately 3 miles	Illegal OHV use continues on ungated snowmobile trails during growing season
Scotch pine removal on dunes (up to 2,000 trees)	Reduces NNIP spread; improves TES plant habitat for up to 7 species	Spread and growth of Scotch pine continues on US-2 dunes

[1]Roads acreage calculated by using a 20 ft. road width.

Table 3- 22. Summary of Determination by Alternative for TES Plants in the Shores Project Area

Determination	Proposed Action (No. of Species)	No Action (No. of Species)
No impact (NI) to RFSS	21	49
Beneficial impact (BI) to RFSS	2	0
May impact individuals but not likely to cause a trend toward federal listing (MINLTF) RFSS	31	5
No effect (NE) to federally listed species	2	5
Not likely to adversely affect (NLAA) federally listed species	3	0

3.10.1 Introduction

Based on comments received from the public during scoping, TES plants were not identified as a significant issue. The HNF Regional Forester Sensitive Species (RFSS) list contains 76 plants (USDA 2006d). Many of these species are inherently uncommon because of limited suitable habitat; they are at the edge of their range or are relict species from previous climatic conditions. The Shores Project Biological Evaluation (BE) describes the process of identifying which TES plants have potential to occupy areas that would be affected by project activities (BE p. 38).

Due to the varying types of wetland and upland habitat, and the presence of two Great Lakes shorelines, there are a large number of TES plants known to occur or to have suitable habitat within the project area. Analysis of the project area resulted in 24 RFSS plants documented to occur within the project area boundary and 30 RFSS plant species with suitable but unoccupied habitat (BE Table 20). These species were analyzed in detail for potential project effects in the BE because the habitat in the project area is considered suitable. However, most habitats would not be affected by project activities and there are only three species that occur in proposed activity areas. They are northern wild comfrey, walking fern, and calypso orchid, all of which would be avoided by the implementation of project design criteria. Three federally listed species are also included in the analysis: Pitcher's thistle, lakeside daisy, and Houghton's goldenrod.

The project would have no impact on 22 RFSS plant species and no effect on two federally listed plants without suitable habitat in the project activity areas (BE Table 23). These species would have no direct or indirect effects as a result of the No Action or Proposed Action and they will not be discussed further.

The Shores BE provides the following determinations as to whether the project would: have no effect (NE), not likely to adversely affect (NLAA), or likely to adversely affect (LAA) for federally listed species; have no impact (NI), beneficial impact (BI), may impact individuals but not likely to cause a trend to federal listing or loss of viability (MINLTF), or likely to result in a trend toward federal listing or loss of viability (LTF) for RFSS plants. Table 3-23 below summarizes determinations by species and Table 3-22 above gives a summary by alternative.

Table 3- 23. Summary of Determinations by Species for TES Plants with Suitable Habitat in the Shores Project Area

Species	Occupied (O) or Unoccupied Habitat (U)	No Action	Proposed Action
Federally Threatened Plants			
American hart's tongue fern	No habitat	NE	NE
Pitcher's thistle	O	NE	NLAA
Dwarf lake iris	No habitat	NE	NE
Houghton's goldenrod	O	NE	NLAA
Lakeside daisy	U	NE	NLAA
Regional Forester Sensitive Species			
Allegheny vine	O	NI	NI
Walking fern	O	NI	MINLTF
Green spleenwort	O	NI	MINLTF
Canadian milk-vetch	U	NI	MINLTF
Cooper's milk-vetch	U	NI	MINLTF
Prairie moonwort	U	MINLTF	MINLTF
Michigan moonwort	U	MINLTF	MINLTF
Goblin moonwort	U	NI	MINLTF
Blunt-lobed grapefern	U	NI	MINLTF
Pale moonwort	U	MINLTF	MINLTF
Ternate grapefern	U	MINLTF	MINLTF
Spathulate moonwort	U	MINLTF	MINLTF
Calypso orchid	O	NI	MINLTF
Beauty sedge	O	NI	MINLTF
New England sedge	U	NI	MINLTF

Species	Occupied (O) or Unoccupied Habitat (U)	No Action	Proposed Action
Richardson sedge	U	NI	MINLTF
Bulrush sedge	O	NI	MINLTF
Douglas' hawthorn	U	NI	MINLTF
Slender cliff brake fern	O	NI	MINLTF
Northern wild comfrey	O	NI	MINLTF
Ram's head lady-slipper	O	NI	MINLTF
Laurentian bladder fern	O	NI	MINLTF
English sundew	U	NI	NI
Spreading wood fern	U	NI	MINLTF
Male fern	O	NI	MINLTF
Flatstem spikerush	U	NI	NI
Blue wild-rye	U	NI	NI
Black crowberry	O	NI	NI
Hyssop-leaved fleabane	O	NI	NI
Limestone swamp bedstraw	U	NI	MINLTF
Boreal bedstraw	U	NI	NI
Limestone oak fern	O	NI	MINLTF
Downy sunflower	O	NI	NI
Fir clubmoss	O	NI	NI
Butternut	U	NI	MINLTF
Moor rush	O	NI	NI
Vasey's rush	U	NI	NI
American dune grass	U	NI	NI
Small flowered woodrush	U	NI	NI
White adder's mouth orchid	O	NI	NI
Woodland cudweed	U	NI	NI
Rayless mountain ragwort	U	NI	MINLTF
Butterwort	O	NI	NI
Canada rice-grass	U	NI	NI
Pinedrops	O	NI	MINLTF
Lapland buttercup	O	NI	NI
Prairie dropseed	U	NI	NI
Long-stalked stitchwort	O	NI	BI
Lake Huron tansy	O	NI	BI
Veiny meadow rue	O	NI	NI
Spongy gourd moss	U	NI	MINLTF
Dotted line lichen	U	NI	MINLTF
Luminous moss	U	NI	MINLTF
Little Georgia moss	U	NI	NI

3.10.2 Analysis Methods

Botanical surveys for the Shores project took place in May through September of 2008 and 2009, with additional site reconnaissance in 2007. Field surveys were carried out by an experienced botanist using the meander method (Goff et al. 1982). The method is a procedure for conducting a floristic examination of sites to determine the presence or absence of listed species and includes the preparation of a general plant species list for each area. Using this method, the surveyor chooses a route that meanders through the target area to cover all

possible variation that is likely to occur in the unit being surveyed, to capture both typical and unique ecological conditions. The route is repeated at appropriate seasons for identifying potential listed plants. Proposed activity areas were picked for survey by priority according to potential for occurrence of listed plants.

Rare plant surveys took place in approximately 93% of the Proposed Action stands. A map of areas surveyed and the survey reports are included in the project record. Some proposed new road construction areas were not surveyed because exact routes were not identified during field season. Non-native invasive plants were also included in the surveys. This percentage represents the percent of stands surveyed; it is important to note that it is not feasible to survey every acre of the stand. There is a chance that species could be overlooked during inventories, or missed due to dormancy periods, drought, and other factors. For this reason, the effects of the project on potential undetected individuals and suitable unoccupied habitat were analyzed as well as the occupied habitats. Additionally, boulders and other outcrops of exposed limestone occur in large quantities throughout the affected environment, providing suitable habitat for a number of RFSS ferns. An accurate map of the limestone features was not available at the time of surveys, so areas of habitat could have been overlooked. Efforts were made to check large concentrations of boulders and other areas of outcrops, but because of the scattered and concealed nature of these geologic features, species could have been overlooked during inventories.

Botanical surveys in Scotch pine treatment areas were not conducted because precise treatment areas have yet to be determined. However, during the course of the 2009 Pitcher's thistle census, the area containing Scotch pine along the north side of US 2 was surveyed. Pitcher's thistle was counted and the area was also evaluated for other potential TES plants such as pinedrops, long-stalked stitchwort, Lake Huron tansy, and moonworts. No TES plants were observed during the census other than Pitcher's thistle (Huebner 2009).

The project record contains references that reflect the best available science for TES plants analysis. These include papers, literature reviews, and results of ground-based observations. The Shores BE provides a complete list of resources used to determine whether TES plants may occur in the project area. The BE lists botanical surveys that have been conducted in the past in the project area. The recent peer-reviewed BE for TES Animals and Plants for the HNF Forest Plan FEIS provides Species Viability Evaluations and represents current documentation of TES plants on the HNF (FEIS p. 3-84 through 3-100).

3.10.3 Analysis Areas

The spatial boundary for direct and indirect effects is limited to the proposed activity areas; that is, areas where proposed management activities would occur or affected habitats that lie directly adjacent to activity areas. This includes all stands proposed for timber treatment, proposed new roads and log landings, Scotch pine removal areas, and road decommissioning. This spatial boundary is for project effects on known rare plant locations as well as suitable habitat. Habitat would remain unaffected in areas that are not proposed for management. The timeframe for analysis of project effects is 0-15 years from the signing of the decision notice for the Shores project. This is when all project activities are expected to be complete and soil disturbance and canopy alterations as a result of the Shores project would cease.

The cumulative effects analysis area is the project boundary, including federal lands and private lands that do not have proposed activities. Most of the TES plant habitat in the project area is closely tied to the Great Lakes shorelines. Since LTA boundaries were used to delineate much

of the project area, this is an ecological boundary that classifies the unique habitat characteristics for rare plants. This spatial boundary is for cumulative effects on known rare plant locations as well as suitable habitat.

The timeframe for determining cumulative effects will vary widely between rare plant species because some species will require and/or tolerate disturbances that would harm other species. The past time scale used for consideration of cumulative effects is 15 years. A span of 15 years into the future will also be considered in analysis, when all project activities are expected to be complete. After this timeframe, succession would continue to take place and continue to change habitats, but predictions on forest composition and habitat availability become increasingly speculative at longer time frames. Projects that have been implemented over the past 15 years are considered and any reasonably foreseeable projects (applicable projects currently on the SOPA) that are expected to contribute to cumulative effects over the next 15 years are also considered (Shores EA, Appendix F).

3.10.4 Affected Environment

The Huron Complex and South Shores MSAs each contain additional affected environment information for the Shores project area (USDA 2007, USDA 2008). The Shores project area contains a wide diversity of plant community types that are closely tied to the Lake Michigan and Lake Huron shorelines. One of which is the wooded dune and swale complex. It is a large complex of parallel upland dune ridges that are typically forested, and low swales that support a variety of herbaceous or forested wetland types, with open wetlands more common near the shoreline and forested wetlands more prevalent further from the lake. The alternating sequence of sand ridges and associated swales often extends up to two miles inland (Kost et al. 2007). The wooded dune and swale complex may encompass several of the other natural communities listed below.

Another major controlling feature for the TES plants in the Shores project area is the limestone bedrock that underlies the Lake Huron side of the project area. The abundance of limestone has a high degree of influence on the plant communities and species that occur. Numerous aggregations of boulders, limestone ledges, small cliffs, fissures, and a few areas known as limestone pavement occur within the project boundary. Limestone pavements have some potential to support rare species but the known sites within the HNF are very small and generally too shaded to support the special plant community known as alvar that is considered to be of regional and even global significance (Marr 1999).

Photo 5. Horseshoe Bay Wilderness area is located within the Shores analysis area

Several natural areas also have a great influence on the TES species that occur in the Shores project area. They include Horseshoe Bay Wilderness, Horseshoe Bay Research Natural Area (RNA), Point Aux Chenes cRNA, and St. Martin's Point cRNA. These areas generally exhibit minimal evidence of

human disturbance. As a result, many of the TES plants within the project boundary occur in these pristine areas.

The following list includes plant communities known to occur in the project area. Communities were determined from survey reports, stand exams, photo interpretation, and personal observations. Each community has habitat characteristics that may support certain rare species of plants. Community types follow the classification of the Michigan Natural Features Inventory (Kost et al. 2007). Listed species known to occur or to have suitable habitat in these communities have been evaluated for potential effects. Communities marked "NA" do not occur in proposed activity areas.

- Submergent marsh (NA)
- Emergent marsh (NA)
- Great Lakes marsh (NA)
- Northern wet meadow (NA)
- Northern Shrub thicket (NA)
- Intermittent wetland (NA)
- Interdunal wetland (NA)
- Northern fen (NA)
- Patterned fen (NA)
- Poor fen (NA)
- Bog (NA)
- Muskeg (NA)
- Rich conifer swamp (NA)
- Poor conifer swamp NA)
- Hardwood conifer swamp (NA)
- Northern hardwood swamp (NA)
- Wooded dune and swale complex
- Dry northern forest
- Dry-mesic northern forest
- Mesic northern forest
- Boreal forest
- Limestone Bedrock Glade
- Limestone cliff
- Sinkhole
- Alvar
- Limestone cobble shore (NA)
- Sand and gravel beach
- Open dunes

Three federally listed species are addressed in the BE (Appendix E, pp. 28-37). The Shores project area contains the entire HNF population of Pitcher's thistle: approximately 136 acres of mapped populations along the Lake Michigan Dunes. A 2009 census of the Pitcher's thistle population resulted in over 10,000 individual plants (Huebner 2009). The project area also contains almost all of the known Houghton's goldenrod occurrences and several miles of suitable shoreline habitat for this species. There is only one known population of Lakeside daisy, which is outside of the project area, but suitable habitat for this species occurs. Project activities would not affect known occurrences of these three species, but a determination of "not likely to adversely affect" has been made in response to potential effects to suitable habitat or undetected individuals.

3.10.5 Proposed Action

3.10.5.1 Direct and Indirect Effects

Documented TES plant occurrences are protected by design criteria measures applied prior to project implementation (Appendix E). These include complete avoidance of Pitcher's thistle during the proposed Scotch pine removal, buffer of known occurrences of walking fern and calypso orchid, and winter logging in areas where northern wild comfrey occurs. Therefore, potential effects to TES plants from the Proposed Action are limited to unoccupied suitable habitat and undetected individuals that may be present in the affected environment. New TES plant locations that may be found during analysis or project planning would be protected using appropriate reserve areas outlined in the Draft RFSS Plant Protection Measures (Huebner 2008a). In addition to project design criteria, the Forest Plan provides TES direction and management guidelines (p. 2-17).

Suitable habitat is present for some individuals that may not have been detected during surveys for several reasons (see section 3.8.2). Therefore, there is a chance that undiscovered individuals may be impacted inadvertently by the Proposed Action. For this reason (potential impact to undiscovered individuals), a determination of "may impact individuals but not likely to cause a trend to federal listing or loss of viability" has been made for 31 species (Table 3-23).

The Proposed Action could result in short-term (0-5 years) impacts to the understory, ground cover, and TES plant habitat due to soil displacement from road equipment and harvesting machinery. Direct impacts on undetected TES plants include breaking, crushing, or uprooting by driving over them or covering them with soil, trees, or slash. The plants may experience altered growth and development, and reduced seed-set and population size (Maschinski et al. 1997). Direct effects being considered in this discussion include those associated with timber falling, skidding, decking, site preparation for planting, and road construction.

There are no proposed activities in wetland or riparian habitats such as fens, cedar swamps, wet meadows, or marshes along Great Lakes shorelines. Indirect effects by potential changes to hydrology from nearby timber harvest are considered; however implementation of Forest Plan soil and hydrology standards and guidelines would provide protection for wetland TES plant habitat (p. 2-15). Winter logging design criteria are proposed to prevent alteration of drainage and protect wetland habitats in stands with wetland soils and wooded dune and swale communities. There are 760 acres of wooded dune and swale potential habitat affected in the Proposed Action. Winter logging is required in approximately 456 acres of the Proposed Action (Appendix B). Where winter logging occurs, it would lessen or eliminate direct effects such as trampling and soil displacement to several TES plants and their habitat. The use of State of Michigan BMPs designed to protect wetlands and riparian areas would also reduce impacts to substrates in suitable habitat. These measures would eliminate the risk of indirect effects by hydrological alteration to species such as Houghton's goldenrod, sundew, butterwort, black crowberry, veiny meadowrue, Vasey's rush, Lapland buttercup, and hyssop-leaved fleabane.

The project area contains suitable habitat for a number of RFSS ferns which grow only on limestone boulders, cliffs, ledges, and fissures. Of the seven known locations of walking fern in the Shores project area, one site occurs in the Proposed Action, in C 128, S 24. The site would be protected by project design criteria which gives it a 400-foot buffer. Any RFSS fern site discovered prior to implementation would also be buffered as outlined under project design criteria. These reserve areas would protect the shaded moist microhabitats required for plant establishment and survival.

The rocky suitable habitat is known to occur only on the east side of the Shores project in the HCMA area. A precise map of the suitable rocky habitat in the project area has not been created and the acreage of available habitat cannot be predicted because of the scattered and somewhat concealed nature of the geologic features. However, there are 703 acres of proposed Huron Complex stands out of a total 1,577 project acres. All of these contain or have potential to contain rocky features based on botany surveyors field visits (Huebner 2008b). Therefore 45% of the proposed stands may contain habitat for RFSS ferns. These areas were surveyed but it is impossible to inventory every acre, so there is a chance that undetected individuals could occur. Timber management that reduces canopy could result in indirect negative effects to unmapped habitat or undetected individuals, including loss of shade, change in temperature regime, and loss of moist moss cover on the limestone substrates as a result of reduction in canopy. It is likely that these ferns are sensitive to drying and scorching from overexposure to sunlight (MNFI 2007). The majority of treatment type in the Shores project is

clearcutting and shelterwood cuts, resulting in much more canopy removal than selection and thinning cuts.

A Forest Plan guideline under soil resources (p. 2-15) stating that heavy equipment should not be operated on slopes greater than 35 percent gradient may protect disturbance to cliff faces. But there is a chance that rocky features such as limestone pavement, outcrops, ledges, or boulders would be disrupted during project implementation. This may result in direct effects to undetected fern individuals by trampling or uprooting, or destruction of moss mats in suitable habitat.

Although there are no proposed activities on Great Lakes cobble or pavement shorelines, there is a possibility that small marginal alvar communities occur within Proposed Action areas. These unmapped pockets of alvar would be classified as dry alvar woodland or bedrock, typically not suitable for HNF TES plants such as bulrush sedge, beauty sedge, Richardson's sedge, flatstem spikerush, and lakeside daisy. But there is a chance that unmapped alvar habitat or undetected individuals could sustain negative effects in project activity areas. Direct effects include trampling and uprooting from harvest machinery, and indirect effects include alteration of hydrological conditions from road building, site preparation, and soil disturbance. These species typically grow in open areas in full sun, so reduction of canopy adjacent to suitable alvar habitat would result in temporary beneficial effects.

Project activities can indirectly impact TES plant habitat by causing changes in vegetation composition and successional pathways, changing local hydrologic patterns, or by changing the soil characteristics of the habitat (Meier et al. 1995). Canopy removal in the Proposed Action results in increased light penetration to the forest floor. Some disturbance-tolerant TES plant species may benefit from canopy removal and respond with increased vigor and population sizes (Whigham 2004). They include species such as milkvetches, moonworts, prairie dropseed, Canada rice-grass, northern wild comfrey, and fir clubmoss. These species tolerate activities which result in opening the canopy and increasing light reception in the understory. They colonize open areas and typically persist for a short while. The effects of timber harvest on these early-seral species are short-term because in the long-term, stands would reforest and revegetate to conditions that are similar to present conditions (Gilliam 2007). Since disturbance may be a factor in species establishment and colonization, road construction may also temporarily improve suitable habitat.

Northern wild comfrey occurs commonly throughout several proposed stands, often occurring on deer trails and old overgrown logging roads. The species appears to be tolerant of increased light related to disturbance and suitable habitat is abundant. The known occurrences of northern wild comfrey would be protected by project a design criterion that requires winter logging. The actual plants would be protected from direct effects such as trampling or uprooting and indirect effects of canopy removal and increased light availability would be beneficial for establishment of seedlings. Because habitat is variable and abundant, there is a chance that undetected individuals occur outside of stands where winter logging is required. In these stands, there is a small chance that plants could be disturbed by machinery or equipment.

In contrast to the disturbance tolerant species mentioned above, some RFSS species which inhabit the interior forest are adapted to closed canopy conditions and low light conditions. Such species thrive in cool, moist, and shaded conditions. Species, which do not tolerate disturbance include ferns, orchids, goblin moonwort, blunt-lobed grapefern, and pine-drops. Changing the vegetation structure to more open, warmer, and drier conditions, whether by timber harvest or road construction, affects the suitability of the species habitat (Meier et al.

1995). Furthermore, many of these species, particularly those in the genus *Cypripedium* and *Botrychium*, have complex mycorrhizal fungus associations. Mycorrhizae require organic matter found in the duff layer, and mechanical treatment is much more likely to disturb and disrupt this organic soil layer (Fogel 1980).

Clearcutting treatments have the highest amount of soil disturbance and light penetration associated with them. Approximately 83% of the Proposed Action involves clearcutting and shelterwood treatments. Stands proposed for thinning or selection cuts would have fewer impacts to the ground flora layer as only portions of the stands would be treated, resulting in less ground disturbance. The effects of selection harvest are short-term as shaded conditions would likely return in 5-10 years. Closed canopy conditions would more likely return in clearcut areas in the long-term (10-15 years).

The Proposed Action removal of Scotch pine would result in improvements to habitat quality of Lake Michigan dunes by reducing the presence of a non-native tree that threatens the open habitat required by species such as Pitcher's thistle, long-stalked stitchwort, Lake Huron tansy, and four moonwort species. Suitable habitat would have beneficial effects as a result of the project. Scotch pine removal and increased sunlight may result in increased survivorship and reproduction, especially for known occurrences of Pitcher's thistle. These beneficial effects would be seen in the short-term (within 5 years) since open habitat may become available in the growing season immediately after project implementation.

The introduction of NNIP could have an indirect effect on TES plant habitat. Soil disturbing activities from timber harvest and road construction could lead to NNIP spread. The risk of NNIP spread is further documented in section 3.7. Ongoing recreation activities such as hiking, camping, fishing, and hunting result in a low risk of disturbance to TES plant habitat. Dispersed recreation such as this would likely have effects that are small in magnitude and short in duration. But areas with high recreation use are more prone to TES habitat disturbance due to trampling and transport of weeds seeds by people, vehicles, and recreational equipment, such as off-highway vehicles (OHV). There may be a temporary increase of unauthorized motorized vehicle use in the Shores project during timber harvest activities resulting from road construction (Recreation section 3.11.6.1) Trail widening for dual use snowmobile and timber hauling also results in a potential loss of TES habitat and increased OHV access for approximately 10½ miles (Recreation section 3.11.6.1). Off highway-vehicle impacts to plant habitat include erosion of steep sandy slopes, dislodging vegetation, compaction and displacement of soils, transferring NNIP seeds, and potential alteration of hydrology.

The Proposed Action includes closing a section of snowmobile trail during non-winter months by installing gates at two access points. This action would result in reduced chance of direct OHV impact to TES plant habitat and its potential indirect contribution to NNIP spread on approximately three miles of existing trail. Implementation of the design criteria for invasive plants, equipment cleaning protocols for timber harvest, and ongoing NNIP treatments would also reduce the indirect effects of NNIP on TES plant habitat. The approximate eight miles of new and temporary road construction in the Proposed Action could contribute to direct short-term disturbance to TES plant habitat, by removing forest canopy and disturbing soil. Temporary road construction in support of timber harvest would be closed after operations are completed.

The approximate 11 miles of road decommissioning in the Proposed Action could result in an increase in suitable TES plant habitat as native plant communities become re-established. Many of the roadbeds proposed for decommissioning are already filling in and appear to be

inaccessible by vehicles. As the canopy fills in, habitat becomes suitable for shade-dependant TES plants. Road decommissioning may also decrease the amount of open disturbed habitat for NNIP growth, decrease the miles of roads open to motor vehicles, and eliminate the opportunity for vehicles to spread NNIP seeds to TES plant locations.

3.10.5.2 Cumulative Effects

It is unclear if the TES plants included in the Shores analysis have always been rare, or were once more common but currently rare due to past land use practices (Forest Plan). Overall management activities that have contributed to the condition of the existing landscape include: timber harvest, fire suppression, prescribed fire, recreational use, road construction, urban development, and NNIP infestation. The development of a forest road system over the last 15 years and installation of underground gas pipelines, have likely reduced the TES plant habitat suitability in the project area. The effects of past management on TES plant habitat has not been documented well due to a lack of long-term habitat monitoring.

Past, present, and reasonably foreseeable Forest Service projects that have potential to affect TES plants are listed in Appendix F. There are very few management activities within the cumulative effects boundary. Past timber management projects have not significantly altered the amount of available suitable habitat, considering the small amount of forested habitat affected (less than 200 acres for the Sprinkler and Rudyard projects). Other projects in the cumulative effects area include 130 acres to be maintained as an opening under the Eastside Permanent Openings project and repairs to American Transmission Company powerlines (currently being analyzed) that could temporarily affect suitable wetland habitat. The effects of these projects, although minor in size and duration, could contribute to cumulative effects such as increased NNIP along roadways, loss of canopy and suitable TES plant habitat, and changes in microclimates and hydrology.

Activities such as road construction, ditching, and other alterations of wetland habitat may have slightly reduced the amount of suitable habitat for species dependant on wetland and riparian habitats in the past. But the overall amount of wetlands would not change as a result of the Shores project because measures are in place to protect wetlands through design criteria and Forest Plan standards and guidelines. The overall amount of alvar habitat is also not expected to be extensively altered as a result of the Shores project, especially since alvar habitat in the project activity areas is of marginal quality.

None of the HNF activities that have taken place in the project area within the last 15 years have contributed to loss of available rocky habitat (cliffs, boulders, limestone outcrops) or in rocky shorelines. Past and future timber harvest on private land could contribute to canopy removal and subsequent drying out of the moss layer on rocky features. Because the majority of proposed treatments are clearcuts or shelterwood cuts, the Shores project would likely result in timber harvest directly over some rocky features. The project may contribute a cumulative effect of reducing the quality of rocky habitat available to TES plants in the future, resulting in a cumulative loss of suitable habitat.

Maintenance and use of roads for transportation and recreation in the project area would be expected to continue at least at present levels in the immediately foreseeable future. In addition, harvest activities with some associated ground disturbance and creation of openings would be expected in present and future management activities on other adjacent private lands, although the amount of which is unknown. Road construction and past and future timber harvest may provide an increase of suitable habitat in the future for disturbance tolerant and

sun-loving TES plants. However, any addition is expected to have a minor effect because habitat which appears suitable for disturbance tolerant TES plants is common on the HNF, yet the species remain rare. Roadside habitat availability does not appear to be a limiting factor for occurrence of these types of species. But the Proposed Action may result in a temporary (5-10 years) decrease to habitat availability or quality for TES plants that require closed canopy conditions by removal of overall shade in the project area.

There are no state lands that intersect the Shores project boundary. Approximately 9% of the project area is in private lands. Past and future development on private land, recreation use and gravel pit development could have a negative cumulative effect on TES plant habitat or populations since they are not required to follow the protective measures developed for Forest Service activities. It is predicted that these activities on private lands will continue and increase in the future, with the possibility of TES plant habitat decline. On private lands, new roads, soil disturbance, and increased recreational use may be expected to accompany population growth.

Ongoing recreational activities in the cumulative effects area and general vehicular travel across forest roads provide a vector for NNIP seed spread into TES plant locations and suitable habitat. Damage to suitable TES plant habitat resulting from OHVs could occur. Non-native invasive plant concerns would likely continue to increase on private lands as no control measures would be implemented. But, ongoing control measures would be implemented on forest lands, under the 2007 Forestwide NNIP Control Project (USDA 2007a) and the site-specific 2010 NNIP Treatment Project. These treatments would contribute to positive cumulative effects by improving overall habitat. The Proposed Action would also be expected to result in beneficial cumulative effects to TES plant habitat over the long-term, because of invasive Scotch pine removal and subsequent improvements of natural dune conditions.

It is anticipated that new road construction or timber harvest activities as a result of the project could contribute to further NNIP spread in the project area and likely contribute to a minor reduction in suitable TES plant habitat for species that favor undisturbed conditions. Overall, the availability of habitat for TES plants on private land has probably decreased in the cumulative effects area, but since the amount of private land is minimal (9%) the cumulative effects from private land activities are expected to be minor. Decommissioning roads would result in a cumulative decrease in road access over time, which may improve habitat conditions.

Over 13,000 acres of HNF lands in the project area are unsuited for timber production (Table 3-24). These areas would remain undisturbed by project activities and protected from disturbance well beyond the life of the project. The areas could provide habitat for TES plant species, whether it is in the form of existing populations or suitable habitat for populations to expand. A large amount of wetland habitat is available, especially in Wilderness, RNAs, and cRNAs. Old growth forest also provide habitat for shade-dependant TES plant species. Some RFSS plants including Pitcher's thistle, Houghton's goldenrod, calypso orchid, ram's head ladyslipper, hyssop-leaved fleabane, black crowberry, and Lake Huron tansy occupy these areas.

Table 3- 24. Acreage of Unsuited Areas that May Provide Suitable TES Plant Habitat

Area	Acres
Horseshoe Bay Wilderness	3,918
Horseshoe Bay RNA	377
Pointe Aux Chenes cRNA	4,266
St. Martin's Point cRNA	518
Openings	1,093
Old Growth	3,310
Total	**13,482**

The extent of cumulative effects depends on the management of project effects as well as the characteristics of the TES plant species located in the project area. The type of management activity proposed dictates the duration of cumulative effects, and for the Shores project the majority of treatments are clearcutting and shelterwood. This results in a longer cumulative effect than thinning and selection cuts. Management of effects through design criteria and Forest Plan standards and guidelines would minimize the potential for overall cumulative effects to TES plant habitat. Considering the small amount of treatments in such a large project area (1,577 acres is less than 1% of the total land in the cumulative effects boundary), cumulative effects are expected to be minimal as a result of implementation of the Proposed Action.

3.10.6 No Action

3.10.6.1 Direct and Indirect Effects

The No Action would involve no new management activities in the project area. Previously approved activities in the project area would still be implemented. Design criteria would not be implemented in the No Action alternative. Existing road and trail conditions would remain unchanged and existing roads would not be closed or decommissioned. Current ongoing activities would continue, such as dispersed recreation use, annual road maintenance, management of NNIP, snowmobile trail use and maintenance, and suppression of wildfires. Natural processes such as blowdown or tree mortality from forest insect and diseases would continue. It is expected that there would be no direct or indirect effects on TES plants from the No Action alternative.

Under No Action, wetland and shoreline habitats would likely remain unchanged as a result of HNF management. Habitat would continue to be available under species requiring open dune conditions. However, the quality of suitable habitat would be reduced over the long-term (up to 15 years) as a result of No Action because Scotch pine would continue to spread and the seed source would persist. Non-native invasive plant concerns would likely continue to increase on private lands in the project area as no control measures would be implemented. But ongoing and future control measures would be implemented on HNF lands under the 2007 Forest-wide NNIP Control Project.

It is expected that over the short-term (0-5 years), existing native vegetation conditions would not appreciably change from current conditions. The existing ground flora layer structure and composition would remain much the same as it is today. In the long-term, 5-15 years, there would be effects occurring on TES plant habitat within early seral habitat from forest succession moving stands into more late seral conditions. Forest succession in conjunction with a lack of suitable disturbance such as minor scraping of the soil or natural wildfire events could impact species that prefer early seral or open canopy habitats, such as milkvetches, moonworts, prairie

dropseed, Canada rice-grass, and northern wild comfrey. Over the long-term, there would also be the opportunity for effects to occur from forest succession by providing more dead and down material, closed canopy and moist, shaded conditions. This results in increased soil nutrients for some TES plants to utilize. Natural succession without forest management could be beneficial for species that favor later seral conditions, such as ferns, orchids, goblin moonwort, blunt-lobed grapefern, and pine-drops.

3.10.6.2 Cumulative Effects

There are no management activities in the No Action that would contribute to cumulative effects.

3.11 WILDLIFE AND TERRESTRIAL MANAGEMENT INDICATOR SPECIES

Table 3- 25. Wildlife Summary of Effects

Activity or Measure	Proposed Action	No Action
Habitat availability for early successional species	Create about 1,340 acres.	Depends on natural disturbance events such as windthrow.
Availability of snag/den and woody debris	Reduce on about 1,580 acres.	More habitat would be available since no trees are removed.
Disturbance to wildlife from road access	About 8 miles of new road construction (increase disturbance). About 11 miles of decommissioning (decrease disturbance).	No change from current condition.

3.11.1 Introduction

The HNF received public comments about the impacts that the Shores project would have on wildlife. Some questions were answered in the response to scoping comments section of this document (Appendix A). Other comments dealt with the disclosure of effects, and these comments are addressed by discussing potential impacts in this section of the EA and the Biological Evaluation (BE). Other concerns were outside the scope of this project (i.e. Forest Plan direction). Therefore, none of the comments were identified as significant issues.

In addition to this EA, there are several documents that discuss the impacts that the Forest Plan would have on wildlife habitat. The FP FEIS discloses impacts on indicator habitats, such as mature northern hardwoods and young/aspen birch, and the wildlife species that are associated with these habitats (FP FEIS, p. 3-101 through 3-122). Additionally, impacts that the Forest Plan direction would have on Management Indicator Species (MIS), Regional Forester Sensitive Species (RFSS), Federally Threatened and Endangered species also are discussed in the FEIS (p. 3-101 through 3-180). The Forest Plan Biological Evaluation (USDA 2006a), Biological Assessment (USDA 2005), and Biological Opinion (USDI 2006) also discuss Forest Plan impacts on RFSS and federally listed species.

Effects determinations for TES species, such as lynx, bald eagle, and goshawk are summarized in Table 3-26. A more detailed discussion of impacts to wildlife TES species is in the BE (Appendix E).

Table 3- 26. Summary of Wildlife TES Species Effects Determinations

Species	Status	Habitat (H) or Species Present (S)	No Action	Proposed Action
Canada lynx	FT	H	NE	NLAA
Gray wolf	FE	S	NE	NLAA
Hine's emerald dragonfly	FE	S	NE	NLAA
Kirtland's warbler	FE	-	NE	NE
Piping plover	FE	S	NE	NLAA
Northern goshawk	RFSS	S	NI	MINLTF
Le Conte's sparrow	RFSS	H	NI	MINLTF
Bald eagle	RFSS	S	NI	MINLTF
Red-shouldered hawk	RFSS	S	NI	MINLTF
Black tern	RFSS	S	NI	NI
Prairie warbler	RFSS	S	NI	MINLTF
American peregrine falcon	RFSS	S	NI	NI
Common loon	RFSS	S	NI	NI
Black-crowned night heron	RFSS	S	NI	NI
Connecticut warbler	RFSS	H	NI	MINLTF
Black-backed woodpecker	RFSS	S	NI	MINLTF
Caspian tern	RFSS	S	NI	NI
Common tern	RFSS	S	NI	NI
Sharp-tailed grouse	RFSS	S	NI	NI
Blanding's turtle	RFSS	S	NI	MINLTF
Land snail - *Euconulus alderi*	RFSS	S	NI	MINLTF
Land snail - *Planogyra asteriscus*	RFSS	S	NI	MINLTF
Land snail - *Vertigo morsei*	RFSS	S	NI	MINLTF
Land snail - *Vallonia gracilicosta*	RFSS	H	NI	MINLTF
Land snail - *Vertigo bollesiana*	RFSS	S	NI	MINLTF
Land snail - *Vertigo morsei*	RFSS	S	NI	MINLTF
Land snail - *Vertigo paradoxa*	RFSS	S	NI	MINLTF
Incurvate emerald	RFSS	S	NI	MINLTF
Ebony boghaunter	RFSS	S	NI	MINLTF
Ringed boghaunter	RFSS	H	NI	MINLTF
Lake Huron locust	RFSS	S	NI	MINLTF

FE = Federally Endangered, FT = Federally Threatened, RFSS = Regional Forester Sensitive Species, MINLTF = May impact individuals but not likely to cause a trend to federal listing or loss of viability, NE = No Effect, NI = No Impact, and NLAA = Not Likely to Adversely Affect

3.11.2 Analysis Methods

Habitat modeling has been done to compare habitat availability for MIS (Table 3-28). However, there are disadvantages to habitat modeling, so Table 3-28 is not an ideal representation of habitat availability. There are delays in database updates, so information of current habitat conditions are not always represented in the model. Additionally, there has been a delay in updating habitat classification based on updated species observation/habitat information. Finally, the model assumes changes occur immediately after harvest, but there is a lag time after harvest as the habitat changes into what the model recognizes as suitable or unsuitable habitat. These problems are limiting the usefulness of this model. Therefore, the information should only be used as a coarse scale estimation of habitat for these species.

Complete summaries of habitat definitions and ecological processes used in the model can be found in the project record (USDA 2006b, Appendix I). American marten utilize older, coniferous and deciduous, forest conditions (Baker 1983). Therefore, mid and late seral habitat on six different ELTs was modeled as suitable American marten habitat. Ruffed grouse utilize different aspen age classes to satisfy particular habitat requirements (Gullion 1984), so modeled habitat consisted of primarily aspen on five different ELTs. Young and old aspen was modeled as nesting and breeding habitat, but brood rearing was specific to young aspen and winter habitat was specific to older aspen. Since sharp-tailed grouse utilize open land and early successional jack pine, habitat calculations were primarily defined as early (forage and nesting) and late seral (winter) habitat on ELT 10/20.

In addition to habitat modeling (terrestrial MIS and federally listed species), various reference resources (research papers, books, conservation assessments, species accounts, etc.) were used to consider effects on different wildlife species. These resources are located in the project record. Additionally, literature referenced in public comments also were reviewed and considered.

Field surveys were part of the analysis process and were utilized to inventory species of concern (RFSS, federally listed, and MIS) within the Shores project area. These surveys focused on a variety of species: red-shouldered hawk, northern goshawk, dragonflies, bald eagles, ruffed grouse, sharp-tailed grouse, common loons, terns, land snails, various breeding birds (Breeding Bird Surveys (BBS)), and various mammals (winter track surveys). All of the field survey information is located in the project record and a summary of the survey effort can be found in the BE (Appendix E - section 2B). This survey information was used to discuss the status of specific species within in this EA and the BE.

3.11.3 Analysis Areas

The majority of management activities would take place within the Brevoort-Pointe Aux Chenes, Huron Lake Beds, Huron Outcrop, Mackinac breccias, Niagara Escarpment 3, and St. Martin Bay Wetlands Landtype associations (LTAs), which each encompass a group of ecosystems with similar ecological processes and management concerns (USDA 2006b, Appendix I). Most of the direct and indirect effects would occur within areas proposed for harvest, road construction, etc. However, effects, such as increased traffic on surrounding roads due to hauling, would occur on a larger scale.

Therefore, the project area boundary was chosen as the direct and indirect effects boundary. This boundary generally follows LTA boundaries, so it serves as a reasonable, ecological boundary that includes much of the surrounding landscape where impacts could occur. The time period for direct and indirect effects is based on the predicted time period within which proposed management activities would occur. The NEPA analysis is normally considered relevant for five years, harvest contracts can generally extend an additional five years, and funding for post harvest Knutson-Vandenberg activities can commonly extend another five years. Therefore, the time period used is 15 years from the date a project decision would be signed.

Most of the direct and indirect effects, which would contribute to cumulative effects, would occur within the project boundary. However, small portions of the project boundary overlap with several different LTAs, which each provide unique habitat characteristics to wildlife populations on and off HNF land. Additionally, there are individual stands located near the edge of the project boundary, and activities in adjacent LTAs could contribute to cumulative effects on some

wildlife species. Therefore, there are eleven ecologically unique LTAs that make up the cumulative effects boundary: Brevoort-Pointe Aux Chenes, Huron Lake Beds, Huron Outcrop, Lower Carp River Complex, Mackinac breccias, Moran Complex, Niagara Escarpment 2, Niagara Escarpment 3, Pine River Patterned Wetland, Silver Creek Uplands, and St. Martin Bay Wetlands. This list includes the LTAs where proposed management activities would take place (project area) and the LTAs adjacent to proposed management (map included in project record). Some information that is not available at the LTA boundary, such as human population trends, is applied from larger political boundaries.

The past and future time scale used for consideration of cumulative effects is 15 years from the date a project decision would be signed. On large projects, management activities can take 15 years before they are complete, so this is the time period during which direct and indirect effects from proposed management activities would result in cumulative effects. Therefore, projects (within the cumulative effects boundary) that have been signed within the past 15 years are considered (Appendix F). Any reasonably foreseeable projects (applicable projects currently being analyzed) that are expected to contribute to cumulative effects over the next 15 years are also considered (Appendix F). After 15 years, habitat would continue to change, but predictions on habitat availability become increasingly speculative with longer timeframes.

3.11.4 Affected Environment

The Huron Complex and South Shore Mid-scale Assessments each contain additional affected environment information for the Shores project area (USDA 2007 and USDA 2008). Therefore, this section briefly discusses the species analyzed, current habitat, and species status in the project area.

Species impacts are based on habitat conditions and known occurrences. Specific species considered throughout the analysis process are from the following wildlife lists: Federal endangered, federal threatened, RFSS, and MIS. A BE was completed to analyze impacts to threatened, endangered, and RFSS (Appendix E), and effects determinations are summarized in Table 3-26. Therefore, the effects discussed in this section will focus on MIS and wildlife species associated with them.

A MIS is one whose presence in a certain location or situation, at a given population, indicates a given environmental condition. Their population changes are believed to indicate effects of management activities on a number of other wildlife species. American marten, ruffed grouse, and sharp-tailed grouse are the wildlife species that make up the terrestrial MIS list for the HNF. Recent trends for these three species are shown in Table 3-27, and habitat availability within the Shores project area is shown in Table 3-28.

Table 3- 27. Population Trend Summary for Management Indicator Species

Species	Population Trend
American marten	Stable in Upper Peninsula (Frawley 2009).
Ruffed grouse	Drumming surveys suggest that the population has declined slightly from 2008 levels (HNF 2009, Frawley and Stewart 2009, and Maples 2009).
Sharp-tailed grouse	Declining population on the HNF (HNF 2009).

Table 3- 28. Habitat Availability Summary for Management Indicator Species

Species		Amount of Habitat (acres)*	
		No Action	Proposed Action
American marten		12,321	12,030
Ruffed grouse	Winter habitat	1,204	964
	Breeding habitat	1,452	1,439
	Nesting habitat	1,646	1,406
	Brood Rearing habitat	474	653
	Total habitat	1,646	1,604
Sharp-tailed grouse		2,209	1,616

*The Habitat Definitions Model (Henderson 2009) was used to calculate habitat.

3.11.5 Proposed Action

3.11.5.1 Direct and Indirect Effects

The impacts of this alternative on wildlife are primarily:

- Increases habitat for early successional species.
- Snag/den and woody debris would decrease.
- Road construction would increase wildlife disturbance in some areas.
- Road decommissioning would decrease wildlife disturbance in other areas.

There are some common effects within stands being harvested. Within all treatment areas, some sedentary animal species would be killed during implementation (from felling, skidding, etc). Other, more mobile, species would be displaced into adjacent habitat. Stands in the eastern portion of the project area contain rocky features, and these features provide unique habitat (crevices, talus field, etc.) for several wildlife species (Kost et al. 2007). Harvest equipment operation, tree felling/dragging, and road construction would occur directly on rocky features, so species that utilize this habitat would be killed or displaced. Additionally, potential damage from harvest equipment, loss of canopy cover, and changes in moisture level and temperature are expected to impact the future suitability of this habitat for some species.

Aside from common effects, specific harvest treatments result in unique changes to wildlife habitat. Early successional aspen habitat creation is part of the Proposed Action, so about 520 acres of aspen habitat would be clearcut and regenerated (A1 and M1). For ruffed grouse, this activity would transition mature aspen stands, which currently serve as winter forage habitat, into young aspen brood and breeding cover (Gullion 1984). The conversion from mature aspen habitat also would remove canopy cover and woody debris, which would reduce American marten habitat. This harvest activity, and all other proposed activities, are not expected to impact sharp-tailed grouse habitat (Appendix E - BE).

About 460 acres of shelterwood harvest and 30 acres of seed-tree harvest are part of the Proposed Action. Shelterwood harvest acres are currently typed as jack pine and aspen, and the purpose of this prescription is to begin the slow process of moving an early successional forest type (mainly jack pine) into a later seral habitat type (white pine, oak, and hemlock). However, this habitat change would not occur immediately, and these stands would still provide patches of suitable habitat for early successional species into the future. Seed-tree harvest is proposed to create early successional white pine and oak habitat. This early successional habitat would provide habitat for species such as snowshoe hare. Additionally, the early successional habitat that is created by clearcut, shelterwood, and seed-tree activities would

provide stopover habitat for a variety of bird species during migration (Moore et al. 1993, 2005a, and 2005b).

The proposed selection harvest (about 200 acres) would result in more understory growth and increased habitat for species such as chestnut-sided warblers and mourning warblers (Jobes 2004). Additionally, the 40 acres of proposed thinning (primarily aspen/conifer) is expected to increase understory growth (nesting/forage habitat) and favor more mature tree species (white pine, cedar, and spruce). Therefore, forage habitat (understory growth) for American marten may increase. However, the removal of trees through selection and thinning harvest would remove a future source of woody debris habitat (Duvall 1999 and Goodburn 1998), which provides den and forage habitat for American marten.

Within many of the areas proposed for harvest, there are also site preparation activities proposed. The majority of the proposed site preparation would occur in even-aged management (clearcut, shelterwood, and seed tree) areas to improve natural regeneration. This would help provide more cover for woodcock and snowshoe hare. Canopy gap creation (in selection harvest areas), would help promote regeneration within stands after harvest, which would result in an increase in understory habitat for various species of mammals and birds. The proposed mechanical site preparation activities would include scarifying the soil in some areas. This activity can lead to direct mortality of some animal species (ex. ground nesting birds, small mammals, etc.) and may result in a loss of snag and woody debris habitat. However, this activity is expected to provide a more suitable condition for white pine, hemlock, red pine, oak, and jack pine to develop, which would increase habitat diversity within the areas proposed.

The proposed hemlock, white pine, and oak planting would help restore habitat components, which were historically more abundant throughout the northern hardwood/conifer region (Mladenoff and Pastor 1993). This activity is expected to provide thermal cover for ruffed grouse, and forage habitat for American marten.

Log landing construction also would be part of the Proposed Action. Log landings can be used as courtship areas for woodcock and can provide forage habitat for species such as ruffed grouse and deer. However, these openings would reduce habitat for species that require mature forest types such as American marten.

The proposed Scotch pine treatment would take place along the Lake Michigan shoreline, and there are several TES species that utilize habitat along the lakeshore and sand dunes (see BE - Appendix E). The Scotch pine trees proposed for treatment are located on upland/older portions of the dunes, and treatments would be limited to individual trees along the dune/highway corridor. One TES species, Lake Huron locust, could be exposed to scattered direct impacts (morality) from increased foot traffic and from trees cut down on the dunes. Potential indirect effects on other species include disturbance from chainsaw noise and human presence. The dune/highway corridor provides limited habitat for the MIS, so impacts are not expected.

Road construction activity can have several different impacts on wildlife habitat, and the Proposed Action would create about six miles of new system roads. Impacts include increased mortality from road construction, modification of animal behavior, and increased alteration and use of habitat by humans (Trombulak and Frissell 2000). However, all new temporary roads would be obliterated following proposed management activities. Additionally, proposed road decommissioning and road closures would increase habitat seclusion for species such as gray wolves and goshawks.

3.11.5.2 Cumulative Effects

The total size of the cumulative effects area is about 218,000 acres, and the HNF manages about 41% of the land within the cumulative effects boundary. Past, present, and future forest management activities have occurred and are expected to occur on HNF land within the cumulative effects area. Several projects (Appendix F) are currently being planned or implemented on the HNF in Chippewa and Mackinac counties. However, not all of the project activities (past and future) overlap with the cumulative effects area.

Over the past 15 years, HNF management projects (Appendix F) have resulted in the creation of about 4,050 acres of early successional habitat (0-15 years old) within the cumulative effects boundary. This habitat consists of mainly aspen (about 73%), and aspen/mix (about 25%). Additionally, about 2,415 acres of early successional habitat (about 67% aspen/mix, 24% aspen, and 9% other species) would be created by other projects that overlap with the cumulative effects boundary within the next 15 years (Sprinkler, Niagara, East Red Pine 2, etc). Cumulative effects of even-aged harvest activities (clearcut, shelterwood, seed tree, etc.) are the reduction of mature forest habitat for species such as American marten, and the increase in early successional forest habitat, which provides brood habitat for ruffed grouse.

Other timber management also has occurred on HNF land within the cumulative effects area in the past and several activities are planned to occur in the future. Uneven-aged management (mainly selection harvest) has occurred in the past and about 260 acres of selection harvest (mainly maple/hardwood) is planned for harvest in the next 15 years. Also, thinning has occurred and about 850 acres (mainly red pine and hardwood) is planned to occur. The cumulative effects of uneven-aged harvests are the loss of snag/cavity habitat and an increase in understory growth, which provides forage and nesting habitat for various species.

Many of the design criteria in the Shores EA have been included in other present and future project areas. However, within the Niagara project area, early successional management includes protection measures for alvar, boulder fields, limestone cliffs, ledges, and fissures. The Shores project does not included these protection measures. Therefore, cumulative effects from early successional harvest on rocky habitat (i.e. damage from equipment, changes in moisture level and temperature) would be greater than other HNF projects.

The cumulative effects area contains portions of Horseshoe Bay Wilderness, Pointe Aux Chenes cRNA, St. Martin Point cRNA, designated old growth, and unsuited wetlands, so about 15% of the entire cumulative effects area is unsuited for timber harvest. Within the cumulative effects area, these areas provide unique habitat (older forest types, increased seclusion, etc.) for species such as lynx, American marten, and goshawk.

The Michigan Department of Natural Resources Environment (MDNRE) has divided state land into management units, and there are two management units (Sault Ste. Marie and Newberry) that border the Eastside of the HNF. A variety of even and uneven aged harvest activities occur on state land, and a summary of state management in the Sault Ste. Marie and Newberry Units (2007-2011) can be found in the project file. The amount of harvest varies by year, and acreage values are not available for each year within the cumulative effects temporal boundary. The Sault Ste. Marie management unit overlaps with the cumulative effects boundary, so about 8% of the land within the cumulative effects boundary is managed by the MDNRE. Management activities, within compartments that overlap with the cumulative effects area are summarized in Table 3-29. Additional harvest is scheduled to occur from 2012-2015 within the cumulative effects area. At this time, compartment reviews have not been written for these areas, so the

exact acreage amounts are not known. As mentioned above, these harvest activities can result in a cumulative loss of habitat (i.e. nesting habitat for goshawk), but can increase habitat for other species (i.e. breeding habitat for woodcock).

Table 3- 29. Summary of MDNRE Management Activities within Compartments that Overlapped with the Wildlife Cumulative Effects Area

Compartment	Year	Management Activity in Acres							Total Compartment Management
		Clear-cut	Selection	Shelter wood	Thinning	Planting	Prescribed Burn	Pesticide	
24	2008	366	0	0	0	0	0	0	366
115	2009	0	4	0	0	0	0	0	4
117	2009	37	55	78	194	0	0	282	644
101	2010	10	105	0	0	0	0	0	115
104	2010	291	0	0	279	40	9	81	701
116	2010	58	0	0	0	0	0	0	58
141	2010	86	0	9	24	0	0	0	120
103	2011	365	71	0	67	0	0	98	601
118	2011	90	0	0	68	0	73	38	269
Total		**1,305**	**235**	**87**	**632**	**40**	**82**	**498**	**2,878**

Source: MDNRE Compartment Reviews (project file)

Human populations are increasing in Chippewa County (+1%) and decreasing in Mackinac (-11%) County (US Census Bureau 2010), and about 47% of the cumulative effects area is privately owned. The cumulative effects area includes the communities of Brevort, Moran, St. Ignace, Hessel/Cedarville, and Detour. On private land past management is difficult to quantify, and future management is speculative. However, within the cumulative effects boundary, some private landowners are enrolled in the Commercial Forest Program, a program in which the landowner agrees to manage land for timber production. Therefore, development activities (i.e. home construction) and timber harvest from private land can contribute to cumulative loss of habitat seclusion/connectivity and alter potential habitat.

In addition to timber harvest, past projects have created and improved recreational trails and private easements (Appendix F). Within the Shores project area, the road construction and maintenance activities may lead to cumulative impacts due to increased recreational access within the cumulative effects area. However, the Proposed Action would result in a net decrease in road access, which may improve habitat seclusion. But, road construction, maintenance, or other development on state or private land could decrease habitat seclusion. Increases in road density may lead to a loss of remote habitat areas that some species use for nest/den construction.

3.11.6 No Action

3.11.6.1 Direct and Indirect Effects

The impacts of this alternative on wildlife are primarily:

- Early successional habitat creation would depend on natural disturbance events such as wildfire, which has been effectively suppressed, and windthrow.
- More snag/den habitat and woody debris.
- No new roads and associated disturbance to wildlife.

- No road closures or decommissioning would occur to reduce disturbance to wildlife.

Implementation of this alternative would maintain the existing plant communities and allow natural succession to occur. Some early successional habitat would be created as aspen stands decay and gaps in the canopy support small pockets of new regeneration. These small pockets may provide forage habitat for goshawk within and adjacent to nesting habitat. Additionally, windthrow and fire would most likely create small pockets of this condition, which would create brood/breeding habitat for ruffed grouse. However, some young stands would mature, resulting in a loss of brood habitat for ruffed grouse.

The remaining forested stands would mature and result in continual snag, cavity tree, and downed woody debris recruitment. Additionally, the small gaps in the canopy, due to tree mortality, would increase patches of understory growth. Over the long term, this would increase nesting and forage habitat for several bird species and maintain woody debris habitat for species such as American marten. However, the habitat model did not project these natural successional changes in American marten habitat; therefore, this increase in habitat is not displayed in Table 3-28.

Road construction, decommissioning, or closures would not occur. Therefore, direct and indirect impacts on habitat seclusion are not expected.

3.11.6.2 Cumulative Effects

Since there are no actions proposed there are no cumulative effects.

3.12 FISHERIES

Table 3- 30. Summary of Resource Effects

Activity or Measure	Proposed Action	No Action
Acres of effect	0 acres	0 acres
Changes in availability or quality of brook trout (MIS) habitat	No change	No change

3.12.1 Introduction

The HNF received no specific comments in response to the project scoping process regarding impacts to the fishery resources. There are no management activities proposed in this project which specifically target fisheries resources; however, vegetation and/or transportation management is being proposed, some in close proximity to streams within the Shores (LTA).

3.12.2 Analysis Methods

The USDA Forest Service, in cooperation with the MDNRE Fisheries Division, periodically inventory the fisheries resources on the HNF. Fish collection and habitat measurements are taken at several locations within and along lakes, rivers, and streams to determine the status of the fishery and associated habitat conditions. A report is prepared with the findings and used to facilitate decisions regarding future courses of management activity and assess results of past management activities on the resources. For the purpose of this analysis, the most recent

information available is the Carp River Fishery Status Report of 2002 and the Brevort River Inventory Data Sheets of 1994 (unpublished reports).

3.12.3 Analysis Areas

The spatial and temporal boundaries for effects are 0 to 500 feet from the edge of streams and rivers adjacent to the project activity areas and ¼ mile downstream with a duration of 5-10 years after the completion of an activity. This is a reasonable time and area to expect changes in shade, sediment deposition, and inputs of large woody debris (LWD).

3.12.4 Affected Environment

The Huron Complex and South Shore MSAs contain specific affected environment information for the fisheries resources within the Shores project area (USDA Forest Service 2007b and 2008). Therefore, this section briefly describes current habitat conditions and known occurrences of brook trout (*Salvelinus fontinalis)*, the only fish designated on the HNF as a MIS.

Brook trout is the only native salmonid and is a popular sport fishing species. They are more dependent on cold groundwater input than any other salmonid species on the HNF (FEIS 3-220). With the exception of some small headwater streams, brook trout occur in virtually all waters classified as cold. Highly suitable habitat for a self sustaining brook trout population has these characteristics: maximum daily water temperatures below 68 degrees F, clean spawning gravel, abundant in stream LWD, low sediment load, and no barriers to migration. Anadromous salmon and steelhead require most of the same habitat characteristics as brook trout, but can tolerate maximum daily water temperature above 68 degrees F. Therefore all three salmonids co-exist in the lower Carp River and Brevoort River, depending on season and habitat quality.

3.12.5 Management Indicator Species

Table 3- 31. Population Trend Summary for Management Indicator Species

Species	Population Trend
Brook trout	Generally stable, well below potential in lower Carp River, Consistently low in Brevort River (HNF 2002,1994 Unpublished Reports). No recent file data on other prospective waters within the LTA.

Table 3- 32. Habitat Availability Summary for Management Indicator Species

Species	Proposed Action	No Action
Brook trout	18.4 miles	18.4 miles (GIS)

3.12.6 Proposed Action

3.12.6.1 Direct and Indirect Effects

Proposals to harvest timber and manage roads would have little or no impact on the fishery resources. Forest Plan standards and guidelines establish river and stream buffers of at least 100 feet where timber harvest is restricted. Trees growing within 100 feet of a stream provide most of the shade and LWD input and also act to stabilize soil. Stream reaches protected by

this buffer allow timber to remain and mature, allowing natural processes to resume. In addition, a 500 foot buffer is identified which prohibits aspen regeneration anywhere within 500 feet of coldwater, high priority streams (FP pp. 2-14). This discourages habitation of these areas by beaver since they rarely travel more than 500 feet (but can travel up to 656 feet) to obtain aspen, one of their preferred foods (Allen 1982). These protection measures ensure less aspen regeneration, and encourage establishment of long lived, large diameter trees; providing future LWD input, shade, and soil stabilization.

Some delivery of sediment to streams through runoff, culvert crossings, normal road use, and maintenance would be expected. This impact is minimized by adherence to BMPs as described in *Sustainable Soil and Water Quality Practices on Forest Land* (MDNR, MDEQ 2009).

By limiting proposed activities through the design criteria described above, there would be no effects to the fisheries habitat and overall resource.

3.12.6.2 Cumulative Effects

Because there would be no direct or indirect effects on fisheries, there would be no cumulative effects.

3.12.7 No Action

3.12.7.1 Direct and Indirect Effects

The implementation of this alternative would maintain the existing condition of the riparian vegetation and allow natural succession to occur. Road management activities identified in the roads analysis would not be implemented. The existing condition of available habitat and population trends described in the analysis would persist.

3.12.7.2 Cumulative Effects

Since there are no actions proposed, there would be no cumulative effects.

3.13 RECREATION

Table 3- 33. Summary of Recreation Effects

	Activity or Measure	Proposed Action	No Action
Developed Recreation	Carp River Campground	None	None
	Mouth of Carp Day Use Area	None	None
	Foley Creek Campground	None	None
	Brevoort Lake Campground	Noise impact of proposed harvest could be heard at 39-55 sites between May 7 and 15 and between October 1 and 15.	None
		Increased traffic on FR3108 for approximately 99 days.	
	Brevoort Lake Day Use Area	None	None
	Lake Michigan Campground	Noise impact of proposed harvest could be heard for a total of 99 days between May 7 and October 15. US-2 vehicle traffic may muffle logging sounds.	None
		No distinguishable change to traffic on US-2.	
	Lake Michigan Day Use Area	Because of its location adjacent to US-2, day users expect to hear traffic noise.	None
		No distinguishable change to traffic on US-2.	
Dispersed Recreation	Search Bay dispersed campsites	None	None
	Brevoort Lake dispersed campsites	No noise impacts.	None
		Increased traffic on FR3303 for approximately 14 days.	
	FR3466 dispersed campsites	Noise impacts of proposed harvest could be heard for a total of 25 days during the summer.	None
		Increased traffic on FR3466 for approximately 62 days.	
Trails	St. Martin's Ski Trail	None	None
	Sand Dunes Ski Trail	Noise impact of proposed harvest could be heard along loops A, B, C, E and G for a total of 27 days.	None
		Increased traffic on H-57 for approximately 79 days.	
	Sand Dunes Ski Trail NCT connector	None	None

	Activity or Measure	Proposed Action	No Action
	North Country Trail	Noise impact of proposed harvest could be heard along approximately 1.5 miles of trail near FR3104 a total of 28 days; along approximately 1.6 miles of trail south of Round Lake for a total of 64 days; along approximately 3.5 miles of trail south of Brevoort Lake for a total of 83 days; and along approximately 2.1 miles of trail west of Brevoort Lake a total of 83 days.	None
		Increased traffic on FR3104 for approximately 14 days; on H-57 for approximately 79 days; on FR3303 for approximately 14 days; and on FR3108 for approximately 99 days.	
	Ridge Interpretive trail	Noise impact of proposed harvest could be heard for a total of 83 days along the whole trail.	None
		Increased traffic on FR3108 for approximately 99 days.	None
	Ridge Trail NCT connector	Noise impact of proposed harvest could be heard for a total of 83 days along the whole trail.	None
		Increased traffic on FR3108 for approximately 99 days.	None
	Camp Round Lake CCC Interpretive Trail	None	None
	Horseshoe Bay Hiking Trail	None	None
	Fisherman's Hike Trail	None	None

3.13.1 Introduction

Because of its geographic location on the shores of Lakes Michigan and Huron and its proximity to the most popular access into the Upper Peninsula (the Mackinac Bridge), this project area is especially popular on the HNF for recreational activities. As seen throughout history, people love to congregate along the water's edge. Many types of recreation activities occur in the Shores project area, including hunting; fishing; developed and dispersed camping; riding off-highway vehicles (OHVs); snowmobiling; skiing; snowshoeing; water sports such as swimming, kayaking and canoeing, boating, and use of personal watercrafts, as well as sunbathing; hiking; biking; mushroom and berry picking; and driving for pleasure or viewing scenery.

This analysis focuses on the following impacts to recreationists and the recreation resource:

- The sights and sounds of harvest-related activities at or near recreation sites and trails.
- Hauling on access roads to developed recreation areas and dispersed sites, as well as on non-motorized trail access on forest roads.
- Duel use on snowmobile trails (i.e. snowmobiles and log trucks).
- The impacts of harvest-related activities to the visual resource (Section 3.15).

Based on comments received from the public during scoping, motorized and non-motorized access was raised as a significant issue (See 1.7.1).

3.13.2 Analysis Methods

3.13.2.1 Developed Recreation

Sounds of Harvest-related Activities. The distance that noise travels from a typical harvest on the Eastside of the HNF was calculated to be 1,879 feet (See Recreation Specialist Report). A 1,879 foot boundary was placed around each proposed harvest activity to depict that distance noise could travel. Those boundaries that overlap Brevoort Lake Campground or day use area, or Lake Michigan Campground or day use area were analyzed for the duration of noise potentially affecting each of those sites. Design criteria for Brevoort Lake Campground were considered, as were design criteria from other resources that limited the time of year the proposed harvesting could occur (Section 2.2.2.2 and Appendix B). Data obtained from the campground concessionaire identified the number of campsites occupied at Brevoort Lake and Lake Michigan campgrounds and the number of registered vehicles at Brevoort Lake and Lake Michigan day use areas in order to determine the number of occupied campsites and registered

Photo 6. Brevoort Lake Campground is one of four developed campgrounds within the Shores analysis area.

vehicles that could be affected by the noise of harvest-related activities (U.P. Campgrounds, 2008 and 2009). See Recreation, Visuals, and Special Area Specialist Report in the project file for further information.

Hauling on Access Roads. In order to determine the duration of hauling on developed recreation access roads, routes from county roads and state highways to the developed recreation area were identified. Proposed harvest stands along the developed recreation access route were then identified and the duration of proposed harvesting was calculated. Design criteria for Brevoort Lake Campground was considered, as were design criteria from other resources that limit the time of year the proposed harvesting could occur (Section 2.2.2.2 and Appendix B).

3.13.2.2 Dispersed Recreation

Sounds of Harvest-related Activities. The process for calculating noise duration on the dispersed sites is the same as that described for the developed recreation. Gathering data to quantify recreationists who use these dispersed sites is difficult due to the nature of this type of recreation activity. Therefore, this analysis will focus on the number of days each site is potentially impacted by noise. See Recreation, Visuals, and Special Area Specialist Report in the project record for further information.

Hauling on Access Roads. The process for determining the duration of hauling on dispersed sites access routes is the same as that described for developed recreation. Gathering data to quantify recreationists who use these roads to access dispersed sites is difficult due to the nature of this type of recreation activity. Therefore, this analysis will focus on the number of days each road is potentially used for hauling. Moreover, there is no time of operation for dispersed sites, as they are open year round. For this reason, the duration and seasonality of the proposed harvest activities was compared to other dispersed site limiting factors such as a winter access. See Recreation, Visuals and Special Area Specialist Report in the project record for further information.

3.13.2.3 Non-motorized Trails

Sounds of Harvest-related Activities. The process for calculating noise duration on the non-motorized trails is the same as that described for the dispersed recreation. However, only those areas of the trail that are determined to be within noise range of the proposed harvest area are analyzed. See Recreation, Visuals and Special Area Specialist Report in the project record for further information.

Hauling on Access Roads. The process for determining the duration of hauling on non-motorized trail access routes is the same as that described for dispersed recreation. However, linear trails such as the NCT have multiple access points; therefore, the route to each access point was analyzed.

3.13.2.4 Snowmobile Trails

Hauling on Access Roads. The process for determining the duration of shared hauling and snowmobiling on the trails is the same as that for non-motorized trails. However, snowmobile trails not only include the access route to the trail, but in some cases, the trail itself.

3.13.2.5 Motorized Access

Change in Motor Vehicle Use Map (MVUM). This analysis compares the existing road use on the MVUM to the proposed road changes to the MVUM. There are several proposals to the road system that would not have an effect on the motorized access since they would not change the MVUM.

Road activities that could affect motorized access are open roads (MLs 2-5) to be decommissioned and open roads (MLs 2-5) to be closed.

- Existing roads to be added to the system that are currently open to motorized use, but are proposed to be closed to motorized use.
- Existing roads to be added to the system that are currently closed to motorized use, but are proposed to be open to motorized use.

3.13.2.6 New Permanent Road Construction of Open Roads (MLs 2-5)

Road Density. In response to public comment, potential road density for each MA in each alternative was calculated. Miles of open and closed roads for each MA within the project area was totaled. The total miles for each MA were then divided by the total number of square miles for each MA within the project area.

Availability of New Roads. Also in response to public comment, availability of new roads was determined. The miles of new road construction that would be left open for public motorized use after the proposed harvest activities were complete was calculated. Similarly, the miles of new road construction that would be closed to public use after the proposed harvest activities are complete were calculated.

Access on I188C, FR3193, and FR3105E. Lastly, in response to specific public comment, three roads, I188C, FR3193, and FR3105E were identified as open to public motorized use, or closed to public motorized use.

Non-motorized Access
Decommissioned Roads. In response to public comment, the total miles of roads proposed for decommissioning was calculated.

Road Closure Method. Also in response to public comment, the method of road closure (either gated or earthen/slash) was identified for each road proposed to be closed to motorized use.

3.13.3 Analysis Areas

3.13.3.1 Developed and Dispersed Recreation

Sounds of Harvest-related Activities. The spatial boundary for the direct, indirect, and cumulative effects of harvest-related noise on developed areas and dispersed sites is 1,879 feet around each developed site. This is because the noise from a typical harvest on the Eastside of the HNF would travel that distance. Anything beyond 1,879 feet would have the decibels equivalent to secluded woods with little or no wind (see Recreation, Visuals, Special Area specialist report in the project record).

The temporal boundary for the direct, indirect, and cumulative effects of harvest-related noise on developed areas and dispersed sites is the duration of all the harvest-related activities because this is the length of time the noise associated with harvest activities could be heard at each area. The duration is different for each developed recreation area because each has different proposed harvest adjacent to them. Brevoort Lake recreation area (campground and day use area) is 14 days. Lake Michigan recreation area (campground and day use area) is 99 days. Brevoort Lake dispersed sites is 0 days. FR3466 dispersed sites is 25 days.

Hauling on Access Roads The spatial boundary for the direct, indirect, and cumulative effects of hauling on developed and dispersed recreation access routes is the access road to the area or site that is also proposed for hauling timber because each of these activities would use the same roads, causing a change in the traffic flow.

The direct, indirect, and cumulative effects temporal boundary of hauling on developed recreation access routes is the duration of all the harvest-related activities that occur on that access route because this is the length of time traffic flow would increase on these dual use roads. The duration is different for each developed recreation area because each has different proposed harvest adjacent to them. Brevoort Lake recreation area (campground and day use area) is 99 days. Lake Michigan recreation area (campground and day use area) is 0 days. Each boundary was determined because of the length of time the adjacent harvest activities would occur. Brevoort Lake dispersed sites is 14 days. FR3466 dispersed sites is 62 days.

3.13.3.2 Non-motorized Trails

Sounds of Harvest-related Activities.
The spatial boundary for the direct and indirect effects of harvest-related noise on non-motorized trails is 1,879 feet around each part of a trail within the project area. This is because the noise from a typical harvest on the Eastside of the HNF would travel that distance. Anything beyond 1,879 feet would have the decibels equivalent to secluded woods with little or no wind (see Recreation, Visuals, Special Area specialist report in the project record).

The spatial boundary for the cumulative effects of harvest-related noise on non-motorized trails is the entire trail because the recreationist could travel the entire trail in less than a day, and the noise associated with harvest activities along one part of the trail may impact the experience for the entire trail. For the NCT, the cumulative effects boundary is 1,879 feet around the trail from the trailhead at Mackinac Bridge Welcome Center to the trailhead at H-40 because the average daily hike is approximately 20 miles.

The temporal boundary for the direct, indirect, and cumulative effects of harvest-related noise on a non-motorized trail is the duration of all the harvest-related activities that occur on that access route because this is the length of time the noise associated with harvest activities could be heard along the trail. The duration is different for each non-motorized trail because each has different proposed harvest adjacent to them. The NCT direct and indirect effect boundary for Area 1[1] is 28 days, Area 2[2] is 64 days in the winter, Area 3[3] is 83 days, and Area 4[4] is 83 days,

[1] Area 1 is near the Castle Rock (FR3104) trailhead. It is estimated hikers could hear harvest activities along approximately 1.5 miles of trail in this area.
[2] Area 2 is southwest of Round Lake. It is estimated hikers could hear harvest activities along approximately 1.6 miles of trail in this area.
[3] Area 3 is south of Brevoort Lake. It is estimated hikers could hear harvest activities along approximately 3.5 miles of trail in this area.
4 Area 4 is west of Brevoort Lake. It is estimated hikers could hear harvest activities along approximately 2.1 miles of trail in this area.

and is 258 days for cumulative effects. Sand Dunes Ski Trail is 27 days. Ridge Interpretive Trail and the NCT connector are 83 days.

Hauling on Access Roads. The spatial boundary for the direct, indirect, and cumulative effects of hauling on non-motorized trail access point routes encompasses each non-motorized trail within the project area, the access routes to the trail, and all the proposed harvest areas that would use that access route. This is because each of these activities would use the same roads, causing a change in the traffic flow.

The temporal boundary for the direct, indirect, and cumulative effects of hauling on non-motorized trail access routes is the duration of all the harvest-related activities that occur on that access route because this is the length of time traffic flow would increase on these dual use roads. The duration is different for each non-motorized trail access route because each has different proposed harvest adjacent to them. The NCT direct and indirect effect boundary for Area 1 is 14 days, Area 2 is 79 days in the winter, Area 3 is 14 days, and Area 4 is 99 days, and is 206 days for cumulative effects. Sand Dunes Ski Trail is 79 days in the winter. Ridge Interpretive Trail and the NCT connector are 99 days.

3.13.3.3 Snowmobile Trails

Hauling on Access Roads. The spatial boundary for the direct and indirect effects on snowmobile trails or their access routes encompasses each snowmobile trail within the project area, the access routes to the snowmobile trail and all proposed harvest areas that would use those access routes. This is because each of these activities would use the same roads, causing a change in the traffic flow.

The spatial boundary for cumulative effects on snowmobile trails or their access routes is the same as the direct and indirect effects; however, each trail length will go from destination point to destination point the recreationist could travel this distance in a day, and the interaction with logging trucks may impact the experience for the entire trip. For Snowmobile Trail 2, the cumulative effects boundary extends from St. Ignace to Moran; for Snowmobile Trail 47, boundary extends from Cedarville to Moran; for Snowmobile Trail 471, the boundary extends the entire length of the connector trail.

The temporal boundary for the direct, indirect, and cumulative effects of hauling on non-motorized trail access routes is the duration of all the harvest-related activities that occur on that access route because this is the length of time traffic flow would increase on these dual use roads. The duration is different for each non-motorized trail access route. Snowmobile Trail 2 is 0 days. Snowmobile Trail 47 is 84 days. Snowmobile Trail 471 is 39 days for Area 1, 71 days for Area 2, 73 days for Area 3, and 183 days cumulatively. Each boundary was determined because of the length of time the adjacent harvest activities would occur. They are different for each snowmobile trail because each trail has different proposed harvest adjacent to them.

3.13.3.4 Motorized Access

Change in MVUM. The spatial boundary for the direct and indirect effects is the project area, since the road closure issues are focused within the project area (see map in project record). Road building would occur in the project area as well.

The spatial boundary for the cumulative effects is the Eastside of the HNF because recreationists feeling displaced in the approximately 54,500 acre project area would still have access to approximately 397,500 acres of non-project area that are available on the Eastside of the HNF.

The temporal boundary for the direct, indirect, and cumulative effects is from the day the decision notice is signed to 15 years in the future. This is the time it would take for all management activities to be implemented in the project area.

Road Density. The spatial boundary for the direct and indirect effects is the MA within the project boundary, since the FP calculates road density by MA. The temporal boundary for direct and indirect effects from the day the decision notice is signed to 15 years in the future. This is the time it would take for all management activities to be implemented.

The spatial boundary for cumulative effects for MAs 6.2 and 6.4 are all the MAs 6.2 and 6.4 forest-wide, because the FP calculates road density by MA. The spatial boundary for cumulative effects for MA 8.1 is the entire cRNA or RNA because each one is a unique ecological area.

The temporal boundary for cumulative effects is from the day the decision notice is signed to 15 years in the future. This is the time it would take for all management activities to be implemented in the project area.

Availability of New Roads. The spatial boundary for direct, indirect, and cumulative effects on the availability of new constructed roads for motorized access is each road, because the change in public access would pertain to each road.

The temporal boundary for determining direct, indirect and cumulative effects on availability of new roads is 10 years from the day the decision notice is signed. This is the time it would take for all harvest-related activities, including harvest, site preparation and reforestation to occur and the road to be decommissioned.

Access on I188C, FR3193, and FR3105E. The spatial boundary for direct and indirect effects on I188C, FR3139, and FR3105E is each road, because the change in public access would pertain to each road.

The spatial boundary for cumulative effects on I188C, FR3139, and FR3105E is within the bounds of US-2, H-57, FR3105, FR3104, Snowmobile Trail 471, and CR 400. This is because all three of these roads are located within the geographic area.

The temporal boundary for direct, indirect, and cumulative effects on availability of new roads is 10 years from the day the decision notice is signed. This is the time it would take for all harvest-related activities, including harvest, site preparation, and reforestation to occur and the road to be decommissioned.

3.13.3.5 Non-motorized Access

Decommissioned Roads. The spatial boundary for direct, indirect, and cumulative effects of road decommissioning on non-motorized access is each road to be decommissioned. This is because the non-motorized recreationist's destination is that particular road.

The temporal boundary for direct, indirect and cumulative effects on availability of new roads is 10 years from the day the decision notice is signed. This is the time it would take for all harvest-related activities, including harvest, site preparation, and reforestation to occur and the road to be decommissioned.

Road Closure Method. The spatial boundary for direct, indirect, and cumulative effects of road closure method on non-motorized access is each road to be closed. This is because the change in public motorized access would pertain to each road.

The temporal boundary for direct, indirect, and cumulative effects on road closure method is 10 years from the day the decision notice is signed. This is the time it would take for all harvest-related activities, including harvest, site preparation, and reforestation to occur and the road to be closed.

3.13.4 Affected Environment

3.13.4.1 Developed Recreation

Listed below are the developed recreation areas within the analysis boundary, their distance from the nearest proposed management activity, and their MA. Noise from proposed harvest-related activities would not travel distances great enough to have an effect on the Carp River Campground, Foley Creek Campground, or the Mouth of the Carp Day Use Area (see the Recreation, Visuals and Special Areas Specialist Report for further information). In addition, none of the proposed harvest stands would use the same access routes as Carp River Campground, Foley Creek Campground, or the Mouth of the Carp Day Use Area; therefore, these three sites will not be analyzed further.

Table 3- 34. Developed Recreation Sites within Analysis Area

Site Name	Proximity to Proposed Management Activities	MA
Brevoort Lake Recreation Area[1]	Adjacent	7.1
Lake Michigan Recreation Area[1]	Within ¼ mile	7.1
Carp River Campground	More than 10 miles	7.1
Foley Creek Campground	More than 5 miles	7.1
Mouth of Carp Day Use Area[2]	More than 10 miles	8.4.2

1. Includes the campground and day use area.
2. Includes the fishing site and the Lake Huron Boat Launch.

Brevoort Lake Recreation Area includes a campground with boat launch and a day use area. The area is typically open from May 7 through October 15.

Brevoort Lake Campground is nestled on a point separating Boedne Bay from the rest of Brevoort Lake. The campground contains 70 campsites on two loops, as well as three flush toilet buildings and a recreation vehicle (RV) station. Occupancy for Brevoort Lake Campground over the past two years suggest between 32 and 38 campsites were occupied between May 7 when the campground opened and May 15 when the design criteria of no harvesting adjacent to Brevoort Lake Campground would begin. And between 7 and 17 camp sites were occupied between October 1 when the design criteria would end and October 15 when the campground closes (UP Campgrounds, 2008 and 2009). Access to the recreation area from US-2 is via FR3108 to FR3437. The campground is to the west on FR3437A and the

day use area is to the east on FR3437B. During the winter, FR3108 is closed to wheeled motor vehicles because it is a groomed snowmobile trail.

The Brevoort Lake day use area is nestled in cedar trees along the grassy shore of Brevoort Lake. There are seven picnic tables, seven grills, and a pit toilet. Vehicle calculations obtained from the concessionaire over the last two years identified no registered vehicles at the Brevoort Lake day use area between May 7 and 15 or between October 1 and 15 (UP Campgrounds, 2008 and 2009).

Lake Michigan Recreation Area sits atop a dunal bluff overlooking Lake Michigan. The day use area is on the west, while the campground stretches to the east between Lake Michigan and US-2. Access to the recreation area is via US-2. It is typically open from May 7 through October 15. The campground contains 33 campsites and 4 pit toilets. Occupancy for Lake Michigan Campground over the past two years suggests campsites were occupied a total of between 1,570 and 1,751 during each camping seasons (UP Campgrounds, 2008 and 2009).

The Lake Michigan day use area has five picnic tables and five grills. A set of stairs leads the day user down to the sandy Lake Michigan beach. Vehicle calculations obtained from the concessionaire over the last two years identified between 312 and 333 vehicles used the Lake Michigan day use area for each of the two seasons (UP Campgrounds, 2008 and 2009).

3.13.4.2 Dispersed Recreation Use

Listed below are the dispersed recreation sites within the analysis boundary, their distance from the nearest proposed management activity, and their MA. Noise from proposed harvest-related activities would not travel distances great enough to have an effect on Search Bay dispersed camping sites (see the Recreation, Visuals and Special Areas Specialist Report for further information). In addition, none of the proposed harvest stands would use the same access routes as Search Bay dispersed camping sites; therefore, Search Bay dispersed camping sites will not analyzed further.

Table 3- 35. Dispersed Recreation Use within Analysis Boundary

Site Name		Proximity to Proposed Management Activities	MA
Search Bay dispersed campsites		Approximately 3 miles away	6.2
Brevoort Dam dispersed campsites	Location 1	Adjacent	6.4
	Location 2	Adjacent	
	Location 3	Approximately 1 mile away	
FR3466 and Snowmobile Trail 47 campsites		Adjacent	6.2

The Brevoort Lake dispersed sites receive the most frequent use in the project area by those searching for unconfined camping opportunities. There are three locations along the NCT at the end of FR3303. Access from US-2 to the three sites is via H-57 north to FR3303 to the NCT. During the winter, FR3303 is closed to wheeled motor vehicles because it is a groomed snowmobile trail.

There are two dispersed camping sites where FR3466 intersects with Snowmobile Trail 47. One of the sites sits atop a bluff overlooking the surrounding area. Access from M-134 to these

Photo 7. Sand Dunes Cross Country Ski Trail

sites is east via CR221 to FR3466. Forest Road 3466 is not plowed in the winter, nor is it part of the snowmobile trail.

3.13.4.3 Non-Motorized Trails

Listed below are the non-motorized trails partially or completely within the analysis boundary, their distance from the nearest proposed management activity, and their MA. Noise from harvest-related activities would not travel distances great enough to have an effect on St. Martin's Cross Country Ski Trail, Sand Dunes Ski Trail Connector to the NCT, Camp Round Lake Civilian Conservation Corps (CCC) Interpretive Trail, Horseshoe Bay Hiking Trail, and Fisherman's Hike Trail (see the Recreation, Visuals and Special Areas Specialist Report for further information). In addition, none of the proposed harvest stands would use the same access routes as St. Martin's Cross Country Ski Trail, Sand Dunes Ski Trail Connector to the NCT, Camp Round Lake CCC Interpretive Trail, Horseshoe Bay Hiking Trail, and Fisherman's Hike Trail; therefore, these five trails will not be analyzed further.

Table 3- 36. Non-motorized Trail Use within Analysis Boundary

Trail Name	Proximity to Proposed Management Activities	MAs
St. Martin's Cross Country Ski Trail	Approximately ½ mile	6.2
Sand Dunes Ski Trail	Approximately ¼ mile	6.4
North Country National Scenic Hiking Trail	Along the trail	6.4
Sand Dunes Ski Trail connector to the NCT	Approximately ½ mile	6.4
Ridge Interpretive Trail	Adjacent to trail	6.4
Ridge Interpretive Trail connector to the NCT	Along the trail	6.4
Camp Round Lake CCC Interpretive Trail	Approximately ¼ mile	6.4
Horseshoe Bay Hiking Trail	More than 5 miles	5.1
Fisherman's Hike Trail	More than 10 miles	8.4.2

The NCT provides an opportunity for recreationists who prefer to travel by foot. Approximately 20 miles of NCT meanders primarily along the ridges and swales of inactive sand dunes. Although most of the use occurs in the summer months, there is some use in winter by cross country skiers and snowshoers.

The trail runs through the city of St. Ignace, following the "Rails to Trails" along CR400, then up to FR3104. This stretch of the trail is concurrent with Snowmobile Trail 2. From the trailhead travelling west, the trail follows the ancient dunes south of FRs 3104 and 3105. Shortly after crossing H-57, the trail crosses the Brevoort River for the first of three times as it makes its way to the south shore of Brevoort Lake. Prior to wrapping around the west end of the lake, the trail passes close to the Brevoort Lake Recreation Area and the Ridge Interpretive Trail. A ¼-mile trail connects the Ridge Interpretive Trail to the NCT.

There are several access points to the NCT within the project area, two of which are trailheads. Access to the trailhead along FR3104 is at the intersection of FR3104 and Snowmobile Trail 2. No trailhead exists where the trail crosses H-57 south of FR3105, but a small pullout accommodates one vehicle. Another access point is at the end of FR3303 west of H-57. The last access point in the project area is at the trailhead near Brevoort Lake Campground.

Photo 8. Snowmobiling on one of the groomed trails within the project area is a popular pastime.

Ridge Interpretive Hiking Trail is located within the Brevoort Lake Recreation Area. This ½-mile trail is a self-guided walking trail. There is a ¼-mile connector trail from the Ridge Interpretive Trail to the NCT for those wishing to experience a longer hike. Access to the trail is via the same route as the Brevoort Lake Recreation Area.

The Sand Dunes Ski Trail meanders up and down inactive sand dunes ¼ mile north of US-2. Loops A through D accommodate skiers from beginner to intermediate while loops E through G are for advanced skiers. The trail is also a popular hiking and mountain biking trail in the summer. Access to the trail from US-2 is via H-57 to the parking lot.

3.13.4.4 Snowmobile Trails

There are three snowmobile trails partially or completely within the project area.

Snowmobile Trail 2 connects St. Ignace to Moran, Rexton, Naubinway, Engadine, and west. Within the project area, the trail runs from St. Ignace along the “Rails to Trails” paralleling CR400, then turns north crossing FR3104 and out of the project area. This section of trail also serves as part of the NCT. Snowmobilers typically do not trailer snowmobiles anywhere within the project area along Snowmobile Trail 2 since it is close to St. Ignace. Instead, they ride between St. Ignace and a destination outside the project area.

Snowmobile Trail 47 connects Detour Village, Cedarville, and Hessel to Moran, Trout Lake, and Raco. Within the project area, the trail shares CR221 for about a mile then follows a series of old logging roads west between CR221 and M-134. The trail crosses CR222 before following CR220 north where it meets up with CR221 to M-134. The trail runs along the shoulder of M-134 for about a mile then diverts northward on FR3425 where it meets up with the bridge across I-75. On the other side of the bridge, the trail parallels Mackinac Trail to FR3118 where it heads outside the project area.

Although the trail crosses or is concurrent with several roads within the project area, there are no trailheads where snowmobilers trailer their snowmobile. Similar to Snowmobile Trail 2, most snowmobilers are passing through the project area from an origin outside the project area to a destination outside the project area. Others travel to and from their homes within the project area.

Snowmobile Trail 471 is a connector trail from Snowmobile Trail 2 at FR3104 to Snowmobile Trail 2 north of Worth Road. This trail uses FRs 3104, 3105, 3303, and 3108, which is closed to wheeled motor vehicles from December to April (MVUM 2010).

Although the trail crosses or is concurrent with several roads within the project area, there are no trailheads where snowmobilers would trailer their snowmobile. Similar to Snowmobile Trail 2, most snowmobilers are passing through the project area from and origin outside the project area to a destination outside the project area. Others travel to and from their homes within the project area.

3.13.4.5 Motorized Access

MVUM. The MVUM shows the National Forest system roads, trails, and the areas on National Forest system lands in the HNF that are designed for motor vehicle use pursuant to 36 CFR 212.51 for the purpose of enforcing the prohibition at 36 CFR 261.31.

The map also contains a list of those designated roads, trails, and areas and shows the types of vehicles allowed on each route and in each area as either:

1. Roads open to highway legal vehicles (motor vehicles licensed under state law for general operation on all public roads within the state), or
2. Roads open to all vehicles (motor vehicles, including smaller off highway vehicles that may be licensed for highway use – but not to oversized or overweight vehicles under state traffic law).

This map also displays any seasonal restrictions. There are many local roads in the project area – 129 miles are open to all motorized use and 106 miles are open to highway vehicles only (see HNF East MVUM, 2007). Together, this connection of roads provides access for Forest visitors, including those participating in recreational activities.

Road Density. The table below identifies the FP guidance for road density and the existing road density for both roads open to all motorized vehicles and for all roads.

Table 3- 37. Road Densities in Shores Project Area (in miles/miles^2)

MA	Forest Plan Density		Existing Density	
	All Roads	Open Roads	All Roads	Open Roads
6.2	2.5	1.5	4.1	2.8
6.4	2.5	1.5	2.4	1.6
8.1	1.0	N/A	1.0	N/A

Access to I188C, FR3193, and FR3105E. Forest Road I188C is a local two-track open to all motorized vehicles (MVUM 2010). However, because this two-track has not been added to the system of Forest Service roads, it is not being maintained. Forest Road I188C travels about 0.2 miles from H-57 into the Point aux Chenes cRNA and across the buried oil pipeline.

FR3193 is a local road that is open to highway vehicles only (MVUM 2010). It travels about 0.2 miles from US-2 into the Point aux Chenes cRNA.

FR3105E is a local road that connects FR3105 to H-57. The ½ mile of road north of the buried gas pipeline is open to all motorized vehicles while the ½ mile of road south of the pipeline is closed to all motorized vehicles (MVUM 2010).

3.13.5 Direct and Indirect Effects

3.13.5.1 Proposed Action

3.13.5.1.1 Developed Recreation

Brevoort Lake Recreation Area. Compartment 167 Stand 3 (C176/S3) is proposed to be logged in the winter when the Brevoort Lake recreation area is closed. Compartment 166/S1 and C167/S11 would only be harvested between October 1 and May 15 since these stands are adjacent to Brevoort Lake Campground (see design criteria in chapter 2). If these two stands are harvested after October 15 when the recreation area is closed, or before May 7 when the recreation area opens, there would be no noise impact on recreationists using the Brevoort Lake Recreation Area.

However, if either stand is harvested between May 7 (when the recreation area opens) and May 14 (before the design criteria starts), the noise could affect campers at sites 1-15 and sites 44-71. Camping numbers obtained from the campground concessionaire identified between 32 and 38 sites being occupied during that time (UP Campgrounds 2008 and 2009). Moreover, if either stand is harvested between October 1 (after the design criteria ends) and October 15 (when the recreation area closes), the noise could also affect campers at sites 1-15 and sites 44-77. Camping numbers obtained from the campground concessionaire identified between 7 and 17 sites being occupied between October 1 and October 15 for the past two years.

Campers occupying sites 1-15 and 44-1 who do not want to hear logging activities could have a diminished camping experience, and/or may be displaced from these sites to sites 6-43 or even from the entire Brevoort Lake campground for the duration of the harvesting activities.

As mentioned earlier, there were no registered vehicles at the Brevoort day use area between May 7 and 15, and between October 1 and 15. It is reasonable to assume this use pattern would continue; therefore, there would be no effect to the Brevoort Lake day use area.

None of the proposed harvesting would have a need to use FR3473, FR3473A or FR3473B as haul roads. Compartment 166/S23, C168/S17(2), C167/S3(1), C167/S3(2), and C167/S3(3) are proposed to be logged in the winter when the campground is closed. Compartment 166/S1 and C167/S11 would only be harvested between October 1 and May 15 since these stands are adjacent to Brevoort Lake Campground (see design criteria in chapter 2). Compartment 166/S21 and C168/S17(1) could be harvested year round. If these stands are harvested when the recreation area is open, there would be dual use on FR3108 for approximately 99 days, depending on if C166/S21 and C168/S17(1) are harvested in the summer. Campers and day users driving FR3108 would notice a slight increase in traffic due to logging trucks. Those not wanting to contend with logging trucks may have a diminished recreation experience, or may be displaced from the Brevoort Lake Recreation Area for the duration of the logging activities.

Lake Michigan Recreation Area. Compartment 166/S23 and C168/S17(2) are proposed to be logged in the winter when the Lake Michigan recreation area is closed. Compartment 166/S21 and C168/S17 (1) could be harvested year round. If these two stands are harvested after October 15 when the recreation area is closed, or before May 7 when the recreation area

opens, there would be no noise impact. However, if either stand is harvested between May 7 and October 15, the noise could affect campers at any of the sites and those using the day use area. Harvest-related noise could impact the campground and day use area at Lake Michigan Recreation Area up to 99 days. Campers who do not want to hear logging activities would be displaced from the campground for the duration of the harvest activities, however, because the stay limit of the campground is a maximum of 14 days, each camper would be implacted up to 14 days. Day users who do not want to hear logging activities would be displaced from Lake Michigan day use area. Since this is a day use area, they would only be displaced for the day.

Since Lake Michigan Recreation Area is adjacent to US-2, campers and day users expect to hear traffic noise. And since the proposed harvest areas are on the opposite side of US-2, the noise from US-2 would be more evident than the noise from the proposed harvest activities. Therefore, it is unlikely that any of the campers or day users would be impacted by the noise of harvest-related activities.

All of the harvest-related activities are across US-2 from the Lake Michigan Recreation Area. Because the proposed harvest activities are not within the recreation area, and the access roads (FR3109) would not be used as a haul road, there would be no dual use of the roads; therefore, there would be no effect on Lake Michigan Recreation Area campers and day users.

3.13.5.1.2 Dispersed Recreation

Brevoort Lake Dispersed Sites. Compartment 165/S6 and C170/S3 are proposed to be logged in the winter. The Brevoort Lake dispersed sites are available year round; however, it is unlikely people camp at these sites during the winter since the typical camper stays in a trailer or motor home and FR3303 is closed to wheeled motor vehicles in the winter. Therefore, there would be no noise impact on recreationists using the Brevoort Lake dispersed sites.

None of these dispersed sites are within the proposed harvest areas and would not be closed. Access to these dispersed sites would be from either the NCT or from FR3303. Access to harvest C165/S6, C170/S3 and C170 /9 would be in the winter only, while C165/S12 and C165/S13 could be harvested year round. Because FR3303 is a designated snowmobile trail (Snowmobile Trail 471), it is closed to wheeled motor vehicles between December 14 and April 30. Since existing access to these dispersed sites is limited to between April 30 and December 14 from FR3303, or from the NCT year round, there is no change to the winter use pattern to access these three sites. Assuming that one stand would be harvested after the other, there would be dual use on FR3303 for approximately 14 days depending on if C165/S12 and C165/S13 are harvested during the summer. Campers driving FR3303 would notice a slight increase in traffic due to logging trucks. Those not wanting to contend with logging trucks may have a diminished camping experience or may be displaced from the Brevoort Lake dispersed sites for the duration of the logging activities.

FR3466 Dispersed Sites. Compartment 128/S24(1), C128/S24(2) and C128/S24(3) could be harvested year round. If all four stands were harvested one after the other, noise from harvest-related activities from these campsites would last for 25 days. The noise could diminish the camping experience or displace campers from FR3466 dispersed sites for 25 days. Neither of the dispersed sites is within proposed harvest areas and would not be closed.

Access to these dispersed sites would be from either the Snowmobile Trail 47 or from FR3466. C128/S26 would be harvested in the winter to comply with the design criteria. Compartment 94/S58, C128/S24(1), C128/S24(2), C128/S24(3), C128/S24(4), C128/S24(5), C129/S3, and

C130/S20 could be harvested year round. Currently, FR3466 is not plowed during the winter months and wheeled motor vehicles do not travel this road to access the dispersed sites when the snow cover is too high. Since wheeled motor vehicle access currently does not use FR3466 during the winter months, there is no change to the winter use pattern to access these two sites. Assuming that one stand would be harvested after the other, there would be dual use on FR3466 for approximately 62 days, depending on if C94/S58, C128/S24(1), C128/S24(2), C128/S24(3), C128/S24(4), C128/S24(5), C129/S3, and C130/S20 are harvested during the summer. Campers driving FR3466 would notice an increase in traffic due to logging trucks. Those not wanting to contend with logging trucks may have a diminished camping experience or may be displaced from FR3466 campsites for the duration of the logging activities.

3.13.5.1.3 Non-Motorized Trails

North Country Trail. Proposed harvest activities could be heard along the NCT in four areas.

The first area is around the FR3104 trailhead where hikers could hear harvest activities along approximately 1.5 miles of trail. Compartment 197/S30 would be harvested in the winter. If the two stands in this area were harvested one after the other, they could be harvested between September 30 and March 1 due to the hawk design criteria for C191/S23. This could diminish the hiking and snow shoeing experience along this area of the NCT for 28 days. Hikers and snowshoers who do not want to hear the sounds of harvest-related activities would be displaced from this area of the NCT for 28 days.

The second area is southwest of Round Lake where hikers could hear harvest activities along approximately 1.6 miles of trail. Compartment 171/S7, C171/S18, C171/S31, C171/S33, C186/S17, and C186/S100 are proposed for winter harvest. If the six stands in this area were harvested one after the other, they would be harvested in the winter only. This could diminish the snow shoeing experience along this area of the NCT for 64 days. Hikers and snowshoers who do not want to hear the sounds of harvest-related activities would be displaced from this area of the NCT for 64 days.

The third area is south of Brevoort Lake where hikers could hear harvest activities along approximately 3.5 miles of trail. Compartment 170/S3, C165/S6, and C170/S9 are proposed to be harvested in the winter while C165/S13, and C165/S12 could be harvested year round. If the five stands in this area were harvested one after the other, they could diminish the hiking and snow shoeing experience along this area of the NCT for 83 days, 71 of which would be during winter. Hikers and snowshoers who do not want to hear the sounds of harvest-related activities would be displaced from this area of the NCT for 83 days.

The fourth area is west of Brevoort Lake where hikers could hear harvest activities along approximately 2.1 miles of trail. Compartment 167/S3(1), C167/S3(2), and C167/S3(3), are proposed to be harvested in the winter while C167/S11, and C166/S1 could be harvested year round. If the five stands in this area were harvested one after the other, they could diminish the hiking and snow shoeing experience along this area of the NCT for 83 days, 47 of which would be during winter. Hikers and snowshoers who do not want to hear the sounds of harvest-related activities would be displaced from this area of the NCT for 83 days.

Hikers and snowshoers access the NCT in the project area from four access points. One access road is along FR3104. Forest Road 3104 is not plowed in the winter, making travelling along the road difficult when the snow is deep. Part of FR3104 is closed to wheeled motor vehicles from December 14 to April 1 because it is part of Snowmobile Trail 2. Access to

harvest C191/S23 and C197/S30 would also be along FR3104. Compartment 191 S23 is proposed to be harvested after September 30 and before March 1 to comply with hawk design criteria. Since existing access to this trail is limited to between April 1 and December 14, there is no change to the winter use pattern to access this area of the NCT. However, if these stands are harvested between October 1 when the hawk design criteria allows, and December 14 when the road is closed to wheeled motor vehicles, there would be dual use on FR3104 for approximately 14 days. Hikers would notice a slight increased traffic flow due to logging trucks. Hikers not wanting to contend with logging trucks may have a diminished hiking experience, or may be displaced from the NCT near FR3104 for the duration of the logging activities.

Another access site is along the Brevoort Lake Road (H-57). Road H-57 is a paved road that is plowed in the winter. Access to harvest C171/S7, C171/S18, C171/S31, C171/S33, C186/S17, C187/S100, C186/S21, and C186/S100 would also be along H-57. All eight stands would be harvested in the winter to comply with the design criteria. Since H-57 is a paved road that is plowed in the winter, no road closure would be expected along H-57 and there would be no change in winter use patterns. There would be dual use on H-57 for approximately 79 days. Those not wanting to contend with logging trucks may have a diminished recreation experience, or may be displaced from the NCT near H-57 for the duration of the logging activities.

Yet another access site is at the end for FR3303. These access effects would be the same as that of the Brevoort Lake dispersed site access.

The last access within the project area is along FR3108 near the Brevoort Lake Recreation Area. These access effects would be the same as that of the Brevoort Lake Recreation Area access.

Sand Dunes Ski Trail. Compartment 186/S21 and C187/S100 are proposed to be logged in the winter. Compartment 187/S20 is proposed to be harvested with seasonal restrictions. If all three stands were harvested one after the other, they would be harvested during the winter to comply with the design criteria for C186/S21 and C187/S100. This would displace cross-country skiers who do not want to hear the sounds of harvest-related activities from segments A, B, C, E, and G for 27 days. Skiers could cross-country ski on segments D and F without hearing noise from harvest-related activities; however, since accessing segments D and F would require skiing through segments A and B it is more likely that skiers who do not want to hear the noise from harvest-related activities would be displaced from the Sand Dunes Ski Trail as a whole.

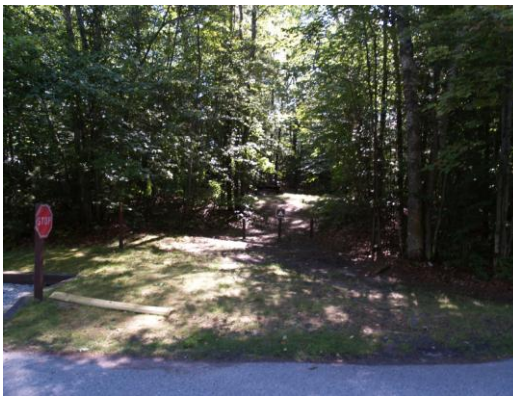

Photo 9. Ridge Interpretive Trail begins within the Brevoort Lake Campground and Connects to the NCT.

None of the harvest activities are along the trail. Access to the ski trail is via H-57 to FR3128. None of the proposed harvest activities would use FR3128 as a haul road; therefore, the access effects to Sand Dunes Ski Trail would be the same as the access to the NCT along H-57.

Ridge Interpretive and NCT Connector Trails. Compartment 176/S3(1), C167/S3(2), and C167/S3(3) are proposed to be logged in the winter. Compartment 166/S1 and C167/S11 would only be harvested between October 1 and May 15 since these stands are adjacent to

Brevoort Lake Campground (see design criteria in chapter 2). If all five stands were harvested one after the other, they would be harvested between October 1 and May 15 to comply with the design criteria for C166/S1 and C167/S11. This would displace hikers who do not want to hear the sounds of harvest-related activities from the whole Ridge Interpretive Trail and the NCT connector for 83 days between October 1 and May 15.

Access to the trail would be the same as access to Brevoort Lake recreation area; therefore, access effects to the Ridge Interpretive Trail would be the same as access to Brevoort Lake Recreation Area.

3.13.5.1.4 Motorized Trails

None of the snowmobile trails would be closed or rerouted. Field visits in winter 2009 determined that most locations where winter access along a snowmobile trail to a proposed timber sale is needed are wide enough to accommodate both hauling and snowmobiles (message M. Sjogren, 12/23/09).

Photo 10. Most locations, where winter access along a snowmobile trail to a timber sale is needed, are wide enough to accommodate both hauling and snowmobiles.

Snowmobile Trail 2. None of the harvest activities are along the trail, and none of the trail would be used as a haul road. Therefore, there would be no effects to Snowmobile Trail 2 due to logging truck access.

Snowmobile Trail 47. Approximately ½ mile of Snowmobile Trail 47 south of FH84 would be used as a haul road. The trail travels through C138/S26(1), C138/S26(2), C130/S100, and C130/S101 which are proposed to be logged in the winter, C127/S6 and C131/S1 which are proposed to be harvested after September 30 and before March 1, and C128/S24(1) and C128/S24(2) which could be harvested year round. The trail would not be closed, but widened and straightened where needed in order to accommodate winter hauling and snowmobiling along the same stretches. In addition, as part of the project design, advanced warning signs would be placed along the trail near the haul portion (see chapter 2 in the EA). Those snowmobilers who do not want to travel the snowmobile trail during harvest activities would be displaced from this section of Snowmobile Trail 47 for 72 to 84 days, depending on if C127/S6, C131/S1, C128/S24(1), and C128/S24(2) are harvested during the winter.

Snowmobile Trail 471. Approximately five miles of Snowmobile Trail 471 would be used as a haul road. Because most of the trail within the project area consists of seasonal roads, the trail only travels through one stand, C165/S6, which is proposed to be logged in the winter. The trail would not be closed, but widened and straightened where needed in order to accommodate winter hauling and snowmobiling along the same stretches. In addition, as part of the project design, advanced warning signs would be placed along the trail near the haul portion (see

chapter 2 in the EA). Those snowmobilers who do not want to travel the snowmobile trail during harvest activities would be displaced from this section of Snowmobile Trail 471 for 39 days.

Approximately three miles of Snowmobile Trail 471 (FR3303) west of H-57 would be used as a haul road. Snowmobile Trail 471, however, would not be closed to snowmobiles during this time. As part of the project design, only part of FR3303 would be plowed to accommodate logging trucks. The remainder of FR3303 would still be a groomed snowmobile trail (see chapter 2 in the EA). Those snowmobilers who do not want to travel the snowmobile trail during harvest activities would be displaced from this section of Snowmobile Trail 471 for 71 days.

Approximately two miles of Snowmobile Trail 471 (FR3108) north of US-2 would be used as a haul road. Snowmobile Trail 471, however, would not be closed to snowmobiles during this time. As part of the project design, only part of FR3303 would be plowed to accommodate logging trucks. The remainder of FR3303 would still be a groomed snowmobile trail (see chapter 2 in the EA). Those snowmobilers who do not want to travel the snowmobile trail during harvest activities would be displaced from this section of Snowmobile Trail 471 for 73 days.

3.13.5.1.5 Motorized Access

Change in MVUM. There are approximately 11 miles of road proposed to be decommissioned. However, all of these sections of roads are currently closed to wheeled motorized use on the MVUM. Because they are already closed to motorized use, decommissioning these roads should not have an effect on motorized use. However, not all of these roads are physically closed. Because they are not physically closed, there may be established (inadvertent) illegal use on these roads. Forest visitors that do travel these roads would be displaced from these roads once they are decommissioned.

This project did not propose any existing roads be added to the system; therefore, there would be no effect on wheeled motorized use due to existing roads to be added to the system that are currently open to motorized use, but proposed to be closed to motorized use. Nor would there be any effect from existing roads being added to the system that are currently closed to motorized use but, proposed to be opened to motorized use.

There are approximately seven miles of new system road construction; however, none of these roads would be open to motorized use. They would be used by loggers to access stands proposed to be harvested and then physically closed to motorized use afterwards. There would be no established use on these roads; therefore, there would be no effect on motorized use.

Access to I188C, FR3193, and FR3105E. These three roads are proposed to be decommissioned along the segments that are closed to all wheeled motorized vehicles. Because they are already closed to motorized use, decommissioning these roads should not have an effect on motorized use. However, not all of these roads are physically closed. Because they are not physically closed, there may be established (inadvertent) illegal use on these roads. Forest visitors that do travel these roads would be displaced from these roads once they are decommissioned.

Table 3-38 below lists the locations for each road, where they are open to motorized vehicle use, where they are closed to motorized vehicles, and where they are proposed to be decommissioned.

Table 3- 38. Proposed Management of I188C, FR3193, and FR3105E

Road	No Action	Proposed Action
I188C	Open to all wheeled motorized vehicles up to the cRNA boundary. Closed to all wheeled motorized vehicles within the cRNA.	Open to all wheeled motorized vehicles up to cRNA boundary. Decommission the road within the cRNA.
FR3193	Closed to all wheeled motorized vehicles the entire length.	Decommission entire length of the road.
FR3015E	Closed to all wheeled motorized vehicles up to the utility corridor. Open to all motorized vehicles from utility corridor north to FR3105.	Decommission the road up to the utility corridor. Open to all motorized vehicles from utility corridor north to FR3105.

Road Density. The road density for MA 6.2 is 4.1 miles/mile^2, for MA 6.4 it is 2.4 miles/mile^2 and for MA 8.1 it is 1 mile/mile^2. See Table 3-37, Road Densities in Shores Project Area.

The small net decrease in roads in MAs 6.2 and 6.4 across a large area yields an unchanged road density for these two MAs. Therefore, there would be no effect to recreationists who travel in these two MAs within the project area. Management Area 8.1 (Point aux Chenes cRNA) has a decrease in road density by 0.2 miles/miles^2. Motorized recreationists who use this MA in this project area would notice the decrease in density, and would either need to use non-motorized transportation in this MA or be displaced from this MA to an area where motorized travel is allowed.

Availability of New Roads. Since all of the proposed new road construction are temporary roads and are planned to be closed or decommissioned once harvest-related activities are complete, there are no direct or indirect effects to this aspect of motorized access.

3.13.5.1.6 Non-motorized Access

Table 3-39 lists the proposed road closure method for each road proposed to be closed.

Table 3- 39. Proposed Closure Method by Road

Road	Location	Miles Closed	Closure Method	
			No Action	Proposed Action
FR3387	On the east side of Nunn's Creek Road (CR222)		None	Gate
FR3387	At trailhead on the south side of St. Ignace Road (FH-84)		None	Gate
1*	Southwest off FR3466	1.9	None	Berm
2*	East side of CR220 to FR3391 (Snowmobile Trail 47)	0.5	None	Berm
3*	CR400 across utility corridor	0.2	None	Berm
6*	North side of FR3760 east of CR220	0.1	None	Berm
7*	East off proposed road 13	0.2	None	Berm
10*	East off FR3433A	0.3	None	Berm
13*	South side of I130C (West of CR220)	0.7	None	Berm
15*	Southeast off proposed road 1	1.3	None	Berm
22*	FR3466 from Snowmobile Trail 2 on the south side of FR3104 to FR3724 on the south side of FR3104	0.5	None	Berm
23*	West side FR3391	0.5	None	Berm

* No assigned road number at this time.

Ten new system roads for a total of approximately 6.2 miles are proposed to be closed using berms. This method of closure, according to the monitoring results from 2007 (Range and Sjogren, 2007), is 33% effective. Because this is a new system road, forest users have not established a use on these roads, and would not feel displaced from this area once the road is closed. Those wishing to explore these roads with a wheeled motor vehicle would need to remove the berms, or go around them. Motorized travel on these roads would be unauthorized.

Because FR3387 is part of a groomed snowmobile trail (Snowmobile Trail 47), two gates on either end of the trail are proposed for the closure method. This would continue to allow snowmobile use in the winter months and deter wheeled motorized use in the summer months. According to road closure monitoring results from 2007 (Range and Sjogren, 2007), gates are only 25% effective, the least of all closure methods monitored. However, since FR3387 is part of the snowmobile trail, other closure methods would not only block the road from wheeled motor vehicles, it would block it from snowmobile use.

3.13.5.2 Cumulative effects

Since the spatial and temporal boundaries for cumulative effects are the same as the direct and indirect effects for Brevoort Lake recreation area, Lake Michigan recreation area, Brevoort Lake dispersed campsites, FR3466 dispersed campsites Sand Dunes Ski Trail, and Ridge Interpretive Trail and NCT connector. Since there is no state, other federal, tribal, or private lands within the cumulative effects boundaries, and since there are no past, present, or reasonably foreseeable projects that would overlap the temporal boundaries, there are no cumulative effects to the above listed area.

3.13.5.2.1 Non-Motorized Trails

North Country Trail. The state of Michigan manages three parcels of land within the cumulative effects area. These parcels range from 40 to 240 acres. Michigan DNRE has posted their analyses and harvest schedules on their website (www.michigan.gov/dnr/doingbusiness). There are no locations within the cumulative effects boundary identified for management activities during the cumulative effects temporal boundary.

The NCT does travel through the Michigan Welcome Center and the Straits State Park. Noise from vehicle traffic on I-75 would be obvious at the Welcome Center, and noise from the campground would be evident while the campground is open. However, these noises are not associated harvest-related activities. Moreover, because the Welcome Center and the campground are in an urban environment, hikers would expect to hear these sounds.

There are several concentrations of private land within the cumulative effects boundary, particularly in and around St. Ignace, on either side of H-57, south and west of Brevoort Lake and near East Lake. With the exception of St. Ignace, the NCT does not cross private land. There is forested National Forest system land in-between the NCT and private land.

Approximately three miles of the NCT travel through the city of St. Ignace. Noises from city traffic and local neighborhoods would be obvious. However, these noises are not associated harvest-related activities. Moreover, because this is an urban environment, hikers would expect to hear these sounds. The next four miles on the outskirts of St. Ignace to the FR3104 trailhead are along the “rails to trails,” which is shared with motor vehicles. Parallel to this trail is CR400, which has light traffic. These noises are also not associated with harvest-related activities, and are expected in this environment.

In addition to the proposed harvest activities in this project area, there are 20 possible stands in the Niagara, East Red Pine 2, and Sprinkler project areas. While there are a few stands within the Interior Wetlands project area that are within the cumulative effects boundary, they are not considered here because they have already been completed and no harvest-related noise would overlap with the cumulative effects temporal boundary. Listed below are the stands, their acres, and any seasonal limits for stands that are within the cumulative effect spatial boundary and potentially within the temporal boundary.

Table 3- 40. Stands, Acres, and Seasonal Limits for Stands that are in the Cumulative Effect Spatial and Temporal Boundary

Project	C	S	Acres	Seasonal Limitations
Shores	197	30	19	Winter log
	191	23	35	Hawk restriction
	171	18	23	Winter log
	165	12	7	None
	165	13	19	None
	170	9	11	Winter log
	165	6	77	Winter log
	170	3	53	Winter log
	166	1	27	None
	167	11	48	None
	167	3	17	Winter log
Niagara	70	7	436	None
	22	10	25	Winter log
	22	11	40	None
	22	8	72	Winter log
	21	12	292	Winter log
	51	1	14	None
	35	2	46	None
	8	1	245	None
	23	17	28	Winter log
Interior Wetlands	125	25	129	None
	125	31	34	None
East Red Pine 2	110	17	12	None
	145	5	116	None
	145	12	28	None
	125	30	28	None
	115	14	35	None
	115	31	16	None
	78	6	50	None
Sprinkler	144	16	80	Winter log
	171	47	24	Winter log
	195	10	33	Winter log
	195	12	10	Winter log

Because it is uncertain when the harvesting activities in this analysis would begin, starting the 168 day cumulative effects temporal boundary, all of the stands listed in the table above are considered to overlap this cumulative effects temporal boundary. Assuming the worst case scenario of timber harvesting of two acres per day, and assuming one stand would be harvested after the other, a total of 897 days (2 years and 167 days) of harvesting will occur in the Niagara, East Red Pine 2, and Sprinkler project areas. Winter harvest will occur in these three project areas for 282 days. Hikers that do not wish to hear the sounds of harvest-related activities would have a diminished hiking experience due to harvesting in several locations along the NCT between St. Ignace and H-40. Signs placed at the trailheads where harvesting activities will occur will alert the hikers. Those not wishing to hike the trail during harvest-related activities would be displaced from the NCT between St. Ignace and H-40 for a maximum of 1,065 days. Snowshoers that do not wish to hear the sounds of harvest-related activities would have a diminished snowshoeing experience due to harvesting in several locations along the NCT between St. Ignace and H-40. Signs placed at the trailheads where harvesting activities

occur will alert the snowshoers. Those not wishing to snowshoe the trail during harvest-related activities would be displaced from the NCT between St. Ignace and H-40 for a maximum of 400 days.

3.13.5.2.2 Snowmobile Trails

Snowmobile Trail 2. Since there are no direct or indirect effects to Snowmobile Trail 2, there are no cumulative effects.

Snowmobile Trail 47. As mentioned earlier, snowmobilers do not trailer their snowmobile to an access point along this section of the trail. Rather, they access the snowmobile trail either from Cedarville, Hessel, or Moran, or they access the trail from home. Therefore, this analysis will focus on change in traffic flow due to dual use of the snowmobile trail as a hauling road.

Past and present federal projects that overlap spatially and temporally with the cumulative effects boundary are Sprinkler. There are 12 stands to be harvested in the Sprinkler analysis. Compartment 122/S16 is 28 acres and located on the west side Mackinac Trail near FR3308. The logging materials from this stand would be hauled via Mackinac Trail, as opposed to Snowmobile Trail 47. Compartment 138/S37 is 9 acres, C55/S42 is 25 acres, and C155/S40 is 23 acres and are located along FR3118 approximately two miles west of Mackinac Trail. Compartment 139/S26 is 57 acres, C139/S29 is 12 acres, and C138/S19 is 35 acres and they are located along FR3118 approximately three miles west of Mackinac Trail. Compartment 138/S8 is 10 acres and C140/S2 is 20 acres and are located at the intersection of FR3118 and FR3119. Compartment 140/S16 is 51 acres and located on FR3119 approximately ½ mile south of FR3118. Compartment 140/S34 is 6 acres, C151/S2 is 36 acres and C151/S3 is 101 acres and are located on FR3119 between FR3118 and M-123.

There are several parcels of private land and city property within the cities of Hessel, Cedarville, and Moran. Moderate to heavy traffic is expected in both of these areas. There are also several parcels of private land east of the forest boundary. Snowmobile Trail 47 is groomed and winter access by wheeled motor vehicles is prohibited. Therefore, there would be no other winter use of this trail. According to the DNRE website, there are no proposed harvests on state land adjacent to the snowmobile trail.

Cumulatively, Snowmobile Trail 47 would have dual use for 265 to 277 days depending on if C127/S6, C131/S1, C128/S24(1) and C128/S24(2) are harvested during the winter. The trail would not be closed, but widened and straightened where needed in order to accommodate winter hauling and snowmobiling along the same stretches. In addition, as part of the project design, advanced warning signs would be placed along the trail in the vicinity of the haul portion (see chapter 2 in the EA). Those snowmobilers who do not want to travel the snowmobile trail during harvest activities would be displaced from this section of snowmobile trail for the duration of harvesting.

Snowmobile Trail 471. As mentioned earlier, snowmobilers do not trailer their snowmobile to an access point along this section of the trail. Rather, they access the snowmobile trail either from St. Ignace, or they access the trail from home. Therefore, this analysis will focus on change in traffic flow due to dual use of the snowmobile trail as a hauling road.

Past and present federal projects that overlap spatially and temporally with the cumulative effects boundary are Sprinkler. There are four stands to be harvested in the Sprinkler analysis.

Compartment 144/S16 is 80 acres, C143/S7 is 37 acres, C115/S31 is 16 acres, and C115/S14 is 35 acres, and are located north of FH-2.

There are several parcels of private land near Round Lake and south and west of Brevoort Lake. Snowmobile Trail 471 is groomed, and winter access by wheeled motor vehicles is prohibited. Therefore, there would be no other winter use of this trail. According to the DNRE website, there are no proposed harvests on state land adjacent to the snowmobile trail.

Cumulatively, Snowmobile Trail 471 would have dual use for 267 days. The trail would not be closed, but widened and straightened where needed in order to accommodate winter hauling and snowmobiling along the same stretches. In addition, as part of the project design, advanced warning signs would be placed along the trail in the vicinity of the haul portion (see chapter 2 in the EA). Those snowmobilers who do not want to travel the snowmobile trail during harvest activities would be displaced from this section of snowmobile trail for the duration of harvesting.

3.13.5.2.3 Motorized Access

Change in MVUM. Past and present federal projects that overlap spatially and temporally with the cumulative effects boundary are Sprinkler, Sand Clay, Rudyard, East Red Pine 2, Interior Wetlands, Niagara, Whitefish Bay Scenic Byway, Raco, and Lake Superior Highlands.

According to the state of Michigan website, there is no proposed road or trail related activities in the cumulative effect boundary (www.mighigan.gov/documents/MDOT_5_year_Plan_SUPERIOR_143119_7.pdf, 2009). There are no planned road activities in Chippewa or Mackinac counties.

Commercial timberlands are private (non-governmental) lands in which the landowner opens up the property for public hunting. The commercial timberlands identification process is Michigan DNRE program. There are four large areas within the cumulative effects boundary. There is approximately 280 acres southwest of the town of Allenville, several thousand acres in the Sullivan Creek area southwest of the Delirium Wilderness, a couple hundred acres around Pardy Pond, and several thousand acres north and west of Piatt Lake. These areas are commercial timberlands and currently well roaded, although several of the roads are gated closed.

There may be road construction, decommissioning, or closure on private lands; however, they are typically not open to public use and would not fit any of the categories below. Therefore, any cumulative effect from private land would apply to that particular private landowner.
Cumulatively in this alternative there would be:

- Approximately 55 miles of new system road construction.
- Approximately 70 miles of existing roads open to motorized vehicle use decommissioned.
- Approximately 20 miles of existing roads open to motorized use closed.
- Approximately 0.4 miles of existing road open to motorized use added to the system and closed.
- Approximately 7 miles of existing road closed to motorized use added to the system and opened.

The net cumulative change to the road system as it related to motorized use would be approximately 29 miles fewer roads open to motorized vehicle use in the cumulative effects area. The changes to motorized use are randomly located throughout the cumulative effects area. That is, there is no concentrated change in one particular area. The change typically consists of one mile of road or less, and the changes are expected to take effect as the projects are implemented over the next 15 years.

While this may be the case, a series of changes to the road system in one location would displace motorized vehicle users. Recreationists who utilized motorized vehicles as part of their recreation experience, such as for hunting, driving for pleasure, mushroom gathering, and berry picking may notice some change in their ability to access an area via motorized vehicle. Closing or decommissioning these roads would mean that forest users who wish to access the adjacent areas would have to walk. Those wishing to recreate using motorized means would be displaced from these areas, and may find a new spot to recreate in the 55 miles of newly open road.

However, should the changes to a particular area occur over a longer period of time, it is likely the motor vehicle user may not notice any change.

Road Density. Since there are no direct and indirect effects for MAs 6.2 and 6.4, there are no cumulative effects.

Since there are no proposed road changes on private land within MA 8.1, the cumulative effects are the same as the direct and indirect effects.

Availability of New Roads. Because there are no direct and indirect effects to this aspect of motorized access, there are no cumulative effects.

Access to I188C, FR3193, and FR3105E. Because the direct and indirect effects spatial and temporal boundary are the same as the cumulative effects spatial and temporal boundary, and because there are no known past, present, or reasonably foreseeable federal or private road construction or closures, the cumulative effects are the same as the direct and indirect effects.

3.13.5.2.4 Non-motorized Access.

Decommissioned Roads. Because the direct and indirect effects spatial and temporal boundary are the same as the cumulative effects spatial and temporal boundary, and because there are no known past, present, or reasonably foreseeable federal or private road construction or closures, the cumulative effects are the same as the direct and indirect effects.

Road Closure Method. Because the direct and indirect effects spatial and temporal boundary are the same as the cumulative effects spatial and temporal boundary, and because there are no known past, present, or reasonably foreseeable federal or private road construction or closures, the cumulative effects are the same as the direct and indirect effects.

3.13.6 No Action

3.13.6.1 Direct and Indirect Effects

3.13.6.1.1 Developed Recreation

There would be no noise from proposed harvest-related activities. Campers at Brevoort Lake and Lake Michigan campgrounds would not have a diminished camping, nor would they be displaced due to proposed harvest-related activities. Similarly, day users from Lake Michigan day use area would not have a diminished day use experience or be displaced due to harvest-related activities.

There would be no logging trucks using FR310; therefore, there would be no change in traffic flow and no effect on the Brevoort Lake and Lake Michigan recreation areas.

3.13.6.1.2 Dispersed Recreation

There would be no noise from proposed harvest-related activities. Campers from Brevoort Lake and FR3466 dispersed camp sites would not have a diminished camping experience, nor be displaced due to harvest-related activities.

There would be no logging trucks using FRs 3303 or 3466; therefore, there would be no change in traffic flow and no effect on the Brevoort Lake and FR3466 dispersed campsites.

3.13.6.1.3 Non-motorized Trails

There would be no harvest-related activities along the any of the trails within the project area and there would not be use of trail access routes for haul roads. Therefore, there would be no effect to the trails within the project area.

3.13.6.1.4 Snowmobile Trails

There would be no harvest-related activities along the any of the trails within the project area and there would not be use of trails or access routes for haul roads. Therefore, there would be no effect to the trails within the project area.

3.13.6.1.5 Motorized Access

Change in MVUM. There would be no open roads to be decommissioned; no open roads to be closed; no existing roads to be added to the system that are currently open to motorized use but, are proposed to be closed to motorized use; no existing roads to be added to the system that are currently closed to motorized use but are proposed to be open to motorized use;, and no permanent road construction of open roads. Therefore, there would be no effect to this aspect of motorized access within the project area.

Road Density. There would be no changes to the road density. Therefore, there would be no change in access for recreationists using motorized means.

Availability of New Roads. No new roads would be constructed. Therefore, there would be no change in availability of new roads for motorized access.

Access to I188C, FR3193 and FR3105E. I188C, FR3139, and FR3105E would not be decommissioned. Motorized access would continue on these three roads. Therefore, there would be no effect to access to these three roads.

3.13.6.1.6 Non-motorized Access

Decommissioned Roads. There would be no roads decommissioned. Therefore, there would be no change in access for recreationists using non-motorized means.

Road Closure Method. There would be no roads closed. Therefore, there would be no change in availability of new roads using non-motorized access.

3.13.6.2 Cumulative Effects

Because there are no management related direct and indirect effects, there are no cumulative effects.

3.14 SPECIAL EMPHASIS AREAS

Table 3- 41. Summary of Effects

Activity or Measure	Proposed Action	Alternative 1 (No Action)
Effects to Horseshoe Bay Wilderness	None	None
Effects to Carp Wild and Scenic River	None	None
Effects to Horseshoe Bay RNA	None	None
Effects to St. Martin's Point cRNA	None	None
Effects to Point aux Chenes cRNA	Ground disturbance from road decommissioning could alter the natural successional patterns along these roads, which could diminish the potential as an RNA.	None
	Road decommissioning would reduce the level of human presence that could alter the natural successional patterns in the cRNA.	

3.14.1 Introduction

Horseshoe Bay Wilderness is situated in a long narrow strip between H-63 (Mackinac Trail) and Lake Huron, adjacent to Foley Creek Campground. It contains 3,910 acres. The closest proposed management activity to Horseshoe Bay Wilderness is more than five miles away.

Photo 11. Horseshoe Bay Wilderness looks out on Lake Huron.

The Carp River is a designated Wild and Scenic River. Approximately six miles of the river lie within the project area. The closest proposed management activity is more than 10 miles from the river corridor.

The St. Martin's Point cRNA is 518 acres and is located at the tip of St. Martin's Point. The closest proposed management activity is more than four miles from the cRNA.

The Horseshoe Bay RNA is divided into two separate land units. The northern unit is 377 acres and is located along the Lake Huron shoreline just north of the Fisherman's Hike Trail. The southern unit is located within the Horseshoe Bay Wilderness Area and is 1,871 acres. The closest proposed management activity is more than five miles from Horseshoe Bay RNA.

Due to the distance between the proposed management activity and the Horseshoe Bay Wilderness, the Carp Wild and Scenic River, St. Martin's Point cRNA, and Horseshoe Bay RNA, no effects to these areas are anticipated. Therefore, they will not be analyzed further.

Shoreline south of Round Lake. Since there is no other management activities proposed near the cRNA, the effects in this section are focused on decommissioning roads I188C and FR3193. Point aux Chenes cRNA is 4,266 acres along the Lake Michigan. Effects to the recreation resource due to decommissioning these two roads can be found in the Recreation section (3.13.5.1.5)

3.14.2 Analysis Methods

The proposed decommissioning of I188C and FR3193 are compared to the Forest Plan directions for compliance in order to ensure the proposed activities did not diminish the cRNA's eligibility status.

3.14.3 Analysis Area

The direct, indirect, and cumulative effects spatial boundary for Point aux Chenes cRNA is the cRNA boundary. This is because the cRNA provides a representation of a Society of American Foresters type and a boundary resistant to both changes caused by natural events and management activities from the surrounding landscape (FP FEIS, p. D-2). In the case of Point aux Chenes cRNA, no change to the boundary was recommended (FP FEIS, p. D-16).

The temporal boundary for direct, indirect, and cumulative effects for Point aux Chenes cRNA is 10 years. This is the time it takes to decommission the roads going into the cRNA and for vegetation to grow on the road beds making them appear more natural.

3.14.4 Affected Environment

Point aux Chenes cRNA was chosen to represent interdunal wetlands ecological community. It includes all or part of Sections 19, 28-33 T41N R4W and Sections 23-25 and 36 T41N R5W. There is a buried gas pipeline immediately to the north of the cRNA, and a buried oil pipeline that passes through the center of the cRNA. Roads I188C, I189A, I189C and I189D, and FRs 3408 and 3408A are within the cRNA, and allow use by all wheeled-motor vehicles, including OHVs. Forest Road 3193 is also within the cRNA, but allows use by highway legal vehicles only. The majority of these roads are in the southeast portion of the cRNA, near private land.

Berry picking in the cRNA in late summer and fall is a favorite pastime for local recreationists. Access to these berry patches is via I188C and FR3193. Road density within this cRNA is one mile, which is the limit for this MA.

Forest Plan direction for cRNAs determines the activities and the intensity allowed. Ground-disturbing activities, alterations to vegetation, recreation use, or other management activities may disturb sensitive areas, alter natural successional patterns, and increase the human presence which could diminish the potential of these areas as RNAs (FP FEIS, p. 3-233). New or expanded recreation use or facilities that conflicts with the cRNA objectives or purposes are prohibited (FP, p. 3-36). Motorized use should be prohibited except for emergency or administrative situations (FP, p. 3-36). New roads should not be constructed (FP, p. 3-37).

Existing roads should be decommissioned and obliterated where not contributing to management objectives or where other feasible alternatives exist (FP, p. 3-37).

3.14.5 Proposed Action

3.14.5.1 Direct and Indirect Effects

Decommissioning roads requires removal of roadbeds in order to render the road useless to all motorized vehicles. The degree of decommissioning depends in part on the location of the road and the established use. In some recent cases, decommissioning the road involved uprooting and knocking over trees and ripping up the roadbed. Because of the knocked over trees, this method of decommissioning can also make it difficult for foot travel along the old roadbed.

Decommissioning I188C and FR3193 would require some ground disturbance such as ripping up the road bed or knocking down and uprooting trees. This ground disturbance could spread existing NNIP, or introduce new NNIP into the cRNA, which could alter the natural successional pattern along these roads and diminish the potential of Point aux Chenes as an RNA.

Decommissioning road I188C and FR3193 within the cRNA would reduce the road density within this MA 8.1 to 0.8 miles/mile^2, which is 0.2 miles/mile^2 less than the Forest Plan limit. Motorized access into the cRNA would be reduced, particularly on the west side. Recreationists who drive these two roads to their favorite berry picking spot or hunting spot, or those who drive for pleasure would no longer be able to drive these roads. Depending on how the roads are decommissioned, foot travel along the old corridor may be difficult and challenging. Therefore, the level of human presence would decrease, reducing the potential for further alteration of natural successional patterns, and maintaining or increasing the potential of this area as an RNA.

This proposal is consistent with FP direction described above.

3.14.5.2 Cumulative effects

Cumulatively, there are approximately 400 acres of private land within the cRNA boundary. The private land is consolidated in the southeast portion of the cRNA. There are no known proposals for building roads within the cRNA on private lands. Nor are there any federal past, present, or foreseeable projects proposed within the cRNA boundary. Therefore, there are no cumulative effects.

3.14.6 Alternative 1 (No Action)

3.14.6.1 Direct and indirect effects

There would be no reduction in motorized access. No ground disturbance such as ripping up the roadbed or knocking down and uprooting trees that could alter natural successional patterns and diminish the potential of Point aux Chenes as an RNA.

The road density within the cRNA would remain the same, at one miles/mile^2, which is at the Forest Plan limit. Motorized access into the cRNA would not be reduced. Recreationists who drive these roads to their favorite berry picking spot or hunting spot, or those who drive for pleasure would still be able to drive these roads. Foot travel along the old corridor would continue to be an option. Therefore, the level of human presence would not change from

current levels. Disturbance from human presence combined with inadvertent transport of NNIP seeds could alter the natural successional patterns, which could diminish the potential of this area as an RNA.

This proposal is consistent with FP direction described above.

3.14.6.2 Cumulative effects

Since there are no direct or indirect effects, there are no cumulative effects.

Proposed Action short term vs. long term productivity. Removal of roads within the cRNA would reduce the recreation opportunity of berry picking that several people enjoy, because many of them currently drive to the berry locations. However, by decommissioning these roads, the integrity of the cRNA is maintained or increased, lending to the potential RNA establishment.

3.15 VISUALS

Table 3- 42. Summary of Visual Effects

Activity or Measure	Proposed Action	No Action
Preservation	None	None
Retention	While harvesting activities are occurring, the Visual Quality Objective (VQO) is not met. The VQO would be met in 2-3 years for uneven aged managed stands. The VQO would be met in 15-20 years for even aged managed stands.	None
Partial Retention	While harvesting activities are occurring, the VQO is not met. The VQO would be met in 2-3 years for uneven aged managed stands. The VQO would be met in 15-20 years for even aged managed stands.	None
Modification	While harvesting activities are occurring, the VQO is not met. The VQO would be met in 2-3 years for even and uneven aged managed stands.	None
Maximum Modification	None	None

3.15.1 Introduction

While there were no public concerns raised about the visual resources during scoping, a Forest Plan goal says, “the visual diversity and the natural-appearing character of the Forest is maintained or enhanced.” The Forest Plan objective calls for “increasing the amount of NF lands meeting Visual Quality Objectives as identified on the VQO map or as otherwise specified within individual MA direction.” (FP, p. 2-8). Guidelines for the NCT state, “Timber activities may be seen along portions of the trail in retention and partial retention. Temporary openings as seen from any point along the trail should be generally not greater than 5 acres in retention and not greater than 10 acres in partial retention.”

3.15.2 Analysis Methods

Forest-wide management direction for visual quality (FP p. 2-8) and VQOs found in Appendix C of the Forest Plan (p. C-1 through C-3) were reviewed and used to analyze project effects. The harvest treatments, design criteria and mitigation measures in the Proposed Action and the alternatives were analyzed using Forest Plan direction.

Forest Plan guidelines for visual quality along the NCT suggest limiting the view of temporary openings to 5 acres and 10 acres from any point along the trail in retention and partial retention areas respectively (FP, p. 2-9). Since clearcut with reserves, shelterwood, and seed-tree final removal cut with reserves are considered temporary openings, the analysis of the NCT focuses on these harvest prescriptions. The other harvest prescriptions reduce the density of the stand either from below or above, but are not considered temporary openings.

3.15.3 Analysis Areas

The direct, indirect, and cumulative effects spatial boundary for visual quality is the project area boundary. The direct and indirect effects spatial boundary for visuals along the NCT is ¼ mile on either side of the NCT within the project area boundary because the effects of proposed management activities are very limited and do not extend beyond the immediate area. The spatial boundary for cumulative effects on the NCT is the length of the trail from the Castle Rock trailhead to the trailhead at H-40. This is because the average daily hike is approximately 20 miles.

The temporal boundary used for direct, and indirect effects analysis is 15 years, the time it would take for all vegetation management activities to take place after the signing of the ROD. The temporal boundary for cumulative effects analysis for the NCT is 10 years prior to and 25 years after signing of the ROD. Vegetation management activities that took place more than 10 years prior would have enough tree growth to no longer be considered an opening. Twenty-five years would be the approximate time required to implement the proposed management activities and have enough tree growth to no longer be considered an opening.

3.15.4 Affected Environment

Visual quality management on the Forest is described in terms of VQOs, which are a measure of the degree to which a landscape is visually perceived to be complete (FP, Appendix E, p. E-13). It refers to the degree of acceptable alteration of the characteristic landscape in five levels: preservation, retention (R), partial retention (PR), modification (M), and maximum modification (MM).

The definitions are as follows:

- **Preservation:** Only ecological changes permitted.
- **Retention:** Management activities are not usually evident.
- **Partial Retention:** Management activities remain visually sub-ordinate.
- **Modification:** Management activities in the foreground and middle ground are dominant, but appear natural.
- **Maximum Modification:** Management activities are dominant, but appear natural when seen as background.

Within the project area, partial retention, retention, and modification VQOs are fairly close in size. The Horseshoe Bay Wilderness has a VQO of preservation. Retention VQO is adjacent to the shorelines of Lakes Michigan and Huron, the Pine River, Carp River WSR corridor, Gamble Lake, Chain Lake, Freshette Lake, Martin Lake, and Brevoort Lake, and encompasses the St. Martin's Point and Point aux Chenes cRNAs. A partial retention VQO is adjacent to the preservation and partial retention areas along Lake Huron, between Brevoort Lake and Lake Michigan partial retention areas, adjacent to Mud Lake, Hoban Creek, Massey Lake, and Chain Lake retention areas, along St. Ignace Road from M-134 to Pontchatrain Road, and north of St. Martin's cRNA retention area to ½ mile north of M-134. The remainder of the project area, including a large area north of M-134, is a modification VQO.

The NCT provides an opportunity for recreationists who prefer to travel by foot. Approximately 20 miles of NCT meanders primarily along the ridges and swales of inactive sand dunes. The trail within the project area is predominately retention with large inclusions of partial retention. Approximately 370 acres along the NCT near the Cheeseman Road is within a modification VQO.

3.15.5 Proposed Action

3.15.5.1 Direct and Indirect Effects

The design criteria for heritage resource provides a protection zone of no earth disturbing activities around certain sites. TES plants and animals, and geology provide 200 to 400 foot buffers around the existing locations within the stands proposed for harvest. These design criteria essentially reduce the amount of acres managed in the stand, and aid in meeting the corresponding VQO (see Table 3-43 below).

Table 3- 43. The Acres of Stands in each VQO to be Harvested by each Method

Proposed Harvest Type	Even or Uneven Age Management	M (acres)	PR (acres)	R (acres)	P (acres)
Invasive species removal	NA	0	0	166	0
Clearcut with reserves	Even	495	216	225	0
Shelterwood	Even	0	0	53	0
Seed tree final removal with reserves	Even	0	25	3	0
Single tree selection	Uneven	109	92	22	0
Two-aged shelterwood establishment and removal	Uneven	134	0	33	0
Commercial thin	Uneven	0	40	0	0

The effects of proposed harvesting on the VQO will focus on six high visibility areas: along Snowmobile Trail 47 east of CR222, stands along CR220, along Snowmobile Trail 2 south of FR3104, along H-57, along FR3303, and along FR3108. The remaining areas will be generalized based on the type of proposed harvest, the seasonal restrictions for that proposed harvest, the type of access to the proposed harvest area, and the VQO for that area.

Snowmobile Trail 47 passes through six stands east of CR222. All of these stands are within a modification VQO where management activities in the foreground and middle ground are dominate, but appear natural. All roads within this area are closed to wheeled motor vehicle use with the exception of FR3466, FR3387, I133B, FR3433, and I133C. The first three roads

are open to all motorized vehicles, while the other two are open to highway legal vehicles only. Snowmobile Trail 47 is open to snowmobilers during the winter (December 1 through April 1). Both FR3387 and Snowmobile Trail 47 have stands proposed for harvest along them.

Logging equipment would be present during harvesting. Since most of the stands along Snowmobile Trail 47 in the area would be clearcut with leave trees in the winter, the logging equipment would be evident for approximately 55 days. In addition to logging equipment, decked logs, slash, and fresh cut stumps would be dominate during the harvest activities. During this time, the VQO of modification along Snowmobile Trail 47 would not be met.

In subsequent years, the clearcuts along Snowmobile Trail 47 would appear as openings ranging up to 40 acres. The slash that was evident during harvesting would start to decompose and would be covered by snow within a year's time. The decked logs and fresh cut stumps would weather to a dull gray, and be camouflaged by aspen sprouts sticking up through the snow. Although the area would still appear as an opening, it would meet the VQO of modification since the evidence of management would appear natural.

The stand along FR3387 is also a proposed clearcut with leave trees. This stand is also in a modification VQO. Since this stand is proposed to be harvested in the winter when the road is inaccessible to motorized vehicles, forest visitors would not see the harvesting activities. During the summer following harvesting, the stand would appear to be a new opening and the browning leaves of slash and the fresh cut stumps would be evident through the ground cover. Although the area appears as an opening, it would meet the VQO of modification since the evidence of management would appear natural. In subsequent years along FR3387, the slash that was evident would start to decompose and would be obscured by the new seedlings and saplings.

There are three stands along CR220. Two of these stands are within a modification VQO where management activities in the foreground and middle ground are dominate, but appear natural. The other stand is partially within a modification VQO and partially within a partial retention VQO where management activities remain visually sub-ordinate. County Road 220 is county-maintained. Forest Road 3812 is open to all wheeled motor vehicles. Forest Road 3760 is seasonally open to all wheeled motor vehicles in the summer and serves as Snowmobile Trail 47 in the winter.

There is a proposed log landing on CR220 south of FR3812. The three stands along CR220 are proposed to be single-tree selection which would alter the density of the overstory by thinning from below. The two stands on the east side of CR220 are on either side of the Snowmobile Trail 47. These two stands would be harvested in the fall or winter to comply with the hawk design criteria. The third stand on the west side of CR220 south of FR3812 would be harvested in the winter. Logging equipment would be present during harvesting. The logging equipment would be evident along CR220 for approximately 64 days in the fall and winter, and would be evident along Snowmobile Trail 47 for approximately 26 days in the fall and winter. In addition to logging equipment, decked logs, slash, and fresh cut stumps would be evident during the harvest activities. During this time, the VQOs of partial retention and modification would not be met. After two to three years the residual stand would appear natural again and would once again meet their corresponding VQOs.

Snowmobile Trail 2 passes through two stands south of FR3104. Both of these stands are within a partial retention VQO where management activities remain visually sub-ordinate. Snowmobile Trail 2 is administered by the MDNRE. Forest Road 3104 is seasonally open to all

wheeled motor vehicles. In the winter, FR3104 is part of Snowmobile Trail 471. Forest Road 3724 is closed to all motor vehicles.

Both stands along Snowmobile Trail 2 are proposed to be two-aged shelterwood harvested. Logging equipment would be present during harvesting for approximately 27 days. In addition to logging equipment, decked logs, slash, and fresh cut stumps would be dominate during the harvest activities. During this time, the VQO of partial retention along Snowmobile Trail 2 would not be met. After two to three years, the residual stand would appear natural again and would once again meet the partial retention VQO.

There are five stands adjacent to H-57 proposed for harvest. Four of the five adjacent stands are proposed to be clearcut with leave trees harvest, and one is proposed for a seed tree removal. Two of the stands have small amounts of retention VQO where management activities are not usually evident. However, all five are within a VQO of partial retention where management activities remain visually sub-ordinate. Forest Road 3105F is open to all motor vehicles from FR3105 to the powerline. Access to all other stands would be via FH-57, which is a county maintained road. Logging equipment would be evident along FH-57, and decking is proposed in three locations along both sides of H-57.

Logging equipment would be present during harvesting. Since all five stands along H-57 would be harvested in the winter, the logging equipment would be evident for approximately 57 days in the winter. In addition to logging equipment, decked logs, slash and fresh cut stumps would be dominate during the harvest activities. During this time, the VQOs of retention and partial retention along H-57 would not be met.

In subsequent years, the clearcuts along H-57 would appear as openings ranging up to 30 acres. The slash that was evident during harvesting would start to decompose and would be covered by ground vegetation within 2-3 years. Any remaining decked logs and the fresh cut stumps would weather to a dull gray, and be camouflaged by ground vegetation. The area would appear as an opening for about 15-20 years when the new growth is tall enough to blend in with the surrounding vegetation. Once the saplings are to this point, the VQO of retention and partial retention would be met.

Within two to three years the two-aged shelterwood harvest would appear natural and meet the retention and partial retention VQOs. This type of harvest would decrease the density of the stand, opening up the understory more that it currently is. Stumps and some slash would be evident for the first couple of years until they are hidden by ground vegetation and new seedlings.

There are five stands adjacent to FR3303 proposed for harvest. One of the five adjacent stands is proposed to be clearcut with leave trees harvest, three are proposed for a two-aged shelterwood removal, and one is proposed for a shelterwood establishment. All five stands have a retention VQO where management activities are not usually evident. Forest Road 3303 is seasonally open to highway legal vehicles only. From December 1 through March 30, FR3303 is part of Snowmobile Trail 471.

Logging equipment would be present during harvesting and would be evident for approximately 84 days, 71 days of which would be in the winter. In addition to logging equipment, decked logs, slash and fresh cut stumps would be evident during the harvest activities. During this time, the VQO of retention would not be met.

In subsequent years, the clearcut with leave trees and shelterwood establishment along FR3303 would appear as openings of 11 and 53 acres respectively. The slash that was evident during harvesting would start to decompose and would be covered by ground vegetation within two to three years. Any remaining decked logs and the fresh cut stumps would weather to a dull gray, and be camouflaged by ground vegetation. The area would appear as an opening for about 15-20 years when the new growth is tall enough to blend in with the surrounding vegetation. Once the saplings are to this point, the VQO of retention would be met.

Within two to three years the two-aged shelterwood harvest would appear natural and meet the retention VQO. This type of harvest would decrease the density of the stand, opening up the understory more than it currently is. Stumps and some slash would be evident for the first couple of years until they are hidden by ground vegetation and new seedlings.

There are seven stands adjacent to FR3108 proposed for harvest. Three of the seven adjacent stands are proposed to be clearcut with leave trees harvest, and four are proposed for a two-aged shelterwood removal. Six of the seven stands have a retention VQO where management activities are not usually evident. The seventh stand has a retention VQO adjacent to FR3108, but also has a partial retention VQO. Forest Road 3108 is seasonally open to highway legal vehicles only. From December 1 through March 30, FR3108 is part of Snowmobile Trail 471.

Logging equipment would be present during harvesting and would be evident for approximately 177 days, 56 days of which would be in the winter. In addition to logging equipment, decked logs, slash, and fresh cut stumps would be evident during the harvest activities. During this time, the VQO of retention would not be met.

In subsequent years, the clearcut with leave trees along FR3108 would appear as openings ranging in size up to 167acres. The slash that was evident during harvesting would start to decompose and would be covered by ground vegetation within two to three years. Any remaining decked logs and the fresh cut stumps would weather to a dull gray, and be camouflaged by ground vegetation. The area would appear as an opening for about 15-20 years when the new growth is tall enough to blend in with the surrounding vegetation. Once the saplings are to this point, the VQO of retention would be met.

Within two to three years the two-aged shelterwood harvest would appear natural and meet the retention VQO. This type of harvest would decrease the density of the stand, opening up the understory more than it currently is. Stumps and some slash would be evident for the first couple of years until they are hidden by ground vegetation and new seedlings.

The remaining stands that are proposed to be harvested via single tree selection, and two-aged shelterwood establishment and removal typically alter the look of the stand by reducing the density of the overstory and by thinning from below. The stand would initially have a managed look to it, but after two or three years the residual stand would appear natural again. The commercial thins are generally undetectable, due to the natural screening provided by the vegetation that remains.

In the short term, clearcut with reserves, shelterwood and seed-tree final removal cut with reserves would appear to be new openings with abundant slash and stumps. The browning of dying leaves would contrast highly with surrounding live green vegetation. However, in as soon as one year these areas would typically have abundant green vegetation re-establish itself, obscuring the slash with bracken fern, blueberry, and other forbs. Within two years, trees

typically become re-established, further obscuring the slash and reducing the contrasts in color and texture.

NCT. The table below lists the harvest method, acres and VQO for each stand in the project area within ¼ mile of the NCT.

Table 3- 44. Harvest Method and VQO for each Compartment and Stand in the Project Area within ¼ Mile of the North Country Trail

Compartment	Stand	Harvest Prescription	Even(E)/ Uneven(U)	Acres	VQO
197	30	Two-aged Shelterwood	U	19	PR
191	23	Two-aged Shelterwood	U	35	PR
171	18	Two-aged Shelterwood	U	23	R
165	12	Two-aged Shelterwood	U	7	R
165	13	Two-aged Shelterwood	U	19	R
170	9	Clearcut with leave trees	E	11	R
165	6	Two-aged Shelterwood	U	77	R
170	3	Shelterwood establishment	E	53	R
166	1	Two-aged Shelterwood	U	27	R
167	11	Two-aged Shelterwood	U	48	R
167	3	Two-aged Shelterwood	U	17	R

There are 11 stands proposed for harvest that are adjacent to the NCT. One stand is proposed for shelterwood establishment and 10 are proposed for a two-aged shelterwood removal. Eight of the stands have a retention VQO where management activities are not usually evident. Three of the stands have a partial retention VQO where management activities remain visually sub-ordinate.

Design criteria identified in chapter 2 would retain most of the vegetation within 30 feet of the NCT in order to reduce the amount of brush. This 30-foot boundary would also provide a screen between the NCT and the harvest activities. Logging equipment would be present during harvesting and would still be evident for approximately 161 days along the trail, 92 days of which would be in the winter, and 18 days in the fall or the winter.

The stand proposed for shelterwood establishment would essentially appear as an opening approximately 53 acres in size. In subsequent years, the slash that was evident during harvesting would start to decompose and would be covered by ground vegetation within two to three years. Any remaining decked logs and fresh cut stumps would weather to a dull gray, and be camouflaged by ground vegetation. The area would appear as an opening for about 15-20 years when the new growth is tall enough to blend in with the surrounding vegetation. Once the saplings are to this point, the VQO of retention would be met.

The vegetation within the 30-foot no-harvest boundary along the NCT would help screen the slash and stumps. The two-aged shelterwood harvest would appear less dense, but natural from the trail allowing the stands to meet the retention VQO.

3.15.5.2 Cumulative Effects

Since the effects of proposed management activities are very limited and do not extend beyond the immediate area, the cumulative effects are the same as the direct and indirect effects.

NCT. The state of Michigan manages three parcels of land within the cumulative effects area. These parcels are 40 to 240 acres in size. The MDNRE has posted their analyses and harvest schedule on their website. There are no locations within the cumulative effects boundary identified for past, present, or future harvest activities.

There is a large concentration of private land in and near Trout Lake. While most of these parcels are less than one acre, there are several larger than 40 acres. There is also a concentration of private land around East Lake, ranging in size from less than one acre to 40 acres. Additionally, there is a large concentration of private land around the west and south shore of Brevoort Lake and on either side of H-57. There are also several tracts of private land scattered throughout the project area, ranging in size from 10-160 acres. None of the private land is identified as commercial timber land. There is no indication that any of the private parcels adjacent to proposed management activities would be harvested in the next 25 years. However, the NCT does not travel through these parcels of private land. There is National Forest System land in-between the private parcels and the NCT.

Nine stands from Niagara, two stands from Interior Wetlands, four stands from Sprinkler, and seven stands from East Red Pine II (see the following table) have been or will be implemented within the cumulative effects area. Given the current rotation of vegetation management, it is likely that this Shores project area would be analyzed for harvest within the next 10-15 years. However, the type and location of harvest prescriptions are speculative.

Table 3- 45. Stands from Past projects that have been or will be Implemented with the Cumulative Effects Area

Project	C	S	Harvest Prescription	Even/ Uneven	Acres	VQO
Shores	197	30	Two-aged Shelterwood	U	19	PR
	191	23	Two-aged Shelterwood	U	35	PR
	171	18	Two-aged Shelterwood	U	23	R
	165	12	Two-aged Shelterwood	U	7	R
	165	13	Two-aged Shelterwood	U	19	R
	170	9	Clearcut with leave trees	E	11	R
	165	6	Two-aged Shelterwood	U	77	R
	170	3	Shelterwood establishment	E	53	R
	166	1	Two-aged Shelterwood	U	27	R
	167	11	Two-aged Shelterwood	U	48	R
	167	3	Two-aged Shelterwood	U	17	R
Niagara	70	7	Overstory Removal	E	436	PR/R
	22	10	Selection harvest	U	25	PR/R
	22	11	Selection harvest	U	40	PR
	22	8	Selection harvest	U	72	PR/R
	21	12	Overstory removal	E	292	P
	51	1	Selection harvest	U	14	PR/R
	35	2	Selection harvest	U	46	R
	8	1	Overstory removal	E	245	PR
	23	17	Overstory removal	E	28	R

Project	C	S	Harvest Prescription	Even/ Uneven	Acres	VQO
Interior Wetlands	125	25	Thin	U	129	PR
	125	31	Thin	U	34	PR
East Red Pine II	110	17	Thin	U	12	R
	145	5	Thin	U	116	R
	145	12	Thin	U	28	R
	125	30	Thin	U	28	PR
	115	14	Clearcut	E	35	PR
	115	31	Clearcut salvage	E	16	PR
	78	6	Shelterwood	U	50	PR
Sprinkler	144	16	Overstory	E	80	PR/R
	171	47	Thin	U	24	R
	195	10	Selection harvest	U	33	PR
	195	12	Clearcut	E	10	PR

There are 22 stands proposed for harvest that are adjacent to the NCT. One stand is scheduled for shelterwood establishment, four stands are scheduled for clearcut, clearcut with leave trees, or clearcut salvage, and five stands are scheduled for overstory removal. In addition, 10 stands are proposed for a two-aged shelterwood removal, six stands are scheduled for selection harvest, and seven stands are scheduled for commercial thin. All 22 of these stands are either in retention VQO where management activities are not usually evident or in partial retention where management activities remain visually sub-ordinate. Cumulatively, harvest activity would occur for approximately 1,064 days over the next 10 years along the NCT from the Castle Rock trailhead to the H-40 trailhead.

Design criteria identified in chapter 2 and within all of the other analyses would retain most of the vegetation within 30 feet of the NCT in order to reduce the amount of brush. This 30-foot boundary would also provide a screen between the NCT and the harvest activities.

As identified in the direct and indirect effects section, with the same harvest method would have similar revegetation processes and would take a similar amount of time to meet the corresponding VQO. However, since all of the stands are not harvested at the same time, there would be different stages of revegetation along the NCT. Those stands that have been harvested more recently would be more evident to the hiker along the NCT. Similarly, those stands that are harvested with an even aged management prescription, such as clearcut, would be more evident to the hiker along the NCT.

3.15.6 No Action

3.15.6.1 Direct and Indirect Effects

The direct and indirect impacts to visual quality may be expressed in terms of the extent to which timber harvest practices meet the VQOs. Under the No Action, there would be no timber harvesting; therefore, there would be no direct or indirect effects on visual quality.

3.15.6.2 Cumulative Effects

Because there would be no direct or indirect effects, there would be no cumulative effects on visual quality.

3.15.7 Short term vs. long term productivity

In the short-term, the even-aged harvest methods would detract from the VQOs where the natural appearing environment dominates.

3.16 HERITAGE RESOURCES

Table 3- 46. Summary of Heritage Resource Effects

Activity or Measure	Proposed Action	No Action
Number of heritage sites affected	33	0

3.16.1 Introduction

The scope of this heritage resource analysis includes all timber stands proposed for treatment and access routes leading into these stands, as well as roads proposed for construction, maintenance, and decommissioning. Pursuant to 36 CFR 800.2(c-f), the results of this heritage analysis, along with all cultural resource survey reports covering the areas of potential effects have been submitted to the Michigan State Historic Preservation Officer (MSHPO) for review and consultation. Likewise, pursuant to 36 CFR 800.2(C)(1)(ii), the results of this analysis have also been submitted to the Tribal Historic Preservation Officer (THPO) for the Bay Mills Indian Community for consultation and review.

No issues related to heritage resources were raised during the scoping process.

3.16.2 Analysis Methods

In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended and 36CFR800, all public lands managed by the Hiawatha National Forest within the areas of potential effects for this project, were inventoried for heritage resources through numerous cultural resource surveys conducted between 1983 and 2009. Heritage sites located within or adjacent to proposed timber stands and/or located along proposed access routes and roads proposed for decommissioning, maintenance, or new construction were considered to be potentially at risk and included in this analysis.

3.16.3 Analysis Area*s*

The spatial boundaries for the analysis of direct and indirect effects were restricted to an area extending 100 feet beyond the boundary of each individual timber stand proposed for treatment, as well as access routes, and other transportation features proposed for construction activities. One hundred feet (30m) is the average height of a mature tree. Sites located within the distance of proposed project areas are assumed to be potentially at risk.

The temporal boundaries for the direct and indirect effects are limited to the period extending five years from the date on which the decision notice will be signed. Five years is assumed to be the time frame in which the proposed activities would be implemented.

The spatial and temporal boundaries for the analysis of cumulative effects are the same as for the direct and indirect effects analysis.

3.16.4 Affected Environment

A total of 33 potentially at risk archaeological sites were identified within the spatial scope for heritage resources for the Shores EA. Archaeological sites are defined as any pre-European contact or post-European contact location where the physical remains or residues of human activities can be identified. Such physical remains include artifacts and/or features (i.e., non-portable artifacts, such as pits, hearths, and structural earthen berm foundations, to name a few). The range of site types includes late 19th and 20th century logging camps, recreation camps, cabin sites, bridges, and a number of pre-European contact era Native American lithic scatters and camp sites.

3.16.5 Proposed Action

3.16.5.1 Direct and Indirect Effects

Earth disturbances resulting from timber harvesting and the construction, maintenance, and decommissioning of roads can result in irreversible damage to heritage resources. A total of 33 heritage sites were identified in the analysis of effects for the Proposed Action. Eight of these sites have been determined “not eligible” for the National Register of Historic Places (NRHP) and do not require protection (Sites 05-107, 05-189/377, 05-330, 05-362, 05-417, 05-418, 05-460, and 05-461). Consequently, a remaining total of 25 sites would need to be protected through the implementation of heritage site avoidance measures. This list of sites includes 05-10, 05-13, 05-14, 05-17, 05-19, 05-40, 05-85, 05-94, 05-106, 05-175, 05-187, 05-188, 05-320, 05-346, 05-363, 05-387, 05-436, 05-437, 05-463, 05-470, 05-471, 05-472, and 05-473. Implementation of these heritage site avoidance measures would protect these 25 sites from any direct and indirect effects by essentially removing them from the APE.

3.16.5.2 Cumulative Effects

There would be no cumulative effects to heritage resources. No direct or indirect effects would be expected due to the implementation of effective heritage resource protection measures, i.e., site avoidance. Past experience in site protection on the HNF has been generally successful (HNF Monitoring and Evaluation Reports 1992-2007). A greater threat to heritage sites includes relic hunting by the public and erosion. Based on this experience, it is assumed that successful site protection would occur during implementation, resulting in long-term maintenance and protection of heritage resources.

3.16.6 No Action

3.16.6.1 Direct and Indirect Effects

No direct or indirect effects to heritage resources would be expected under the No Action alternative.

3.16.6.2 Cumulative Effects

No cumulative effects to heritage resources are expected under the No Action alternative.

3.17 TRANSPORTATION

3.17.1 Introduction

Table 3- 47. Shores Proposed Road Work Summary

Activity	Approximate Miles	
	No Action	Proposed Action
New construction, classified road	0	6.3
New construction, winter only	0	5.5
New construction, temporary road	0	2.0
Decommissioning	0	11.0

Table 3- 48. Road Densities in Shores Project Area

MA	Forest Plan Density Guidelines (miles/mile^2)	Existing Density (miles/mile^2)	System Road Construction (mi)	Roads to Decommission (mi)	New Density (miles/mile^2)
6.2	2.5 (1.5 open)	4.1 (2.8 open)	0	0.1	4.1 (2.8 open)
6.4	2.5 (1.5 open)	2.4 (1.6 open)	6.3	9.9	2.4 (1.6 open)
8.1	1	1	0	1.1	0.8

3.17.2 Analysis Methods

The objective of the proposed transportation system for the Proposed Action is to provide access to proposed timber harvest areas and to provide a safe and efficient transportation system (section 1.3 Need 2). The road analysis for the proposal used the most current information available in the Forest Service database. Routes into vegetation treatment were developed using a Geographic Information System (GIS). Route development utilized information from topographic maps, soil surveys, existing road maps, aerial photographs, wildlife and botanical surveys, staff field knowledge, and heritage surveys (MDEQ BMP p. 22; FS BMP pp. 21-29). Route lengths and land areas were calculated using GIS software.

Road density is the key metric for transportation in the Forest Plan. Road density for the project area was based upon the roads and MAs within the project boundary. Density was calculated for MAs with proposed activities only (FP pp. 2-25, 2-26).

3.17.3 Analysis Areas

Direct and Indirect Effects Area. The analysis will consider road corridors used to access the stands where treatment is proposed and those proposed to be closed or decommissioned. The time period will consider all activities for the next 10 years which is the reasonably expected maximum time period for the proposed activities. The project area currently has an adequate system of collector and arterial roads. These roads connect the local roads, which lead into

proposed treatment areas, with major highways. The existing local roads used to access the stands consist of both native and improved surfaces.

Cumulative Effects Area. The analysis will consider transportation activities on the HNF in comparable MAs where proposed activity occurs within the project boundary. This area will account for how road activities from this and other projects will affect road densities in comparable MAs. The time period for cumulative effects will consider activities underway concurrently with the Proposed Action and for the next 10 years, the reasonably expected maximum time period for the proposed activities to be completed.

3.17.4 Affected Environment

The transportation system in the project area is made up of arterial, collector, and local roads. Arterial roads provide service to large land areas, and usually connect with public highways or other forest arterial roads to form an integrated network of primary travel routes. Many roads in the project area function as arterial roads because the project area is long and narrow. These roads include I-75, US-2, M-134, Mackinac Trail (FH-26, CR H-63), Brevoort Lake Road (CR H-57), CR 405, and Forest Road FR3108. Collector roads serve smaller land areas than an arterial road and usually connect to an arterial or public highway. It collects traffic from local roads. Its location and standard are influenced by both long-term multi-resource service needs and travel efficiency. Mackinac County roads 320, 222, 410, 224, 230, 235, 400 as well as FRs 3105, 3118, 3900, 3105, 3104, and 3960 are designated collector routes within the project area. A local road connects terminal facilities (resources) with a Forest collector, arterial, or state highway. Its location and standards are usually determined by a single specific resource activity rather than travel efficiency. The remaining roads in the Shores project area are local roads. The HNF is responsible for maintenance on local roads within the project area (Appendix H - Vicinity Map).

Roads are further qualified as system (classified) or non-system (unclassified) roads. System roads are permanent, managed roads that provide forest access. They are inventoried and include arterials, collectors, and locals. Non-system roads are not managed and may be old temporary roads used for timber harvest or other management activities that were not returned to forest production or are a user-developed road.

There are approximately 132 miles of identified, existing roads on Forest Service land in the project area. Approximately 63% of these roads are classified as local and approximately 65% of the total miles of roads are open to public motorized traffic.

Road density for each MA has been defined by the Forest Plan (p. 2-26). The project area encompasses nine MAs. The Proposed Action includes construction of system roads in one MA (6.4) and decommissioning of roads in three MAs (6.2, 6.4, and 8.1). The majority of work would be in MAs 6.4 and 8.1.

3.17.5 Proposed Action

3.17.5.1 Direct and Indirect Effects

Construction: The Proposed Action calls for the construction of approximately 8.3 miles of new roads to access proposed harvest stands. The approximate locations of new road construction may be seen on the Proposed Action maps (3) in Appendix H. The newly constructed roads, in most cases, would extend existing roads into proposed vegetation

treatment areas; and therefore, would provide more access to these areas for the Forest Service and public. The newly constructed roads would be classified as ML 1 roads (i.e. closed to motorized use). These roads would add minimal new maintenance costs because ML 1 roads are only maintained when needed for administrative purposes. The roads would be closed with various tools such as root wads, timber slash, rocks, gates, or berms. With proper installation and monitoring, these can be effective tools to limit resource damage from motorized use and trespassing on to neighboring property (Range, Sjogren 2007, TMP, p. 13). Some routes would be designated as winter-only haul roads due to soil and moisture conditions. New construction in wet areas, specifically on the east end of the project area in the Pontchartrain and Hessel quads,would be designated as winter-only routes. Routes adjacent to or proposed to be new sections of the snowmobile trail would be closed with gates and given seasonal restrictions opening them in the winter months. See the Recreation section for more details. Placement, construction, closure, and decommissioning would follow state and Forest Service BMPs (DEQ BMP pp. 21-28, FS BMP pp. 21-36).

Decommissioning: The Proposed Action would obliterate approximately 11 miles of road in the project area. Obliteration of the road includes ripping the road and eliminating the corridor for all traffic, motorized and non-motorized. The proposed roads are a mix of ML 1, ML 2, and unclassified roads (see Table 3-49). Roads were proposed for decommissioning if they were no longer needed for administrative purposes, if they are showing signs of resource damage due to motorized vehicles, or if the road provided access to an area receiving resource damage from motorized vehicles (Forest Plan, pp. 2-25; Travel Management Policy (TMP), p. 5). The Proposed Action would lead to no perceivable net change in road density in MAs 6.2 or 6.4 and a decrease of 0.2 miles per square mile in MA 8.1 (see Table 3-48). Reducing road density lowers the potential for resource damage due to roads such as soil erosion, sediment loading in streams, and alterations to the natural hydrology (Travel Management Rule, p. 10; FS BMP 33-35). The work would move the area toward the Forest Plan guideline for road density. Access would still be available up to the cRNA, with non-motorized access available within the cRNA.

The roads proposed for obliteration would reduce public motorized access to some parts of the St. Ignace Ranger District. The St. Ignace and Sault Ste. Marie ranger districts are herein referred to as the Eastside. The Proposed Action would decrease the total miles of road in the project area by 3.6 percent, but would decrease the miles of road open to all motor vehicles by 0.4%. The decrease in miles open to all vehicles is not perceptible at the scale of the Eastside. The transportation purpose and need, stated in chapter 1, is met because the Proposed Action would provide a safe, manageable transportation system that also discourages resource damage. Many opportunities for motorized access remain open and users would be able to find other areas to enjoy (TMP, p. 14).

Access to Timber: The Proposed Action would allow approximately 1,577 acres of timber to be harvested. Existing forest roads would be utilized to access many of these stands for harvesting and hauling. Timber purchasers are required to maintain roads commensurate with their designated maintenance level so the transportation system is not degraded from heavy use. Approximately 11 miles of existing roads would be utilized to access harvest stands, with approximately 5 miles of ML 1 and 6 miles of ML 2. Most roads would receive normal maintenance, which would include, but not be limited to, clearing and grubbing, brushing, excavating, spot graveling, and replacing drainage culverts. Fewer roads may have light work, such as brushing and excavating, or heavy work, such as cutting and filling, placing sand borrow and heavy gravel, as well as water crossings. It is anticipated that less than 10% of the access roads would require heavy maintenance, but because of variable conditions, unexpected use, and length of time until implementation, the final amount may be higher. The determination

of work details, including material amounts, locations along the road, and cost estimate would be performed by a member of the Forest engineering staff prior to sale of the timber units. See Appendix C for a complete list of routes and lengths and a general cost estimate for road work.

Unclassified Roads: Unclassified roads can be found across the project area. While these alpha-numeric roads are not managed as system roads, their length is included in road density calculations for the MA they occur in. Routes close to proposed timber sale areas that are currently used or needed for forest management would be added to the system and assigned a route number and maintenance level. Roads that have already been assigned a maintenance level in the Forest Service database would keep their designation. See Table 3-50 for a complete list. This action would add approximately 2.6 miles to the Forest System road maintenance schedule but, as stated above, would not add to the road density in the project area.

Table 3- 49. Proposed Unclassified Roads Added to System

Road ID	Miles	Operational Maintenance Level
I186B	0.11	ML2 – MA 6.4
I130C	0.56	ML1 – MA 6.4
I132B	0.97	ML1 – MA 6.4
I132C	0.65	ML1 – MA 6.4
I133B	0.19	ML2 – MA 6.4
I188C	0.17	ML2 – MA 6.4

Combined, these actions to adjust the transportation system would meet need 2.

3.17.5.2 Cumulative Effects

Past Activities. Many of the roads in the Eastside and in the Shores project area were established in the late 1800s and early 1900s, primarily to provide access for logging. Throughout the last 40 years, the majority of these roads classified as collector or arterial have been reconstructed or maintained. Construction, reconstruction, and maintenance of local roads have taken place throughout the years to meet the needs of general forest management.

The amount of recreational use by 4-wheel drive vehicles, motorcycles, snowmobiles, and other OHVs has increased on National Forest roads. This use varies by road. While some receive little or no use, others are used heavily. Past management activities on the HNF often left corridors open as opportunities for travel. Corridors that were established as temporary roads, skid trails, or winter-use only roads were not always sufficiently closed or decommissioned. As a result, many of these corridors have been perpetuated without authorization from the Forest Service.

Present Activities.

Table 3- 50. Road Work from Current EAs

Assessment Area	Net Road Work To Be Done (miles)		
	MA 6.2	MA 6.4	MA 8.1
Sprinkler	0	-7.9	-0.7
Carmen (Westside of the HNF)	0	0	-0.6
Beech Bark Disease	0.7	0	0
Total	**0.7**	**-7.9**	**-1.3**

Projects are currently underway from two decision notices (DN) that would affect road density. See Table 3-50 (above) for net miles of roadwork by MA. The Carmen and Beech Bark Disease DNs cover areas on the Westside and Sprinkler DN covers an area on the Eastside of the HNF. Road density for the MAs would remain below Forest Plan guidelines.

Table 3- 51. Cumulative Effects Road Density Change

MA	Existing Density (All Rds)	Existing Density (Open Rds)	New Density (All Rds)	New Density (Open Rds)	Change (All Rds)	Change (Open Rds)
6.2	2.7	1.7	2.7	1.7	0.0	0.0
6.4	1.4	1.2	1.3	1.2	-0.2	-0.1
8.1	0.9	N/A	0.8	N/A	-0.1	N/A

These projects, when included with the Proposed Action in this analysis, would result in a reduction in MA 6.4 of Forest-wide road density of 0.2 mi/mi^2 for all roads and 0.1 mi/mi^2 for open roads. A reduction of 0.1 mi/mi^2 can be seen in MA 8.1. No measurable change can be seen in Forest-wide road density for MA 6.2.

All of the above projects also include temporary road construction. Temporary roads on National Forest System lands are decommissioned after the use for which they are established is completed. Current Forest Service policy is to decommission the temporary roads and to monitor the effectiveness of the decommissioning (FP, p. 2-25; Forest Service Manual (FSM) 7703.2; FS BMP pp. 33-35).

Local roads on state or private lands are usually maintained by the landowners or by local government to a standard commensurate with use.

Roads developed on private land are generally for use by the landowner to access their dwellings. Roads developed or maintained on private land for timber harvest are usually very low standard and are usually not left open to the public.

The above projects have identified several corridors within their project areas that meet the current Forest Service Manual definition of a road, but are not necessarily needed for management of the Forest. These roads are unclassified and some were identified as being needed on the road system. These unclassified roads are already counted against the road density in the MA in which they are located; and therefore, would not add to the road density when they are added to the HNF road system.

Other DNs, including Whitefish Bay Scenic Byway,Raco Plains Jack Pine Budworm, and AOP East and West CEs may overlap the defined temporal and spatial boundaries of this analysis, but no relevant work (road construction or decommissioning) is occurring within the boundaries. The recently signed decisions for Niagara EIS and Sand Clay EA projects do not fall within the spatial effects boundaries.

Future Activities. The Mirrorwood EA has developed a Proposed Action but no DN has been signed. The Mirrorwood EA, though, does not fall within the spatial effects boundary of this analysis. East Red Pine 3, a red pine thinning project proposal has been developed and will be sent out for public scoping in Spring 2011.

There is little information available for future activities on private land. No state land is within the cumulative effects boundary. There would likely continue to be private land developed. Roads would be constructed and reconstructed in the populated areas across the Eastside. The exact number of miles of road is unknown.

There are no new collector or arterial roads foreseen to be constructed by either the Forest Service, state, county, or private landowners.

The Forest Service would continue to work toward a road system that meets the needs of these users within the guidelines set by the Forest Plan and by other controlling regulations and laws. The Motor Vehicle Use Map is republished annually in April. The map identifies authorized road use in the HNF. Signing on the Forest Service roads will continue to improve, which will help people identify what routes they are on and should help deter unauthorized road use and make law enforcement efforts more effective (EM-7700-30 p. 6).

3.17.6 No Action

3.17.6.1 Direct and Indirect Effects

This alternative would have no effect on road density or access because there would be no road construction or decommissioning. Without closures and decommissioning, some roads would continue to see resource damage from illegal motorized vehicle use.

3.17.6.2 Cumulative Effects

There would be no cumulative effects because no direct or indirect effects to transportation for this alternative would occur.

3.18 ECONOMICS

3.18.1 Introduction

This analysis focuses on the difference between revenues and expenditures for the No Action Alternative and the Proposed Action. The Proposed Action produces intangible benefits regarding forest health, wildlife habitat, transportation efficiency, and reduced wildfire risk. These values are not easily quantifiable and are not discussed in this economic section. These types of benefits were discussed and disclosed in the Forest Plan (FP, pp. 3-380 through 3-397).

3.18.2 Analysis Methods

This financial and economic efficiency analysis presents costs and returns associated timber sales, reforestation, roadwork and Scotch pine reduction. These are the major costs of the alternatives. The values presented are estimates based on the most recent stumpage and unit cost estimates of activities. Values were not compounded to the future nor depreciated, but simply represent estimates as if they occurred at the present time.

3.18.3 Affected Environment

Approximately 70 percent of the project area is in federal ownership. The area provides a mix of recreation and commercial uses to local communities and users of the area. Recreation uses range from camping in developed campgrounds, to fishing and hunting, to OHV riding and snowmobiling, as well as other dispersed activities. Many of these recreational users purchase a variety of goods and services in St. Ignace and other small communities.

Historically, this area has been a source of forest products that provide a variety of jobs and other benefits. Red pine, jack pine, aspen, and mixed hardwood pulpwood and sawlogs are in demand in this area and the Lake States region. Sale of these products provides employment in a variety of forest product and support service industries.

3.18.4 Proposed Action

3.18.4.1 Direct and indirect effects

Table 3-52 reflects Forest Service expenditures and estimated receipts that would be collected. It does not reflect any sunk costs. Stumpage values are currently low, reflecting the impacts of the 2009 economic downturn. By the time the environmental analysis is completed and the timber sold, the economic situation and markets may recover, increasing stumpage values.

Table 3- 52. Estimated Forest Service Expenditures and Receipts Collected from Proposed Timber Sales within the Shores Project

	Proposed Action	No Action
	Estimated Cost	
Timber sale preparation and administration	-$214,274.27	$0.00
Site preparation	-$113,135.73	$0.00
Planting	-$79,001.46	$0.00
New system road construction	-$47,886.00	$0.00
Decommission roads	-$12,275.00	$0.00
Reconstruction	-$35,750.00	$0.00
Scotch pine treatment	-$3,240.50	$0.00
Total Costs	**-$505,562.96**	**$0.00**
	Estimated Returns	
Volume (MMBF)	9.00	0
Value of timber	$438,809.57	$0.00
25% return to counties	-$109,702.39	$0.00
10% return to roads & trails	-$43,880.96	$0.00
Grand Total	**-$220,336.74**	**$0.00**

3.18.4.2 Cumulative effects

The Shores project would provide a steady, sustainable flow of tangible and intangible benefits to consumers of forest products and local government in terms of wood fiber and payments to counties. Current timber sales from Sprinkler and East Red Pine 2 EAs are also contributing benefits.

3.18.5 No Action

3.18.5.1 Direct and Indirect Effects

If this alternative were selected there would be no sale of timber from this project area in the short term. There are no effects associated with this alternative.

3.18.5.2 Cumulative Effects

There are no direct and indirect effects with this alternative; therefore, there would be no cumulative effects.

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Glossary and Acronyms

Canopy – The continuous overhead formed from the uppermost spreading branchy layer of the forest.

Canopy Gap - A small opening created in the canopy.

Decommission Road – Activities that result in the stabilization and restoration of unneeded roads to a more natural state.

Design Criteria - Site specific application of Forest Plan or other required standards or guidelines that are incorporated into the design of the project activity.

Fire Regime Condition Class (FRCC) – A landscape classification that determines departure of the current landscape conditions from the historic landscape conditions using vegetation type and fire dynamics. The three classes describe low (FRCC1), moderate (FRCC2), and high (FRCC3), departure from historic conditions.

Maintenance Levels (Roads) – Each Forest System road is to be maintained to a level commensurate with the planned function and use of the road. The intended level of maintenance to be received by each road is termed the Objective maintenance level (OML), which are divided into five levels of maintenance intensity. OML-1 is the lowest level and OML-5 is the highest level.

Monitoring – The collection of information over time, generally on a sample basis by measuring change in an indicator or variable, to determine the effects of resource management treatments in the long term.

System Road – Permanent managed roads that provide Forest access. They are located and built for long-term though not necessarily continuous use. System roads are inventoried and include arterial, collector, and local roads.

Temporary Road – Roads authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be a part of the forest transportation system and not necessary for long-term resource management.

Watershed Level - HUC: The United States is divided and subdivided into successively smaller hydrologic units which are classified into four levels: regions, sub-regions, accounting units and cataloging units. The hydrologic units are arranged within each other, from the smallest (cataloging units) to the largest (regions). Each hydrologic unit is identified by a unique HUC consisting of two to eight digits based on the four levels of classification in the hydrologic unit system.

- Sixth level: HUC are watersheds between 10,000 to 40,000 acres (FEIS 6-6).

Seral Class Definitions

Vegetation composition goals are based on ecological land type (ELT) and seral class. The five seral classes used on the Hiawatha are: open, aspen, jack pine, mid and late. Each ecological land type has a unique mix of species that define the seral classes within that ELT. Table D -1 provides a crosswalk between forest cover type and seral classes by ELT.

Table D-1. Forest Cover Types Representing Seral Classes by Ecological Land Type

ELT	Open	Aspen	Jack Pine	Mid Seral	Late Seral
10/20	98, 99	91, 92, 93, 94, 95	01	11, 16, 17, 18, 19, 41, 47, 48, 49, 55, 83	02, 03, 04, 05, 71, 76, 79, 81, 84, 85, 86, 89
30	98, 99	91, 92, 93, 94, 95	01	02, 11, 16, 41, 47, 48, 49, 55, 83	03, 04, 05, 76, 81, 82, 84, 85, 86, 89
40/50/90	98, 99	91, 92, 93, 94, 95	01	02, 03, 11, 16, 19, 41, 49, 55, 83	04, 05, 71, 76, 79, 81, 82, 84, 85, 86, 87, 89
60	97, 98, 99	91, 92, 93, 94	01	02, 11, 15, 16, 18, 19, 41, 48, 49, 55, 83, 95	03, 04, 05, 12, 14, 17, 71, 76, 79, 81, 82, 84, 85, 86, 87, 89
70A	97, 98, 99	91, 92, 93, 94	01	11, 15, 16, 18, 19, 95	03, 04, 05, 12, 14, 17, 71, 76, 79, 84
70B	97, 98, 99	91, 92, 93, 94	01	11, 15, 16, 18, 19, 95	03, 04, 05, 12, 14, 17, 71, 76, 79, 84
80A	97, 98, 99	N/A	N/A	01, 11, 18, 91, 92, 93, 94, 95	03, 04, 05, 12, 14, 15, 17, 19, 71
80B	97, 98, 99	N/A	N/A	11, 15, 16, 18, 19, 91, 92, 93, 94, 95	03, 04, 05, 12, 14, 15, 17, 19, 71, 79

The following forest cover type codes were used to define the seral classes:

Code Description
01 ---- Jack pine
02 ---- Red pine
03 ---- White pine
04 ---- White pine-hemlock
05 ---- Hemlock
11 ----- Balsam fir - aspen - paper birch
12----- Black spruce
14----- Northern white cedar
15----- Tamarack
16 ---- White spruce - balsam fir - Norway spruce
17----- Upland black spruce
18 ---- Mixed swamp conifer
19 ---- Cedar - aspen - paper birch
41----- White pine - northern red oak - white ash
48 ---- Jack pine - oak
49 ---- Red pine - oak
55 ---- Northern red oak
71----- Black ash - American elm - red maple
76 ---- Red maple (wet site)

Code Description
79 -----Mixed lowland hardwoods
81 -----Sugar maple - beech - yellow birch
82 -----Sugar maple - basswood
83 -----Black cherry - white ash - yellow poplar
84 -----Red maple (dry site)
85 -----Sugar maple
86 -----Beech
87 -----Sugar maple - beech - yellow birch - red spruce
89 -----Mixed hardwoods (maple, basswood, white ash and paper birch)
91 -----Quaking aspen
92 -----Paper birch
93 -----Bigtooth aspen
94 -----Balsam poplar
95 -----Aspen - white spruce - balsam fir
97 -----Lowland brush
98 -----Upland brush
99 -----Open

Acronyms

A1 – Aspen seral class (see Seral Class Definitions for forest types), stocked; trees less than 4.5 feet tall
A2 – Aspen seral class (see Seral Class Definitions for forest types), stocked; trees greater than 4.5 feet tall but less than five inches D.B.H
A3 – Aspen seral class (see Seral Class Definitions for forest types), stocked; trees between five and nine inches D.B.H
A4 – Aspen seral class (see Seral Class Definitions for forest types), stocked; trees between nine and 18 inches D.B.H
A5 - Aspen seral class (see Seral Class Definitions for forest types), at least 10 trees per acre or 30 square feet of basal area per acre is occupied by trees greater than 18 inches D.B.H
APE – Area of Potential Effects
BA – Basal Area
BBD – beech bark disease
BBS – Breeding Bird Surveys
BE – Biological Evaluation
BI – Beneficial Impact
BMPs – Best Management Practices
C – Compartment
CCC – Civilian Conservation Corps
CEQ – Council of Environmental Quality
CR – County Road
cRNA – candidate Research Natural Area
D.B.H – diameter at 4.5 feet from the base of the tree on the uphill side
EA – environmental assessment
EAB – emerald ash borer
EIS – environmental impact statement
ELT – ecological landtype
ELTP – ecological landtype phase
ET – evapotranspiration
FE – Federally Endangered
FEIS – final environmental impact statement
FP – Forest Plan
FR – Forest Road
FT – Fedrally Threatened
FRCC – Fire Regime Condition class
GAO – Government Accounting Office
GIS – Global Positioning System
HC Huron Complex
HCMSA – Huron Complex Midscale Area
HNF – Hiawatha National Forest
HUC – Hydrologic Unit Code
IDT – Interdisciplinary Team
INFRA - Infrastructure
J1 – Jack pine, stocked; trees less than 4.5 feet tall
J2 – Jack pine, stocked; trees greater than 4.5 feet tall but less than five inches D.B.H
J3 – Jack pine, stocked; trees between five and nine inches D.B.H
J4 – Jack pine, stocked; trees between nine and 18 inches D.B.H

J5 - Jack pine, at least 10 trees per acre or 30 square feet of basal area per acre is occupied by trees greater than 18 inches D.B.H
L1 – Late seral class (see Seral Class Definitions for forest types), stocked; trees less than 4.5 feet tall
L2 – Late seral class (see Seral Class Definitions for forest types), stocked; trees greater than 4.5 feet tall but less than five inches D.B.H
L3 – Late seral class (see Seral Class Definitions for forest types), stocked; trees between five and nine inches D.B.H
L4 – Late seral class (see Seral Class Definitions for forest types), stocked; trees between nine and 18 inches D.B.H
L5 - Late seral class (see Seral Class Definitions for forest types), at least 10 trees per acre or 30 square feet of basal area per acre is occupied by trees greater than 18 inches D.B.H
LAA – Likely to Adversely Affect
LTA – landtype association
LTF – Loss of Viability
LWD – Large woody debris
M - Modification
M1 – Mid seral class (see Seral Class Definitions for forest types), stocked; trees less than 4.5 feet tall
M2 – Mid seral class (see Seral Class Definitions for forest types), stocked; trees greater than 4.5 feet tall but less than five inches D.B.H
M3 – Mid seral class (see Seral Class Definitions for forest types), stocked; trees between five and nine inches D.B.H
M4 – Mid seral class (see Seral Class Definitions for forest types), stocked; trees between nine and 18 inches D.B.H
M5 - Mid seral class (see Seral Class Definitions for forest types), at least 10 trees per acre or 30 square feet of basal area per acre is occupied by trees greater than 18 inches D.B.H
MA – management area
MDEQ – Michigan Department of Environmental Quality
MDNRE – Michigan Department of Natural Resources Environment
MIS – Management Indicator Species
MINLTF – May Impact Individuals but not likely to cause a Trend toward Federal Listing
MM – Maximum Modification
MVUM – Motor Vehicle Use Map
ML – maintenance level
N - North
NA – No Action
NE – No Effect
NI – No Impact
NLAA Not likely to Adversely Affect
MSA – midscale assessment
NCASI – National Council for Air & Stream Improvement
NCT – North Country Trail
NEPA – National Environmental Policy Act
NFMA – National Forest Management Act
NNIP – Non-native Invasive Plant
NNIS – Non-native Invasive Species
NRHP – National Register of Historic Places
NRIS – Natural Resources Information Systems
NWI – National Wetlands Inventory
O - Occupied

OHV – Off-highway Vehicle
PA – Proposed Action
PCB – Polychlorinated biphenyls
PR – Partial Retention
R – Retention
R - Range
RFSS – Regional Forester's Sensitive Species
RNA – Research Natural Area
ROD – Record of Decision
RV – Recreation Vehicle
S – Stand
SAF – Society of American Foresters
SMU – Soil Management Unit
SOPA – Schedule of Proposed Actions
SPM – semi-primitive motorized
SQS – Soil Quality Standards
SS – South Shores
T - Township
TES – Threatened Endangered and Sensitive
TMP – Travel Management Plan
TS – Timber Sale
Unoccupied
UP – Upper Peninsula
VQO – visual quality objective
W – West
WSR – Wild and Scenic River