United States
Department of
Agriculture

Forest
Service

August 2004

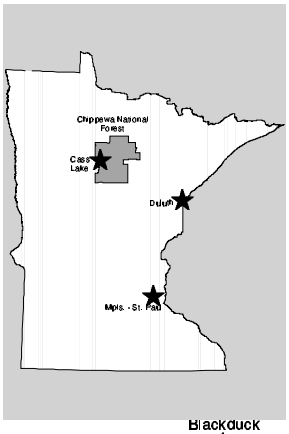
# Environmental Assessment

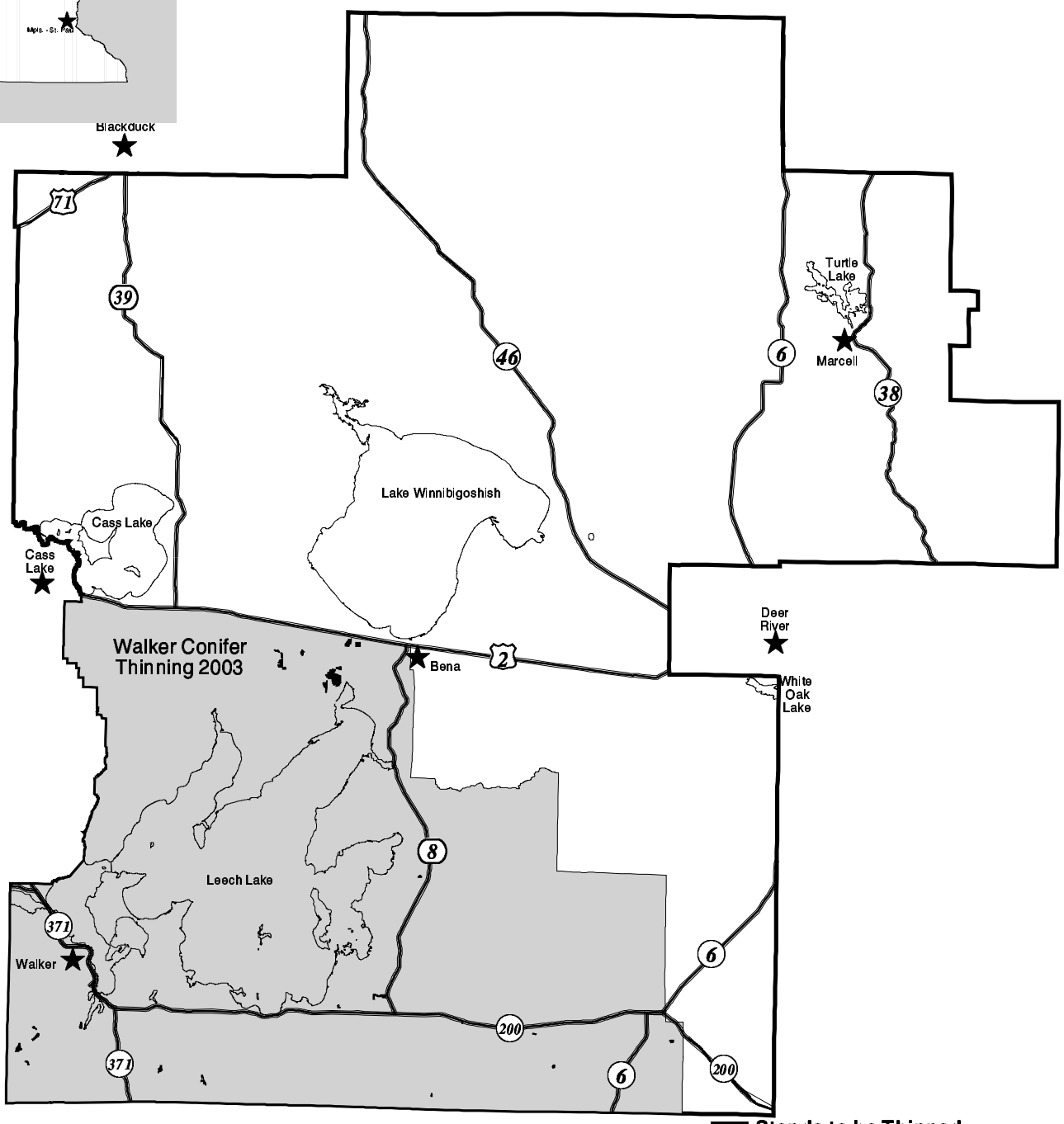
## Walker Conifer Thin

**Walker Ranger District**
**Cass County, Minnesota**

For Information Contact: Sharon Klinkhammer
200 Ash Ave NW
Cass Lake, MN 56633
218-335-8660
111.fs.fed.us/r9/Chippewa/plan/forest planning

# CHIPPEWA NATIONAL FOREST AND WALKER CONIFER THIN




**Stands to be Thinned**
**Select Roads**
**Select Lakes**
**Walker Conifer Thin Boundary**
**Chippewa National Forest Boundary**

10 0 10 Miles

1:550000

/fsfiles/gis/district/walker/con_thin_03/jan/vicinity_mn_cnf.apr
jng
11/24/03

The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be: developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Using GIS products for purposes other than those for which they were created, may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification. The Forest Service will not be liable for any activity involving this information. For more information contact:

Chippewa National Forest
GIS Coordinator
200 Ash Avenue
Cass Lake, MN 56633
(218)335-8600

The USDA Forest Service is an Equal Opportunity provider.

## Table of Contents

**CHAPTER 1 PURPOSE AND NEED .....5**
1.1 Document Structure ..... 5
1.2 Background for Purpose and Need ..... 5
1.3 Purpose and Need for Action ..... 10
1.4 Proposed Action (Alternative 2) ..... 13
1.5 Decision Framework ..... 13
1.6 Public Involvement ..... 14
1.7 Issues ..... 14
**CHAPTER 2 ALTERNATIVES .....17**
2.1 Introduction ..... 17
2.2 Alternatives Analyzed in Detail ..... 17
2.3 Vegetative Management Alternatives Considered But Dropped From Detailed Analysis 18
2.4 Design Features, Mitigation Measures, and Post Treatment Activities ..... 19
2.5 Comparison of Alternatives ..... 28
**CHAPTER 3: ENVIRONMENTAL CONSEQUENCES.....30**
3.1 Introduction ..... 30
3.2 Vegetation ..... 30
3.3 Wildlife ..... 55
3.4 Fire and Fuels ..... 70
3.5 Water Quality, Aquatic Resources, And Wetlands ..... 77
3.6 Soils ..... 88
3.7 Transportation ..... 95
3.8 Economics ..... 96
3.9 Other Disclosures ..... 98
**CHAPTER 4: LIST OF PREPARERS AND CONTRIBUTORS, AND OTHERS CONSULTED .....101**

# CHAPTER 1 PURPOSE AND NEED

## 1.1 Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This Environmental Assessment 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 Introduction:* This section 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 section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on major issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of some of the environmental consequences associated with each alternative.
- *Chapter 3 Environmental Consequences*: This section 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.
- *Chapter 4 Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *Appendices*: The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Walker Ranger District Office in Walker, Minnesota.

## 1.2 Background for Purpose and Need

**Project Area**
The Walker Conifer Thin project encompasses the entire area administered by the Walker Ranger District. Stands proposed for thinning are scattered across the project area. The area is located in Cass County and is bounded by US Highway 2 on the North and the Forest boundary on the west, and south, and the Deer River/Marcell District boundary on the east. The remaining acres are private, county, state or tribal lands.

**Forest Plan Direction**
The Conifer Thin project is consistent with the management direction of the Chippewa National

Forest Plan, 2004. The Forest Plan establishes multiple-use goals and objectives for management of the Forest (Chapter 2). The following list includes Forest-wide Goals pertinent to the project area.

- Promote ecosystem health and conservation….
- Protect and where appropriate restore soil, air, and water resources.
- Provide for a variety of life by managing biologically diverse ecosystems.
- Provide for sustained forest product use in an environmentally acceptable manner.
- Provide forest settings and natural resources that enhance social and economic benefits….
- Provide a variety of uses, values, products and services for present and future generations….
- Provide management direction that enhances social and economic benefits for individuals and communities….

The Forest Plan describes the emphasis, the desired future condition, and the standards and guidelines for each management area (Chapter 3). The Management Areas (MA) present in the Conifer Thin project, along with a brief description is provided below in Table 1.2.1 (See Appendix D for a Management Area map). Management Area direction may override Forest-wide direction.

**Other Direction**

The purpose and need for this project is consistent with management direction from numerous laws and policies, as well as the Forest Plan. National Forests are required to comply with several environmental laws, including: the Endangered Species Act, the National Historic Preservation Act, the Clean Air Act, The National Environmental Policy Act, and the National Forest Management Act. Proposed management activities for this project that incorporate these ideas are consistent with the Revised Forest Plan, as well as laws and policies applicable to natural resource management.

**Table 1.2.1 - Management Area Summaries**

| Management Area | Estimated Acres To be treated | Emphasis | Summary of Desired Condition for Vegetation Management, Forest Health and Disturbance Processes, Terrestrial and Aquatic Wildlife |
|---|---|---|---|
| 8.3 Unique Areas- Ten Section Area | 250 | Unique biological, geological, or historical areas are preserved. Management focuses on conserving special social or ecological features of the Forest. In some areas, the focus is on interpreting features. Timber production is incidental to the primary objective. Recreation facilities are provided only when needed to interpret or protect the resource. | Ten Section Area – Large red and white pine trees remain as stands and individual trees within younger stands.<br>D-UB-2 Provides habitat for federally listed endangered, threatened, proposed, or candidate species or for Regional Forester sensitive species…. Native plant communities are maintained, restored or enhanced.<br>D-UB-9 Ten Section Area is managed to maintain, restore, or enhance old-growth forest characteristics as were generally present when the area was reserved from sale or settlement in 1903. (p 3-26, 3-27) |
| 8.6 Riparian Emphasis Areas | 121 * | This MA emphasizes riparian values and functions. Riparian resources are restored, protected, and enhanced in areas where ecosystem processes are sensitive to degradation. | D-RE-2 Forest stands are dominated by older vegetative growth stages of the landscape ecosystem they lie within. Management activities mimic natural disturbances and result in structural diversity. Insect and disease potential is reduced through vegetative management. Fuels are managed to retain a natural forest appearance and to reduce threat of wildfire damage to Forest resources.<br>D-RE-3 Many tree species present because these areas cross a number of different landscape ecosystems. A mixture of young, but more frequently old trees, with multi-layered canopies are present, snags and downed wood. Large red and white pine appears in pockets, accenting many areas. Aspen and other hardwoods often in patches. Flood plains present consist of sedge and shrub communities, lowland conifers.<br>D-RE-4 Vegetation is managed to provide for public safety and improve forest health….<br>D-RE-5 A wide variety of wildlife occurs including multiple species of fish, birds, mammals, reptiles, and amphibians. Older vegetative growth stages provide for cavity-nesting species. Coarse woody debris recruited to aquatic and riparian ecosystems enhances habitat for fish and amphibians. Wetlands provide important nesting habitat for waterfowl. (p 3-30) |

| Management Area | Estimated Acres To be treated | Emphasis | Summary of Desired Condition for Vegetation Management, Forest Health and Disturbance Processes, Terrestrial and Aquatic Wildlife |
|---|---|---|---|
| 7.2 Recreation Use in a Scenic Landscape | 13 | Recreation occurs in these areas. Viewsheds are managed for scenic beauty and big-tree character. Generally, these areas offer a natural-appearing forest setting with some development and roads for recreation | D-RU-1 Managed to provide natural-appearing landscape that may be slightly modified by activities. Emphasizes a large tree and old forest character. Generally maintain and enhance the older vegetative growth stages.<br>D-RU-2 Management activities such as timber harvest and management-ignited fire may be used to achieve Landscape Ecosystem objectives. Recreation and scenic integrity objectives guide the appearance of timber harvest, management-ignited fire, tree planting, and other management techniques. .<br>D-RU-3 Vegetation management activities also enhance wildlife habitat. (p. 3-14) |
| 10.1 General Forest | 500 ** | Timber harvest is one of the primary activities. A wide variety of recreation opportunities is provided.<br>Forest vegetation communities are managed with practices that mimic ecosystem processes, mainly stand replacement disturbance. A full range of silvicultural practices is used. However, compared to the Longer Rotation Emphasis MA, there is more clearcutting.<br>Management activities generally create young, even-aged forests. A mosaic of young to mature (1-150 years) trees dominates these areas. Management-ignited fire is used primarily to prepare sites for regenerating new forests and to reduce woody fuel that could cause wildfires | D-GF-1 Forests largely a mosaic of tree groupings of different ages and heights. Disturbed areas quickly revegetate. Recently harvested area may have a partial canopy of older trees. Boundaries of cut areas appear to follow natural landscape patterns.<br>D-GF-2 Forest vegetation communities are managed with practices that mimic ecosystem processes, mainly stand replacement disturbances. A variety of stand sizes, shapes, crown closures, age structures and interspersions occur. Larger patch sizes are emphasized….<br>D-GF-3 A full range of silvicultural practices is used. There is more even-aged management than the Longer Rotation MA.<br>D-GF-4 Stands are generally dominated by the young to mature vegetative growth stages. Management activities generally create young, even-aged stands. A mosaic of young to mature (1-150 yrs) trees dominates these areas. Insect and disease outbreaks are evident, but are managed to be within historical, natural levels in terms of longevity and area impacted.<br>D-GF-5 Forest health is maintained and management investments are protected to sustain the productivity of the area. To maintain or restore vegetation communities, natural disturbances are mimicked through management activities such as timber harvest and management-ignited fire. Fire is used as a tool to prepare sites for regenerating new forests and to reduce woody fuel that could cause wildfires. (p 3-6) |

| Management Area | Estimated Acres To be treated | Emphasis | Summary of Desired Condition for Vegetation Management, Forest Health and Disturbance Processes, Terrestrial and Aquatic Wildlife |
|---|---|---|---|
| 10.2 Longer Rotation Emphasis | 600 ** | As with MA 10.1, timber harvest is one of the primary activities. A wide variety of recreation opportunities is provided.<br>In the Longer Rotation Emphasis MA, final harvest occurs more often at extended rotation ages than at minimum rotation ages for some forest types. The range of rotation ages for each forest type is determined by the management objectives for each landscape ecosystem.<br>Forest vegetation communities are managed with practices that mimic both stand replacement disturbance and less severe stand maintenance disturbance. A full range of silvicultural practices is employed. However, compared to the General Forest MA, there is more partial cutting. When clearcutting is used in the Longer Rotation Emphasis MA, it would generally be at an extended rotation age. | D-LR-1 Forests are largely a mosaic of tree groups of different ages and heights. Many recently cut areas have a partial canopy of older trees. Areas disturbed through management quickly revegetate. Boundaries of cut areas generally follow natural landscape patterns.<br>D-LR-2 Forest vegetation communities are generally managed with practices that mimic less severe stand maintenance disturbance, along with some stand replacement disturbance. A variety of stand sizes, shapes, crown closures, age structures and interspersions occur. Some larger patches occur, but young, even-aged patches are less frequent than for the General Forest MA.<br>D-LR-3 A full range of silvicultural practices is employed. Compared to the General Forest MA, there is more uneven-aged and partial harvesting resulting in more uneven-aged and multi-aged forests. This area will have less extensive even-aged harvests than the General Forest MA. When clearcutting, is used, it is often done at longer rotation ages.<br>D-LR-4 Stands are a mix of young , even-aged and older, multi-aged vegetative growth stages. A mosaic of young to old to old (1-250 years) trees dominates these areas. Insect and disease outbreaks are evident, but are mange dot be within historical, natural levels in terms of logievity and area impacted.<br>D-LF-5 Forest health is maintained and management investments are protected to sustain the productivity of the area. To maintain or restore vegetation communities, natural disturbances are mimicked through management activities such as timber harvest and management-ignited fire. Fire is used as a tool to prepare sites for regenerating new forests and to reduce woody fuel that could cause wildfires. (p 3-10). |

* *These are stands that occur in more than one MA. Approximately 110 acres are in stands that occur in both MA 8.6 and 10.2.*

** *These are stands that occur in more than one MA. Approximately 400 acre sare in stands that occur in both MA 10.1 and 10.2*

## 1.3 Purpose and Need for Action

The purpose and need for actions in the Walker Conifer Thin project is to implement the goals and objectives of the Forest Plan while incorporating up-to-date resource management knowledge and information. The purpose and need is consistent with the Forest Plan goals, objectives, standards and guidelines, and management area direction. The following objectives and existing conditions define the purpose and need for this project:

**Maintain or improve health, growth, and vigor of conifer stands.**

Existing condition:

- Stands consist primarily of red pine stands, with a few white pine, and white spruce.
- Stands vary in age from approximately 25-100 years with the majority of them 40-60 years old.
- Stands are primarily plantations but there are some older stands that established naturally.
- Stands are dense, overstocked and have reduced tree vigor and growth making them susceptible to insect damage and mortality. Crowding also contributes to the development of taller more slender trees adding to the risk of wind damage and beetle activity as infection pockets develop.
- Stands generally have small crown to height ratios due to dense conditions and shading.

Desired condition:

- D-VG-1 Native vegetation communities are diverse, productive, healthy, and resilient. (p 2-21)
- D-VG-4 Tree vegetation is present in amounts, distributions, and characteristics that allow contribution to a sustained yeild of timber and pulpwood products. (p 2-21)
- D-ID-1 Resource conditions minimize undesirable fire, insect, and disease outbreaks…. (p 2-18)
- D-ID-2 Integrated pest management approaches are used to avoid epidemics and infestations of un-desirable native or non-native invasive species.

Commercial thinning would reduce density, competition, and stress among trees and contribute to improved health, vigor and growth of stands. Forest health, as discussed here, includes the presence of snags, woody debris, and an array of plant species that provide diversity, and structural and functional components typically found on similar non-plantation sites.

**Improve the within-stand complexity (species and structural diversity) of conifer stands.**

Existing condition:

- Conifer stands generally consist of a single conifer species (>95% of one species) with limited, if any, other conifer or hardwood tree species.
- Planted conifer stands frequently have rows or rigid spacing creating an un-natural appearance.
- Stands have crown closures that allow little sunlight penetration to the forest floor, thereby reducing and limiting the development of the native understory and mid-story associated with the native plant community expected to occupy the site.

- The absence of low-intensity, re-occurring ground fires in some fire-dependent or tolerant communities has resulted in species compositions and structural characteristics that are not typical of the vegetation that occupied these sites historically.

Desired condition:

- D-VG-2 Vegetation conditions contribute to ecosystem sustainability and biological diversity…. (p 2-21)
- D-VG-3 Vegetation (live and dead) is present in amounts, distributions, and characteristics that are representative of the spectrum of environmental conditions that would have resulted from the natural cycles, processes, and disturbances under which current forest ecosystems and their accompanying biological diversity eveolved…. (p 2-21)
- D-VG-6 d. Diverse mixes of trees, shrubs, herbs, mosses, lichens, and fungi species at site and landscape levels that are more representative of native vegetation communities. (p 2-21)
- D-VG-6 e. Diverse structure in native vegetation communities .... (p 2-21)

Commercial thinning would retain tree species that increase species diversity and abundance. Reduced tree densities would also allow increased sunlight penetration, promoting a greater diversity of shrubs and herbaceous plants thereby providing habitat for a wider variety of animals.

**Maintain or improve wildlife habitat conditions of conifer stands**

Existing condition:

- Planted conifer stands generally are monotypic in terms of the habitat characteristics.
- Planted conifer stands do not provide the associated habitat characteristics required by wildlife species associated with conifer communities.

Desired condition:

- D-VG-2, D-VG-3, D-VG-6 d., and D-VG-6 e. from previous section.
- D-WL-1 Aquatic and terrestrial wildlife habitats are diverse, healthy, productive, and resilient. (p 2-24)
- D-WL-3 a. Provide representation of the full spectrum of habitats and conditions that would have resulted form natural cycles, processes, and disturbances under which the biological diversity of the National Forest evolved. (p 2-24)
- D-WL-3 b. Maintain viable populations for all existing native and desired non-native species. (p 2-24)
- D-WL-3 h. Provide structure, composition, connectivity, function, and spatial patterns of aquatics and terrestrial habitats that maintain or restore opportunities for species….(p 2-25)

**Provide wood fiber**

Existing condition:

- Reduced stand densities would provide wood fiber to local processing facilities through timber harvest.

- Diameter growth, height and crown development has slowed. Mortality resulting from competition and natural thinning is increasing.

Desired Condition:

- D-TM-1 The amount of commercial timber sales available for purchase is at a level that is sustainable overtime. (p 2-19)
- D-VG-4 from "maintain or improve health, growth, and vigor of conifer stands".
- D-SE-1 The Forest provides commodity resources…to contribute to the…economic sustainability and diversity of local communities. (2-35)

**Reduce fire hazard or fuels accumulations**

Existing condition:

- Fuel hazard and risk are high behind the Chippewa National Forest, Forest Supervisors Office.
- Crown cover in dense stands is continuous which may result in fires that move through the crowns of trees rather than just on the ground. These types of fires are more destructive, difficult to control, and potentially catastrophic.
- Concentrations of fuels along bike trails, pipeline corridors, and roads increase the risk of un-natural fire starts.

Desired condition:

- D-ID-4 Accumulations of natural and activity fuels are treated to enhance ecosystem resiliency and to maintain desired fuel levels. (2-18)
- D-ID-5 Fire is recent on the landscape, restoring or maintaining desireable attributes, processes, and functions of natural communities. (2-18)
- D-ID-6 Unwanted wildland fire is actively suppressed where necessary to protect life, investments, and natural resources….(2-18)

Reducing fuels would reduce the fire hazard, the associated risks, and fire intensity should a fire start occur making it easier to protect facilities, private property, and other resource values.

**Provide an adequate transportation system**

Existing condition:

- Adequate access to most stands is available. However, short segments of temporary road construction may be needed. In an effort to avoid stream crossings, alternate access routes resulting in temporary roads may be warranted.

Desired condition:

- D-TS-2 The National Forest road system is the minimum needed to provide adequate access to both NFS and non-NFS land. (p 2-47)

## 1.4 Proposed Action (Alternative 2)

Alternative 2 emphasizes improving the growth and vigor of conifer stands through commercial thinning, and improving within-stand complexity through the retention of existing hardwood species, non-featured conifer species such as jack pine and balsam fir, snags, and coarse woody debris.

In response to the purpose and need, the proposed action (alternative 2) was developed and consists of the following:

- Commercial thinning of approximately 1600 acres that would improve growth and vigor of conifer stands, improve within-stand complexity, and maintain or improve wildlife habitat conditions. Summarily, prescriptions may emphasize retention of other conifer and hardwood species. About 1213 of red pine, 303 acres of white spruce, and 88 acres of white pine would be thinned. Approximately 121 acres in Riparian Emphasis Areas (MA 8.6) will be tailored to meet riparian values and functions.

- Thinning of approximately 40 acres behind the Supervisors Office designed primarily to reduce fuels. Tree tops and limbs from thinning would be reduced through mechanical treatment or burning.

- Reduction of fuel concentrations along trails, pipeline corridors, and roads that are in close proximity to thinning units. Treatments, such as removing slash (tops and branches), and lopping and scattering slash, would occur within the first 200 feet.

- Construction of about ½ mile of temporary road to access portions of treatment areas. In addition, approximately 3.2 miles of road currently gated, closed or brushed in would undergo maintenance necessary to use them during this project. Their disposition after use will be similar to what it was prior to project implementation, i.e. if it was closed by any means prior to implementation, it will be closed after implementation is completed.

- Harvest an estimated 17,500 CCF in wood products.

Actions proposed are consistent with the Forest Plan (2004) goals and objectives. In addition, up-to-date resource management knowledge and ecosystem management principles were incorporated to implement the goals and objectives of the Forest Plan.

## 1.5 Decision Framework

This environmental assessment (EA) is tiered to the Chippewa National Forest Plan (2004), the Final Environmental Impact Statement (2004), and is within the scope of the Record of Decision.

This EA only discloses the effects of the proposed alternative treatments; it is not a decision document. Based on the analysis in this document, the Walker District Ranger will review the proposed action and the other alternatives, then decide which alternative vegetative treatments and temporary road construction best meets the purpose and need for the project.

## 1.6 Public Involvement

Public participation helps the Forest Service identify concerns with possible effects and alternatives to its proposals. This information enables the responsible official to make decisions with an understanding of their environmental and social consequences. It also allows the Forest Service to disclose to the public the nature and consequences of actions on NFS lands. Opportunities for the public to provide comments regarding this proposed project were made available through the process outlined below:

- As part of the public involvement process, Walker district employees presented project information at Local Indian Council meetings in December 2003, April, June, July, and August 2004.
- In addition this project was listed in the *Chippewa National Forest Quarterly Schedule of Proposed Actions* beginning with the January 2004 edition through July 2004.
- Scoping letters were sent to approximately 250 individuals and groups on March 29, 2004. Comments and responses are included in the appendix.
- An ad was published in the *Pilot-Independent* on April 1, 2004 requesting comments on the proposed action, preliminary issues and alternatives.

Using the comments from the public, other agencies, and Leech Lake Band of Ojibwe, the interdisciplinary team developed a list of issues to address.

## 1.7 Issues

The interdisciplinary (ID) team separated the issues into two groups: major and other issues. Major issues were defined as those directly or indirectly caused by implementing the proposed action. Other issues 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) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council for Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A list of comments received for this project and their disposition may be found in Appendix A. The issues include:

**Vegetation**

Issue 1: What affects would each alternative have growth, vigor, health and overall condition of the stands?

Indicators: acres treated by forest type; growth and yield; qualitative assessment of insect and disease risk

Issue 2: What affects will the proposed treatments have on the existing and future native plant community historically associated with the site?

Indicators: acres treated by native plant community type with treatments that improve the natural stand complexity (species and structural diversity) associated with the ecological capability of the site.

Issue 3: What affects will the proposed treatments in MA 8.3, the Ten Section area, have on the development of large diameter red and white pine? According to the Forest Plan,

management practices will be designed to emphasize red and white pine old growth, as well as recreation and scenic values. Many of the stands in the Ten Section area are plantations 50-60 years old that are slowing in growth, and have limited species and structural diversity. Treatments could promote the development of larger diameter trees and more quickly move the stands towards increased structural complexity.

Indicators: acres treated that imporve overall large red and white pine character of this Unique Biological Area and a qualitative measure of increased within-stand complexity in the stands proposed for treatment.

**Wildlife**

Issue 4: What affects will the proposed treatments have on the existing and future wildlife habitat conditions at the stand and landscape levels?

Indicators: acres treated by forest type with treatments that improve wildlife habitat conditions at the site, stand, and landscape levels, with emphasis in TES; MIS and MIH; and overall biological diversity.

**Fuels and Fire**

Issue 5: What affects will treatments have in reducing fuels accumulations and fire hazards?

Indicators: acres treated mechanically or with fire

Issue 6: Re-introduction of fire in red pine stands would result in some tree mortality, basal injury, and charring. Although some sectors of the public are supportive of burning, injury and damage may result in decreased desirability of certain forest products.

Indictors: acres of red pine proposed for prescribed burning

**Water Quality, Aquatic Resources, and Wetlands**

Issue 7: Timber harvest, prescribed burning, and temporary roads may affect water quality, aquatic resources, and wetlands.

Indicators: acres of riparian features (lakes, streams, wetlands) within proposed harvest or burn boundaries; acres of timber harvest or prescribed burning within riparian management zones (area within 200 feet of streams, lakes, or open water wetlands) and Riparian Emphasis Management Area; acres of wetland affected by temporary roads or system road maintenance; number of new stream crossings that are required to access harvest units.

**Soils**

Issue 8: What effects will timber harvest, temporary roads and prescribed burns have on soil stability and productivity?

Indicators: Potential for soil compaction and rutting; amounts of severely burned soil, slash remaining on low-nutrient soils; risk for soil erosion and suitability of soils for temorary road construction.

**Minor issues**

The following resources were considered and addressed where appropriate, but were not considered to be major issues that would drive alternative development. There would be little or no effects by the proposed treatments; therefore there will be no discussion in Chapter 3.

- Recreation – Proposed treatment areas are adjacent to several trails used for summer and winter recreation activities. These include the Paul Bunyan Connector, Soo Line, and Migizi, and National Recreation trails. No treatments are proposed adjacent to the North Country Trail. Mitigation measures have been identified to protect the trails and minimize conflict. Similar practices have been successfully used in other projects.
- Noxious Weeds – Field review indicated that significant populations of noxious weeds did not exist within or adjacent to the proposed treatment areas and are not a major concern for this project.

There are several topics that because of laws or regulations will be briefly discussed in Chapter 3. They include even-aged management, air quality, cultural resources, environmental justice, and civil rights.

# CHAPTER 2 ALTERNATIVES

## 2.1 Introduction

This chapter describes the alternatives considered, including design features, mitigation measures, and summarizes how those alternatives address the issues presented in Chapter 1. Alternatives considered but eliminated from detailed analysis are also described.

Alternatives were developed to respond to these issues as well as the purpose and need. The deciding officer has determined that the alternatives presented here provide a reasonable range of alternatives given the purpose and need and issues of the project.

The amount (e.g. acres, miles) of a particular activity and the precise location depicted on the treatment maps, for any alternative, is approximate based on inventory and survey estimates. Treatment acres, that is, the number of acres within a stand proposed for treatment, rather than all the stand acres, are identified in the alternative descriptions. Actual figures may change slightly during implementation based on such things as: avoidance of site specific areas that are too small to be depicted on the scale of maps used for display, small inclusions of inoperable terrain, non-uniform stand structure, slight refinements in the amount of temporary road needed, etc.

## 2.2 Alternatives Analyzed in Detail

Two alternatives were developed to address the purpose and need and issues raised during scoping of the proposed action. Tables and maps for the alternatives are in Appendix B.

**Alternative 1--No Action**

The National Environmental Policy Act and Forest Service Handbook requires the Forest Service to study the No Action Alternative in detail, and to use it as a baseline for comparing the effect of alternatives (40 CFR 1502.15(d); Forest Service Handbook 1909.15, 14.1). This alternative does not respond to the defined purpose and need for addressing Forest Plan objectives. The No Action Alternative, assumes current management plans would continue to guide management of the project area.

**Alternative 2 -Proposed Action**

Alternative 2 emphasizes improving the growth and vigor of conifer stands through commercial thinning, and improving within-stand complexity through the retention of existing hardwood species, non-featured conifer species such as jack pine and balsam fir, snags, and coarse woody debris. The details of this alternative were previously described in Chapter 1. An alternative table and maps can be found in Appendix B.

**Alternative 3**

Alternative 3 incorporates aspects of the purpose and need and includes almost all of the stands in Alternative 2. Alternative 3 emphasizes actively improving the within-stand complexity and improved wildlife habitat conditions more so than Alternative 2. In addition, Alternative 3

addresses the issue of reintroducing low intensity fire and commercial thinning several stands in the Ten Section Area. An alternative table and maps can be found in Appendix B. Activities proposed consist of the following:

- Variable density commercial thinning on approximately 1719 acres to improve growth and vigor of conifer stands, to improve within-stand complexity, and to improve wildlife habitat conditions. As in alternative 2, prescriptions may emphasize retention of other conifer and hardwood species but go farther in improving within-stand complexity by varying tree densities within a stand, by further reducing stand densities, by creating gaps within stands, and by planting conifer species. About 1378 of red pine, 279 acres of white spruce, and 62 acres of white pine would be thinned.

- Plant and underplant 600-700 acres of a mixture of conifer tree species in created canopy gaps and under low density pine and spruce canopies, followed by a hand release where necessary.

- Wildlife habitat improvement activities including: snag creation, downed log placement, and creation of scattered brush piles on approximately 1675 acres.

- Thinning of approximately 44 acres behind the Supervisors Office designed primarily to reduce fuels and fire hazard. Tree tops and limbs from thinning would be reduced through mechanical treatment or burning.

- Reduction of fuel concentrations along trails, pipeline corridors, and roads that are in close proximity to thinning units. Treatments, such as removing tree tops and braches, and lopping and scattering slash, would occur within the first 200 feet.

- Re-introduction of low intensity fire on approximately 355 acres to reduce fuel accumulations, to create a low level of tree mortality for snags, to release nutrients, and to stimulate shrub and herbaceous community response.

- Construction of about ½ mile of temporary road to access portions of treatment areas. In addition, approximately 3.2 miles of road currently gated, closed or brushed in will undergo maintenance necessary to open them for use during this project. Their disposition after use will be similar to what it was prior to project implementation, i.e. if it was closed by any means prior to implementation, it will be closed after implementation is completed.

- Harvest an estimated 23,500 CCF in wood products.

## 2.3 Vegetative Management Alternatives Considered But Dropped From Detailed Analysis

Several alternatives were considered as a result of scoping comments received.

1. An alternative that does not use logging in an effort to restore forest types, achieve range of natural variation, reduce fire risk, or any of the other project objectives.

2. An alternative that uses fire with no harvest which would more naturally replicate natural occurrences in stands.

Both alternatives propose no harvesting. Existing stands generally have a high tree density some of which need to be removed or killed. In concept, a number of tools could be used to accomplish this: fire, mechanical equipment, girdling, or some form of cutting. With these options the trees removed from the stand would not be sold for commercial purposes. There have been large investments in establishing and caring for these plantations and commercial harvest begins to repay these investments. Various treatments that do not include harvest would not contribute to the local demand for wood fiber. These alternatives were dismissed because the purpose and need of the project can not be met without harvesting, nor are they consistent with Forest Plan management direction. The environmental consequences of the no-action alternative presented in Chapter 3 looks at how effectively the purpose and need and issues would be met without harvest.

3. An alternative that results in a net reduction in the temporary and classified roads in the project area.

This project evaluated the roads needed to access the treatment units, their condition, and short term and long term needs for those roads. The resulting recommendations are in the roads analysis report for this project. Because this project area includes the entire Walker district, detailed analysis of all the roads is not feasible at this time. That type of detailed analysis is best done when smaller analysis areas (usually consisting of 1-4 watersheds) are defined. A recent example is the roads analysis completed for Leech Lake River project. For this project, the disposition of system roads after use will be similar to what it was prior to project implementation, i.e. if a road was closed by any means prior to implementation, it will be closed after implementation is completed.

## 2.4 Design Features, Mitigation Measures, and Post Treatment Activities

Application of design features, mitigation measures, and post treatment activities for wildlife, fish, rare plants, soil and water have been identified for specific stands in a table in Appendix C.

**Harvest Design Features**

1. Provide variable stem densities within the treated stand by thinning approximately:
   - 15%-40% of the stand to a <u>low</u> basal area (60-70BA for pine, 40-50BA for spruce);
   - 50%-75% of the stand to the <u>average/target</u> basal area; and
   - 10% left <u>unthinned.</u>

   The percent of the area thinned to the low BA and the lowest BA implemented will be based upon the existing stand conditions.

   The **primary objective** of this aspect of the harvest treatment is to create light conditions on the forest floor light over a considerable portion of the stand that will allow for the establishment and advancement of other tree, shrub, and herbaceous species.

**(Alternative 3)**

2. Create gaps in the canopy ranging from 0.1 acre to 0.25 acre (up to 0.75 acre if jack pine is to be planted), at a rate of approximately 1 gap per every 5 acres (generally, 2%-5% of the stand). Retain scattered trees within created gaps. Gap size should be variable. Shape and distribution will be dependent upon the light requirements of the tree species to be planted and upon existing within-stand characteristics. **(Alternative 3)**

3. Protect existing within-stand tree diversity, by retaining and protecting all non-featured tree species in the treatment areas. **(Alternative 3)**

4. Protect (to the greatest degree possible) all existing snags > 4 inches dbh within treated areas. **(Alternative 2 and 3)**

5. During logging operations, retain existing and purchaser generated slash and brush piles beyond the designated slash disposal zones, as per fuels mitigation measures. **(Alternative 3)**

6. Retain all large diameter (20+ inches dbh) long-lived conifer species. **(Alternative 2 and 3)**

7. Retain existing within-stand tree diversity, by retaining most of the non-featured tree species in the treatment areas. **(Alternative 2)**

**Prescribed Fire Design Features**

8. Apply broadcast burn to all portions of the stands available for burning to meet the following objectives:
   - Initiate the ecological role of fire in producing the compositional and structural features (understory, midstory, and overstory) ecologically appropriate to the site.
   - Strive for approximately 5-10% mortality of the live trees to provide fire-killed snags clumped and scattered throughout the stand.
   - Reduce hazardous fuels.

   **(Alternative 3)**

**Mitigation Measures for Action Alternatives**

All applicable Forest Plan Standards and Guidelines, Minnesota State Site-Level Forest Management Guidelines, Timber Sale Contract provisions, and Minnesota Smoke Management Plan recommendations would be implemented. Some of these are included here. In addition, site-specific mitigation measures listed below would be employed to reduce potential adverse impacts to a minimal level. Refer to Appendix C for wildlife, fish, rare plants, soil and water mitigation measures that apply to specific stands.

**Mitigation Measures (for Wildlife, Fish, and Rare Plants; Soil and Water)**

1. Exclude from all management activities, those portions of any stand to be treated within 13 chains of any known northern goshawk nest tree. **(Mitigation Measure – Northern goshawk)**

2. Maintain a minimum stand average of 75% canopy closure on stands to be treated within 43 chains (0.55 miles) of any known northern goshawk nest tree. **(Mitigation Measure – Northern goshawk)**

3. To minimize disturbance to nesting birds during the critical breeding periods, all road building, maintenance and obliteration activities or tree harvesting activities will occur between September 1 and February 29. The burning, planting, and other post-harvest activities will occur as late in the breeding season as possible to avoid the courtship, egg-laying and incubation period. **(Mitigation Measure – RFSS and MIS birds)**

4. In order to eliminate adverse impacts to individual botrychiums associated with the white cedars, no ground disturbing activities will be allowed within 20 feet of any white cedar tree. Trees to be cut within this 20-foot zone will be hand felled and pulled away from the cedars by hand. No skidding, hauling, or driving will be allowed within this 20-foot zone. **(Mitigation Measure – RFSS plants)**

5. All temporary roads will be obliterated once treatment activities requiring road access associated with this project are completed. The road surface would be loosened and seeded using a mixture of annual rye for quick green up, and native perennial grasses for long-term cover. Any culverts would be removed. The roads would be made impassable to snowmobiles and to two or four wheel drive vehicles, by placing slash, dropping trees, or creating barriers across the road for approximately 150 feet from the main road. The point of departure from the main road would be blocked with root wads, soil berms, rocks, or logging debris. This applies to all treated stands requiring temporary road construction and to those with temporary roads which have not been effectively closed. Within identified Lynx Analysis Units, the Forest Service will monitor vehicular use on the obliterated roadbed for a period up to five years. **(Mitigation Measure – Canada lynx, Gray wolf, and other wildlife)**

6. All tree harvesting, and other ground disturbing, activities must occur during frozen ground conditions. **(Mitigation Measure – RFSS plants)**

7. Retain spruce trees, especially along the edges of stands, which have live branches extending to ground level. **(Mitigation Measure – Canada lynx, Spruce grouse)**

8. Exclude from all management activities, those portions of any stand to be treated within 250 feet of any known botrychium site. **(Mitigation Measure – RFSS plants)**

9. During prescribed fire planning and implementation, include an objective to strive for 5-10% mortality of fire killed trees during prescribed fire activities. Retain fire-killed trees in prescribed fire units, to recruit coarse woody debris and future denning habitat. Reanalysis would determine future management if greater than 10% mortality occurs. **(Mitigation Measure – Black-backed woodpecker)**

10. When logging on sandy soils, retain on-site the fine logging slash (material < 3 inches in diameter). Whole tree harvesting will not be allowed on sandy soils unless the slash is returned to the site **(Mitigation Measure – Soils).**

11. Limit harvest to frozen ground conditions on these soils: somewhat poorly drained, poorly drained and very poorly drained soils. Harvest on frozen or dry soil conditions on all other soil types. **(Mitigation Measure – Soils)**

12. A field review to assess possible impacts to bald eagle breeding territories will be conducted prior to implementation of any management activities on stands within ¼ mile of a known bald eagle nest site. **(Mitigation Measure – Bald eagle)**

13. From 0-330 feet from a bald eagle nest tree – exclude all land use activities, except those necessary to protect nest sites. **(Mitigation Measure – Bald eagle)**

14. From 330-1320 feet from a bald eagle nest tree – all road building, maintenance and obliteration activities, prescribed fire activities, tree harvesting activities, and other potentially eagle pair disturbing activities will be permitted from October 1 to February 14 only. The conifer planting, release, and other minimally disturbing activities will occur as late in the breeding season as possible to avoid the courtship, egg-laying and incubation period. This distance may be extended beyond 1320 feet if justified (line of sight between eagle nest and project activity. **(Mitigation Measure – Bald eagle)**

15. Mechanical fireline construction will not be allowed within 100' of any lake, stream or open water wetland. **(Mitigation Measure – Riparian Areas)**

16. No streams (intermittent or perennial) will be crossed during harvest activities (skidding or hauling). **(Mitigation Measure – Riparian Areas)**

17. Forest management activities will not take place in wetlands, including building landings, skid trails and roads, harvesting or running equipment through the wetland depression. **(Mitigation Measure – All stands with wetland features)**

18. Seasonal Pond Mitigation: For all seasonal ponds/Type 1 wetlands/vernal pools (forested and non-forested), do not drive equipment through them and leave no tops or slash in them.

19. Filter strips are applied to all streams (perennial and intermittent), lakes, and wetlands, including wetland inclusions and seasonal ponds, seeps and springs. **(Mitigation Measure – All stands with lakes, streams, or wetland features)**

    a. Limit mineral soil exposure to less than 5%, well distributed throughout the filter strip
    b. Avoid concentrating disturbance in the filter strip, to prevent concentration of flows across the filter strip. Keep skid trails, haul roads, and landings outside of the filter strip area.

c. Temporary roads will be constructed outside of the filter strip area.

20. Implement prescribed fire guidelines for water quality protection as follows:
    a. No more than 5% of the soil surface within the RMZ will be detrimentally burned.
    b. Avoid placement of piles for burning inside of filter strips or riparian management zones.
    c. Use fuel break construction methods in wetlands that do not expose bare soil.
    d. Maintain erosion control measures as needed on fuel breaks. If possible, use roads or natural barriers for fuel breaks.
    e. Prevent or minimize runoff of fire-retardant chemicals into the water by keeping filter strip areas off-limits to retardant use.
    f. Avoid cleaning fire-retardant application equipment in lakes, streams or wetlands.

21. Stabilize bare soil areas with vegetative cover immediately following construction.

22. Slopes will be protected on temporary roads and skid trails by creating water bars or dips when slopes are equal to or greater than 5% and elevation change is greater than 6 feet in accordance with Forest Plan direction. Temporary approaches and roads will be decommissioned once reforestation activities are completed. The road surface will be loosened and seeded using a mix of annual rye or wheat for quick green up and native perennial grass and plants for long-term cover. Travel on temporary roads after the project is completed will be discouraged by blocking the road for 150 to 200 feet from the point of departure from the main road with root wads, berms, rocks, and/or logging debris, while meeting the scenic intregity objectives for the location.

23. For alternative 3, prescribed burning will be conducted during times and conditions that will prevent severe burning of the topsoil.

24. For alternative 3, maintain erosion control measures as needed on fuel breaks. If possible, use roads or natural barriers for fuel breaks.

25. If using a hydro-ax (or similar equipment) to lower slash, the same seasonal restrictions used for harvesting will apply.

26. To minimize the spread of noxious weeds in all soil-disturbing projects:
    - Clean gravel and fill (no weeds).
    - Use weed free seed, mulch, and bales for ditch blocks.
    - Monitor and control any weeds that get started. Clean weeds and seeds from construction, maintenance, and mowing equipment prior to entering and leaving the site. Revegetate in a timely manner with a mix of perennial grasses and plants and fast growing annual grass such as annual ryegrass. Don't leave exposed mineral soil for weeds to get started.

## Additional TES Site Protection Measures

[Note: These additional mitigation measures are to be utilized in the event of the discovery of new TES locations made during the course of project implementation. They apply to all stands scheduled for treatment.]

1. If a new goshawk territory is discovered in or adjacent to a stand proposed for treatment, a 600-acre zone around the nest will be analyzed and the appropriate mitigation measures, as previously stated above (Mitigation Measures #1, #2, and #3) will be implemented.

2. If a red-shouldered hawk nest is discovered in or near a stand proposed for thinning, the portion of the stand within 300' (minimum) of the nest tree will remain and all road building, maintenance and obliteration activities and tree harvesting activities in the remainder of the stand will occur between September 1 and February 29 (#3) .

3. If a great gray owl nest is discovered adjacent to a unit to be thinned, a 20-acre buffer will be maintained around the nest. No tree harvesting activities will occur within 0.5 miles of a nest during the months of April through July.

4. If a new bald eagle nest territory is found within 1320 feet of a unit to be thinned, Forest Plan Standards and Guidelines shall be evaluated and applied.

5. If an active wolf rendezvous or den site is found within one-fourth mile of any unit prior to thinning, no road building, maintenance and obliteration activities or tree harvesting activities will occur between March 1 and July 1.

### Mitigation measures for other resources

### Insect and Disease

1. Harvest in red pine stands should be done in late summer, fall or early winter to avoid creating conditions conducive to the build up of *Ips* bark beetles. Winter harvested material should be removed before warm spring (March – April) weather occurs. **(All red pine units -Alternative 2 only.)**

### Heritage

1. During commercial sale layout, harvest unit identification would consider practices that do not detract or devalue species being gathered (e.g. tree marking to note boundaries, leave or cut trees on paper birch). **(Alternatives 2 and 3)**

2. Heritage sites will be flagged and protected during treatment implementation. **(Alternatives 2 and 3)**

### Fuels

1. Where practicable for alternatives 2 and 3—
    a. Remove slash within 25' of other ownership boundary (not necessary to remove slash around entire perimeter of unit).
    b. Remove slash within 25' of trails, roads that dead-end or along spurs unless otherwise specified.

c. Remove slash within 50 feet of main or through roads. Specific to the Beaver Lake area, remove slash within 100 feet of unit boundary or clearing edge along all interior roads/trails. Specific to the Pike Bay area, remove slash within 100 feet of unit boundary or clearing edge along all main roads, pipeline corridor, and Migizi bike trail.
d. Outside the slash removal zones, lop and scatter slash to 2 feet or less; or if whole tree skidding is an option, have logger pile slash in strategic locations near landing. (Applies only to Alternative 2; no lopping and scattering in alternative 3)
e. In all treated stands, avoid windrows parallel to the roads that would result in fuels concentrations.
f. In spruce stands, allow for additional landings due to high slash loadings.

Refer to Appendix C for fuels requirements by stand.

2. In alternative 3, in burn units in compartment 60 and 122, whole tree skidding is required. For contractual purposes, use SYD clause. BD funds should be collected to burn the accumulated piles at the landing.

**Migizi Bike Trail Mitigation in stand 2-50-13 (Alternatives 3)**

1. Conduct implementation activities during the months of November through March along the Migizi Bike Trail to avoid user conflicts.

2. The contractor will document with photographs or video the condition of the trail prior to implementation activities to aid in identifying locations that may need to be repaired following timber operations.

3. At crossings of the paved Migizi Bike Trail, require all tracked vehicles to cross on rubber mats, tires, plywood sheets, steel plates, or similar material to prevent damage to the trail surface.

4. Restore the Migizi Bike Trail to its original engineering specifications, which include, among other things, repaving damage sections of trail and the installation of a new root barrier under the portions of the trail disturbed by implementation activities.

5. Clean all equipment by high-pressure washing before it is used on in the project area to prevent the spread of noxious weeds.

6. Coordinate with the recreation staff to assist in marking trees for removal along the trail corridor.

7. At the discretion of the recreation staff, fine the contractor $500 per tree for damage to leave trees. This includes nicks, scaring, removal of leave trees, or other damage to leave trees along the trail corridor.

8. Flush cut stumps within the foreground of the Migizi Trail, or up to 25' from the edge of the trail.

9. Remove 100% of slash within 25' of the edge of the Migizi Trail, and lop and scatter slash to a height of 2' or less within 25'-50' or from the "seen" portion of the trail corridor.

10. Mark trees, unit boundaries, and other paint applications on the backside of trees so that it is not visible from the trail.

11. Provide detours for the trail users when the Migizi Bike Trail would be closed for project implantation, and use appropriate traffic controls such as signing, barriers, flag persons, or other appropriate measures to ensure public safety. This mitigation may not be needed if operations occur outside of the high use season.

**Trails**

1. Identify trails on sale map as Protected Improvements (PI).

2. For National Recreation Trail, (stand 5-99-51), recreation staff to assist in marking; emphasis is on featuring big red pine and white pine; remove aspen. Preferred operating season is June 1 – December 1. Blade and re-seed trail after use. Remove slash within 25 feet from trail.

3. For Paul Bunyan Connector Trail and Snowmobile trail: Coordinate with State. Refer to Operation and Maintenance Plan for Paul Bunyan State Trail for general guidance.
    a. Along 5-104-6 winter logging is required.
    b. For 5-105-18 & 20, avoid using the paved section of trail and access units through the gravel pit. Winter logging is required in stand 20. For stand 18, preferred operating season is June 1 – December 1.

4. For State Snow-way 1 snowmobile trail, stand 5-106-3, winter logging is required. Coordinate with Cass Co. Blade trail upon completion of work in stand. Remove slash within 25 feet from trail.

5. For stand 5-180-21, winter log using access from west to avoid conflict with snowmobile trail users.

6. For Soo Line Trail adjacent to stand 2-120-35, avoid using the Trail. Avoid winter logging due to snowmobile activity on trail.

**Dispersed Recreation Sites (in 2-50-9)**

1. Dispersed recreation sites impacted by implementation activities will be restored to there pre-implementation condition, or better.

2. Dispersed recreation sites will not be used for landings, temp roads, or skid trails.

3. The contractor will perform 100% slash removal within 50' of dispersed sites and any associated improvements.

**Noxious Weeds**

1. To minimize the spread of noxious weeds, "unless the entire Sale Area is already infested with specific noxious weed species of concern, Purchaser shall ensure that prior to moving on to the Sale Area all Off-Road Equipment, which last operated in areas known by Forest Service to be infested with specific noxious weeds of concern, is free of soil, seeds, vegetative matter, and other debris that could contain or hold seeds." (CT 6.35 from Sale Contract)

2. Known noxious weed locations shall be clearly flagged, and equipment shall avoid areas occupied by noxious weeds.

3. Areas that are likely candidates for purple loosestrife occurrence (downstream of known current or historic locations) will be surveyed for loosestrife presence during project-specific burn plan development. Portions of wet meadows, which are known to have occurrences of purple loosestrife, will be excluded from prescribed fire treatment, so that the loosestrife does not spread. Field implementation design notes are to contain site-specific locations of known loosestrife occurrence, to ensure application of the mitigation measure as needed. Any new loosestrife locations discovered will be reported to appropriate noxious weed contacts to ensure site tracking and potential treatment occurs.

## Post-Treatment Activities for Wildlife, Fish, and Rare Plants

[Note: These activities, in order of priority, would be accomplished with funds from wildlife, fire, vegetation, or KV; and not with timber or salvage funds.]

1. Where understory light conditions are favorable to the establishment of desired hardwoods or conifers, plant canopy gaps and underplant portions of the stand with an appropriate mixture of conifers and/or hardwoods based upon the native plant community that is inherent on the ecological unit (landtype and phase combination) that the stand is found on. Planting will be with variable spacing. An alternative to planting is seeding.

2. Planted conifers may require one hand release and/or other stand tending activity to ensure an adequate stocking level is maintained.

3. Where existing snag densities are unacceptably low (average < 5 per acre, greater than 7 inches dbh), create snags, through girdling or other means, to provide a minimum of 5 per acre, scattered and clumped throughout the stand.

4. Where existing down log densities are unacceptably low (average < 5 per acre, greater than 7 inches, leave or create down logs to provide a minimum of 5 per acre, scattered and clumped throughout the stand. Where available, these down logs should be the largest available on site or > 8".

5. Create 2-4 scattered brush piles per acre throughout the stands to be thinned. These piles should be of material and size to persist in the stands for an extended period of time. Pile dimensions are to be approximately 10 feet long by 10 feet wide by 5 feet high. Place the brush piles in small openings. These brush piles should not be burned or spread out when rotten, but rather left in place indefinitely. Piles should be placed outside designated slash removal zones to avoid creating a fuels hazard.

## 2.5 Comparison of Alternatives

This section provides a summary of the effects of implementing the alternatives. Information in the tables is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2.5.1 summarizes proposed activities related to vegetative management activities (approximate acreages and volumes).

**Table 2.5.1. Vegetation Management Activites.**

| Activity | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Commercial Thin | -- | 1573 | 44 |
| Riparian Prescription | -- | 121 | |
| Commercial Thin with Gaps | -- | | 73 |
| Variable Density Thin with Gaps | -- | | 1602 |
| **Total Acres Harvest Treatment** | -- | 1604 | 1719 |
| | | | |
| **Total Volume** (CCF) | -- | 17,500 | 23,000 |
| | | | |
| **Roads** (miles)<br>Temporary Roads Construction<br>Maintenance | -- | <br>.5<br>3.2 | <br>.5<br>3.2 |
| **Prescribed Burn**<br>NFS lands (acres) | -- | 0 | 355 |
| **Economics** | -- | | |
| Value of timber harvest | -- | $789,959 | $1,044,910 |
| Costs | -- | $306,930 | $ 975,799 |
| Present Net Value | -- | $483,029 | $ 69,111 |
| Benefit/Cost Ratio | -- | 2.57 | 1.07 |

**Table 2.5.2 Comparison of Issue Indicators by alternative.**

| Issues | Indicator | Alt. 1 | Alt. 2 | Alt. 3 |
|---|---|---|---|---|
| 1: Growth, vigor, and health | Acres Thinned:<br>Red Pine<br>White Spruce<br>White Pine<br>Acres Burned<br>Growth and Yield<br>Insect & Disease Risk | <br>0<br>0<br>0<br>0<br>Declining<br>Increasing | <br>1213<br>303<br>88<br>0<br>Optimal<br>Reduced | <br>1378<br>279<br>62<br>0<br>Below Optimal<br>Potential for Increase |
| 2: Within-stand complexity | Potential response/increase | Limited | Limited | Substantial |
| 3: Ten Section area | Acres treated<br><br>Increase in complexity | 0<br><br>Maintains | 0<br><br>Maintains | 249<br><br>Improves |
| 4: Wildlife habitat | Habitat conditions | Marginal-unsuitable | Marginal-unsuitable | Improves |
| 5: Fuels and fire hazard reduction | Acres treated<br>Behind Supervisors Office<br>Pike Bay area<br>Beaver Lake area<br>Acres thinned<br>Acres burned | <br>0<br>0<br>0<br>0<br>0 | <br>44<br>0<br>324<br>1604<br>0 | <br>11<br>249<br>302<br>1719<br>355 |

| Issues | Indicator | Alt. 1 | Alt. 2 | Alt. 3 |
|---|---|---|---|---|
| 6: Fire damage to forest products | Acres red pine burned | 0 | 0 | 313 |
| 7: Water | Acres of riparian Mgmt zone in harvest units | N/A | 12 ac stream RMZ<br>85.2 ac lake & open-water wetland RMZ | 12 ac stream RMZ<br>128.7 ac lake & open-water wetland RMZ |
| | Acres of riparian Mgmt zone in burn units | N/A | N/A | 46 |
| | Acres of harvest in Riparian Emphasis MA | N/A | N/A | 121 ac |
| | Acres of riparian features | 0 ac wetlands<br>0 mi streams<br>0 ac lakes | 5.5 ac lake & open water wetlands<br>0.25 mi streams<br>67 ac non-open water wetlands | 5.5 ac lake & open water wetlands<br>0.25 mi streams<br>104 ac non-open water wetlands |
| | Acres of wetland affected by roads | 0 | 0 | 0 |
| | Number of stream crossings | 0 | 0 | 0 |
| 8: Soils | Compaction & rutting | No effect | Harvest on frozen or dry soils (98 ac) | Harvest on frozen or dry soils (98 ac) |
| | Risk of erosion | No effect | Low-limited bare mineral soil Exposure | Low-limited bare mineral soil exposure |
| | Slash on low-nutrient site | No effect | Retained | Retained |
| | Amount severely burned soil | No effect | No effect | <15% of treated area, < 5% in riparian zone |

# CHAPTER 3: ENVIRONMENTAL CONSEQUENCES

## 3.1 Introduction

This section describes potential consequences or effects that may occur if any of the action or no action alternatives were implemented. This information provides an analytic basis for comparing alternatives. The affected environment and environmental consequences are presented by resource area. All effects are discussed in terms of environmental changes from the current situation and include direct and indirect effects.

The scope of the analysis describes the area considered for the resource analyzed. The affected environment discusses the existing conditions within the project area. Direct and indirect effects may be thought of as resource changes as a result of implementation of the alternatives analyzed in detail. Cumulative effects differ from direct and indirect effects in that they take into account past, present and future activities that may occur in the vicinity of project on National Forest System lands and lands of other ownership. Potential cumulative effects were analyzed by considering the proposed activities in the context of the past, present and reasonably foreseeable actions across other ownerships.

The interdisciplinary team used the following tools and sources of information to complete the analysis: resource models, relevant literature, field observations, experience with past activities or similar actions, information from previous analyses, monitoring of past activities, aerial photography, district and forest databases, and the professional recommendations from resource specialists. The project file contains complete analytical data and documents.

The Forest Plan final environmental impact statement describes impacts that result from implementing various management activities. This environmental assessment is tiered to that document and therefore the effects will not be repeated in this analysis. This analysis concentrates on the specific resource effects involved with implementing each of the alternatives analyzed in detail. Each alternative analyzed in detail has a different mix of effects.

## 3.2 Vegetation

**Issue 1: What effects would each alternative have on growth, vigor, health and overall condition of stands?**

**Indicators:** acres treated by forest type; growth and yield; qualitative assessment of insect and disease risk

**Scope of the Analysis**: Discussion of effects is limited to the stands proposed for commercial thinning and burning in this project because only these stands would be affected by the treatments

**Management Direction**
Desired conditions, objectives and management direction from the Forest Plan (2004) most pertinent to this issue include:

- D-TM-1 The amount of commercial timber sales available for purchase is at a level that is sustainable overtime. (p 2-19)
- D-SE-1 The Forest provides commodity resources…to contribute to the…economic sustainability and diversity of local communities. (2-35)
- D-VG-1 Native vegetation communities are diverse, productive, healthy, and resilient. (p 2-21)
- D-VG-2 Vegetation conditions contribute to ecosystem sustainability and biological diversity…. (p 2-21)
- D-VG-4 Tree vegetation is present in amounts, distributions, and characteristics that allow contribution to a sustained yield of timber and pulpwood products. (p 2-21)
- D-VG-5 Vegetation constantly changes through management activities and through naturally occurring disturbances and ecosystem recovery processes such as wind, fire, flooding, insects, disease, and vegetation succession. (p 2-21)
- D-VG-6 d. Diverse mixes of trees, shrubs, herbs, mosses, lichens, and fungi species at site and landscape levels that are more representative of native vegetation communities. (p 2-21)
- O-VG-9 Restore structural diversity and ecosystem processes within stands when harvesting or burning by retaining: a diverse mix of trees, shrubs, and herbs; live and dead standing trees; earth and tree root mounds caused by uprooted trees; coarse woody debris from fallen trees; and patches of live trees. (p 2-22)
- D-ID-1 Resource conditions minimize undesirable fire, insect, and disease outbreaks. (p 2-18)
- D-ID-2 Integrated pest management approaches are used to avoid epidemics and infestations of un-desirable native or non-native invasive species. (p 2-18)
- D-ID-3 Native insects and diseases are present and fulfilling their ecosystem functions. Epidemics, when they occur, do not last longer than would be expected in a healthy ecosystem. (p 2-18)

**Affected Environment**
Within the project area, there are approximately 17,500 acres of red pine stands; 2,500 acres of white pine stands; and 4,000 acres of white spruce stands. The stands proposed for treatment at this time are those suitable for commercial thinning and those with the appropriate surveys completed. The table below shows the number of acres proposed for commercial thinning in the Conifer Thin project.

**Table 3.2.1. Proposed acres to commercial thin by alternative.**

| | Approx. Acres in Project Area | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Red Pine | 17,500 | 1213 | 1378 |
| White Pine | 2,500 | 88 | 62 |
| White Spruce | 4,000 | 303 | 279 |
| **Total** | | **1604** | **1719** |

Existing condition of stands proposed for treatment:

- Stands consist primarily of red pine stands, with a few white pine, and white spruce.
- Stands vary in age from approximately 25-100 years with the majority of them 40-60 years old. Average stand diameters range from 7-15 inches dbh.
- Stands are primarily plantations but there are some older stands that established naturally. Plantations frequently have rows or rigid spacing creating an un-natural appearance.
- Stands are fully occupying the site; close to or at upper density levels as indicated by crown closure and occurrence of natural thinning. Stands are dense, overstocked, and experiencing increased competition for limited resources. These conditions result in reduced tree vigor, growth, and mortality.
- Some stands have been previously thinned.
- Red pine and white spruce stands are generally monocultures, that is, they consist of a single conifer species (>95% of one species) with limited, if any, other conifers. Some red pine stands have scattered individuals to small groups of jack pine that are dying due primarily to senescence. Hardwood tree species may be present in varying amounts and are most prevalent where past windrowing of slash occurred. White pine stands have more diversity and tend to consist of a mixture of conifer species – white, red, and jack pine, spruce, and sometimes balsam fir.
- Stands have crown closures that allow little sunlight penetration to the forest floor, thereby reducing and limiting the development of the native understory and mid-story associated with the native plant community expected to occupy the site. A few stands have some balsam fir, spruce, or white pine in lower canopy layers. Stand understories typically consist of light to heavy layer of hazel brush. Raspberry, oak, maple may be present. Dense stands had very minimal herbaceous and grass understory.
- Insects and diseases are present at low levels. Pockets of mortality occur in some red pine stands; past mortality from spruce budworm occurs in spruce stands; and blister rust in white pine continues to cause dead branches and some tree mortality.

The proposed treatment acres occur on several different landscape ecosystems and landtypes. Landscape ecosytems are described in more detail under Issue 2. Landtypes are explained in more detail in the silvicultural diagnosis vegetation report in the project file.

**Direct and Indirect Effects**

The following table summarizes the effects of the alternatives.

**Table 3.2.2 Summary of effects by indicators for each alternative**

| | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Acres to thin: | | | |
| Total | 0 | 1604 | 1719 |
| Red Pine | | 1213 | 1378 |
| White Spruce | | 303 | 279 |
| White Pine | | 88 | 62 |
| Acres to burn | 0 | 0 | 355 |
| Growth and yield | Declining | Optimal | Below optimal |
| Insect and Disease risk | Increases with time | Reduced risk | Potential for increased risk in some stands |

**Alternative 1—No Action**
Under this alternative, no thinning or burning would occur. Neither trees nor competing vegetation would be removed. There would be no change in the existing condition. The no action alternative does not improve tree growth, vigor and health or stand conditions.

Growth and yield:

- Stands have high densities in terms of the number of trees or average basal area. Competition among trees for nutrients, light and moisture would continue causing reduced tree growth, losses in volume, and mortality through self-thinning, insects and diseases.

- When crown closure occurs, individual tree diameter growth slows dramatically. Individual tree and stand volume increases become minimal. Total stand volume continues to increase as the high numbers of trees within the stand continue to slowly grow. Remaining trees continue to persist and collectively add to stand volume until competition and crowding become severe enough to result in mortality. At that point net volume remains relatively constant or may begin declining.

- Crowding and competition leads to the development of taller, more slender trees. Tree crowns continue to overlap and encroach on adjacent trees, resulting in lower live crown ratios. Trees with low crown ratios are limited in their ability to respond to release or thinning. At a certain point, thinning is no longer feasible which limits treatment options to regeneration harvests. Small crowned, tall trees seem more likely to suffer wind, snow or ice damage/breakage.

- Crown closure within these stands allows little sunlight to penetrate to the forest floor, thereby reducing the diversity and abundance of understory vegetation. Where this effect is most severe, vegetation including shrubs, herbs, and tree seedlings are virtually absent. Under this alternative, the abundance and number of species in both the understory and the overstory would be very low until succession results in mortality and openings begin to appear in the canopy allowing more light to penetrate and give way to other species. This would eventually lead to slow reappearance of more diversity in all layers of the stand. An indepth discussion of species composition and structural diversity appears under issue 2.

Insect and disease risk:

- Dense conditions predispose stands to insects and disease risks, especially if an additional stress, such as drought occurs. Monocultures seem to be more susceptible to insect and disease problems than those that are more diverse in species composition (Gilmore and Yount, 2002, p.97). Monocultures are often simplified systems that lack natural diversity and therefore the necessary checks and balances that keep insects or diseases in balance. Crowding and competition leads to poor growth, lower tree vigor, and reduces the stands' ability to withstand insect and disease activity.

- Red pine is susceptible to a number of insects and diseases. *Ips* bark beetles attack trees that are weakened by poor site conditions, drought or intense competition. Outbreaks are often associated with lack of thinning and drought In most cases, small groups of 1-10 trees are killed but, on rare occasions, areas as large as 1-10 acres may be killed (Gilmore and Yount, 2004, p 100). The red pine cone beetle, generally present, can affect cone development and may be a contributing factor in the poor natural regeneration of red pine. Diseases that affect growth and cause mortality are shoot blights, *Armillaria* root disease, and needle diseases. Many times insects and diseases work in concert to stress trees and eventually cause mortality. There is also some speculation that the lack of fire has contributed to the spread and establishment of some pathogens.

- Dense spruce plantations provide favorable habitat for spruce budworm. Large patches or entire stands can be lost due to budworm activity. The potential for spruce budworm defoliation increases with reduced growth and mortality. Affected trees have reduced foliage, diameter and height growth, causing further stress and increased susceptibility to other disease agents. As mortality creates holes in the canopy, limited regeneration of a variety of tree species would gradually occur. Due to brush competition, development of regeneration would be slow and sporadic. Currently there are no signs of building spruce budworm populations.

- White pine incurs damage, reduced growth, and mortality from white pine blister rust (an introduced disease). Although there is little that can be done in older trees to minimize the effects other than remove the infected trees, in younger white pine, removing the lower branches and infected branches can reduce losses. With this alternative, sources and conditions for blister rust infection would remain contributing to the spread of blister rust.

**Alternative 2**
Alternative 2 emphasizes improving the growth and vigor of conifer stands through commercial thinning, and improving within-stand complexity through the retention of existing hardwood species, non-featured conifer species such as jack pine and balsam fir, snags, and coarse woody debris. Approximately 121 acres in Riparian Emphasis Areas would be designed to meet riparian values and function.

Commercial thinning treatments are designed to reduce stand basal area yet stay within the recommended management and stocking guidelines. In this way, treatments are similar to past commercial thinning implemented during the past 15-20 years. They differ in that in this project, as with other recent projects, efforts have been made to retain hardwoods, non-featured conifer species and other structural components such as existing snags and coarse woody debris.

Growth and Yield:
For this alternative, red pine prescriptions are based on the stocking guides from *Manager's Handbook for Red Pine in the North Central States* (Benzie, 1977) that was the basis for the 1986 Forest Plan standards and guidelines for stocking. These guidelines were also included in *A Revised Management Guide for Red Pine* (Gilmore, et al, 2004). Typically basal areas would be reduced by about 1/3 to maintain productivity and stand stability. Residual stocking levels

would vary depending on initial stand densities. For production management, guidelines state that: at least the minimum recommended stocking should be left but not over half, and preferably less, of the basal area should be removed in any one thinning (Gilmore, et al 2004, p. 28). Accordingly, sawtimber stands (9-15 inches average diameter) have their best growth at basal area densities of 90-120 sq. ft. per acre. Smaller diameter stands (9 inches dbh or less) generally should be thinned to leave about 90 sq. ft. (Benzie, 1977).

For the most part, post treatment basal areas would range from 90-120 sq. ft. although depending on the initial basal area, some stands may be lower and others higher. In stands with high initial basal areas (160-250 sq. ft.), following the guidelines for removing approximately 1/3 of the basal area, target basal areas may be from 110-160 sq. ft. Higher residual levels would protect stands from wind, ice or snow breakage that may occur if opened up too much. This is particularly important in stands not previously thinned.

With alternative 2, the thinning proposed would improve the growth, vigor and health of the stands by increasing space for the residual tree growth, by providing individual trees with more light, moisture and nutrients, by improving crown depth and crown ratios (USDA, Ag Handbook, p. 449) which in turn increases individual tree and overall stand growth. Thinning would develop larger crowns, more drought and storm resistant trees. Mortality resulting from self-thinning would be minimized. Distance between crowns would result in a well-spaced overstory. Due to within stand variability, a range of basal areas generally would occur.

Insect and Disease:
Thinning would result in stands containing primarily conifers but would include other hardwoods, aspen, or non-featured conifer species that occur in the various canopy levels. The hardwood/aspen component may be present as scattered individuals, in clumps, larger pockets, or strips. Space between crowns would allow increased sunlight penetration, promoting a greater diversity of shrubs and herbaceous plants until crown closure occurred at some point in the future. The improved diversity, spacing and environment for individual trees would enable them to better defend against insects, disease and other agents that adversely affect forest health (Gilmore and Yount, 2004, p. 108). The retention of snags and coarse woody debris provide niches for a multitude of insects and small animals that contribute to maintaining a healthy and productive forest.

- In red pine stands, thinning would reduce competition stress and decrease the likelihood of *Ips* infections. However, logging operations can trigger local outbreaks of *Ips*. Freshly cut logs left in the woods in the spring and early summer provides brood material potentially increasing *Ips* populations. A 10-fold population increase can occur in one growing season. A mitigation measure that requires the removal of harvested material before warm spring weather (Gilmore, 2004. p. 52) should eliminate or minimize that concern. Cat faces at the base of trees caused by logging damage can also predispose trees to bark beetles – *Ips* and *Dendroctonus valens* (red turpentine beetle) and eventual mortality (Gilmore, et al, 2004, p. 49, 51). Generally this occurs in small localized areas and provides a low level of background mortality.

- Thinning in spruce can be used to prevent a build-up of spruce budworm activity. There

are past indications of budworm activity (tree mortality). Thinning allows trees time to respond and to be at maximum vigor prior to budworm defoliation. Spruce budworm is a host specific forest pest. Trees other than spruce or balsam fir do not provide an adequate food source. A stand that has species diversity or space between spruce trees impedes the dispersal of budworm and the potential for damage.

- Removal of white pine overstory infected with blister rust would remove sources of the infection but because the disease is so pervasive across the forest, beneficial effects would be limited.

Duration of benefits associated with thinning treatments are expected to last 10-15 years, depending on age and growth rates of residual trees.

**Alternative 3**
Alternative 3 emphasizes actively improving within-stand complexity and wildlife habitat conditions. It includes treatments in the Ten Section area south of Pike Bay. Alternative 3 retains all non-featured species, incorporates variable density thinning to lower basal areas than alternative 2, creates gaps, reintroduces low intensity fire, and plants conifers to increase conifer diversity.

Growth and Yield:
As with alternative 2, this alternative would also improve the growth, vigor and health of the stands by increasing space for the residual tree growth, by providing individual trees with more light, moisture and nutrients, by improving crown depth and crown ratios (USDA, Ag Handbook, p. 449) which in turn increases individual tree and overall stand growth. Alternative 3 thin about 100 acres more than alternative 2.

To achieve within-stand complexity objectives, a variable density thinning with gaps is prescribed for most stands. In general, target basal areas for red pine stands are between 80-100 sq. ft. of basal area, with 15-40% of the stand thinned to a lower basal area of 60-70 BA (40-50 BA for spruce stands), and 10% of the stand remaining unthinned (Harvest design features 1 and 2). Another 2%-5% of the stand would be in gaps generally ranging from 0.1 acres to 0.25 acres.

With alternative 3, basal areas would be reduced in all or portions of the stand to below the minimum stocking levels recommended in the red pine species manager's guide.
Lower basal areas would grow larger trees faster, which may be higher in value, but can also affect long-term volume production. Lundgren (1981) indicates that in red pine stands volume increase per acre is greatest in stands that are more closely spaced. Using a growth projection model (FVS) for a red pine stand, output indicated that if the basal area were reduced from 90 to 70 sq. ft., the loss in volume over the rotation would be approximately 200 merchantable cu. ft per acre.

In many of the small diameter, high density stands, this alternative removes more than the recommended 1/3-1/2 of the existing basal area. There are approximately 500 acres of these stands which have not been previously thinned. Opening them up too much, too quickly could

result in wind, snow or ice breakage leaving stocking levels more representative of a regeneration cut than a thinning.

Planting 656 acres at approximately 300 conifers per acre is planned in the gaps created and in portions of stands with the lowest tree density. Trees to be planted include red pine, white pine, balsam fir, and white spruce. Since these are not regeneration harvests, no site preparation would occur, and regeneration to meet NFMA requirements or specified stocking levels is not required. For red and white pine, at least one release or other stand tending activities would be required to ensure tree survival. The availability of funds to accomplish this work is limited. Effects include the following:

- For white pine, although the seedlings can withstand shade, trees are susceptible to deer browse and blister rust. Animal control for several years would be required in order to maintain high survival rates. Pathological pruning of white pine would reduce the risk of blister rust infection and survival rates.

- Red pine seedlings do best in sun and where site preparation has removed shrubs. Ground disturbance during summer or fall logging would provide sites suitable for red pine. Winter logging would eliminate ground disturbance. Without ground disturbance, site preparation or required sunlight, seedling survival and growth would be expected to be poor. Seedlings often require tending for several years after they are established to release them from regrowth of competing vegetation. (Benzie, 1977, p. 10).

- Without tending of white or red pine for several years, greater than 90% failure is likely (based on survey results of similar treatments on districts). If red pine is planted under red pine, diseases can be a major cause of first season mortality.

- Balsam fir and white spruce are shade tolerant species that can withstand competing vegetation and understory positions. Generally growth is slow but trees can respond when disturbance occurs.

Spring burning can kill red pine cone beetles thus could increase the likelihood of natural regeneration. With spring burning, however, density of hazel in the understory may actually increase (Buckman, 1964) impeding the establishment of regeneration. Buckman further states that prescribed burning during the summer may reduce the amount of hazel. If burning coincides with a good cone crop year, natural regeneration may be increased.

Insects and Disease:
With alternative 3, beetle caused mortality is desirable to increase within stand complexity and the number of snags in stands. To facilitate that, this alternative <u>does not</u> require removal of logs that could trigger local outbreaks of *Ips*. Freshly cut logs, left in the woods in the spring and early summer, provide brood material potentially increasing *Ips* populations. A 10-fold population increase can occur in one growing season (Gilmore, 2004 p. 54). Steve Katovich, entomologist with State and Private Forestry in St. Paul provides the following:

> *Ips* beetles will colonize the logs in April and May, complete development of the first generation by mid-June and emerge at population levels that should be high enough to infest and kill standing live trees in close proximity to the logs. How much mortality you get will depend upon the health of the standing trees and upon the prevailing weather conditions. Drought will induce higher mortality levels. During a drought there is a good chance of killing 10-20 percent of the standing trees in one year. During a normal to wet year, only scattered dead standing pine may result. How long these little mini-outbreaks will persist is difficult to predict, much depends again upon the weather. In my experience, once these pockets get initiated they persist, slowly killing trees over many years. In drought years the mortality will expand. Over a 10-20 year period the impact may approach 25-50 percent.
>
> The problem is not introducing mortality into these plantations--that is relatively easy to do. The problem is trying to limit the mortality to what could be defined as "endemic" levels. Small pockets of dead trees can be initiated but there is no guarantee that those pockets can be kept from expanding and killing many more trees than desired. Weather conditions are unpredictable and therefore predicting the behavior of a local bark beetle outbreak is impossible.
>
> From a landscape perspective there are regional declines and high levels of tree mortality in many of our tree species. This includes white spruce and balsam fir mortality, tamarack mortality, black ash decline and mortality, paper birch dieback, high levels of oak mortality, and expanding jack pine budworm outbreaks, Dead and dying trees are everywhere. Plantations of red pine that have limited levels of ongoing mortality are in the minority.
>
> It took 40-70 years to develop many of the stands proposed for treatment. Management actions can quickly set into motion changes that can occur over a short period of time that can undo what has taken decades to develop and achieve (personal communication, Steve Katovich 2004).

Additionally, cat faces at the base of trees caused by logging can predispose trees to bark beetles – *Ips* and *Dendroctonus valens* (red turpentine beetle) and eventual mortality (Gilmore, 2004, p. 49, 51) providing a low level of background mortality. Generally this occurs in small localized areas.

With this alternative, burning is planned on 355 acres. One of the burn objectives is for 5-10% mortality. Individual trees stressed by fire injury would be more susceptible to bark beetle and wood borer attack and mortality. If burning occurred during a droughty period, then trees already stressed would be more prone to mortality from fire or beetles. In this situation mortality is more apt to occur across larger areas rather than in small, isolated patches.

Duration of benefits associated with thinning treatments in alternative 3 may last 15-20 years, possibly longer, before crowns close and growth slows.

**Cumulative effects**

Thinning with either alternative 2 or 3 would generally result in increased growth of the remaining trees, improved vigor, and improved resistance to insects and diseases.

Alternative 2 thins approximately 1600 acres. The residual stocking levels are expected to result in optimal growth and yield and reduced risk to insects and diseases.

Alternative 3 thins approximately 100 acres more than alternative 2. With alternative 3, there are some tradeoffs with regard to long-term reduction in growth and yield because the residual stocking is lower, consequently growth and yield is below optimal. Mortality caused by beetles

may be minimal or where conditions support higher populations of beetles, mortality may accrue over a period of years killing another 10-50% of the trees (personal communication, Steve Katovich). Success of achieving increased species diversity through planting depends on implementing stand tending activities. Understory response to burning may affect the success of regeneration and depends on the season of prescribed fire and burn conditions.

For both alternative 2 and 3, thinning treatments are scattered across the Walker district, they maintain forested conditions, and are less intense and impactive than regeneration harvests. Less than 7% of the red pine, white pine, and white spruce stands on the district are included in this project. Given that overall the effects are generally expected to be beneficial, no adverse cumulative effects are anticipated. Therefore, cumulative effects are not considered further for this issue.

**Issue 2: What affects will the proposed treatments have on the existing and future native plant community historically associated with the site?**

**Indicators:** Acres treated by native plant community type with treatments that improve the natural stand complexity (species composition and structural diversity) associated with the ecological capability of the site.

**Scope of the analysis**: The direct and indirect effects analysis is confined to the stands proposed for management treatment. The cumulative effects analysis puts these effects in the context of the entire project area and across the entire CNF.

The overall analysis for the within-stand complexity aspect of vegetation management in the Walker Conifer Thin (WCT) project area is focused primarily on the effects of proposed management treatments on the native plant communities associated with the sites. The direct, indirect and cumulative effects analysis of this aspect of vegetation management is presented in this section.

**Management Direction**
The Forest Service is mandated to preserve biodiversity by maintaining the viability of all native species on each National Forest. Several sources provide direction for achieving this mandate on the Chippewa National Forest (CNF).

The National Forest Management Act (NFMA) of 1976 made the concept of biological diversity a primary consideration in multiple resource land management. Specifically, the act includes the following provisions related to maintaining vegetation diversity:

- ". . . provide for diversity of plant and animal communities and tree species consistent with the overall multiple-use objectives of the planning area" (CFR 219.26).
- " . . . preserve and enhance the diversity of plant and animal communities . . . so that it is at least as great as that which would be expected in a natural forest . . . " (CFR 219.27(g)).

The 2004 Land and Resource Management Plan (Forest Plan) for the CNF provides goals, desired conditions, objectives and management direction specific to vegetation management

on the CNF (Forest Plan, 2-21 through 2-24). Selected excerpts of Forest Plan direction relevant to vegetation management in this project include:

- Vegetation (live and dead) is present in amounts, distributions, and characteristics that are representative of the spectrum of environmental conditions that would have resulted from the natural cycles, processes, and disturbances under which current forest ecosystems and their accompanying biological diversity evolved.
- Vegetation constantly changes through management activities and through naturally occurring disturbances and ecosystem recovery processes such as wind, fire, flooding, insects, disease, and vegetation succession.
- Vegetation conditions that have been degraded or greatly diminished in quality or extent on the landscape by past land use are restored to conditions more representative of native vegetation communities. These conditions, in ecologically and socially appropriate areas, result from gradually reestablishing:
    - ✓ Diverse mixes of trees, shrubs, herbs, mosses, lichens, and fungi species at site and landscape levels that is more representative of native vegetation communities. This includes an increase, in appropriate areas, of: rare and sensitive plants and native plant communities; white, red, and jack pine; white cedar; upland tamarack; and in some areas, white and black spruce as components of native vegetation communities.
    - ✓ Diverse structure in native vegetation communities that have been harvested, salvaged, prescribe burned, or have undergone natural disturbance. Structural diversity components will be provided by small patches of forest (reserve islands); scattered or clumped standing, mature and older live trees; dead trees; and coarse woody debris (down logs and branches).
- The ecological processes of native vegetation communities are maintained, emulated, or restored at multiple landscape scales to provide representation of their natural range of distribution and variation within the context of multiple-use goals and ecosystem sustainability. These include: processes such as disturbance from fire, wind, flooding, insects and disease; biological community and species interactions; nutrient cycling; and vegetation succession.
- Restore the diversity of tree species within stands to conditions more representative of native vegetation communities by increasing the component of white pine, red pine, paper birch, white cedar, upland tamarack, and in some areas, white spruce and black spruce.
- Restore the diversity of shrubs and herbs, including sensitive or rare shrubs and herbs, to conditions more representative of native vegetation communities.
- Restore structural diversity and ecosystem processes within stands when harvesting or burning by retaining: a diverse mix of trees, shrubs, and herbs; live and dead standing trees; earth and tree root mounds caused by uprooted trees; coarse woody debris from fallen trees; and patches of live trees.
- Increase amount of a variety of prescribed burning practices to restore the ecological process of fire and provide habitat for threatened and endangered species and other wildlife that benefit from or require burned vegetation.
- In mature or older red and white pine forest types maintain characteristics of mature or older native vegetation communities and promote the maintenance or development of interior forest habitat conditions.

- Native insects and diseases are present and fulfilling their ecosystem functions. Epidemics, when they occur, do not last longer than would be expected in a healthy ecosystem.

**Affected Environment**

This indicator evaluates active management treatments that may affect within-stand complexity. There are a variety of factors that can affect the immediate and long-term compositional and structural complexity of a forested stand. Forest succession, natural disturbances and forest management activities all can exert major influences on within-stand complexity.

Forest succession is the process of change to a particular forest community in a particular location over an extended period of time, measured in 10s to 1,000s of years. This process is characterized by a sequential change in relative structure, kind, and abundance of the dominant species (Barnes et al. 1998).

Forest communities on the CNF are constantly changing due to the natural process of forest succession. This process occurs in all forested stands, managed or unmanaged, regardless of age. The progression of changes to forest composition and structure in a particular area is largely dependent on the inherent ecological capability of the site. This inherent capability is a product of the combined influences that soil, topography, and climate exert on the site. Additionally, natural and human-induced disturbances and forest management activities play a critical role in the dynamics of change to composition and structure that occurs within a forested stand. The type, amount, and intensity of a disturbance or activity, or sequence of disturbances or activities, can substantially alter the successional sequence in a particular stand or across an area.

Natural disturbances, such as insect infestations, disease outbreaks, wind events, floods, or fires, can occur locally within stands or more broadly to multiple stands or even landscapes. These kinds of disturbances, along with the inherent ecological capability of an area, are primarily what shaped the composition and structure of the natural forests occurring on what now is the CNF.

Similarly, active forest management activities, such as timber harvesting methods, reforestation, supplemental planting, road building, prescribed fire and fire suppression can have profound influences on the changes to the composition and structure of forests at the local and landscape levels.

Forest succession is a natural phenomenon that occurs and will continue to occur on the CNF under all alternatives. The potential affects to the successional pathways for each stand and their eventual compositional and structural characteristics due to active and passive management strategies are expected to vary by alternative and are analyzed in this environmental assessment. The possible successional pathways that a forest community can take, based upon the disturbances and forest management activities they undergo, are still largely dictated by the landscape ecosystems in which they occur.

During the process to revise their Forest Plans, the National Forests in Minnesota cooperated with the Minnesota Forest Resource Council to identify and define the major forest ecosystems in northern Minnesota. These major forest ecosystems are referred to as Landscape Ecosystems

(LE). LEs are ecological areas derived from a combination of individual or groupings of native plant communities, ecological systems, and Terrestrial Ecological Unit Inventories at the Landtype Association and Ecological Landtype scales. Each LE is characterized by its dominant vegetation communities and patterns, which are a product of local climate, glacial topography, dominant soils, and natural processes, such as succession, fire, wind, insects, and disease.

The 2004 Forest Plan identifies eight LEs on the CNF. It also provides management objectives for vegetation composition, age class, and tree species diversity for each of these LEs. The following table provides a brief description of each of the LEs on the CNF.

**Table 3.2.3. Landscape Ecosystem Descriptions**

| Landscape Ecosystem | General Description |
|---|---|
| Dry Pine | Jack pine and red pine are the dominant species in this fire dependent LE; aspen, paper birch, white pine, oak, white spruce and balsam fir are also present. Mixed cohorts of all three native pines were common in the understory. |
| Dry-mesic Pine | Mature and older stands in this fire tolerant LE are dominated by a supercanopy of red pine and white pine. The subcanopy is a mixed stand of red maple and paper birch. White spruce, balsam fir, aspen, northern red oak, bur oak and bigtooth aspen are also found in this mixed subcanopy in some of the stands at lower stocking levels. Jack pine, red pine and white pine can occasionally occur in pure stands. |
| Dry-mesic Pine/Oak | This fire dependent LE has a jack pine, red pine and white pine supercanopy either alone or as mixed pines. Deciduous trees usually occur as a subcanopy comprised of quaking aspen, paper birch, northern red oak, bur oak, red maple and bigtooth aspen. These deciduous trees grow to merchantable size and in the absence of pines form a cover type. These forests, in a mature condition, typically are a mix of pines and deciduous trees, frequently with 2 pine species and a subordinate canopy of 3 deciduous species. |
| Boreal Hardwood/ Conifer | This fire tolerant LE is dominated by mixed stands composed of aspen, paper birch, balsam fir, and northern white cedar. White pine, red pine, ash, basswood, bur oak, white spruce, and elm were also present with minor amounts of red maple, sugar maple, and jack pine. Red maple, aspen, black ash and balsam fir are the most prevalent trees regenerating in the understory of mature stands. |
| Mesic Northern Hardwood and Rich Hardwood | The canopy of this fire intolerant LE was dominated by sugar maple, basswood, and paper birch. Often listed as associated species present is minor amounts are yellow birch, bur oak and northern red oak. Rare were balsam fir, red pine, white pine and northern white cedar, which are never abundant. Sugar maple, basswood and ironwood are the major understory trees. |
| White Cedar Swamp and Semi-terrestrial White Cedar | This fire intolerant LE is dominated by northern white cedar and balsam fir. The semi-terrestrial white cedar system also includes occasional paper birch. |
| Tamarack Swamp, Forested Bog, and Forested Poor Fen | Tamarack is the dominant tree species in this fire tolerant LE. The composition of the lowland conifer systems is influenced by the pH of the wetland. Black spruce also occurs in this LE and can be a canopy dominant tree. |
| Wet Sedge Meadow | This fire dependent LE is a nonforested community occurring on the floodplains of streams and lakes. The ground layer of the community is composed of dense, closed stands of predominately wide-leaved sedges as well as grasses and forbs. |

This project consists almost entirely of treatments to conifer (red pine, white pine and white spruce) stands. This project does not propose any activities in the White Cedar Swamp and Semi-terrestrial White Cedar or the Wet Sedge Meadow LEs. A very large majority of these stands occur as plantations, ranging in age from 18 to 80 years old. Most of these stands are planted in rows and generally lack the within-stand structural complexity or species composition diversity associated with native conifer forest communities. Most of the stands proposed for treatment are generally closed canopied, single layered, monotypic conifer plantations with very little or no midstory or understory development. Some of these stands have been previously thinned, while others have not.

Additionally, there are four natural origin stands whose ages are greater than 80 years old. All of these stands are in the fire dependent Dry-mesic Pine/Oak LE. Three of these four stands are to be prescribed burned only. These stands are generally more diverse in terms of their compositional and structural components.

A relatively large majority (60-70%, or possibly greater) of the red pine, white pine, and white spruce plantations between the ages of 35 and 80 years old, that are accessible and available for timber harvest, within the project area and across the CNF have received at least one thinning. Some of these stands have received multiple thinnings. A very large percentage (90%+) of these thinnings have been accomplished using the standard commercial thinning prescription, which is based largely on providing certain spacing between and among the remaining trees. The primary objectives for this silvicultural treatment were to improve the growth and vigor of the remaining crop trees, to remove trees which were not expected to live to the next stand entry, and to maximize timber production over the life of the stand. The standard thinning approach tends to maintain relative uniform canopy closure (stands will be partially opened for a period of 10-15 years) and minimize the development of within-stand complexity generally associated with the aging of natural conifer communities. It commits these treated stands to a more monotypic condition for the foreseeable future (10-20 years) depending on the next stand entry. Plantations thinned in this manner tend to lack fuller understory and midstory development (species diversity and multiple layers), snags, down logs, and the wide variety of compositional and structural components usually associated with native conifer communities.

The application of prescribed fire in fire dependent and fire tolerant ecosystems can aid in the restoration of the compositional and structural components of the associated native plant and animal communities. Recurring fire prior to European settlement shaped the native plant communities on many of the landscape ecosystems on the Chippewa. Most of these fires were low intensity ground fires, which maintained the composition and structure of the native plant communities that evolved on those landforms. With the exception of wet meadow burning, there has been a relatively minimal amount of prescribed fire applied to the upland fire dependent and fire tolerant communities on the CNF. Thus, the beneficial effects of fire in a large majority these upland communities have been lacking for several decades.

**Direct and Indirect Effects**

The primary differences between the two action alternatives for this project are in their approach to maintaining or improving the within-stand complexity of treated stands, and the subsequent

effects to native plant communities inherent to the sites. This indicator evaluates the use of forest management treatments, such as harvest cutting methods, underplanting, prescribed fire, and other management activities that influence the within-stand complexity of the understory, midstory, and overstory layers. It is a means of comparing a variety of forest stand attributes, such as species diversity and abundance from the ground layer through the canopy, crown closure and density, standing snags, and downed logs, and the diversity of tree ages within a stand. Within-stand complexity includes both species and structural diversity. For this analysis, within-stand complexity refers to the vertical structure and associated species diversity at the stand scale.

Vertical structure is the bottom to top configuration of above ground vegetation within a forested stand and varies with forest types and stand ages. Stand complexity changes markedly during forest succession, from a relatively simple structure in early successional stands to more complex structures displayed as stands age. This increase in complexity generally occurs as the overstory matures with the associated canopy thinning and differential height growth of individual canopy trees. The gradual heterogeneity of the overstory permits more light to penetrate lower levels of a forest stand creating conditions for understory establishment and increased vertical complexity. Additionally, as stands age and self-thin themselves, there are increased amounts of standing snags and downed woody debris. As trees die in older forest stands leaving gaps of various sizes, vertical structure redevelops through a succession process similar to that at the larger stand scale. The staggered timing and variety of gap sizes and shapes produces variation in the vertical structure of the stand with an associated variation in the overall species composition (Brokaw and Lent in Hunter et al.1999; personnel communication, Brian Palik 2004)

In natural origin forests, developing complex spatial patterning or structural patches within the stand (horizontal heterogeneity) is largely the result of patchy or spatially aggregated mortality caused by diseases, insects, and wind. Forest "gaps" are an obvious manifestation of this patterning. In dense young stands, competitive mortality among trees ("self-thinning") dominates. Important features of competitive mortality (from a stand development perspective) are that it (a) results in death of smaller trees and (b) has a relatively even spatial distribution—i.e., it creates uniformity in the stand. Mortality in older stands is dominantly the result of diseases, insects, and wind. These agents kill large trees as well as small and tend to make holes in the stand (Franklin 2001). *Ips* bark beetles are one of the insects endemic to red pine stands. However, they tend to be secondary pests and invade trees that are dead or soon to die; and so they have not been much of an issue in red pine management. In endemic situations, an outbreak of this bark beetle tends to occur in small groups (3-5 trees, occasionally up to ten trees). An extended period of drought may produce stressful conditions for overcrowded trees in some stands and allow this insect to invade entire stands or portions of stands where tree overcrowding exists (personnel communication, Brian Palik). These insects, and other pathogens, are important agents in creating gaps in the forest canopy and initiating and promoting additional vertical complexity in the affected stands.

Traditionally, forestry has recognized only competitive mortality as being a normal and acceptable part of stand development. Mortality generated by pests and pathogens, which removed large trees and produced holes in stands, has not been viewed as an acceptable and normal part of stand development. Indeed, traditional thinning practices were specifically

designed to capture much of the competitive mortality of the young stand and to forestall the aggregated mortality, such as that resulting from the natural and expected outbreaks of bark beetles and other pathogens in mature stands (Franklin 2001).

Thinning young stands is one important tool to initiating and promoting stand development processes which contribute to the creation of richness in individual structures and heterogeneity in the spatial arrangement of these structures. Variable density thinnings are the most appropriate general approach. These will incorporate "skips" (areas with no thinning) and "gaps" (areas that are heavily thinned) along with a dominant stand matrix that receives intermediate treatments. Some variability is important in both skips and gaps. Many other silvicultural activities, in addition to thinning, can help accelerate development of structural complexity. These include: felling trees to create woody debris and killing trees to create snags; wounding trees to stimulate decay and cavity creation and to generate upper canopy complexity; and underplanting shade-tolerant tree species makes an important contribution to stand development in stands that currently lack a shade-tolerant component (Franklin 2001).

The amounts and type of harvest treatments, prescribed fire, planting and underplanting, and other management activities which may influence within-stand complexity will be evaluated under each alternative. This indicator does a good job of highlighting the differences between alternatives because the treatments proposed will result in varying degrees of within-stand complexity over time. Within-stand complexity has definite implications to both native plant communities and wildlife habitat quality. The reader is referred to the Wildlife resource area of this assessment for an analysis of the effects to wildlife habitats and populations.

The 2004 Forest Plan Forestwide Management Direction, provided above, includes objectives that are relevant to this analysis. They include:

- Reestablish diverse mixes of trees, shrubs, herbs, mosses, lichens, and fungi species that are more representative of native vegetation communities.
- Reestablish diverse structure in native vegetation communities.
- Maintain, emulate or restore the ecological processes of native vegetation communities. These include processes such as disturbance from fire, wind, flooding, insects and disease; biological community and species interactions; nutrient cycling; and vegetation succession.
- Restore the diversity of tree species within stands to conditions more representative of native vegetation communities.
- Restore the diversity of shrubs and herbs, including sensitive or rare shrubs and herbs, to conditions more representative of native vegetation communities.
- Restore structural diversity and ecosystem processes within stands when harvesting or burning by retaining: a diverse mix of trees, shrubs, and herbs; live and dead standing trees; earth and tree root mounds caused by uprooted trees; coarse woody debris from fallen trees; and patches of live trees.
- Increase the amount and variety of prescribed burning practices to restore the ecological process of fire and provide habitat for threatened and endangered species and other wildlife that benefit from or require burned vegetation.

- Ensure that native insects and diseases are present and fulfilling their ecosystem functions. Epidemics, when they occur, do not last longer than would be expected in a healthy ecosystem.

In addition to these, the 2004 Forest Plan provides specific Tree Species Diversity Objectives (USDA Forest Service 2004a) for each LE. The following table provides information on the specific tree species to be increased by LE.

**Table 3.2.4. Tree Species Diversity Objectives for each LE.**

| Landscape Ecosystem | Jack Pine | Red Pine | White Pine | White Spruce | Black Spruce | Tamarack | White Cedar | Balsam Fir | Bur Oak | Sugar Maple | Paper Birch | Red Maple |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dry Pine** | X | | X | | | X | X | | | | | |
| **Dry-Mesic Pine** | | X | X | X | | X | X | | | | X | |
| **Dry-Mesic Pine/Oak** | X | X | X | X | | X | X | | | | | |
| **Boreal Hardwood/ Conifer** | X | X | X | X | | X | X | | X | | | X |
| **Mesic Northern Hardwood** | | | X | | | X | | X | | X | | X |
| **Tamarack Swamp** | | | X | X | X | X | X | | | | | |

X = tree species to be increased within this LE.

The following table displays information about the acreage amounts of forest types by LE proposed for treatment in WCT.

**Table 3.2.5. Acreage amounts of forest types by LE.**

| Landscape Ecosystem | Red Pine | White Pine | White Spruce | Mixed Swamp Conifer | Black Ash | Upland Brush | Total |
|---|---|---|---|---|---|---|---|
| **Dry Pine** | 20 | 33 | 0 | 0 | 0 | 0 | 53 |
| **Dry-Mesic Pine** | 393 | 0 | 112 | 0 | 0 | 0 | 505 |
| **Dry-Mesic Pine/Oak** | 1077 | 35 | 140 | 8 | 30 | 4 | 1294 |
| **Boreal Hardwood/Conifer** | 24 | 0 | 0 | 0 | 0 | 0 | 24 |
| **Mesic Northern Hardwood** | 75 | 0 | 60 | 0 | 0 | 0 | 135 |
| **Tamarack Swamp** | 78 | 0 | 17 | 0 | 0 | 0 | 95 |

The alternatives are evaluated based primarily upon their response to meeting the stated objectives, relevant to species diversity and structural complexity, in the 2004 Forest Plan. The evaluation of each alternative addresses the different aspects of the stands to be treated, the natural origin stands (>80 years old) and the plantations (20-80 years old) separately.

**Alternative 1 (No Action)**
Alternative 1 does not propose any activities (thinning, planting, etc.) for stands in the project area. For the red pine stands of natural origin (>80 years old), typical forest succession would continue to occur. All of these stands are in the fire dependent Dry-mesic Pine/Oak LE. An increase in complexity would generally occur in these stands as the overstory matures. This overstory maturation is accompanied by additional self-thinning which increases the amounts of snags, down logs, understory establishment, and mid- and understory development. The increases in these components generally add to the overall vertical complexity associated with the native plant community inherent in these sites. However, due to the continued lack of fire in these stands, the plant and animal species composition as well as the structural characteristics in these stands will differ from those associated with fire dependent native plant communities which historically occupied these sites.

Under this alternative, the conifer plantations are not expected to undergo the changes that typically accompany forest succession for these forest types and age classes. Because the trees in these plantations were planted, and possibly thinned, to spacings that optimize light and nutrient sharing, differential height growth and self-thinning among the planted trees in these plantations generally does not occur. Thus, the ensuing variation in light penetration responsible for overstory, midstory, and understory development; and the abundance and availability of snags and downed woody debris continues to be largely lacking in these stands. However, in some plantations or portions of plantations, where tree densities are very high and overcrowding conditions exist, the potential for endemic insect and disease infestations as well as some self-thinning is increased. Where this occurs, the within-stand complexity of the affected stands will increase as tree mortality opens holes of significant size in the canopy, allowing limited regeneration of a variety of tree, shrub and understory species to gradually occur. Due to brush competition, development of various aspects of this regeneration may be slow and sporadic. With the continued lack of fire in these stands, the plant and animal species composition as well as the structural characteristics in these stands will differ from those associated with the fire dependent and fire tolerant native plant communities which historically occupied approximately 90% of these stands.

Overall, the passive management proposed under this alternative, <u>responds in a very limited manner to the 2004 Forest Plan objectives for increasing the within-stand complexity of the native plant communities</u> which occupied the stands proposed for treatment in this project.

**Alternative 2**
Alternative 2 generally follows the standard commercial thinning practices used in the past on most of the previously thinned conifer stands, especially plantations, within the project area. This alternative does not propose to plant or underplant any of tree species that are expected to be increased in any of the LEs. It does leave most of the non-featured tree species in the treated stands,

The natural origin stands (>80 years old) would continue to undergo most of the processes associated with forest succession. All of these stands are in the fire dependent Dry-mesic Pine/Oak LE. However, the standard commercial thinning prescription on 170 acres of these kinds of stands may reduce the self-thinning process in this stand and limit the availability of

snags and down logs in the future. The decreases in these components generally detract from the overall vertical complexity associated with the native plant community(s) inherent in these sites. Again, due to the continued lack of fire in these stands, the resulting plant and animal species composition as well as the structural characteristics in these stands will differ from those associated with fire dependent native plant communities which historically occupied these sites.

Under this alternative, the conifer plantations are not expected to undergo the changes that typically accompany forest succession for these forest types and age classes. Because the trees in these plantations were planted, and possibly thinned, to spacings that optimize light and nutrient sharing, differential height growth and self-thinning among the planted trees in these plantations generally does not occur. Thus, the ensuing variation in light penetration responsible for overstory, midstory, and understory development; and the abundance and availability of snags and downed woody debris continues to largely lacking in these stands. Thinning prescriptions under this alternative maintain this near optimal spacing for the remaining trees. Thus, the ability of these stands to undergo the processes associated with forest succession and the expected increases to within-stand complexity are largely halted and delayed. The potential for endemic insect and disease infestations, self-thinning, and damage due to wind or ice events in all or portions of the treated stands is greatly decreased with this thinning prescription and its associated mitigation measures. This expected lack of canopy tree mortality will limit the gradual regeneration and advancement of a variety of tree, shrub and understory species. With the continued lack of fire in these stands, the resulting plant and animal species composition as well as the structural characteristics in these stands will differ from those associated with the fire dependent and fire tolerant native plant communities which historically occupied approximately 90% of these stands.

Overall, the management activities proposed under this alternative, do not actively respond to the 2004 Forest Plan objectives for increasing the within-stand complexity of the native plant communities which occupied the stands proposed for treatment in this project. Some limited within-stand species diversity may occur on treated stands after the canopy is initially thinned. However, the majority of this increase in species diversity is expected to be lost or stagnated after the canopy closes and limits light penetration to the forest floor.

**Alternative 3**

Alternative 3 incorporates objectives which actively improve within-stand complexity in treated stands. This alternative proposes to plant or underplant (600-700 acres) ecologically appropriate mixtures of tree species that are expected to be increased in all of the LEs.

The natural origin stands (>80 years old) would continue to undergo most of the processes associated with forest succession. All of these stands are in the fire dependent Dry-mesic Pine/Oak LE. The potential for the variable density thinning prescription on 160 acres of these kinds of stands to reduce the self-thinning process in this stand and limit the availability of snags and down logs in the future is compensated by the application of prescribed fire which is expected to contribute fire-killed snags and down logs to the stand. The increases in these components generally add to the overall vertical complexity associated with the native plant community inherent in these sites. The application of prescribed fire in these stands (355 acres)

should result in plant and animal species composition as well as the structural characteristics that more closely resemble those associated with fire dependent native plant communities which historically occupied these sites.

Through variable density thinning with canopy gaps prescriptions and post-treatment activities (conifer planting, snag, down log and brush pile creation), this alternative initiates and promotes many of the processes that generally accompany forest succession in natural stands in the plantation stands to be treated. The variable spacing among the remaining trees is expected to result in differential canopy tree height growth and variation in light penetration responsible for overstory, midstory, and understory development ecologically inherent in the plant communities which occupied these sites. The unthinned areas may provide some potential for endemic insect and disease infestations, self-thinning, and damage due to wind or ice events to occur in portions of the treated stands. Any additional canopy tree mortality will add to the gradual regeneration and advancement of a variety of tree, shrub and understory species and to the abundance and availability of snags and downed woody debris which is largely lacking in these stands. The snag, down log and brush pile creation in these stands will also contribute to the structural diversity of the resulting plant community. With the continued lack of fire in these stands, the resulting plant and animal species composition as well as the structural characteristics in these stands will differ from those associated with the fire dependent and fire tolerant native plant communities which historically occupied approximately 90% of these stands.

Overall, the management activities proposed under this alternative, actively and substantially respond to the 2004 Forest Plan objectives for increasing the within-stand complexity of the native plant communities which occupied the stands proposed for treatment in this project. The within-stand species diversity increases which are expected to follow the thinning, canopy gap creation, and subsequent planting and underplanting activities will become long-term components of the stands in the canopy gaps and in portions of the stands where the overstory canopy is not expected to close in and drastically limit light penetration to the forest floor.

**Cumulative Effects**

During the time period from 1986 through 2001, the Chippewa harvested timber on approximately 108,800 acres, averaging approximately 6800 acres of harvest per year. Approximately 22% of the total acres harvested (24,000 acres) was thinning. This prescription was implemented primarily in red pine stands and in some white spruce plantations. Thinning from below to create an evenly spaced, thrifty growing stand was the standard approach for most of these stands (USDA Forest Service 2004). Recently, there has been increased emphasis on conifer thinning. Currently, over 60%, at a minimum, of the conifer stands (plantations) on the CNF between the ages of 35 and 80 have been thinned using a similar silvicultural prescription.

The primary objectives for this silvicultural treatment were to:

1. Improve the growth and vigor of the remaining crop trees;
2. Remove trees which were not expected to live to the next stand entry
3. Minimize the potential for damage to the stand from a wind or ice event;
4. Reduce the susceptibility of the stand to local insect and disease outbreaks; and
5. Maximize timber production over the life of the stand.

This standard thinning approach tends to minimize the development of within-stand complexity generally associated with the aging of natural conifer communities. It commits these treated stands to a more monotypic condition for the foreseeable future (10-20 years) depending on the next stand entry. Plantations thinned in this manner tend to lack fuller understory and midstory development (species diversity and multiple layers), snags, down logs, and the wide variety of habitat niches usually associated with native conifer communities. The widespread application of this thinning prescription has had profound effects on native upland conifer communities, particularly at the stand and within-stand scales.

This silvicultural prescription has been, and generally continues to be, employed on conifer plantations on other managed forests (state, county, etc.). A very large majority of the conifer plantation thinnings on other lands in this part of Minnesota have used, and continue to use, the same standard commercial thinning approach as described above. The general exception to this approach is in some stands, where there is a mixture of conifer tree species (especially jack pine), and all or most of the jack pine would be removed if it were of an age where it would begin to die out of the stand. The resulting stand would then exhibit a variable density tree pattern. However, the removal of a majority of the older jack pine in these situations reduces the potential for future snags, down logs, and endemic insect and disease infestations (personal communication Harvey Tjader, MN DNR).

The use of prescribed fire during this same time period has been minimal on the CNF and throughout this part of northern Minnesota. It has been used as a site preparation method, for brush disposal, and for hazardous fuels reduction, primarily in non-forested wet meadows (USDA Forest Service 2004). For plants, animals and native plant communities which have co-evolved with fire, the lack of recurring fires on the landscape has also diminished important compositional and structural components associated with fire dependent and fire tolerant communities.

Alternative 1 proposes no management activities in any of the stands proposed for treatment in this project. Cumulatively, it continues to contribute to conifer stands on all ownerships which have relatively high tree densities and may be experiencing the effects of over-crowding. Most natural origin stands would continue to follow the processes associated with typical forest succession. For conifer plantations, this passive approach tends to keep most of these stands in a condition which in most respects does not resemble the native plant community inherent to the site.

Alternative 2 generally follows the standard commercial thinning practices used in the past on most of the previously thinned conifer stands, especially plantations, within the CNF and on other managed forest lands within its proclamation boundary. Its primary affect on natural origin stands is the reduced abundance and availability of snags and down logs. For conifer plantations, it would contribute additional acres to the already existing large majority of plantations previously thinned within the CNF proclamation boundary. It commits additional upland conifer sites to a condition which lacks most of the compositional and structural components associated with the native plant communities inherent to the site for the foreseeable future.

Alternative 3 incorporates objectives which actively improves and promotes within-stand complexity in treated stands. The detrimental impacts of variable thinnings in natural origin stands are largely compensated for with the application of prescribed fire. The demonstration and use of other approaches to conifer plantations which actively seeks to improve within-stand complexity may influence future forest management in these kinds of stands on all ownerships and have a long-term benefit to native upland conifer plant communities. Additionally, the application of prescribed fire in these fire dependent communities may also serve as a demonstration of beneficial fire effects in these forest types to other forest managers, and may become more accepted as an important tool for managing native plant communities in northern Minnesota.

**Issue 3: What affects will the proposed treatments in MA 8.3, the Ten Section area, have on the development of large diameter red and white pine?**

**Indicators:** Acres treated that improve overall large red and white pine character of this Unique Biological Area (UB) and a qualitative measure of increased within-stand complexity in the stands proposed for treatment.

**Scope of the analysis**: The direct and indirect effects analysis is confined to the stands proposed for management treatment. The cumulative effects analysis puts these effects in the context of the Ten Section UB area.

The overall analysis for the Ten Section Unique Biological Area in the Walker Conifer Thin (WCT) project area is focused primarily on the effects of proposed management treatments on the "big tree" and old growth character within this area. The direct, indirect and cumulative effects analysis of this aspect of vegetation management is presented in this section.

**Management Direction**

The 2004 Land and Resource Management Plan (Forest Plan) for the CNF provides goals, desired conditions, objectives and management direction specific to vegetation management on the CNF (Forest Plan, 2-21 through 2-24, and 3-23 through 3-28). Selected excerpts of Forest Plan direction relevant to vegetation management in Unique Biological Areas (UB) and the Ten Section area include:

- Vegetation (live and dead) is present in amounts, distributions, and characteristics that are representative of the spectrum of environmental conditions that would have resulted from the natural cycles, processes, and disturbances under which current forest ecosystems and their accompanying biological diversity evolved.
- Vegetation constantly changes through management activities and through naturally occurring disturbances and ecosystem recovery processes such as wind, fire, flooding, insects, disease, and vegetation succession.
- Vegetation conditions that have been degraded or greatly diminished in quality or extent on the landscape by past land use are restored to conditions more representative of native vegetation communities. These conditions, in ecologically and socially appropriate areas, result from gradually reestablishing:

- ✓ Diverse mixes of trees, shrubs, herbs, mosses, lichens, and fungi species at site and landscape levels that is more representative of native vegetation communities. This includes an increase, in appropriate areas, of: rare and sensitive plants and native plant communities; white, red, and jack pine; white cedar; upland tamarack; and in some areas, white and black spruce as components of native vegetation communities.
- ✓ Diverse structure in native vegetation communities that have been harvested, salvaged, prescribe burned, or have undergone natural disturbance. Structural diversity components will be provided by small patches of forest (reserve islands); scattered or clumped standing, mature and older live trees; dead trees; and coarse woody debris (down logs and branches).

- The ecological processes of native vegetation communities are maintained, emulated, or restored at multiple landscape scales to provide representation of their natural range of distribution and variation within context of multiple-use goals and ecosystem sustainability. These include: processes such as disturbance from fire, wind, flooding, insects and disease; biological community and species interactions; nutrient cycling; and vegetation succession.
- In mature or older red and white pine forest types maintain characteristics of mature or older native vegetation communities and promote the maintenance or development of interior forest habitat conditions.
- Native insects and diseases are present and fulfilling their ecosystem functions. Epidemics, when they occur, do not last longer than would be expected in a healthy ecosystem.
- Management emphasis is on conserving or enhancing areas of unique biological, aquatic, geological, and historical interest while developing and interpreting these areas for public education. Management practices that would alter important values associated with the UB management areas are not appropriate unless necessary for public health and safety.
- UB management areas provide habitat for federally listed endangered, threatened, proposed, or candidate species or for Regional Forester sensitive species; and other elements of biological diversity, … Native plant communities are maintained, restored, or enhanced.
- The Forest maintains or enhances UB management areas that include unique communities (old-growth, wetlands, unique species) or native habitat characteristics that result in concentrations (variety and quantity) of bird or other native species.
- If consistent with other UB management area values, the compositional and structural character of the younger forests within the area will generally be created and restored for eventual management as old-growth or old forest.

**Affected Environment**

This indicator evaluates active management treatments that may affect the growth and character of the pine trees and the within-stand complexity of the stands proposed for treatment. The focus of this analysis is on the effects to the forest vegetation in the Ten Section UB area where large red and white pine trees remain as stands and as individual trees within younger stands. This area was protected from timber cutting and Euro-American settlement during the logging era in the early 1900s. The Ten Section UB management area is managed to maintain, restore, or enhance

old-growth forest and "big tree" characteristics as were generally present when the area was reserved from sale or settlement in 1903. The reader is referred to the Vegetation resource area (Issue 2) and the Wildlife resource area (Issue 4) of this environmental assessment for a detailed discussion, analysis of effects and overall comparisons and conclusions as to how the within-stand complexity of native plant communities and wildlife habitat are affected by the proposed alternatives to this project.

Many of the stands in the Ten Section area are plantations, the majority of which fall into the 50-60 years old age class. This project consists entirely of treatments to red pine plantations, ranging in age from 46 to 61 years old. These stands were planted in relatively tightly spaced rows and generally lack the within-stand structural complexity or species composition diversity associated with native conifer forest communities. All of these stands are in the fire dependent Dry-mesic Pine/Oak landscape ecosystem. The stands proposed for treatment are generally closed canopied, single layered, monotypic conifer plantations with very little or no midstory or understory development. They generally lack snags and down logs. Current mortality levels are low, so foraging substrate for woodpeckers, nuthatches, and other bark gleaning birds is essentially unavailable in these stands. Some of these stands have been previously thinned, while others have not. Those that have been thinned were done so using the standard commercial thinning prescription, which is based largely on providing certain spacing between and among the remaining trees. This thinning approach tends to maintain canopy closure and minimize the development of within-stand complexity generally associated with the aging of natural conifer communities. Individual pine tree height and diameter growth is slowing as competition for light, moisture and nutrients increases.

Thinning young stands can be an important tool in initiating and promoting stand development processes which contribute to the creation of richness in individual structures and heterogeneity in the spatial arrangement of these structures; and in accelerating the development of many old-growth structural attributes. Variable density thinnings are the most appropriate general approach. These will incorporate "skips" (areas with no thinning) and "gaps" (areas that are heavily thinned) along with a dominant stand matrix that receives intermediate treatments. Some variability is important in both skips and gaps. Many other silvicultural activities, in addition to thinning, can help accelerate development of structural complexity. These include: felling trees to create woody debris and killing trees to create snags; wounding trees to stimulate decay and cavity creation and to generate upper canopy complexity; and underplanting shade-tolerant tree species makes an important contribution to stand development in stands that currently lack a shade-tolerant component (Franklin 2001).

**Direct, Indirect, and Cumulative Effects**

Alternative 3 is the only alternative which proposes management activities in the Ten Section UB management area. It proposes to use a variable density thin with canopy gaps prescription, followed by planting a conifer mixture, ecologically appropriate to the site, in the canopy gaps and under low density portions of the thinned stand. Additionally, wildlife habitat improvements through snag, down log, and brush pile creation will be implemented on all treated stands. Alternative 3 proposes to treat 10 red pine plantations (317 acres) in this area. These stands range in age from 46-61 years of age. The variable density thinning with canopy gaps will be

applied to 249 of the 317 acres. The remaining acres are portions (approximately 10%) of the larger stands which will remain unthinned.

**Alternatives 1 (No Action) and 2**
Under these alternatives, the conifer plantations are not expected to undergo the changes that typically accompany forest succession for these forest types and age classes. Because the trees in these plantations were planted, and possibly thinned, to spacings that optimize light and nutrient sharing, differential height growth and self-thinning among the planted trees in these plantations generally does not occur. Thus, the ensuing variation in light penetration responsible for overstory, midstory, and understory development; and the abundance and availability of snags and downed woody debris continues to be largely lacking in these stands. Tree height and diameter growth will continue to slow with increasing competition for resources. These untreated plantations may experience some scattered individuals or pockets of tree mortality; but in general, they will continue to provide marginal to unsuitable habitat conditions for most of the wildlife species associated with these habitats.

With the continued lack of fire in these stands, the plant and animal species composition as well as the structural characteristics in these stands will differ from those associated with the fire dependent native plant communities which historically occupied these stands.

Overall, the passive management proposed under these alternatives, will generally maintain these stands in their current condition. This is expected to delay the processes whereby these stands would begin to develop a "big tree" appearance or the species composition and vertical structure complexity characteristics associated with old growth red pine forests. These alternatives do not respond to the management goals for Unique Biological areas.

**Alternative 3**
Through variable density thinning with canopy gaps prescriptions and post-treatment activities (conifer planting, snag, down log and brush pile creation), this alternative initiates and promotes many of the processes that generally accompany forest succession in natural stands in the plantation stands to be treated, and is expected to accelerate the development of old growth attributes. The variable spacing among the remaining trees is expected to result in differential canopy pine tree height growth and variation in light penetration responsible for overstory, midstory, and understory development ecologically inherent in the plant communities which occupied these sites. Tree height and diameter growth is expected to increase to varying degrees dependent on the degree of thinning and the resulting competition for resources. The unthinned areas may provide some potential for endemic insect and disease infestations, self-thinning, and damage due to wind or ice events to occur in portions of the treated stands. The resulting stand conditions improve the overall habitat suitability and habitat characteristics important to wide variety of plant and animal species on the CNF.

With the continued lack of fire in these stands, the plant and animal species composition as well as the structural characteristics in these stands will differ from those associated with the fire dependent native plant communities which historically occupied these stands.

Overall, the management activities proposed under this alternative actively initiate and promote the processes which improve the overall big tree and old growth character of these stands and the Ten Section area in general. This is compatible with the overall desired conditions and management objectives of this Unique Biological Area (UB). Additionally, the overall improvements to wildlife and plant habitat conditions will make wildlife viewing and other forms of nature watch activities more fulfilling. This too is compatible with the overall theme of the UB management area.

## 3.3 Wildlife

The overall analysis for terrestrial and aquatic resources in the Walker Conifer Thin (WCT) project area is focused primarily on the Chippewa National Forest's Threatened, Endangered, and Sensitive (TES) species; Management Indicator Species (MIS) and Management Indicator Habitats (MIH); and overall biological diversity. The direct and indirect effects analysis of wildlife resource issues is presented in two parts. The first part provides analysis for TES species, and the second part provides analysis for the MIS, MIH and overall biological diversity. A combined cumulative effects analysis is provided for all terrestrial and aquatic resources at the end of this resource area.

**Issue 4: What affects will the proposed treatments have on the existing and future wildlife habitat conditions at the stand and landscape levels?**

**Indicators:** Acres treated by forest type with treatments that improve wildlife habitat conditions at the site, stand, and landscape levels, with emphasis on impacts to TES; MIS and MIH; and overall biological diversity.

**Scope of the Analysis:** The direct and indirect effects analysis is confined to the stands proposed for management treatment. The cumulative effects analysis puts these effects in the context of the entire project area and across the entire CNF.

**Management Direction**

The Forest Service is mandated to preserve biodiversity by maintaining the viability of all native species on each National Forest. Several sources provide direction for achieving this mandate on the Chippewa National Forest (CNF).

The National Forest Management Act (NFMA) of 1976 made the concept of biological diversity a primary consideration in multiple resource land management. Specifically, the act includes the following provisions related to maintaining biological diversity:
"Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one, which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area" (36 CFR 219.19 Fish and Wildlife Resource).

". . . provide for diversity of plant and animal communities and tree species consistent with the overall multiple-use objectives of the planning area" (CFR 219.26).
" . . . preserve and enhance the diversity of plant and animal communities . . . so that it is at least as great as that which would be expected in a natural forest . . . " (CFR 219.27(g)).

The 2004 Land and Resource Management Plan (Forest Plan) for the CNF provides goals, desired conditions, objectives and management direction specific to terrestrial and aquatic wildlife on the CNF (Forest Plan, 2-24 through 2-34). Selected excerpts of Forest Plan direction relevant to wildlife resources and biological diversity and pertinent to this analysis include:

- Aquatic and terrestrial wildlife habitats and species populations, while constantly changing due to both management activities and naturally occurring events, are present in amounts, quality, distributions, and patterns so that NFS lands:
    - ✓ Provide representation of the full spectrum of habitats and conditions that would have resulted from the natural cycles, processes, and disturbances under which the biological diversity of the National Forest evolved.
    - ✓ Contribute to the conservation and recovery of federally-listed, proposed, or candidate threatened and endangered species and the habitats upon which these species depend.
    - ✓ Contribute to the conservation of sensitive species and the habitats upon which these species depend.
    - ✓ Provide for the desired quality and quantity of habitat for management indicator species and indicator habitats.
- Provide ecological conditions to sustain viable populations of native and desired non-native species and to achieve objectives for management indicator species and management indicator habitats.
- Seek opportunities to benefit threatened and endangered species by integrating habitat management objectives into plans for the full spectrum of management activities on NFS land.
- Increase amount of a variety of prescribed burning practices to restore the ecological process of fire and provide habitat for threatened and endangered species and other wildlife that benefit from or require burned vegetation.
- Maintain, protect, or improve habitat for all sensitive species….this includes site-level (or fine filter) management strategies which address species' needs by managing specifically for high quality potential habitat or known locations of sensitive species.
- Avoid or minimize negative impacts to known occurrences of sensitive species.

Native insects and diseases are present and fulfilling their ecosystem functions. Epidemics, when they occur, do not last longer than would be expected in a healthy ecosystem.

**Affected Environment:**
This indicator evaluates the active management treatments that may affect terrestrial and aquatic wildlife (plant and animal) habitat conditions at the site, stand, and landscape levels. The activities (intermediate tree harvesting, prescribed burning, planting, and other activities) associated with the WCT project are primarily focused on the individual stand scale and primarily affect the amounts and distribution of important within-stand habitat characteristics, features and attributes of upland conifer forests. The reader is referred to the Vegetation

resource area of this environmental assessment (Issue 2) for a detailed discussion, analysis of effects and overall comparisons and conclusions as to how within-stand complexity is affected by the proposed alternatives to this project.

Within-stand wildlife habitat diversity and habitat quality can be influenced by a variety of factors. Natural disturbances, such as insect infestations, disease outbreaks, wind events, floods, or fires, can occur locally within stands or more broadly to multiple stands or even landscapes. These kinds of disturbances, along with the ecological capability of the area, are what shaped wildlife habitats at the landscape, stand and within-stand scales. Additionally, timber harvest cutting methods and amounts, reforestation strategies, supplemental planting, prescribed fire and fire suppression are management activities that can have an affect on the immediate and long-term amounts, varieties and distributions of important habitat components in a forested stand. Forest type and stand age are two important factors to consider when determining the habitat suitability for a particular species. However, past management activities and natural disturbances may have a profound influence on the quality of that habitat for individual species.

This project consists almost entirely of treatments to conifer (red pine, white pine and white spruce) habitats in a variety of age classes. A very large majority of these stands occur as plantations, ranging in age from 18 to 80 years old. Most of these stands are planted in tightly spaced rows and generally lack the within-stand structural complexity or species composition diversity associated with native conifer forest communities. Most of the stands proposed for treatment are generally closed canopied, single layered, monotypic conifer plantations with very little or no midstory or understory development. They generally lack snags and down logs. Current mortality levels are low so foraging substrate for woodpeckers, nuthatches, and other bark gleaning birds is essentially unavailable in these stands. Some of these stands have been previously thinned, while others have not. In general, these stands currently provide marginal to unsuitable habitat conditions for most wildlife species associated with upland conifer forests.

Additionally, there are four natural origin stands whose ages are greater than 80 years old. Three of these four stands are to be prescribed burned only as they are considered to be fire dependent communities. These stands are generally more diverse in terms of their compositional and structural components and are currently providing quality habitat conditions for species associated with mature upland conifer forests. The following table displays current information about the amounts of a particular conifer group in the project area, to be treated, and forest-wide.

**Table 3.3.1. Amounts of a particular conifer group in the project area, to be treated, and forest-wide.**

| Conifer Group | Total Acres within WCT Project Area | Acres within Project Area, To Be Thinned with WCT | | Total Acres on Chippewa NF |
|---|---|---|---|---|
| **Red Pine – 80+ years old** | 4721 | 243 | | 26385 |
| **Red Pine – 60-79 years old** | 1114 | 49 | | 9916 |
| **Red Pine – 50-59 years old** | 726 | 326 | | 2488 |
| **Red Pine – 35-49 years old** | 5098 | 861 | | 15669 |
| **Red Pine – 20-34 years old** | 4384 | 151 | | 13626 |
| **TOTALS** | **16043** | **1630** | | **68084** |
| **White Pine – 80+ years old** | 1250 | 0 | | 2311 |
| **White Pine – 60-79 years old** | 451 | 20 | | 731 |
| **White Pine – 50-59 years old** | 94 | 53 | | 94 |
| **White Pine – 35-49 years old** | 13 | 0 | | 13 |
| **White Pine – 20-34 years old** | 91 | 0 | | 229 |
| **TOTALS** | **1899** | **73** | | **3378** |
| **White Spruce - 80+ years old** | 23 | 0 | | 109 |
| **White Spruce) - 60-79 years old** | 351 | 20 | | 1537 |
| **White Spruce - 50-59 years old** | 51 | 13 | | 79 |
| **White Spruce - 35-49 years old** | 967 | 283 | | 2817 |
| **White Spruce - 20-34 years old** | 1746 | 0 | | 6976 |
| **TOTALS** | **3138** | **316** | | **11518** |
| **Red Pine 35-79 years old** | 6938 | 1236 | | 28073 |
| **White Pine 35-79 years old** | 558 | 73 | | 838 |
| **White Spruce 35-79 years old** | 1369 | 316 | | 4433 |
| **TOTALS** | **8865** | **1625** | | **33344** |

A relatively large majority (60-70%, or possibly greater) of the red pine, white pine, and white spruce plantations between the ages of 35 and 80 years old, that are accessible and available for timber harvest, within the project area and across the CNF have received at least one thinning. Some of these stands have received multiple thinnings. The reader is referred back to the Vegetation resource area, Issue 2 for more detailed discussions on this. Plantations thinned in this manner tend to lack fuller understory and midstory development (species diversity and multiple layers), snags, down logs, and the wide variety of habitat niches required by wildlife species that inhabit native conifer communities.

The application of prescribed fire in fire dependent and fire tolerant ecosystems can aid in the restoration of important compositional and structural habitat components for associated native plant and animal communities. The plant and animal species associated with these ecosystems

may increase in population due to the partial restoration of beneficial habitat conditions created by fire. The reader is referred back to the Vegetation resource area, Issue 2 for more detailed discussions on this. The application of prescribed fire in upland conifer habitats on the CNF has been minimal over the past 10-20 years or longer.

**Direct and Indirect Effects Applicable to all Wildlife Resources**
The primary differences between the two action alternatives for this project are in their approach to maintaining or improving the within-stand complexity of treated stands, and the subsequent effects to wildlife habitats including TES, MIS, and other terrestrial or aquatic species of concern. Again, the reader is referred to the Vegetation resource area of this environmental assessment (Issue 2) for a detailed discussion on effects to within-stand complexity to stands proposed for treatment.

For this analysis, within-stand complexity refers to the vertical structure and associated species diversity at the stand scale. Vertical structure is the bottom to top configuration of above ground vegetation within a forested stand and varies with forest types and stand ages. Stand complexity has direct and indirect effects to plants and animals. In general, the more vertically diverse a forested stand is, the more diverse will be the plants and animals inhabiting that stand. The variety of light and temperature conditions results in an array of microclimates, which provide habitat conditions for additional species. Indirect effects occur as the distribution of prey and forage species within a stand becomes available to herbivores and predators. An example of this occurs as gaps within the forest canopy create conditions suitable for increased flying insects. These in turn become available to insectivorous birds, such as flycatchers, which are adapted to "hawking" for prey from a suitable branch near an opening in the forest (Brokaw and Lent in Hunter et. al. 1999).

The effects analysis, comparison of alternatives, and conclusions for general wildlife habitat conditions generally mirror that for improving within-stand complexity as discussed for Issue 2.

**Alternative 1 (No Action)**
Alternative 1 does not propose any activities for stands in the project area. The passive management approach under this alternative generally tends to maintain habitat conditions as they are now. The natural origin stands will continue to provide quality suitable habitat for most conifer associated species. The untreated plantations may experience some scattered individuals or pockets of tree mortality; but in general, they will continue to <u>provide marginal to unsuitable habitat conditions</u> for most of the wildlife species associated with these habitats.

**Alternative 2**
Alternative 2 generally follows the standard commercial thinning practices used in the past on most of the previously thinned conifer stands, especially plantations, within the CNF and on other managed forest lands within its proclamation boundary. It contributes additional acres to the already existing large majority of plantations previously thinned within the CNF proclamation boundary. By maintaining near optimal spacing for the remaining trees, the ability of these stands to undergo the processes associated with forest succession and the expected increases to within-stand complexity are largely halted and delayed. The resulting stand

conditions produce marginal to unsuitable habitat conditions for many of the wildlife species associated with these upland conifer forest communities.

**Alternative 3**
Alternative 3 incorporates objectives which actively improve within-stand complexity in treated stands. Through variable density thinning with canopy gaps prescriptions, prescribed burning, and post-treatment activities (conifer planting, snag, down log and brush pile creation), this alternative initiates and promotes many of the processes that accompany forest succession in these stands. The resulting stand conditions improve the overall habitat suitability and habitat characteristics important to wide variety of plant and animal species on the CNF. Plantations treated under Alternative 3 may contribute to the "habitats well-distributed" mandate required by NFMA to maintain viability within the planning area, now and in the future. The prescribed burning proposed under this alternative will begin to restore some additional habitat conditions for species associated with fire dependent ecosystems.

## PART 1: THREATENED, ENDANGERED, AND SENSITIVE SPECIES

**Direct and Indirect Effects specific to Threatened, Endangered and Sensitive Species:**
Threatened and Endangered Species
The Twin Cities Field Office of the U. S. Fish and Wildlife Service (US FWS) currently identifies three federally-listed threatened species that may occur within the CNF. A determination on whether proposed project activities may affect these species and/or their critical habitat (correspondence, US FWS, 01/01/2004) is required. The three species, all federally-listed as threatened, are the bald eagle (*Haliaeetus leucocephalus*), the Canada lynx (*Lynx canadensis*) and the gray wolf (*Canis lupus*). All three of these species are known to utilize conifer habitats or rely on prey species that utilize these habitats. The Walker Conifer Thin project may have an affect on the current and future habitat conditions for these threatened species. Subsequently, these three federally-listed species are evaluated in detail in the "Biological Assessment of the Federally-Listed Threatened and Endangered Species for the Walker Conifer Thin Project", dated July 14, 2004. This Biological Assessment (BA) is part of the project record and available upon request. It contains a full discussion of direct, indirect, and cumulative effects to species evaluated; findings, and references used.

This BA addresses the potential effects of the proposed alternatives to management activities within the Walker Conifer Thin Project on all federally-listed endangered, threatened and proposed species that are known or suspected to occur within the project area. The purpose of this BA is to determine the likely effects of the proposed project on these species and their habitat, and provide this information to the responsible official prior to making land management decisions so that conservation of threatened and endangered species receive full consideration in the decision making process.

The findings of this BA are based on the best data and scientific information available at the time of preparation. If new information reveals effects that may impact these species or their habitats, if a new species is listed or habitat identified that may be affected by the action, or if there is a deviation from the project proposal, then a revised biological assessment should be prepared along with a request for US FWS concurrence if needed.

The Walker Conifer Thin Project is not expected to have major direct or indirect affects on any federally-listed species in the project area. This is largely due to the following:

- The primary forest management activities are commercial thinnings which will not substantially alter existing habitat conditions for the gray wolf, Canada lynx, bald eagle or their primary prey species.
- The current road densities are not expected to change after implementation of the project, thus human and competitor interactions will remain much the same as they exist today.
- Effective mitigation measures have been designed and included on appropriate stands to minimize the potential for adverse impacts to known occurrences of threatened species. Refer to the table in Appendix C for the specific stands to which the appropriate mitigation measures apply.

Cumulatively, changing how conifer plantations are managed for increased within-stand diversity may provide long term beneficial affects to the Canada lynx. The primary differences between the two action alternatives are in their approach to improving the within-stand complexity of treated stands. Alternative 3 actively seeks to improve and promote within-stand complexity which may have both short-term and long-term benefits to snowshoe hare and other important prey species of the Canada lynx. Additionally, the continued demonstration of prescribed burning in upland conifer habitats may also serve to benefit snowshoe hare in the future. For this reason it receives a May Benefit determination for this species.

The Endangered Species Act (ESA) requires federal agencies to ensure that all actions which they "authorize, fund, or carry out" are not likely to jeopardize the continued existence of any threatened, endangered, or proposed species. In accordance with Section 7 of the ESA, the CNF is required to request written concurrence with the US FWS regarding proposed management activities where the biological determination is that they may affect threatened, endangered, and proposed species.

A summary of the biological determinations for each of the federally-listed species in this project is provided in the following table.

**Table 3.3.2. Biological determinations for federally-listed species in the project area.**

| SPECIES | Alternative 1 (No Action) | Alternative 2 | Alternative 3 |
|---|---|---|---|
| **Gray Wolf (Canis lupus)** | No Effect | May Affect, Not Likely to Adversely Affect | May Affect, Not Likely to Adversely Affect |
| **Canada Lynx (Lynx canadensis)** | No Effect | May Affect, Not Likely to Adversely Affect | May Affect, Beneficial Affect |
| **Bald Eagle (Haliaeetus leucocephalus)** | No Effect | May Affect, Not Likely to Adversely Affect | May Affect, Not Likely to Adversely Affect |

The US FWS has concurred with these determinations in their letter dated July 28, 2004. This concurrence letter is also part of the project record.

Regional Forester's Sensitive Species

NFMA requires that the Regional Forester administratively list Regional Forester's Sensitive Species (RFSS), whose viability is of concern within the Eastern Region of the U.S. Forest Service or on the CNF, or has the potential to be federally listed as threatened or endangered. Whenever the Forest Service proposes an action, part of the environmental analysis is to determine how the proposed activity(s) would impact species on the RFSS list. The format for documenting this analysis is known as a Biological Evaluation (BE). The purpose of the BE (FSM 2672.4, 2672.41) is to:

1. Ensure that Forest Service actions do not contribute to the loss of population viability of any native or desired non/native species within the planning area, and prevent a trend toward Federal listing of any species; and
2. Provide a process and standard by which to ensure that species on the RFSS list receive full consideration in the decision making process.

Of the 47 plant and animal species currently on the RFSS list for the CNF, 15 were found to be associated with habitats that are proposed to be treated with a thinning or prescribed burn in this project. These 15 species are evaluated in detail in the "Biological Evaluation of the Regional Forester's Sensitive Species for the Walker Conifer Thin Project" dated August 9, 2004. This BE contains a full disclosure of direct, indirect, and cumulative effects to species evaluated; findings; and references used. It is part of the project record and available upon request. A summary of the biological determinations for each of the Regional Forester's Sensitive Species evaluated in this BE for the Walker Conifer Thin project is provided in the following table.

**Table 3.3.3. Summary of Impact Determinations[1]**

| Species | | Alternative 1 (No Action) | Alternative 2 | Alternative 3 | Most Beneficial, Least Impactive Alternative |
|---|---|---|---|---|---|
| BIRDS | | | | | |
| Northern Goshawk | *Accipiter gentilis* | **No Impact** | **May Impact** | **May Benefit** | **Alternative 3** |
| Olive-sided Flycatcher | *Contopus cooperi* | **No Impact** | **May Impact** | **May Benefit** | **Alternative 3** |
| Black-throated Blue Warbler | *Dendroica caerulescens* | **No Impact** | **May Impact** | **May Benefit** | **Alternative 3** |
| Bay-breasted Warbler | *Dendroica castanea* | **May Benefit** | **May Impact** | **May Impact** | **Alternative 1** |

[1] **No Impact** = No Impact.
**May Impact** = May Impact Individuals or Habitat, but will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species.
**Will Impact** = Will Impact Individuals or Habitat with a Consequence that the Action Will Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species.
**May Benefit** = May Benefit.
**Most Beneficial, Least Impactive Alternative** = Identifies the alternative which benefits the species and its habitat the most in the short and long term, or is the least detrimental to species occurrences or existing suitable habitat..

| Species | | Alternative 1 (No Action) | Alternative 2 | Alternative 3 | Most Beneficial, Least Impactive Alternative |
|---|---|---|---|---|---|
| Spruce Grouse | *Falcipennis canadensis* | **No Impact** | **May Impact** | **May Impact** | **Alternative 1** |
| Black-backed Woodpecker | *Picoides arcticus* | **May Benefit** | **May Impact** | **May Benefit** | **Alternative 3** |
| Great Gray Owl | *Strix nebulosa* | **No Impact** | **May Impact** | **May Impact** | **Alternative 1** |
| FISH, REPTILES, and AMPHIBIANS | | | | | |
| Pugnose Shiner | *Notropis anogenus* | **No Impact** | **May Impact** | **May Impact** | **Alternative 1** |
| Least Darter | *Etheostoma microperca* | **No Impact** | **May Impact** | **May Impact** | **Alternative 1** |
| INVERTEBRATES | | | | | |
| Vertree's Caddisfly | *Ceraclea vertreesi* | **No Impact** | **May Impact** | **May Impact** | **Alternative 1** |
| Creek Heelsplitter | *Lasmigona compressa* | **No Impact** | **May Impact** | **May Impact** | **Alternative 1** |
| PLANTS | | | | | |
| Blunt-lobed Grapefern | *Botrychium oneidense* | **No Impact** | **May Impact** | **May Impact** | **Alternative 1** |
| Pale Moonwort | *Botrychium pallidum* | **No Impact** | **May Impact** | **May Benefit** | **Alternative 3** |
| Ternate Grapefern | *Botrychium rugulosum* | **No Impact** | **May Impact** | **May Benefit** | **Alternative 3** |
| Least Moonwort | *Botrychium simplex* | **No Impact** | **May Impact** | **May Impact** | **Alternative 1** |

The following statements summarize the findings of the BE for the WCT project:

- None of the alternatives, including the No Action Alternative, would lead to a Will Impact Individuals or Habitat with a Consequence that the Action Will Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species.

- Species whose habitat suitability is improved with increased within-stand complexity, such as the northern goshawk and black-throated blue warbler, may benefit from activities proposed under Alternative 3;

- Species whose habitat suitability is improved with increased snags and downed logs, such as northern goshawk, olive-sided flycatcher, and black-backed woodpecker, may benefit from activities proposed under Alternative 3;

- Species whose habitat suitability is improved with increased sunlight to the forest floor, such as the black-throated blue warbler, pale moonwort, and ternate grapefern, may benefit from activities proposed under Alternative 3;

- Species whose habitat suitability is improved with increased susceptibility to insect infestations, such as the bay-breasted warbler and the black-backed woodpecker may benefit from activities proposed under Alternative 3 or the lack of activities proposed in Alternative 1 (No Action).

- Effective mitigation measures have been designed and included on appropriate stands to minimize the potential for adverse impacts to known occurrences of RFSS. The table in

Appendix C displays the specific stands to which the appropriate mitigation measures apply.

## PART 2: MANAGEMENT INDICATOR SPECIES/MANAGEMENT INDICATOR HABITATS

**Direct and Indirect Effects specific to Management Indicator Species and Management Indicator Habitats:**
The 2004 Forest Plan identifies 4 Management Indicator Species (MIS) and 14 Management Indicator Habitats (MIH) for the CNF. These two components will be assessed and monitored overtime to evaluate the effects of management activities on terrestrial and aquatic resources. Management indicator species (MIS) are defined as species monitored over time to assess the effects of management activities on their populations and the populations of other species with similar habitat needs.

The four MIS identified in the Forest Plan and their associated habitats are provided in the following table.

**Table 3.3.4 MIS identified in the Forest Plan and their associated habitats.**

| Species | Other Designations | Associated Habitats |
|---|---|---|
| **Gray Wolf** | Federally-listed Threatened | Broad spectrum of habitats with abundant ungulate prey |
| **Bald Eagle** | Federally-listed Threatened | Large trees adjacent to riparian areas with fish |
| **Northern Goshawk** | Regional Forester's Sensitive Species | Large tracts of mature, closed canopy, deciduous, coniferous and mixed forests with an open understory |
| **White Pine** | None | A component of a broad spectrum of upland native plant communities |

The effects of the proposed alternatives on the **Gray wolf** and **Bald eagle**, for the WCT project, were analyzed and documented in detail in the Biological Assessment (BA) of the Federally-Listed Threatened and Endangered Species for the Walker Conifer Thin Project dated July 14, 2004. This BA is part of the project record and available upon request. The following are summaries for these species taken from that BA.

Determination of Effects Summary for the Gray Wolf:

- Alternative 1 (No Action) would have no effect on the gray wolf or its habitat.
- Alternatives 2 and 3 would have a may affect, but not likely to adversely affect on the gray wolf or its habitat. The primary rationale for this determination is based on negligible effects to white-tailed deer habitat and populations, on no changes to long term road densities and the potential for human-caused mortalities, and on implementation of assigned mitigation measures. These effects would be largely discountable or insignificant. They would be temporary, occurring in an environment already impacted to a very large degree by human development and activity. Any changes in plant

communities that may affect prey populations would also be temporary and relatively inconsequential.

Determination of Effects Summary for the Bald Eagle:

- Alternative 1 (No Action) would have no effect on bald eagles or their habitat.
- Alternatives 2 and 3 would have a may affect, but not likely to adversely affect on the bald eagle or its habitat. This determination is based primarily on negligible effects to its habitat, low potential for human disturbance, and full implementation of assigned mitigation measures.

The effects of the proposed alternatives on the **Northern goshawk**, for the WCT project, were analyzed and documented in detail in the Biological Evaluation (BE) of the Regional Forester's Sensitive Species for the Walker Conifer Thin Project dated August 11, 2004. This BE is part of the project record and available upon request. The following is a summary for this species taken from that BE.

Impact Determination Summary for the Northern Goshawk:

- Alternative 1 (No Action) would have No Impact on the northern goshawk or its habitat.
- Alternative 2 would have a May Impact Individuals or Habitat, but will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species affect on the northern goshawk or its habitat. This determination is primarily based on negligible improvement to the within-stand complexity on most of the stands treated and full implementation of stated mitigation measures. This alternative results in a lack of improvement to important goshawk prey species habitat in these stands. The prescriptions proposed under Alternative 2 would maintain the large majority of treated stands in low quality habitat for the goshawk for the foreseeable future.
- Alternative 3 would have a May Benefit affect on the northern goshawk or its habitat. This determination is primarily based on considerable improvement to the within-stand complexity on most of the stands treated and full implementation of stated mitigation measures. This alternative results in considerable improvement to important goshawk prey species habitat in these stands. The prescriptions and additional activities proposed under Alternative 3 would improve the abundance, distribution and availability of goshawk prey.

Both action alternatives propose to thin three **White pine** stands (73 acres). Alternative 2 proposes to use a standard commercial thinning prescription, while Alternative 3 proposes to use a variable density thin with canopy gaps. Neither of these alternatives will change the amount, age class distribution, or spatial arrangement of white pine stands that are currently on the CNF.

The 2004 Forest Plan includes objectives to: 1) increase the amount of white pine to amounts more representative of native plant communities by planting or naturally regenerating white pine trees in white pine forest types and in other upland deciduous, mixed, and conifer forest types; and 2) manage to improve white pine survival on planted sites and as many naturally regenerating sites as practical.

Alternatives 1 and 2 do not propose to increase the white pine component in any of the stands proposed for treatment, and so these alternatives do not contribute to Forest Plan objectives for white pine.

Alternative 3 proposes to plant and underplant approximately 600-700 acres of a mixture of conifer tree species in created canopy gaps and under low density pine and spruce canopies. Because white pine was an important component in all of these native communities, it will be a component in the conifer mixtures to be planted in these areas, and so this alternative contributes substantially to Forest Plan objectives for white pine.

Management indicator habitats (MIH) are based on groupings of forest types in different age groupings. The age groupings are surrogates for ecological successional or vegetative growth stages. Because of the ecology of the different forest types, age grouping depends on forest type and was selected to best typify vegetative growth stages. The 14 MIHs identified in the Forest Plan, their descriptions, and age groupings are provided in the following tables.

**Table 3.3.5 MIH identified in the Forest Plan and their descriptions**

| # | Management Indicator Habitat | Description and Forest Types |
|---|---|---|
| **1** | Upland forest | All upland forest types: jack pine (01), red pine (02), white pine (03), balsam fir-aspen-birch (11), spruce-fir (16), black spruce-jack pine (17), northern hardwoods, including oak and maple (50s, 80s), aspen (91), paper birch (92), bigtooth aspen (93), balsam poplar (94), 95 (aspen-spruce-fir) |
| **2** | Upland deciduous forest | All upland deciduous and deciduous-dominated mixed forest types: (50s, 80s, 91, 92, 93, 94, 95) |
| **3** | Northern hardwood and oak forest | All northern hardwood and oak forest types: (50s, 80s) |
| **4** | Aspen-birch and mixed aspen-conifer forest | All aspen, birch, and aspen-dominated aspen-birch-conifer mixed forest types: (91, 92, 93, 94, 95) |
| **5** | Upland conifer forest | All upland conifer and conifer-dominated mixed forest types: (01, 02, 03, 11,16, 17) |
| **6** | Upland spruce-fir forest | All spruce-fir and spruce-fir-dominated mixed forest types: (11,16, 17) |
| **7** | Red and white pine forest | Both red and white pine forest types: (02, 03) |
| **8** | Jack pine forest | Jack pine forest type: (01) |
| **9** | Lowland black spruce-tamarack forest | All lowland conifer and lowland mixed conifer types dominated by black spruce or tamarack: (12, 15, 18) |
| **10** | Upland mature riparian forest | All upland mature or old forest types in Riparian areas; inner zone 0-100 feet and outer zone 100-200 feet: (01, 02, 03, 11,16, 17, 50s, 80s, 91, 92, 93, 94, 95) |
| **11** | Management-induced Edge Density Upland forest & Lowland forest | Edge density (miles/sq mile) of young upland (management indicator habitat 1) or lowland forest (management indicator habitat 9). This indicator does not include or measure inherent edge such as edges between forested lands and lakes, streams, non-forested lands. |
| **12** | Upland Interior forest habitat | Acres of forest interior in all mature and older upland forest patches of any size (see management indicator habitat 1 for forest types in upland forest). All forest patches were buffered inwardly with100 meter buffer. |
| **13** | Large patches of upland mature/old forest | Large (>300 acres) upland mature/old forest patches acres. (See management indicator habitat 1 for forest types in upland forest). |

| # | Management Indicator Habitat | Description and Forest Types |
|---|---|---|
| **14** | Aquatic habitats | These represent the wide variety of lakes, rivers, streams, pond, marshes or pools (permanent, intermittent, or seasonal) that provide habitat to wildlife. |

**Table 3.3.6. MIH Age Groupings.**

| Forest Types | Young (Seedling/Open) | Sapling/ Pole | Mature/ Old | Old/Old Growth | Old Growth Multi--aged |
|---|---|---|---|---|---|
| Jack pine (01) | 0-9 | 10-39 | 40-59 | 60-79 | 80+ |
| Red pine (02) | 0-9 | 10-49 | 50-119 | 120-149 | 150+ |
| White pine (03) | 0-9 | 10-49 | 50-119 | 120-149 | 150+ |
| Lowland black spruce-tamarack dominated conifers (12, 15, 18) | 0-19 | 20-59 | 60-119 | 120-149 | 150+ |
| White cedar (14, 19) | 0-19 | 20-59 | 60-119 | 120-149 | 150+ |
| Spruce/fir (11, 16, 17) | 0-9 | 10-49 | 50-89 | 90-149 | 150+ |
| Upland northern hardwoods (80s) | 0-9 | 10-59 | 60-119 | 120-149 | 150+ |
| Oak (50s) | 0-9 | 10-59 | 60-99 | 100-149 | 150+ |
| Lowland northern hardwoods (70s) | 0-19 | 20-59 | 60-119 | 120-149 | 150+ |
| Aspen-birch and aspen-birch-Conifer (91, 92, 93, 94, 95) | 0-9 | 10-49 | 50-79 | 80+ | 80+ |

Because none of the alternatives propose to regenerate any stands, the total acres, amounts in each age group, or spatial distribution of any of the MIHs currently on the CNF will not change. The silvicultural prescriptions (intermediate harvests), prescribed burning, or additional treatment activities as proposed under any of the alternatives will not have any affects on management-induced edge density (MIH 11), upland interior forest habitat (MIH 12), or large patches of upland mature/old forest (MIH 13). One black spruce stand (MIH 9) is identified to be prescribed burned under Alternative 3. This wetland stand is expected to act as a "natural" fire-line, and fire effects on this MIH will be negligible. For both action alternatives, implementation of the Minnesota Forest Resources Council guidelines for filter strips, as directed in the 2004 Forest Plan, will eliminate or minimize any detrimental impacts to MIH 14.

Both action alternatives propose to treat stands in MIHs 1, 5, 6, 7, 9, and 10. The following table displays the amount of proposed treatments within the potentially affected MIHs by each alternative.

**Table 3.3.7. Amount of proposed treatments within potentially affected MIHs by alternative.**

| MIH # | Alternative 1 Acres Thinned | Alternative 1 Acres Burned | Alternative 2 Acres Thinned | Alternative 2 Acres Burned | Alternative 3 Acres Thinned | Alternative 3 Acres Burned |
|---|---|---|---|---|---|---|
| **1** | 0 | 0 | 1604 | 0 | 1719 | 355 |
| **5** | 0 | 0 | 1604 | 0 | 1719 | 355 |
| **6** | 0 | 0 | 303 | 0 | 279 | 0 |
| **7** | 0 | 0 | 1301 | 0 | 1440 | 355 |
| **9** | 0 | 0 | 0 | 0 | 0 | 8 |
| **10** | 0 | 0 | 97 | 0 | 141 | 46 |

Alternative 1 does not propose any treatments in the project area. The natural origin stands would continue to undergo forest succession and provide high quality habitat for many of the species associated with MIHs 1, 5 and 7. Due to the lack of fire in these stands, some of the plant and animal species associated with fire dependent and fire tolerant native plant communities, especially MIHs 5 and 7, may decline in populations due to the loss of habitat conditions created by fire.

The plantations in MIHs 1, 5, 6, 7 and 10 would generally continue to provide marginal to unsuitable habitat conditions for most species associated with these MIHs. Their susceptibility to endemic insect and disease outbreaks is expected to increase with time, and this may contribute some, limited important habitat characteristics to these stands.

Alternative 2 proposes to thin in these habitats using a standard commercial thinning prescription. The natural origin stands would continue to undergo most of the processes associated with forest succession and provide quality habitat for many of the species associated with MIHs 1, 5 and 7. However, the commercial thinning prescription on 170 acres of this habitat may reduce the self-thinning process in this stand and limit the availability of snags and down logs in the future. Again, due to the lack of fire in these stands, some of the plant and animal species associated with fire dependent and fire tolerant native plant communities, especially MIHs 5 and 7, may decline in populations due to the loss of habitat conditions created by fire.

The treated plantations in MIHs 1, 5, 6 and 7 would generally continue to provide marginal to unsuitable habitat conditions for many of the wildlife species and overall biological diversity associated with these MIHs for the foreseeable future due to the lack of within-stand complexity. Their susceptibility to damage from wind, ice and endemic insect and disease outbreaks is expected to be minimized, so the possibility of these agents contributing some, limited important habitat characteristics to these stands is largely foregone. The timber harvest and prescribed fire design features associated with Alternative 3 will be employed within the riparian inner (0-100 feet) and outer (101-200 feet) zones, so the effects to MIH 10 should be largely beneficial.

Alternative 3 incorporates variable density thinning with canopy gaps prescriptions, prescribed burning, and post-treatment activities which actively improve within-stand complexity in treated stands. The natural origin stands would continue to undergo most of the processes associated

with forest succession and provide high quality habitat for many of the species associated with MIHs 1, 5 and 7. The potential for the variable density thinning prescription on 160 acres of this habitat to reduce the self-thinning process in this stand and limit the availability of snags and down logs in the future is compensated by the application of prescribed fire which is expected to contribute fire-killed snags and down logs to the stand. The plant and animal species associated with fire dependent and fire tolerant native plant communities, especially MIHs 5 and 7, may increase in populations due to the partial restoration of beneficial habitat conditions created by fire.

The wildlife habitat conditions in the treated plantations in MIHs 1, 5, 6 and 7 would improve considerably for many of the wildlife species and overall biological diversity associated with these MIHs due to the immediate and future increases in within-stand complexity. Their susceptibility to damage from wind, ice and endemic insect and disease outbreaks is expected to be increased somewhat, so there is some possibility of these agents contributing some, limited important habitat characteristics to these stands. The timber harvest and prescribed fire design features employed within the riparian inner (0-100 feet) and outer (101-200 feet) zones should be largely beneficial to MIH 10.

**Cumulative Effects**

The cumulative effects to wildlife habitat and subsequently to wildlife populations will again mirror those described for improving within-stand complexity in the Vegetation resource area.

The standard thinning approach tends to minimize the development of within-stand complexity generally associated with the aging of natural conifer communities. It commits these treated stands to a more monotypic condition for the foreseeable future (10-20 years) depending on the next stand entry. Plantations thinned in this manner tend to lack fuller understory and midstory development (species diversity and multiple layers), snags, down logs, and the wide variety of habitat niches usually associated with native conifer communities. The widespread application of this thinning prescription has had profound effects on terrestrial wildlife habitats and populations at the site, stand and landscape scales.

This silvicultural prescription has been and generally continues to be employed on conifer plantations on other managed forests (state, county, etc.). A very large majority of the conifer plantation thinnings on other lands in this part of Minnesota have used and continue to use the same standard commercial thinning approach as described above. The general exception to this approach is in some stands, where there is a mixture of conifer tree species (especially jack pine), and all or most of the jack pine would be removed if it were of an age where it would begin to die out of the stand. The resulting stand would then exhibit a variable density tree pattern. However, the removal of a majority of the older jack pine in these situations reduces the potential for future snags, down logs, and endemic insect and disease infestations (personal communication Harvey Tjader, MN DNR).

The use of prescribed fire during this same time period has been minimal on the CNF and throughout this part of northern Minnesota. It has been used as a site preparation method, for brush disposal, and for hazardous fuels reduction, primarily in non-forested wet meadows (USDA Forest Service 2004). For wildlife species which have co-evolved with fire dependent

and fire tolerant forest communities, the lack of recurring fires on the landscape has also diminished important habitat components and conditions at both the local and landscape scales.

Alternative 1 proposes no management activities in any of the stands proposed for treatment in this project. Cumulatively, it continues to contribute to the stands which have relatively high tree densities, may be experiencing the effects of over-crowding, and are providing marginal to unsuitable habitat for species which are upland conifer associates.

Alternative 2 generally follows the standard commercial thinning practices used in the past on most of the previously thinned conifer stands, especially plantations, within the CNF and on other managed forest lands within its proclamation boundary. It would contribute additional acres to the already existing large majority of plantations previously thinned within the CNF proclamation boundary. It commits additional upland conifer habitats to marginal to unsuitable habitat conditions for many plant and animal species which rely on these habitats for all or portions of their life requirements for the foreseeable future. These acres constitute a continued irretrievable loss of quality upland conifer habitats for an additional period of 10-20 years, or at least until the next stand entry.

Alternative 3 incorporates objectives which actively improve within-stand complexity in treated stands. Through variable density thinning prescriptions, prescribed burning, and post-treatment activities (conifer planting, snag, down log and brush pile creation), this alternative initiates and promotes habitat characteristics important to many plant and animal species which rely on these habitats for all or portions of their life requirements. Plantations treated under Alternative 3 may contribute to the "habitats well-distributed" required by the National Forest Management Act to maintain viability within the planning area. Additionally, the demonstration and use of other approaches to conifer plantations which actively seeks to improve within-stand complexity may influence future forest management in these stands and have a net long-term benefit to terrestrial and aquatic resources, including some species on the TES and MIS lists as well as those associated with upland conifer communities.

## 3.4 Fire and Fuels

There were two issues identified that are discussed in the following analysis.

**Issue 5: What effects will treatments have in reducing fuels accumulations and fire hazards?**

**Indicators:** acres treated mechanically or with fire

**Scope of Analysis**

Scope of analysis is the stands and acres proposed for treatment within the project area because the objectives for reducing fuels can be efficiently and effectively achieved through or in combination with thinning activities, mechanical treatments or prescribed fire.

**Management Direction**
Desired conditions and management direction from the Forest Plan (2004) most pertinent to this issue include:

- D-ID-4 Accumulations of natural and activity fuels are treated to enhance ecosystem resiliency and to maintain desired fuel levels. (2-18)
- D-ID-5 Fire is recent on the landscape, restoring or maintaining desirable attributes, processes, and functions of natural communities. (2-18)
- D-ID-6 Unwanted wildland fire is actively suppressed where necessary to protect life, investments, and natural resources….(2-18)

Management direction regarding the use of fire as a disturbance or ecological process is discussed under Issues 2 and 4.

Fuel treatment activities are consistent with The Healthy Forest Initiative, which emphasizes the need for fuel treatment on National Forest Lands and describes the need to positively change the condition class of stands on fire dependent landtypes.

**Affected Environment**
There are several different areas with slightly different conditions, hazards and risks within the project area. For simplification and organization purposes, stands have been grouped to represent areas and discussion will be presented for the following:

1. Behind the Chippewa National Forest Supervisor's Office,
2. South of Pike Bay,
3. Beaver Lake area, and
4. In stands proposed for thinning.

Descriptions of conditions with respect to fuels accumulations and the corresponding hazards for each of these areas are briefly presented below.

1. Behind the Supervisor's Office (compartment 2-155)–The Supervisor's Office is located on the western edge of the City of Cass Lake. Plantations behind the office are dense and have tree branches extending to the ground creating high fuel hazards. There is a considerable amount of use in this area at all times of the day accompanied by smoking and small campfires that increases the risk of fire. These circumstances pose an ongoing hazard and risk to property and facilities in the vicinity should a fire start occur.

2. South of Pike Bay (compartment 2-50 and 2-92) -- Concentrations of dead and dying trees occur in high use areas along trails, public roads, and a pipeline corridor. Here the following conditions exist:

    - A fire in 2000 burned approximately 55 acres killing the majority of the trees. Additionally, there are some jack pine stands with high levels of mortality due to old age and jack pine budworm defoliation. The majority of dead trees is still standing but will fall in the next few years. In doing so, fuel accumulations will increase. In the meantime, concentrations of fuels currently exist along the roads due to down trees and firewood cutters that have left slash and debris.

- In addition to the roads, there is a bike trail and pipeline through the area. The fire in 2000 was human caused and started along the edge of the pipeline corridor.

3. Beaver Lake area (compartment 5-51) – This area consists of several hundred acres of contiguous conifer stands surrounded by private developments. There is a risk of fire starting within this block and moving onto private lands, or vice versa, moving from private lands onto National Forest land. Previously, some of the stands were thinned and fuel breaks were established along interior roads/trails. Additional thinning and maintenance of the fuel breaks would reduce fire hazards.

4. In stands proposed for thinning -- The crown cover in dense stands is continuous which may result in fires that move through the crowns of trees rather than along the ground. In some areas ladder fuels exist, that is, trees with branches that extend to the ground, which serve as an avenue for fire to climb into the crowns of trees. Crown fires are more destructive, difficult to control, and potentially catastrophic than lower intensity ground fires.

**Direct and Indirect Effects**
Approximate acres proposed for treatment in each area by alternative are displayed in the table below.

**Table 3.4.1. Approximate acres proposed for treatment by alternative.**

| | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Behind Supervisor's Office | 0 | 44 | 44 |
| Pike Bay area | 0 | 0 | 249 |
| Beaver Lake area | 0 | 324 | 302 |
| Acres to be thinned | 0 | 1604 | 1719 |
| Acres to be burned | 0 | 0 | 355 |

There is some overlap in the acres thinned and acres burned. Some, but not all, of the acres thinned will also be burned. Table 3.4.2, below, shows where that overlap occurs.

**Alternative 1 -- No-action**
Fuels behind the Supervisor's Office would remain untreated; the high hazard and risk conditions would persist. A fire could potentially threaten facilities and property in the immediate vicinity.

In the Pike Bay area, no action would mean that concentrations of fuels along the roads, trails, and pipeline would remain and increase over time. Consequently, fire hazard and risk would at best stay the same and most likely increase with additional fuel accumulations and more public use. Should a fire start occur, conditions would support a more intense fire, one more difficult to control, and one that could easily threaten private property and residences in the vicinity. Forest statistics on recent fires show that 95% of the fire starts occur along roads and are a result of arson (personal communication, G. Roerick, Walker fire management officer). The 2000 fire in this area, which was started in the pipeline corridor, is a good example of this.

In the Beaver Lake area and elsewhere, no thinning would occur. Stand densities would remain high. Unthinned stands would be more susceptible to insects and disease damage and mortality as discussed in the vegetation section. With these conditions, fuels can accumulate substantially over time. The development of shade tolerant conifers in the understory may increase ladder fuels. Crown closure in these stands would be close to 100 percent creating a continuous layer of fuel that supports crown fires. Crown fires are typically stand replacement fires that due to their intensity kill most of the trees in the stand. Wildfire control would be difficult during extreme conditions.

**Alternative 2**
With alternative 2 the following areas would be treated: fuels behind the Supervisor's Office, the Beaver Lake area, and stands proposed for thinning elsewhere. Alternative 2 does not treat the Pike Bay area so the effects are the same as discussed in Alternative 1, no-action.

Behind the Supervisor's Office, stand densities and fuels would be reduced through thinning. Treetops and branches would be removed by either piling and burning or mechanical treatment. Should a fire start occur, the more open conditions would be conducive to a low intensity fire that moves across the ground, is easier to control and substantially reduces the threat to facilities and property in the immediate vicinity.

In the Beaver Lake area and in stands proposed for thinning, the following actions are planned to reduce fuels accumulations in high-risk areas along roads, trails, and other ownership boundaries.

Where practicable and unless specified otherwise:

- Remove slash within 25 feet of other ownership's boundary.
- Remove slash within 25 feet of trails, roads that dead-end or along spurs within the unit.
- Remove slash within 50 feet of main or through roads. Specific to the Beaver Lake area, remove slash within 100 feet of unit boundary or clearing edge along all interior roads/trails.
- In all treated stands, avoid windrows parallel to the roads that would result in fuels concentrations.
- Outside the slash removal zones, lop and scatter slash to 2 feet or less; or if whole tree skidding is an option, have logger pile slash in strategic locations near landing. Collect BD funds to burn piles later.

Appendix C contains slash removal requirements for each stand.

The treatment of slash would have the following effects. Slash removal would reduce concentrations of fuels along travel ways where risk of human caused fire starts is highest. Slash from thinning could temporarily increase the fine fuels for 2-3 years after harvest. Lopping to place slash on to the ground can mitigate this. Once on the ground, slash takes longer to dry, more quickly breaks down due to higher moisture content, and reduces the fire hazard. Fuel concentrations and distributions would reflect more natural levels and minimize the fire hazard.

Thinning would remove biomass, reduce the density of stands, and reduce potential mortality as discussed previously for Issue 1 in the vegetation section. A partially open canopy with space between individual tree crowns would discourage movement of fire through the crowns and generally confines fire to movement along the ground. Unwanted fire starts would be easier to control and potentially less damaging. Overall, reducing fuels would reduce the fire hazard, fire intensity and make it easier to protect facilities, private property, and other resource values.

Duration of the benefits associated with thinning and fuels reduction is expected to last 10-15 years, depending on age and growth rates of the residual trees.

**Alternative 3**
Alternative 3 includes almost all the areas proposed for thinning in alternative 2. In addition, this alternative would thin about 250 acres in the Pike Bay area and would apply fire to two blocks of stands.

The effects of thinning would be the same as discussed for alternative 2. Thinning would remove biomass, reduce the density of stands, and reduce potential mortality as discussed previously for Issue 1 in the vegetation section. A partially open canopy with space between individual tree crowns would discourage movement of fire through the crowns and generally confines fire to movement along the ground.

Slash removal would occur to reduce concentrations of fuels along travel ways where risk of human caused fire starts is the highest and in the stands behind the Supervisor's Office. In addition, the following would be applied where practicable and unless specified otherwise:

- Remove slash within 25 feet of other ownership's boundary.
- Remove slash within 25 feet of trails, roads that dead-end or along spurs within the unit.
- Remove slash within 50 feet of main or through roads. Specific to the Beaver Lake area, remove slash within 100 feet of unit boundary or clearing edge along all interior roads/trails. Specific to the Pike Bay area, remove slash within 100 feet of unit boundary or clearing edge along all main roads, pipeline corridor, and Migizi bike trail.
- In all treated stands, avoid windrows parallel to the roads that would result in fuels concentrations.
- If whole tree skidding is an option, have the logger pile slash in strategic locations near landing. Collect BD funds to burn piles later.

Appendix C provides slash removal requirements for each stand.

Unlike alternative 2, logging slash and brush piles would be retained beyond the designated slash disposal zones. Lopping to place slash on the ground would not be done. Generally, during harvest operations slash is placed in corridors and the equipment travels across the top of it, breaking and crushing in the process. However, concentrations of slash may occur outside these corridors. Depending on the arrangement, some slash may dry out more quickly, and persist longer than in alternative 2, but because of the discontinuous distribution, and the likelihood of a fire start outside the slash disposal zones, fire risk would generally not be a concern.

Unwanted fire starts would be easier to control and potentially less damaging. Overall, reducing fuels would reduce the fire hazard, fire intensity and make it easier to protect facilities, private property, and other resource values.

With alternative 3, approximately 355 acres are planned for prescribed burning in compartment 2-60 and 2-122. Of the acres to be burned, 42 acres consist of swamp, upland brush, and black ash communities that provide natural burning boundaries but pose minimal concerns in terms of fuels accumulations and fire hazard. Some of the stands would be thinned, in others the only treatment would be burning. In units thinned, a 25-foot slash free zone would occur along roads, other ownerships, and burning boundaries to create a fuel break. Whole tree skidding is required. Prescribed burning would consume the fine fuels from tops and branches of the trees. Small diameter fuels would be reduced, small diameter trees most likely killed.

As with alternative 2, the duration of effects associated with thinning, fuels reduction, and prescribed burning are expected to last at least 10-15 years, most likely longer because tree densities are lower and spacing wider to achieve wildlife objectives. The exception would be stands with wind or snow breakage. Should this occur, concentrations of fuels would result but because of the scattered distribution would not be a major concern.

**Cumulative Effects**
Both alternatives 2 and 3 would have beneficial effects in terms of reducing fuels accumulations and fire hazards. Alternative 2 treats 1604 acres; alternative 3 treats 1719 acres. Fire hazard on the acres treated would be reduced. Should a fire start occur, changed stand conditions would result in less intense fires that are more easily controlled. Consequently adverse cumulative effects would not occur with the proposed fuels and fire activities and cumulative effects are not considered further for this issue.

**Issue 6: Re-introduction of fire in these stand would result in some tree mortality, basal injury, and charring. Although some sectors of the public are supportive of burning, injury and damage may result in decreased desirability of certain forest products.**

**Indicators:** acres of red pine proposed for prescribed burning

**Scope of analysis**
Scope of analysis is limited to acres of red pine proposed for prescribed burning within the project area because only those stands would incur the damage that is of concern and reflected in the issue. Prescribed burning would not occur in the white pine or white spruce stands. The analysis does not include the acres of black ash forest type because these sites tend to be wetter, are included to provide natural burning boundaries, and are expected to incur little if any mortality. Furthermore, the analysis does not include the potential for fire-killed or fire damaged trees associated with wildfire because of the number of assumptions that can be made about severity, size, and duration.

**Management direction**
There is direction as pointed out in the sections for Issues 2 and 4 regarding the role of fire as a disturbance process. There is also management direction that addresses providing commercial wood for mills (Forest Plan, 2004, p 2-19) but none that specifically addresses the desirability of certain forest products.

**Affected environment**
Fire was an integral natural process in fire dependant and tolerant communities within the project. These aspects are discussed in more detail under Issue 2and 4.

In selecting areas to burn, consideration was given to fire history, stand age, and areas greater than 50 acres in size so that efficiencies could be realized in terms of costs and burning accomplishments. Landscape ecosystem information provided the historic information on fire intensities and frequencies for the different forest types and communities. Based on this information, the red pine stands over 80 years old had the highest priority for treatment. Two blocks were identified; one consisting of a group of adjacent stands in compartment 2-60, the other in compartment 2-122. These are explained in more detail in the discussion for Issue 2. Stands in the swamp, upland brush, and black ash communities were included to provide natural burning boundaries. Table 3.4.2 shows the stands, forest type and acres to be treated.

**Table 3.4.2. Stands proposed for prescribed burning**.

| Stands | Forest or Cover Type | Proposed Burn Acres | Proposed for Thinning |
|---|---|---|---|
| 2-60-10 | Black Ash | 16 | |
| 2-60-12 | Red Pine | 53 | x |
| 2-60-13 | Black Ash | 14 | |
| 2-60-14 | Red Pine | 4 | |
| 2-60-59 | Red Pine | 37 | |
| **Approx. Red Pine acres** | | **94** | |
| 2-122-15 | Red Pine | 190 | x |
| 2-122-21 | Red Pine | 6 | |
| 2-122-22 | Upland Brush | 4 | |
| 2-122-24 | Red Pine | 23 | x |
| 2-122-28 | Mixed Swamp Conifer | 8 | |
| **Approx. Red Pine acres** | | **219** | |
| **Total Red Pine acres to burn** | | **313** | |
| Total acres to burn | | 355 | |

**Direct and Indirect Effects**
**Alternative 1 and 2**
Prescribed burning would not be done; consequently there would not be any fire damage or fire-killed trees.

**Alternative 3**
Prescribed burning would occur on approximately 355 acres, of these approximately 313 acres occurs in red pine stands where fire damage could affect the quality of forest products; 94 acres in compartment 2-60, and 219 acres in compartment 2-122. Fire would be applied after thinning is completed. To achieve resource objectives, 5-10% mortality is desirable. Fire-killed and damaged trees are expected to provide within-stand complexity, future snags and down woody debris. After treatment, stands would not be ready for harvest for at least another 10-15 years, perhaps longer, because of the lower stand densities with alternative 3. Since none of these stands are planned for harvest in the near future, and with the need for snags, snag replacements, and woody debris, little if any of the trees would be available for harvest. The effects in terms of decreased desirability of forest products would be minimal.

**Cumulative Effects**
The effects of prescribed burning in terms of decreased desirability of certain forest products would be minimal given there are no immediate plans for future harvest in these stands, the low levels of expected fire damage or mortality, the need for snags and down woody debris, and the relatively few acres to be burned. Fire would be applied to about 300 acres of red pine. To put that in context, approximately 18% of the acres proposed for thinning in the project would be burned. That is less than 2% of the 17,000 acres of red pine considered to be in fire dependant ecosystems on the Walker District. Consequently adverse cumulative effects would not occur with this project and cumulative effects are not considered further for this issue.

## 3.5 Water Quality, Aquatic Resources, And Wetlands

**Issue 7: Timber harvest, temporary roads and prescribed burn may affect water quality, aquatic resources and wetlands.**

**Indicators:**
- Acres of riparian features (lakes, streams, wetlands) within proposed timber harvest or burn unit boundaries.
- Acres of timber harvest or prescribed burning proposed within riparian management zones (area within 200 feet of streams, lakes, or open water wetlands) and Riparian Emphasis Management Area.
- Acres of wetland affected by temporary roads or system road maintenance.
- Number of new stream crossings that are required to access harvest units.

**Scope of the Analysis**
The scope of this document includes most of the south half of the Chippewa National Forest. The project area includes portions of eight 5$^{th}$ Level Watersheds (12-digit Hydrologic Unit Code) and 64 6$^{th}$ Level Watersheds (14-digit Hydrologic Unit Code) nested within them, covering 478,778 acres.

Stands proposed for conifer thinning or burning are scattered across the project area. In Alternative 2, activities are proposed in 74 stands located in 24 of the 64 6$^{th}$ Level Watersheds. In Alternative 3, activities are proposed in 87 stands, which are located in 25 of the 64 6$^{th}$ Level

Watersheds. Because the proposed activities are scattered throughout numerous watersheds and because they are considered to be low impact due to thinning and low intensity underburning vs. final harvest, the effects on water quality, aquatic resources, and wetlands will be analyzed by stand rather than a watershed basis.

**Management Direction**

A variety of sources provide direction for management related to wetlands, water quality, riparian areas, and fish and aquatic habitat on the Forest. These include Executive Orders 11990 (requires protection of wetlands and defines them) and 11988 (requires protection of floodplains and defines them) for the protection of wetlands and floodplains, the Clean Water Act, NFMA and the Forest Service Manual (Chapters 2526 and 2527). In addition, Forest Service policy mandates management of "riparian areas in the context of the environment in which they are located, recognizing their unique value" (FSM 2526.02) and directs managers to "give preferential consideration to riparian dependent resources when conflicts among land use activities occur" (FSM 25826.03). Forest management activities in riparian management zones (the area within 200 feet of a lake, stream, or open water wetland) will only be conducted for the purposes of maintaining or restoring riparian ecological condition, and all activities will be conducted so as not to cause a reduction in existing water quality or to impair designated uses (2004 Forest Plan Goals, Desired Conditions, and Objectives for Watershed Health, Riparian Areas, and Soil Resources).

The Forest Plan states that the Forest road system is the minimum needed to provide adequate access to both federal and non-federal lands, and that road and trail crossings of streams, wetlands, and riparian areas will be minimized. It also states that unclassified roads will either be designated as a National Forest system road or be decommissioned and closed to motorized vehicles. The Forest will decommission approximately 200 miles of road over the next 10 to 15 years (Forest Plan Goals, Desired Conditions, and Objectives for Transportation System).

Forest Plan (2004) Standards and Guidelines relating to water and riparian resources include:

- S-WS-4 Water quality Best Management Practices which are represented by some of the MN Forest Resource Council (MFRC, 1999) Voluntary Site Level Forest Management Guidelines, will be implemented as standards on NFS land. Refer to guideline G FW-1 for a discussion of the overall relationship between MFRC site level guidelines and the management direction established in the Forest Plan. These BMPs include the creation of filter strips to trap sediment and provide an infiltration zone for surface runoff. The filter strip width varies by percent and length of slope (MFRC 1999).

- S-WS-6 Management activities involving heavy equipment crossing (by road, trail, or skid trail) of any stream or drainage ditch or operations on the immediate shoreline of any lake or open water wetland will be designed and conducted in a way that:

  a.) Limits the number of crossing locations to the absolute minimum needed to conduct the activity.
  b.) Maintains or improves channel stability or shoreline stability in the affected or connected waters, and

c.) Follows MFRC site level guidelines and Guideline WS-3 for the use of filter strips.

- S-WS-9 Within the near-bank zone, harvest trees only to maintain or restore riparian ecological function.

- G-WS-4 On slopes averaging 18% or steeper, the width of filter strips adjacent to lakes or streams will be either 150 ft. from the ordinary high water mark, 150 ft. from the bankfull elevation, or the width of the entire slope that is adjacent to the water's edge, which ever is greater. Exceptions to filter strip guidelines are allowed for projects specifically designed for stream, lakeshore, or wetland restoration.

- G-WS-5 In project areas subject to soil or vegetation disturbance, where the landward limit of the functional riparian area has not been site-specifically identified as part of project planning, a default "near bank" and "remainder" riparian management zone width of 100 feet each will generally be used along lakes, open water wetlands and streams.

- G-WS-6 Within the near-bank zone, minimize soil disturbance and avoid activities that may destabilize soils or add sediment to the water.

- G-WS-9 Use of wetlands under frozen conditions for temporary roads and skid trails will be permitted as long as no fill is placed in the wetland. These roads or trails will be blocked to discourage vehicle use under unfrozen conditions.

- G-WS-10 Wetland impacts will be avoided whenever possible. Where impacts are unavoidable, minimize and compensate for loss when undertaking projects.

- G-WS-11 Avoid felling trees into non-forested wetlands, except where done for purposes of habitat restoration.

- G-WS-12 Wetlands will be managed to prevent the reduction of their water quality, fish and wildlife habitat and aesthetic values. Management actions will not reduce water quality within a wetland or upstream or downstream of a wetland, unless restoration of natural conditions is the primary goal of the activity.

Some of the stands proposed for conifer thinning are within the Riparian Emphasis Management Area. This management area (MA) is designated to emphasize restoration, protection, or enhancement of areas where ecosystem processes are sensitive to degradation. The MA is ¼ mile in width along selected waterbodies, and possible management activities include maintaining and restoring native vegetation communities; maintaining and restoring riparian / hydrologic functions, such as shoreline stability, wildlife habitat, coarse woody debris recruitment to aquatic and riparian ecosystems, and temperature regulation; and controlling non-native invasive species. Forest Plan (2004) direction for this management area includes:

- D-RE-3 Many tree species are present, because these areas cross a number of different Landscape Ecosystems. A mixture of young, but more frequently old, trees, with multi-layered canopies are present as well as snags and downed wood. Large red and white

pine appear in pockets, accenting many areas. Aspen and other hardwoods often grow in patches adjacent to water bodies. Floodplains present in the area consist of sedge meadow and shrub wetland communities. Where ecologically suited, floodplains accommodate lowland conifers such as black spruce, cedar and tamarack.

- O-RE-1 Maintain or increase stands and acres of red pine, white pine, white spruce and northern hardwoods, primarily through partial cutting prescriptions. Maintain existing stands and acres of lowland conifer and black ash. Maintain or increase species diversity and the number of wildlife viewing opportunities. Retain coarse woody debris.
-

Permits from the Army Corps of Engineers will be required for projects that take place in waters of the United States and jurisdictional wetlands. Consultation with the Minnesota Department of Natural Resources Division of Waters will also need to take place for projects involving Minnesota State Protected Waters. Permits and consultation could result in additional requirements.

**Affected Environment**

Many lakes, several rivers and numerous small streams can be found within the project area. There are 132,103 acres of lakes, with Leech Lake the largest, at approximately 111,000 acres in size, 353 miles of stream, and 103,437 acres of wetland (emergent, scrub shrub, or forested wetlands; Table 3.5.1). Small (< 0.3 acre) isolated unmapped wetlands are also prevalent in some parts of the project area.

**Table 3.5.1. Wetland types found within the Conifer Thin project area.**

| Wetland Type (Fish and Wildlife Service 1979) | Acres in Conifer Thin Project Area |
|---|---|
| Emergent | 31,651 |
| Forested | 41,823 |
| Scrub Shrub | 29,963 |

Limited data are available to accurately assess long-term trends in water quality, and data were only available after 1999 for most lakes. More than 600 lakes and small ponds fall within the project area, and data are available for 10. Most of the lakes fall within the typical Trophic State Index values for lakes in this ecoregion, with Carlson Trophic State Indices ranging from oligotrophic (2 lakes) to mesotrophic (4 lakes) to eutrophic (4 lakes). (Details can be found in the aquatics report in the project file).

In the past, there have been small wildfires and prescribed burns in the project area, but most burns have not been severe and the fires have not been widespread, so the long-term effect on water quality was minimal.

The Forest Plan (2004) specifies proactive management for riparian management zones and calls for a site-specific identification of the functional riparian area along lakes, streams, and wetlands. In the absence of that site-specific boundary delineation, it sets up a two-tiered approach for

managing riparian areas. The zone nearest the lake, stream, or open-water wetland (0-100 ft. from the waterbody) is called the "near-bank" zone; the zone further removed from the waterbody (100-200 ft. away) is called the "remainder" zone. The near-bank zone is not suitable for commercial timber production, but timber harvest can be used as a tool to actively manage vegetation for the primary purpose of enhancing or restoring the functional linkage between aquatic and terrestrial ecosystems, and to favor long-lived, site-suitable, tree species. The remainder zone is to be managed for extended rotations of site-suitable trees, in order to maintain critical habitat components and to maintain the integrity of the near-bank zone (Forest Plan 2004; Guideline FW-1).

In the Conifer Thin project proposal, a number of plantations are scheduled to be thinned (under both action alternatives), and several of these plantations border lakes, streams, or open-water wetlands. Several of these plantations were machine-planted, and trees are evenly spaced and sized, providing little, if any, suitable habitat for riparian-dependent wildlife. Furthermore, these trees may be at greater risk of mortality from insects or disease, due to the uniform spacing and age-class, which may reduce their ability to provide bank stability, stream shading, allochthanous material to lakes and streams, etc. Other plantations change in composition as they near the water's edge, with extensive margins of non-open water wetlands or a change in the tree species composition to more hardwood or lowland conifer species.

Where roads traverse wetlands, there are often changes in both surface and subsurface hydrology resulting from compaction of wetland soils and an inadequate amount of drainage structures. This results in changes in water surface elevations and corresponding habitat. Details of this analysis are in the project file.

Within the project area, only one of the 64 6$^{th}$ code watersheds is the "very low" Impact Class; meaning that there are no roads within riparian areas in that watershed. Two watersheds are in the "low" Impact Class. Ten watersheds (16%) have a "high" impact class rating, meaning that in these watersheds, the percent of the riparian area currently impacted by roads is at least one standard deviation greater than the Forest average. For those watersheds in the "high" impact class, the impacts range from 5 to 10% of the total riparian acreage within the watershed impacted by roads (Details are in the aquatics report in the project file).

**Direct and Indirect Effects**

**TABLE 3.5.2. Impacts of Alternatives on Selected Indicators for the Issues**

| | Alt. 1 – No Action | Alt. 2 | Alt. 3 |
|---|---|---|---|
| Acres of riparian management zone (area within 200 feet of streams, lakes, or open water wetlands) within proposed harvest unit boundaries | N/A | 12 ac stream RMZ<br><br>85.2 ac lake & open-water wetland RMZ | 12 ac stream RMZ<br>128.7 ac lake & open-water wetland RMZ |
| Acres of riparian management zone (area within 200 feet of streams, lakes, or open water wetlands) within proposed burn unit boundaries | N/A | N/A | 46 |
| Acres of harvest within Riparian Emphasis Management Areas (CNF Forest Plan, 2004) | N/A | 121 acres | 121 acres |

| | Alt. 1 – No Action | Alt. 2 | Alt. 3 |
|---|---|---|---|
| Area of riparian features (streams, lakes, or wetlands) within proposed harvest or burn unit boundaries | 0 ac wetlands<br>0 mi streams<br>0 ac lakes | 5.5 ac lake & open-water wetland<br>0.25 mi streams<br>67 ac non-open water wetlands | 5.5 ac lake & open-water wetland<br>0.25 mi streams<br>104 ac non-open water wetlands |
| Acres of wetlands affected by new temporary roads or proposed system road maintenance | 0 | 0 | 0 |
| Number of new stream crossings needed to access harvest units | 0 | 0 | 0 |

Under Alternative 2, 74 stands would be thinned. Forty-two of those stands have wetland inclusions, totaling 67 acres (Table 3.4.x.x.), and one stand is bisected by a perennial stream, Portage Creek, which runs through the stand for 0.7 miles. There are 3 intermittent streams in 3 separate stands for a total of 2.6 miles and there is one swale in a stand that is 0.7 miles.

Under Alternative 3, 85 stands would be thinned, and 10 would be underburned. Fifty-one of those stands have wetland inclusions, totaling 104 acres (Table 3.4.x.x.), and one stand is bisected by a perennial stream, Portage Creek, that runs through the stand for 0.7 miles. There are 3 intermittent streams in 3 separate stands for a total of 2.6 miles and there is one swale in a stand that is .7 miles.

**Table 3.5.3. Wetland acreage within the project area and in each alternative.**

| Wetland type | Acres of wetland in Conifer Thin Project area | Alt. 2 Acres of wetlands in proposed activity stands** | Alt. 3 Acres of wetlands in proposed activity stands*** |
|---|---|---|---|
| Open wetland | 7152 acres | 1 | 1 |
| Emergent marsh | 31,651 ac. | 24 | 29 |
| Shrub swamp | 29,963 ac. | 16 | 17 |
| Forested wetland | 41,823 ac. | 26 | 27 |

**Based on the National Wetlands Inventory, U.S. Fish and Wildlife 1979.*
***Alternative 2 has 74 stands, 42 with wetlands*
***Alternative 3 has 85 stands, 51 with wetlands

***Effects on Water Quality***

No harvest activities would occur under Alternative 1, and no impacts to water quality, riparian function, or aquatic habitat due to harvesting would be expected.

Alternatives 2 and 3 both prescribe a moderate amount of timber harvest in riparian areas (Table 3.5.2.). Potential direct effects of timber harvest and road management on water quality could include increased sedimentation of streams, lakes, or wetlands and loss of riparian woody debris or coarse particulate organic matter (CPOM, i.e. leaves and detritus) input to streams and lakes.

Runoff and infiltration rates can also be affected by increased soil compaction in harvested units, but this is expected to be minimal since most stands would be harvested during winter, under frozen conditions, or during summer on dry soils conditions (Mitigation Table, Appendix C) under both Alternative 2 and 3.

Under Alternative 2, thinning would be conducted in 74 stands (Appendix B). The thinning would maintain crown closures of greater than 50% and as such, would minimally affect runoff regimes and stream hydrology as long as mitigation measures are in effect (Mitigation Table, Appendix C). In those stands with wetland inclusions, filter strips will be maintained around the wetlands. As per the Site-Level Forest Management Guidelines (MFRC 1999), skid trails and haul roads will not be placed in filter strips and mineral soil exposure will be kept to less than 5% of the filter strip area (Mitigation Table, Appendix C).

In addition to the timber harvest, approximately ½ mile of temporary road would be built to access these stands, and 3.2 miles of existing system road would receive maintenance to prepare them for timber hauling. None of the system road maintenance or temporary road construction would occur in watersheds with high riparian road impacts, and none of the temporary roads would be constructed within the filter strip of lakes, streams, or wetlands, or require a stream or wetland crossing. With application of the specified mitigation measures, none of the activities proposed in Alternative 2 are expected to have any effect on water quality.

Under Alternative 3, 85 stands would be thinned (Appendix B). The proposed treatment would result in stands that have been thinned to a variable density, and one-tenth to one-quarter acre gaps would be created in the canopy. The total acreage of the gaps would range from about 80 acres to 190 acres. In addition to the timber harvest, 10 stands would be underburned, but the burn prescription would not allow more than 5-10% mortality in the stand. These treatments are not expected to have any impact on surface runoff or water quality. In those stands with wetland inclusions, filter strips will be maintained around the wetlands. As per the Site-Level Forest Management Guidelines (MFRC 1999), skid trails and haul roads will not be placed in filter strips and mineral soil exposure will be kept to less than 5% of the filter strip area (Mitigation Table, Appendix C).

Similar to Alternative 2, approximately ½ mile of temporary road would be required to access these stands, and 3.2 miles of existing system road would receive maintenance to prepare them for timber hauling. None of the system road maintenance or temporary road construction would occur in watersheds with high riparian road impacts, and none of the temporary roads would be constructed within the filter strip of lakes, streams, or wetlands, or require a stream or wetland crossing. With application of the specified mitigation measures, none of the activities proposed in Alternative 3 are expected to have any effect on water quality.

### *Effects on Riparian Resources*

**Riparian Management Zones**

No harvest activities would occur under Alternative 1, and there would be no impacts on riparian resources or riparian function.

Under Alternative 2, approximately 20 of the 74 stands proposed for timber harvest are adjacent to lakes, streams, or open water wetlands. The Riparian Management Zones within those stands total approximately 97 acres (Table 3.5.2.). Because the riparian management zones are delineated to promote proactive riparian management, timber harvest in the near-bank and remainder zones under Alternative 2 would be used to increase within stand diversity and improve riparian functions. Harvest Design Features 1 – 4 and #6 will be applied, as appropriate, to create variable-sized gaps in the canopy to encourage a multi-layered canopy of long-lived species. All large diameter red and white pine would be retained for growth into super-canopy trees. Although there would be variable-sized gaps in the canopy, the thinning would maintain crown closures of greater than 50% across the riparian management zone that would help to increase species diversity and the age-class or structural diversity of the riparian forest.

Voluntary Site Level Guidelines (MFRC 1999) would be implemented to ensure that water quality is maintained, through the use of filter strips. Additional mitigation measures would be applied to prevent streams adjacent to or bisecting the stands from being crossed, either during skidding or hauling, and landings will not be placed in wetland areas (Mitigation Table, Appendix C). No harvest would occur in the riparian management zones of stands that change in composition as they near the water's edge, since all non-featured tree species in the treatment areas would be protected and retained.

These activities are expected to benefit riparian resources and improve function over the long-term by diversifying riparian stand structure and species composition, and by providing a future source of large woody debris.

Under Alternative 3, approximately 26 of the 85 stands proposed for timber harvest are adjacent to lakes, streams, or open water wetlands. The Riparian Management Zones within those stands total approximately 141 acres (Table 3.5.2.). Timber harvest design in the nearbank and remainder zones under Alternative 3 would be similar to that applied to the rest of the stand, because the prescribed treatments are intended to:

- increase within stand diversity by creating light conditions on the forest floor light over a considerable portion of the stand that will allow for the establishment and advancement of other tree, shrub, and herbaceous species,
- protect existing within-stand tree diversity, by retaining and protecting all non-featured tree species in the treatment areas,
- protect existing snags > 4 inches dbh within treated areas,
- retain all large diameter (20+ inches dbh) long-lived conifer species

Harvest Design Features 1 – 4 and #6 will be applied, as appropriate, to create variable-sized gaps in the canopy to encourage a multi-layered canopy of long-lived species. All large diameter red and white pine would be retained for growth into super-canopy trees. Although there would be variable-sized gaps in the canopy, the thinning would maintain crown closures of greater than 50% across the riparian management zone that would help to increase species diversity and the age-class or structural diversity of the riparian forest. Voluntary Site Level Guidelines (MFRC

1999) would be implemented to ensure that water quality is maintained, through the use of filter strips. Additional mitigation measures would be applied to prevent streams adjacent to or bisecting the stands from being crossed, either during skidding or hauling, and landings will not be placed in wetland areas (Mitigation Table, Appendix C). No harvest would occur in the riparian management zones of stands that change in composition as they near the water's edge, since all non-featured tree species in the treatment areas would be protected and retained.

These activities are expected to benefit riparian resources and improve function over the long-term by diversifying riparian stand structure and species composition, and by providing a future source of large woody debris.

**Riparian Emphasis Area Management Area**

There are 5 stands, totaling 121 acres, proposed for thinning within the Riparian Emphasis Management Area (see Table 3.5.2). These stands are near the Shingobee River (see map in Appendix D).

Harvest Design Features 1 – 4 and #6 will be applied across these units, as appropriate, to create variable-sized gaps in the canopy to encourage a multi-layered canopy of long-lived species. All large diameter red and white pine would be retained for growth into super-canopy trees. Although there would be variable-sized gaps in the canopy, the thinning would maintain crown closures of greater than 50% across the management area that would help to increase species diversity and the age-class or structural diversity of the riparian forest.
Stands within the Riparian Emphasis Management Area would be managed similarly under both Alternatives 2 and 3.

***Effects on Wetlands***

No harvest activities would occur under Alternative 1, and no impacts to wetlands due to harvesting would be expected.

In Alternative 2, forty-two of the 74 stands have known palustrine wetland inclusions or wetlands bordering the stand. In Alternative 3, fifty-one of the 85 stands have known palustrine wetland inclusions or wetlands bordering the stand (data source - National Wetlands Inventory).

Sedimentation of wetlands due to erosion from ground disturbance or soil exposure in or adjacent to wetlands could alter their function (e.g. ground water recharge/discharge, wildlife habitat, filtering pollutants), and sedimentation of lakes and streams can increase nutrient loading, lower trophic level dynamics, and reduce aquatic vegetation. For example, invertebrates that transfer energy to others in the food web may be reduced when large sediment inputs occur.

Potential impacts for soil erosion and wetland disturbance are reduced under both Alternatives, since a thinning harvest is much less impactive than a clearcut harvest. There will still be trees remaining around the wetlands and seasonal ponds to provide a source of coarse particulate organic matter (CPOM) and shade. Additionally, in both Alternatives, mitigation measures designed to minimize sediment loading or surface run-off will be implemented in all stands with wetland features. These mitigation measures include limiting mineral soil exposure to no more than 5% of the filter strip area, keeping skid trails, haul roads, and landings outside of the filter

strip, and restricting landings to upland areas, and keeping equipment out of wetland depressions. In addition, no temporary roads will be constructed across wetlands. As long as the mitigation measures are followed in alternatives 2 and 3, wetland impacts are not expected.

Fire

Fires can have adverse effects on water quality. These effects vary with intensity and season of the fire, extent of the fire and site characteristics of the burn area adjacent to a water body. However, many of the detrimental effects are associated with large scale fires of high intensity in steep terrain.

Under Alternative 3 there are 10 stands planned for prescribed burning. Prescribed burning would occur in 46 acres of the riparian management zone (Table 3.5.2). With the implementation of standards and guidelines and mitigation measures there would be no long-term effects on water quality. Fuel treatment activities would be conducted in one stand along a road with high fuel loads, but treatment activities are not expected to occur within the riparian management zone, and there would be no impacts on riparian resources or aquatic habitats.

Upper Sucker Lake is adjacent to one area planned for prescribed burning (Compartment 60). There is a lake and black ash swamps adjacent to one of the stands and they would be used as edges of the burn instead of constructing fireline. Most of the stand is nearly level to gently rolling, but there is a short, steeper slope that goes down to the lake. Mitigation measures along this zone require that severely burned soil be limited to 5% of the riparian zone. The effects on the water quality of Sucker Lake due to soil erosion would be minimal since the slope is short, the burning would be low to moderate and the vegetation grows back quickly after a prescribed burn of this intensity.

**Mitigation Measures and Post Treatment Activities associated with Alternatives 2 and 3**

Some of the following mitigation measures have been referenced from the Voluntary Site-level Forest Management Guidelines: Sustaining Minnesota Forest Resources (MFRC 1999).

15. Mechanical fireline construction will not be allowed within 100' of any lake, stream or open water wetland. **(Mitigation Measure – Riparian Areas)**

16. No streams (intermittent or perennial) will be crossed during harvest activities (skidding or hauling). **(Mitigation Measure – Riparian Areas)**

17. Forest management activities will not take place in wetlands, including building landings, skid trails and roads, harvesting or running equipment through the wetland depression. **(Mitigation Measure – All stands with wetland features)**

18. Seasonal Pond Mitigation: For all seasonal ponds / Type 1 wetlands /vernal pools (forested and non-forested), do not drive equipment through them and leave no tops or slash in them. **(Mitigation Measure – All stands with seasonal ponds)**

19. Filter strips are applied to all streams (perennial and intermittent), lakes, and wetlands, including wetland inclusions and seasonal ponds, seeps and springs. **(Mitigation Measure – All stands with lakes, streams, or wetland features)**

a. Limit mineral soil exposure to less than 5%, well distributed throughout the filter strip
b. Avoid concentrating disturbance in the filter strip, to prevent concentration of flows across the filter strip. Keep skid trails, haul roads, and landings outside of the filter strip area.
c. Temporary roads will be constructed outside of the filter strip area.

20. For alternative 3 implement prescribed fire guidelines for water quality protection as follows: **(Mitigation Measure – Riparian Areas)**
    g. No more than 5% of the soil surface within the RMZ will be detrimentally burned.
    h. Avoid placement of piles for burning inside of filter strips or riparian management zones.
    i. Use fuel break construction methods in wetlands that do not expose bare soil.
    j. Maintain erosion control measures as needed on fuel breaks. If possible, use roads or natural barriers for fuel breaks.
    k. Prevent or minimize runoff of fire-retardant chemicals into the water by keeping filter strip areas off-limits to retardant use.
    l. Avoid cleaning fire-retardant application equipment in lakes, streams or wetlands.

**21.** Stabilize bare soil areas with vegetative cover immediately following construction. **(Mitigation measure – soil and hydrology)**

22. Slopes will be protected on temporary roads and skid trails by creating water bars or dips when slopes are equal to or greater than 5% and elevation change is greater than 6 feet. **(Mitigation measure – soil and hydrology)**

**Cumulative Effects**
Timber Harvest
There would be no increased runoff or other direct or indirect effects at the watershed level.

The proper application of Riparian Management Zones and Riparian Emphasis Areas would ensure that water quality in open water is not affected by this harvest operation. As long as mitigation measures are followed for alternatives 2 and 3 for the thinning to be conducted, there would be no long-term adverse cumulative effects associated with water quality and effects to wetlands.

County, State, and tribal agencies will continue to harvest from their lands. However the exact sub-watershed where harvest units would be located could not be determined for all ownership given the information provided by each agency. It is impossible to predict how much, or if, harvest would occur on private lands. The Minnesota Dept. of Natural Resources conducts timber harvest monitoring on logging sites of different ownerships to monitor compliance of forest management guidelines. In addition, there are logger education programs to teach loggers about the proper use of the guidelines.

Fire
Water quality monitoring in prescribed burn units within riparian areas on the Chippewa National Forest (2000) has shown no increase in turbidity and nitrates and no decrease in dissolved oxygen, even following large rainfall events occurring shortly after the burn. However, at one site there was an increase in phosphorous in the adjacent water body, but the levels returned to normal after a few days. As long as mitigation measures are followed with the proposed prescribed burning in alternative 3, there would be no long-term direct and indirect effects associated with water quality. Consequently there would be no long-term adverse effect cumulative effects.

Roads
There are no known road related projects within the project area other than new construction of temporary roads necessary to access timber stands. Since the temporary roads are not crossing wetlands and they will be obliterated once the project is complete, they are not expected to contribute to long-term effects of the water quality in the analysis area.

There is no proposed stream crossing repair or other treatments to streambanks known to be proposed by any of the above entities. These activities are equated with sedimentation, since they and associated roads could contribute to bare mineral soil and hence erosion. The fore-going information implies that cumulatively there would not be a sedimentation problem.

## 3.6 Soils

**Issue 8: What affects will timber harvest, temporary roads and prescribed burns have on soil stability and productivity?**

**Indicators:** Potential for soil compaction and rutting, amounts of severely burned soil, slash remaining on low-nutrient soils; risk for soil erosion and suitability of soils for temporary road construction.

**Scope of the Analysis**
The bounds of this analysis for determining direct and indirect effects of the proposed activities would be the project area boundaries. Potential direct and indirect effects of erosion, compaction, rutting and site productivity are reasonably confined to the soil directly beneath where the disturbance factors are taking place. This is due to the relatively short slope lengths and the natural revegetation of exposed soil over the majority of a site.

**Management Direction**
Forest Service Region 9 Draft Soil Quality Standards state that at least 85 percent of an activity area must be maintained in a non-detrimentally disturbed state (USFS, 2002). Standards used for determining a detrimentally disturbed state are shown below:

- Detrimental erosion – presence of rills, gullies, pedestals and soil deposition.
- Detrimental displacement – removal of the forest floor and more than 1 inch of the mineral soil surface.

- Detrimental rutting – more than 1 percent of an activity area has ruts of at least 4 inches deep and 6 feet long.
- Detrimentally burned – the entire forest floor is consumed down to bare mineral soil. Fine roots and organic matter are charred in the upper 1 inch of mineral soil and / or the soil is abnormally reddish in color.
- Detrimental loss of soil productivity – a 15 percent reduction in long-term soil productivity based on a combination of the above thresholds, organic matter loss and impaired nutrient cycling.

From the Chippewa National Forest Plan (2004):

- Objectives: In all management actions involving soil disturbance:
    - Maintain adequate ground cover and soil organic layers, both during and after treatment, to minimize erosion (including rill and gully formation) and allow water to infiltrate the soil.
    - Minimize soil displacement, nutrient loss and the effects of severe burning.
    - Restore and re-vegetate disturbed areas.
    - Provide for the maintenance of physical, chemical and biological properties of the forest floor (soil organic matter, surface O layer) that make soil productive.
    - Protect soil-hydrologic functions by minimizing rutting, puddling and compaction.

- Guidelines: On low-nutrient sites (excessively well-drained to well-drained sands - ELT group 1 and phase group 9) maintain soil productivity by:
    a.) Retain or return fine slash (< 3" in diameter) well distributed over the site;
    b.) Maintaining or converting to pine type;
    c.) Meeting vegetation objectives for older growth stages.(Chapter 3, Watershed Health)

**Affected Environment**

The area of Walker Conifer Thin includes a relatively wide area and there is a wide range of soils and landforms included in the analysis area. These Landtype Associations (LTAs) and the number of stands included are:

| | |
|---|---|
| Bemidji sand plain (Bsp) | 34 stands |
| Itasca end moraine (Im) | 25 stands |
| Guthrie till plain (Gtp) | 14 stands |
| Itasca end moraine, hummocky (Imh) | 8 stands |
| Bena dunes and peatlands (Bdp) | 5 stands |
| Hill City till plain (Htp) | 1 stand |

Landtype Associations are based on landforms that have a unique terrain and generally have soils that are similar. For example, the Itasca end moraine is hilly, has many closed depressions and the soils are typically well drained mixed outwash, lacustrine sediments and glacial till. Steep slopes are a concern on the Itasca end moraine. On the other hand, the Bemidji sand plain is

nearly level to rolling, there are few small wetlands and streams and the soils are typically excessively well drained deep sands.

Each stand was further analyzed by looking at the ecological landtype phase (ELTp) or the ecological landtype (ELT), if the phase information was not available. These phases and ELT's are more specific in regards to the soil type and plant community. There are three soil types that are a concern in this analysis area:

1. Wet soils– these are soils with a high water table that are: very poorly drained, poorly drained, or somewhat poorly drained soils. These soils are more susceptible to compaction and rutting since they remain wet most or all of the time. Compaction of the soil can affect the productivity of the site (Jaakko Poyry, 1993). Compaction can be mitigated by harvesting when the soil is dry or frozen. The Guthrie till plain and Hill City till plain LTAs have soils which are most susceptible to compaction.

2. Steep slopes – these soils have a slope of 18% or greater. The concern for this soil type is the potential for soil erosion if the mineral soil is exposed. Soil erosion can result in a loss of nutrients at the site, which in turn, affects plant growth. This can be mitigated by limiting the use of heavy equipment on these slopes or avoiding a continuous downhill path for water to channel. If that cannot be avoided, water bars and slash should be applied to the trail to reduce the potential for soil erosion. The Itasca end moraine and Itasca end moraine, hummocky LTAs have the steepest slopes in the Walker Conifer Thin EA.

3. Low nutrient soils – These are excessively well-drained deep sands that are lower in nutrients compared to other soil types on the Forest. This can be mitigated by leaving slash, which contain nutrients, at the site. Low-nutrient soils are a concern on the Bemidji sand plain.

Featured in the table below is a summary of the three soil types.

**Table 3.6.1 – Soils of Concern**

| Soil Type | Alternative 2 | Alternative 3 |
|---|---|---|
| Wet soils --Very poorly, poorly, somewhat poorly drained soils | 98 acres | 98 acres |
| Steep soils – slopes > 18% | 77 acres | 77 acres |
| Low nutrient soils – excessively well-drained to well-drained sandy soils | 701 acres | 918 acres |

For alternative 2 the approximately 900 acres of the total acreage 1604 is of some concern. For alternative 3, the approximately 1100 acres of a total acreage 2074 acres is of concern. There may be a slight difference in total acreages compared to other sections due to adjustments that were made with small soil map units.

There are existing roads within the analysis area. In terms of soil productivity, this is land that is taken out of production.

Many of the stands are plantations and some have been thinned previously. If proper mitigations were practiced at the time, the effect on the soil from the previous harvest entry or entries would be minimal. Some plantations were windrowed and / or rock raked where some soil displacement likely occurred.

**Direct and Indirect Effects**

**Table 3.6.2. Summary of effects by indicator.**

| Indicator | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Compaction & rutting | No effect | Harvest on frozen or dry soil<br>Frozen soil only on 98 acres | Harvest on frozen or dry soil<br>Frozen soil only on 98 acres |
| Amount severely burned soil | No effect | No effect | <15% of the treatment area, <5% in riparian zone |
| Risk of erosion | No effect | Low<br>Limited bare mineral exposure | Low<br>Limited bare mineral exposure |
| Slash on low-nutrient (sandy) sites | No effect | Retained | Retained |

**Alternative 1 (No Action)**
No further effects on the soil, beyond the existing condition, would occur. No further accelerated disturbance would occur, whether compaction, displacement, or erosion at whatever rate beyond existing condition, due to any timber harvest activities. There would be an increased chance that a wildfire could occur that would severely burn the soil if the fuels are not reduced. However, there are so many variables involved, such as weather, moisture conditions, and type of burn, that it would be difficult to predict results. All road related activities, such as repairing rutting that was done in the past, would not be conducted at this point.

**Alternative 2**
Timber Harvest
In terms of effect to soils, this alternative has fewer stands and acres to be harvested than alternative 3.

Steep slopes are areas most prone to soil erosion. Erosion hazard is the inherent susceptibility of a soil to erosive forces such as raindrop impact or waterflow over the surface. Most of the soils in the project area have an erosion hazard that is low. Erosion is a concern on about 77 acres (see Table 3.6.1). Some harvest units have inclusions of steeper slopes where special precautions, such as minimizing exposed mineral soil, would be needed. Erosion would be minimized or eliminated by such methods as leaving organic residue or vegetative cover at the site or by other forest management guidelines (MFRC, 1999).

Compaction is a rather complex process. The degree and extent of it depends on the harvesting system used, site conditions during operation and soil texture. If the soil does become compacted there are varying reports about how long it would take for the effects of compaction to recover to pre-harvest levels (Jaakko Poyry, 1992). Recovery periods varied from a few years to several decades. In general, the rate of recovery was proportional to the degree of compaction.

Since wet soils are more prone to compaction (McNabb, et al, 2001), the somewhat poorly to very poorly drained soils of pose a concern. These are soils that are wet during most of the non-frozen part of the year. According to Table 3.6.1, there are 98 acres of very poorly to somewhat poorly drained soil types within the project area. This acreage is the same for alternatives 2 and 3. Most of the stands containing the wet soils only contain a small acreage and do not have conifers planted in those soil types. However, soils that have better drainage are still prone to detrimental compaction if they are harvested during a wet period of the year. Limiting operation of heavy equipment used in harvesting to dry or frozen soil conditions is a mitigation measure used to keep compaction within acceptable limits.

On low nutrient soils (well-drained to excessively well-drained sands), leaving a certain amount of slash is important in maintaining long-term soil productivity. After meeting requirements for regeneration and fuel levels, as much slash should be left as possible. Alternative 2 has about 701 acres of low-nutrient sandy soils, which is about 217 acres less low-nutrient sandy soil than alternative 3 (Table 3.6.1).

Roads

Placement of temporary roads --- Because the newly roaded areas would become highly compacted, there would be irretrievable effects on those roadbeds. However, the mitigation measures require obliteration of temporary roads so they should return to a pre-compaction level.

Choosing the proper location for a temporary road can help reduce the effects on the soil and hydrology. Avoiding poorly drained areas, such as seasonal ponds, would help to reduce rutting and compaction. According to the ecological classification inventory, the .5 miles of temporary roads that are to be constructed do not cross somewhat poorly drained soils to very poorly drained soils. However, there could be small inclusions of wet soils, which should be avoided. Soil erosion is also a concern on newly constructed roads, but there are no steep slopes where temporary roads are located.

When the logging operation is over, bare mineral soil on the roads, main skid trails, and landings should be seeded to minimize erosion and prevent noxious weeds. Revegetation would help to restore the soil productivity, but unless efforts are made to loosen the soil, compaction would remain for an indeterminate length of time.

Prescribed Fire

There is no prescribed burning that is planned for this alternative.

**Alternative 3**

Timber Harvest

The effects would be similar to alternative 2. With alternative 3, about 100 more acres would be thinned. The area added to this alternative, Ten Section, are on excessively well-drained sandy sites. These are the low nutrient soils (see Table 3.6.1). The mitigation to leave slash on the site would be the same as in alternative 2, except there would be more stands to be treated in that manner.

Roads

Roads are the same as discussed for alternative 2.

Prescribed Fire

About 355 acres are scheduled to have prescribed burning under this alternative. The effect of prescribed fire depends on the severity of the burn. In a low to moderate burn the effects are thought to be of short term in duration. According to the forest soils section in the Generic Environmental Impact Statement (GEIS) on Timber Harvesting and Forest Management in Minnesota (Jaakko Poyry, 1992), there is a volatilization of some nitrogen and phosphorous during the burning process. On the other hand, many of the nutrients that do remain are transformed to a state that is more available for plant growth. Plant growth is typically greater after a low to moderate burn and the increased plant growth would eventually contribute to an increased nutrient base. Furthermore, there is evidence that there could be more nitrogen fixing plants after a fire. According to the Minnesota GEIS, *unless prescribed burns are carried out under extremely dry conditions and are associated with piling and windrowing of slash, they are of little long-term consequence to the nutrient economy of Minnesota's forests* (Jaakko Poyry, 1992)

The prescribed burning planned in Alternative 3 would not affect long-term soil productivity. The combination of the type of burn and the season they are planned would not detrimentally burn the soil. However, there might be scattered small pockets that are severely burned. Slash that has been piled and burned may severely burn the soil under the piles. Soil erosion or erosion of the ash after the prescribed fires would be minimal since the slopes are nearly level to gently sloping, sites would be rapidly re-vegetated naturally and firelines would be constructed properly and would use existing roads and natural barriers. According to the ecological classification inventory there are no steep slopes in the prescribed burn units. However, since there is an inclusion of steeper slopes along the edge of Sucker Lake, efforts should be made to plan for fire severity at a low level along that edge to reduce the risk of soil erosion.

**Mitigation Measures and Post Treatment Activities associated with Alternatives 2 and 3**

Refer to the mitigation measures table in Appendix C for site-specific recommendations by stand.

Some of the mitigation measures have been taken from the Voluntary Site-level Forest Management Guidelines: Sustaining Minnesota Forest Resources (MFRC, 1999).

10. When logging on sandy soils (stands listed in the project file), retain on-site the fine logging slash (material < 3" diameter). Whole tree harvesting will not be allowed on sandy soils unless the slash is returned to the site.

11. Limit harvest to frozen ground conditions on somewhat poorly, poorly and very poorly drained soils. Harvest on frozen or dry soil conditions on all other soil types.

23. For alternative 3, prescribed burning would be conducted during times and conditions that would prevent severe burning of the topsoil.

27. For alternative 3, maintain erosion control measures as needed on fuel breaks. If possible, use roads or natural barriers for fuel breaks.

28. If using a hydro-ax (or similar equipment) to lower slash, the same seasonal restrictions used for harvesting will apply.

29. To minimize the spread of noxious weeds in all soil-disturbing projects:
    - Clean gravel and fill (no weeds).
    - Use weed free seed, mulch, and bales for ditch blocks.
    - Monitor and control any weeds that get started. Clean weeds and seeds from construction, maintenance, and mowing equipment prior to entering and leaving the site. Revegetate in a timely manner with a mix of perennial grasses and plants and fast growing annual grass such as annual ryegrass. Don't leave exposed mineral soil for weeds to get started.

**Cumulative Effects**

Alternative 1 would have no cumulative effects related to soil compaction, rutting, erosion or nutrient removal because no harvesting or prescribed burning is planned within this alternative.

As long as mitigation measures are followed for Alternatives 2 and 3, the potential for activities in these alternatives to impact long-term soil productivity in the project area is low. The exception would be burn piles, log landings and main skid trails. The area involved with the activities is minimal and the effects would be considered irretrievable. The transport of sediments would be minimal if the mitigations are followed.

Since there is more harvesting and there is prescribed burning in Alternative 3, the effects from Alternative 2 would be less. However, by retaining nutrients (slash) in the harvested area and limiting the areas of severely burned soil in the prescribed burn, the differences between the alternatives would be small.

Soil monitoring of forest stands in Minnesota conducted by the Minnesota Dept. of Natural Resources (MN DNR) in 2000 and 2001 has shown that 1.8% to 2.5% of harvest areas were devoted to log landings and forest roads. This is below the 3% level recommended by the MNDNR. The Forest Service, MNDNR and Cass County will try to continue to abide by their agency's management direction and the Minnesota Forest Resource Council's Voluntary Site-

Level Forest Management Guidelines (1999). In addition, these agencies continue to educate loggers and private landowners about sustainable forest management.

## 3.7 Transportation

There are no issues specific to the road system. Access needs have been identified for this project and consist of temporary road construction and maintenance needs.

**Scope of the Analysis**

This project evaluated the roads needed to access the treatment units, their condition, and short term and long term needs for those roads. A roads analysis was completed for the project and is part of the project record. Because this project area includes the entire Walker district, detailed analysis of all the roads is not feasible at this time. That type of detailed analysis is best done when smaller analysis areas (usually consisting of 1-4 watersheds) are defined.

**Management Direction**

The objective of the road analysis is to provide decision makers with critical information to develop road systems that are safe and responsive to pubic needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, and are in balance with available funding for needed management actions. As of January 3003, projects must consider the affected road system within their project area.

In addition, management directions from the Forest Plan (2004) on roads include:

- D-TS-1 The existing National Forest system roads…provide a safe and affordable system for administrative and public access to NFS lands. (p 2-47)

- D-TS-2 The National Forest road system is the minimum needed to provide adequate access to both NFS and non-NFS land. (p 2-47)

Additional guidance is provided in the Forest Plan (2004), pages 2-47 to 2-49.

**Affected Environment**

Adequate access to most stands is available. However, short segments of temporary road construction will be needed. In an effort to avoid stream crossings, alternate access routes resulting in some temporary roads were also warranted.

During project planning, several segments of system roads were identified as needing surface maintenance. Generally, the maintenance consists of blading, possibly graveling, rutted or low spots in the road. In some cases, brushing of the roadway may be needed. Road reconstruction will not be done with this project.

**Direct and Indirect Effects**

Temporary road construction and maintenance are the same for both alternatives. (Refer to Appendix B maps for location.) Temporary roads will be obliterated after use (refer to mitigation measure #5 for wildlife, Chapter 2).

**Table 3.7.1. Proposed temporary road construction and maintenance.**

| Stand | Temporary Road (mi) | Maintenance (mi) |
|---|---|---|
| 2-75-003 | .1 | |
| 2-75-005 | | .6 |
| 2-75-014 | | Same road as 2-75-5 |
| 2-123-38 | .1 | |
| 2-123-96 | | .3 |
| 2-128-7 | | .3 |
| 5-36-5 | .1 | |
| 5-49-5 | | .3 |
| 5-87-16 | | .5 |
| 5-102-94 | .1 | |
| 5-105-18 | | .3 |
| 5-178-02 | .1 | |
| 5-193-65 | | .3 |
| 5-195-17 | | .2 |
| 5-197-01 | | .4 |
| **Total** | **.5** | **3.2** |

For this project, the disposition of system roads after use will be similar to what it was prior to project implementation, i.e. if a road was closed by any means prior to implementation, it will be closed after implementation is completed.
The effects of roads on specific resources, such as wildlife, are discussed in their respective sections.

## 3.8 Economics

While there are no issues regarding economics, an economic analysis is required for the project.

**Scope of the Analysis**

The Walker Conifer Thin project area was used for analysis of the direct and indirect effects, while the Chippewa National Forest was used for cumulative effects. The economic analysis includes activities associated with timber sale preparation and administration, road maintenance, prescribed burning, wildlife habitat improvement and reforestation.

**Management Direction**

The National Environmental Policy Act regulations 40CFR 1508.8(b) require that all analyses consider economic factors. The law does not require a quantitative, monetary analysis of non-commodity resources. In addition, Forest Service Handbook 1950.22 requires that the Forest Service fully consider economic impacts. The Forest Service Manual 1970.6 provides non-binding guidance as to the scope of economic analysis. This document is tiered to the Forest

Plan Final Environmental Impact Statement (FEIS). An economic analysis was included in the FEIS for the Forest and this analysis in included by reference.

**Affected Environment**

For this analysis, the "Quick Silver-Forestry Investment Analysis Program" was used to evaluate commercial timber harvest and related projects. The program incorporates the projected revenue from stumpage as well as costs associated with sale preparation, sale administration, site preparation, reforestation and habitat improvement. The project record contains detailed information about this economic analysis. One aspect of the project that is not definable in terms of dollars is mortality or degradation of the value in commercial trees in the burning areas. The amount of such damage is small and not accurately quantifiable. Also, what may be a loss in commercial terms may be a gain in wildlife habitat values (snags, downed logs, openings, etc.).

The economic analysis should be used as a means of comparing the cost/benefits of the commercial timber harvest between alternatives, not as a total analysis of everything within the project area. While commercial timber harvest operations provide direct and indirect jobs to the local economy, no attempt was made to estimate these additional jobs. However, they are recognized as a benefit. Payments that are made to counties from revenues generated by timber sales are called the "25% Fund." This money is used by local school districts and for the improvement of county roads.

**Direct and Indirect Effects**

Table 3.8.1 displays the results of the Quick Silver program discussed above.

**Table 3.8.1. Summary of Economic Factors for the Walker Conifer Thin Project Vegetative Management Alternatives**

| Factor | Alt. 1 | Alt. 2 | Alt. 3 |
|---|---|---|---|
| Estimated volume of timber harvested (CCF) | 0 | 17,644 | 23,328 |
| Value of timber harvested | 0 | $789,959 | $1,044,910 |
| Costs of associated sale preparation, administration, temporary roads, burning and reforestation ** | 0 | $306,930 | $975,799 |
| Present Net Value | 0 | $483,029 | $69,111 |
| Benefit/Cost Ratio | N/A | 2.57 | 1.07 |
| Estimated payments to counties ** | 0 | $120,757 | $17,278 |

**Actual funds generated from the commercial timber harvest would depend on stumpage prices in the year of offer (likely FY 2004 and 2005).

**Alternative 1**

There were no costs attributable to the project in this alternative. All ongoing activities (yearly road maintenance, fire suppression, and facilities maintenance) would still occur whether or not the project was implemented. There would be no revenues associated with this alternative.

**Alternative 2**
Alternative 2 has a cost benefit ratio of 2.57 and a positive present net value. While this harvests a lower volume amount than alternative 3, it has a high cost benefit ratio due to the reduced sale preparation costs, lack of underplanting and no wildlife habitat projects. Estimated payments to counties with the 25% Fund, based on recent bid values, would be $120,757. Actual payments generated would depend on stumpage prices in the year of offer.

**Alternative 3**
Alternative 3 has the lowest benefit/cost ratio and a lower positive present net value because of the increased sale preparation costs, the associated underplanting and wildlife habitat improvement projects. Estimated payments to counties with the 25% Fund, based on recent bid values, would be $17,278. Actual payments generated would depend on stumpage prices in the year of offer.

**Cumulative Effects**
Within the Walker Conifer Thin project area there have been economic benefits from several timber Forest Service sales over the last five years. There also have been periodic sales on state, county and tribal lands over the past five years in the project area. These sales are of unknown economic value.

Payments to counties from timber sale receipts for 2003 from the 25% Fund on the Chippewa National Forest were $717,683. Future economic impacts are expected from harvest activities on other ownerships in the project area.

## 3.9 Other Disclosures
Due to Forest Plan Standards and Guidelines and existing laws, the proposed action and other alternatives would have limited or no impact on the following resources.

**Regeneration Harvest Cutting Methods and Optimality and Appropriateness of Even Age Management**
The National Forest Management Act states, "When timber is to be harvested using an even-aged management system, a determination that the system is appropriate to meet the objectives and requirements of the Forest Plan must be made and where clear cutting is to be used, it must be determined to be the optimum method."

Regeneration is not an objective with this project, consequently, there are no clearcutting or other regeneration harvests planned.

Stands proposed for treatment are even-aged, most of them plantations that were established 25-60 years ago. Commercial thinning treatments proposed would maintain the even-aged character of the stands, but in the process of planting conifers at low densities to increase diversity, it may be possible to move towards uneven-aged management in future entries.

**Air Quality**
Air Quality was not raised as an issue, but particle emissions from prescribed burning and wildfires can impact human health and smoke can reduce visibility. The Clean Air Act is the primary instrument for air resource management. The EPA has issued an interim policy on wild-land prescribed fire to address the impacts of air pollutant emissions from prescribed fire. They established six criteria for National Ambient Air Quality Standards for fine particles. Geographic regions of the country are classified by level of air quality protection they need and designated as a Class I, Class II or Class III air-shed, Class I is the most restrictive and Class III is the least restrictive. The Chippewa is in a Class II air shed.

The prevailing winds on the Forest are from the west and northwest to the east. The smell of smoke as well as visible particulates from burning agricultural fields in Canada is occasionally experienced across the Chippewa National Forest. Smoke from prescribed burning does affect air quality. Depending on fuel moisture and weather, smoke from prescribed burning can last up to eight hours after ignition. Where there are large concentrations of slowly smoldering, wet slash piles, the smoke may last up to a month; however, the smoke is usually localized near the burn piles. Because prescribed burns are controlled, they generally diminish air quality for shorter periods of time than wildfires.

**Cultural Resources**
The National Historic Preservation Act establishes a requirement for consideration of potential impacts to historic properties. Field surveys were completed. Results of the surveys must receive concurrence from The Minnesota State Historic Preservation Officer and the Leech Lake Band of Ojibwe Tribal Historic Preservation Officer. If a cultural resource site was located in or adjacent to a harvest unit or temporary road, the area of activity would be moved to avoid any effects. Therefore, no cultural resource sites would be affected by any of the proposed actions.

Information concerning the locations and nature of cultural resource sites is protected from public disclosure by the National Historic Preservation Act, the Archeological Resources Protection Act, and is exempt from information requests under the Freedom of Information Act**.**

**Environmental Justice**
Executive Order 12898 requiring Federal Actions to address environmental justice in minority populations and low-income populations was approved on February 11, 1994. The responsible official must consider demographic, geographic, economic, and human health risk factors when conducting and documenting an environmental analysis.

The project area lies within Cass County of Minnesota. Under Executive Order Number 12898– Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, when low-income or minority populations of the affected area or the county are greater than twice the state percentage for low-income or minority populations, an assessment must be conducted. In MN, twice the state percentage is 17.4 percent for low-income and 11.0 percent for minority populations. Since Cass County is 15.3 percent low income and 13.5 percent minority, it exceeds twice the state percentage for minorities. This environmental assessment

incorporates an analysis of issues, concerns, and effects that may be specific to Environmental Justice in the following ways**:**

- Scoping of Ojibwe communities through news releases, letters, and presentations at several Local Indian Council meetings.
- Consultation with the Tribal Historic Preservation Office.
- Archaeological and traditional cultural property surveys were conducted to ensure three would be no effect to sites.

The minority population in the vicinity of the project area is predominately Ojibwe Indian, as a portion of the project area falls within the Leech Lake Reservation. Native American communities included are Cass Lake, Onigum, Kego Lake/Smokey Point, Sugar Point, Oak Point, and Bena. Many other Native American households are scattered throughout the forest and near or within the project area. Tribal members and local residents use the project area for hunting, recreation and gathering activities. The action alternatives include treatments to improve species and wildlife diversity.

The proposed activities are consistent with activities that have been taking place on the National Forest for decades and their environmental effects are predictable. The activities proposed would not result in demographic changes such as displacement of minorities, geographic changes such as land use, or economic hardship such as an increase in taxes. The alternatives would not have negative effects on public health and may have beneficial effects such as increased opportunities for wildlife or berries. None of the alternatives would impose a hardship on minorities, low income people, or local communities and would not produce hazardous waste or conditions that might adversely effect local populations.

**Civil Rights**

Forest service activities must be conducted in a discrimination-free atmosphere. Contract work that may be generated from the decision would include specific clauses offering civil rights protection. The Forest Service would make a concerted effort to enforce these clauses.

# CHAPTER 4: LIST OF PREPARERS AND CONTRIBUTORS, AND OTHERS CONSULTED

Forest Service Interdisciplinary Team:

Millie Baird, Transportation Planner
Sharon Klinkhammer, Team Leader and Silviculturist
Alan Williamson, Wildlife Biologist
Gary Roerick, Fuels Specialist
Chantel Cook, Fisheries Biologist
Jim Barott, Soils Scientist
Cindy Miller, Natural Resources Operations Team Leader
Mike Martin, Recreation Program Manager

Other Forest Service Contributors:

Mark Van Tassel, Timber Specialist
Jan Geerdes, GIS Technician
Ray Newman, Botanist
Darren Buckentin, Sale Administrator
Andrea LeVasseur, Archeologist
Mitch Bouchnonville, Public Services Team Leader
Tom Schackman, Recreation Technician
Brian Palik, North Central Research Station
Steve Katovich, State and Private Forestry

Others Consulted:

United States Department of Interior Fish and Wildlife Service
Leech Lake Band of Ojibwe Department of Resource Management
Local Indian Councils
Leech Lake Band of Ojibwe Tribal Historic Preservation Office
Minnesota State Historic Preservation Office