3.8 Wildlife

Summary

This section covers the effects on the wildlife resource that would result from the implementation of each alternative. The analysis highlights beneficial, negative, and/or important differences that would result from implementing each alternative. The determination of effects shows that each alternative provides for viability and distribution of all species consistent with the 2004 Land and Resource Management Plan (Forest Plan); however, Alternative 1 would make it difficult to be consistent with the Forest Plan direction (for the DRW Landscape Ecosystem) because it would maintain more than desired amounts of mature and older Upland Forest (MIH 1) and would not create young upland forest.

Introduction

Land management activities such as timber harvest, road construction, and road use can affect wildlife and the habitats they depend on. In addition, regulations (National Forest Management Act and Forest Plan 2004) specify that National Forests are managed for the full array of rare to common species and habitats. This analysis considers the effects to wildlife and wildlife habitats. The wildlife resource is complex and the analysis considers many indicators to assess effects to wildlife and habitat. These indicators correspond to many of those used in the Forest Plan Final EIS to analyze impacts to species and assess species diversity and viability. The background and rationale for this analysis approach is summarized in Forest Plan FEIS Volume 1, p. 3.3.0-1 to 3.3.0-2 and is documented in detail in Forest Plan FEIS Volume II, pages B-24 to B-31.

This resource analysis has been organized into three sections based on the following analysis groups.

3.8.1 Management Indicator Habitats (MIH 1-13). This includes Forest Type and Age Indicators (MIHs 1-10) and Spatial Patterns Management Indicator Habitats (MIH 11-13). This section also includes discussion on **Management Indicator Species (MIS): white pine.**

3.8.2 Regional Forester Sensitive Species. This section will contain a brief summary and the full Biological Evaluation on Regional Forester Sensitive Species. The **Management Indicator Species: goshawk, bald eagle and gray wolf,** are covered within this section.

3.8.3 Threatened and Endangered Species. This section will contain a brief summary and the full Biological Assessment of threatened and endangered species. **Management Indicator Species: gray wolf** is found in this section.

These sections incorporate analysis and discussion of the significant issue identified during public scoping (see Chapter 1, pg. 1-25) as Alternative 3 was developed specifically to address this issue.

3.8.1 Management Indicator Habitats

3.8.1.1 Analysis Methods

Management Indicator Habitats
Overview

The Forest Plan identifies Management Indicator Habitats (MIH) to represent the major biological communities on the National Forest that are most affected by our management activities. Management Indicator Habitats provide a broad-scale look and assumes that their representation will provide habitat for as many species as possible. Further, analysis of MIH provides a practical and efficient approach to assessing the effects on thousands of species that are found on the forest. Management Indicator Habitats in combinations with management and analysis for individual species (such as Management Indicator Species, threatened, endangered and sensitive species, and other species of interest) provide a means for assessing species viability and habitat distribution.

Table 3.8.1 Management Indicator Habitats

MIH #	MIH Name	Measure
Forest Type and Age Indicators		
1	Upland Forest	Acres and Percent
2	Upland Deciduous Forest[1]	
3	Northern Hardwood Forest[2]	
4	Aspen-birch Forest	
5	Upland Conifer Forest	
6	Spruce-fir Forest	
7	Red and White Pine Forest	
8	Jack Pine Forest	
9	Lowland Black Spruce-Tamarack Forest	
10	Riparian Upland Forest[3]	
Forest Spatial Pattern indicators		
11	Upland Edge Habitat (management-induced)	Miles/sq. mile
12	Upland Interior Forest Habitat	Acres
13	Large Patches of Upland Mature Forest	Acres

[1] Not analyzed in the Border Project because MIH 4=MIH 2 in this Project area.

[2]Not analyzed in the Border Project because less than 2% of the Project area Federal Lands is in this forest type (830 acres) and no treatments are proposed in them.

[3] Not analyzed in detail because no activities are proposed in the habitat that would result in change to forest type or age.

Management Indicator Habitats are generally divided into two broad groups. Indicators that address the amount of various forest types and ages are indicator habitats 1 thru 10. Those that address habitat spatial patterns are indicators 11 thru 13. A list of all Management Indicator Habitats is provided in Table 3.8.1.

The Forest Plan provides objectives for all Management Indicator Habitats and assumes that moving toward them will achieve long-term desired conditions for amounts, quality, and distribution of habitats along with their associated species. In this analysis, those Management Indicator Habitats identified during mid-level analysis as areas for this Project to focus on are compared by alternative and measured against Forest Plan objectives.

The interdisciplinary team identified differences between the existing and desired condition and identified several opportunities within the Border area to contribute to forest-wide objectives. Specifically, the objectives addressed by the Border Project were to promote mature forest patches and interior forest, reduce edge (fragmentation) and increase patch size, maintain red and white pine patches, increase young jack pine, spruce, aspen and red/white pine, decrease old aspen-birch, and mature upland spruce-fir, and to increase overall acres of conifer by converting aspen-birch to jack pine, spruce or red/white pine.

Forest Type and Age Management Indicator Habitats (MIH 1-10)

Management Indicator Habitats 1-10 measure acres and percent of young, sapling/pole, mature, old/old growth, and multi-aged forest in 10 different categories: Upland Forest, Upland Deciduous Forest, Northern Hardwood Forest, Aspen Birch Forest, Upland Conifer, Spruce-fir Forest, Red and White Pine Forest, Jack Pine Forest, Lowland Black Spruce Tamarack and Upland Riparian Forest. These indicators allow us to analyze the amount, distribution, and trends of forested habitat types for a wide variety of species.

Sapling /pole aged forest will not be discussed in detail as the Forest Plan does not provide objectives for this age group. MIH 2, Upland Deciduous Forest, will not be analyzed in detail. It would be redundant, as all the Upland Deciduous Forest where there would be treatments is Aspen-birch Forest (MIH 4). Also, Northern Hardwoods (MIH 3) will not be analyzed as less than 2% of the Project area federal lands are in this forest type (830 acres) and no treatments are proposed in them. Also, Upland Riparian Forest (MIH 10) will not be analyzed in detail because no activities are proposed in this habitat that would result in change to forest type or age. Appendix I, Table I-4 provides detailed data on existing condition (and by alternative) of the Forest Type and age MIHs in the Project area.

Forest Spatial Patterns Management Indicators (MIHs 11-13)

Spatial pattern Management Indicator Habitats (MIH 11-13) measure the amount of large, mature patches; interior habitat; and the density of edge habitat. These indicators allow us to address the size, shape and arrangement of habitats. This is important because some species require or benefit from specific spatial arrangements, including large patches of contiguous habitat, linkages of habitat patches, or juxtaposition of patches.

Management Induced Edge (MIH 11) Management Indicator (MIH) 11 provides a measure of intensity of habitat fragmentation resulting from forest management activities.

It measures edge density (mile/square mile) of young forest (age 0-9 for uplands and 0-19 for lowlands). The perimeter of young forest stands created by management (i.e. even-aged timber harvest) was measured and a density estimate was calculated for upland and lowland forests for each alternative. This indicator allows for evaluation of species of management concern that benefit or are negatively impacted by edge habitat. Examples of affected species include most game species associated with hunting opportunities such as deer, moose, and American woodcock. Others include heather vole, American redstart, and a suite of sensitive moonwort. Species potentially negatively impacted by MIH 11 include those species associated with MIH 12 (see below).

Amount of Upland Mature/Old Forest (MIH 12)

Management Indicator (MIH) 12 is the amount of mature upland forest interior habitat. Forest interior habitat is used as an indication of habitat quality and the extent of large forest patches in a landscape (Sachs et al. 1998). Forest interior habitat was calculated by buffering inward 100 meters (328 feet) from the edge of all forest patches in existing and predicated large mature patches. This indicator allows for evaluation of species of management concern that are known or thought to benefit from environmental conditions associated with interior forest conditions. Examples of affected species include northern goshawk, black-throated blue warbler, bay-breasted warbler, Connecticut warbler, boreal owl, pileated woodpecker, goblin fern, and ram's-head lady's slipper. Species potentially negatively affected by large patches and interior forest habitat include those species associated with MIH 11 (see above).

Size and Amount of Old/Mature Large Forest Patches (MIH 13)

Management Indicator Habitat (MIH) 13 is a measure of the size and amount of large (300 acres or larger) mature/old upland and lowland forest patches. This indicator allows evaluation of species of management concern that are known or thought to benefit from environmental conditions such as interior forest, connected habitats, and patterns that emulate natural disturbances. Species potentially benefiting from a large amount of old/mature forest patches include those species listed for MIH 12, while species potentially negatively impacted by a large amount of old/mature forest patches include those species listed for MIH 11.

A more complete description of each Management Indicator Habitat and its associated suite of wildlife species can be found in the Forest Plan Final Environmental Impact Statement (FEIS) Volume I pages 3.3.1-1 to 3.3.1-62, 3.3.2-1 to 3.3.2-8 and Volume II Appendix D pages D-1 to D-70. In addition, documentation of the selection process is described in greater detail in Forest Plan FEIS Volume II, pages B-24 to B-31.

3.8.1.2 Analysis Area

Site level

The Analysis Area for direct, indirect, and cumulative effects is the Border Project area boundary. This scale is appropriate because it encompasses sufficient habitats for multiple wildlife species to complete the needed analysis and allows us to measure the site-specific effects of management action. Effects analysis and comparison of each alternative is made for the year 2014. This time scale is chosen because it is reasonable to assume that the Border Project would be implemented within this timeframe and

expected effects would have occurred. Further, this is an appropriate time scale for cumulative effects because it allows for the most realistic prediction of projects in the reasonably foreseeable future.

The cumulative effects take into account past, present, and reasonably foreseeable future projects on all ownerships. See Appendix G for a list and discussion of actions accounted for and/or considered.

Landscape level

This analysis scale allows for comparisons to Forest Plan predicted effects and movement toward
objectives for the first decade of Forest Plan implementation. The Analysis Area for Forest Type and Age Management Indicator Habitats for this project is National Forest System lands in the Jack Pine Black Spruce, Dry-mesic Red and White Pine, and Lowland Conifer Landscape Ecosystems (see Forest Plan pg 2-57 for a map of Landscape Ecosystems). These landscapes are chosen because they are the landscapes that this Project would affect.

For spatial pattern Management Indictor Habitats, the landscape level Analysis Areas are Zone 1 and Zone 3 as described by the Forest Plan (see Forest Plan pg 2-25 for a Zone map). These spatial zones of analysis are appropriate because parts of these zones fall within the Project boundary. The time scale used for landscape level analysis is the year 2014. This time scale is appropriate because it allows for direct comparisons with objectives and predicted effects from the first decade of forest plan implementation. The Forest Plan states that the MIH objectives are for National Forest System lands only, outside the Boundary Waters Canoe Area Wilderness. The objectives were developed considering the conditions of the wilderness and the conditions of other ownerships. (Forest Plan p.2-55. See also Forest Plan Final Impact Statement Appendix D.)

3.8.1.3 Affected Environment

The existing mix of forest types, ages, size, shape and arrangement of habitats are the result of past land-management practices (primarily timber harvest), and natural processes (such as vegetation succession, fire, wind, insects and disease) over the past 100 years.

Forest Type and Age Indicator Habitats (MIH 1-10)

Site level (see Tables 3.8.2 - 3.8.5, see also Appendix I; Table I-4 for complete Project-wide data for MIHs 1-10)

Mature and older forest habitats dominate in the Border area. Five percent of federal lands are currently young and there is no young forest in the northeast third of the Project area. This young forest habitat is primarily aspen-birch or white pine. The uplands are a near even mix of deciduous forest (almost exclusively aspen-birch) and conifer forest. Both of these habitat types are common and well distributed. The amount of aspen forest is a product of past logging practices and is in greater abundance than would exist under natural conditions. In order of abundance, the upland conifer is made up of; red and white pine forest, jack pine forest and spruce-fir forest. Young forests of spruce-fir are rare and young jack pine is non-existent. Very little jack pine is found in the southern third of the

Project area. Lowland conifer is scattered in small patches throughout the Project area. This lowland conifer is overwhelmingly mature or older in age.

In general, conditions in the uplands favor species that prefer mature or older aspen-birch forest such as; goshawk, boreal owl, pine marten, blue-spotted salamander, pileated woodpecker, black-throated blue warbler, three-toed woodpecker, bay-breasted warbler, and various other songbirds.
Small scattered patches of young forest provide habitat for species who favor those conditions such as deer and moose (foraging), ruffed grouse, woodcock, gray wolf, lynx (foraging), ringneck snake, veery, mourning warbler, and various other songbirds.
Abundant pole to mature upland conifer favors species that utilize conifer habitat: lynx, three-toed woodpecker, black backed woodpecker, bay-breasted warbler, moose and deer (thermal cover) and various songbirds.
Conditions in the lowlands favor species who utilize mature and older forest: boreal owl, Connecticut warbler, black backed woodpecker, great gray owl, spruce grouse, and various songbirds. However, the lack of any large contiguous patches of mature and older forest may limit the benefits to many of these species. The lowland conifer component of this project is very small and any contribution to forest wide objectives would be minimal. Appendix I, Table I-4 provides detailed data on existing condition (and by alternative) of the MIHs in the Project area.

Landscape level (see Tables 3.8.6 and 3.8.7)

The Border Project area contains 21% of the forest-wide Dry-mesic Red and White Pine (DRW) Landscape Ecosystem (LE) and only 2% of the forest-wide Jack Pine Black Spruce (JPB) Landscape Ecosystem. For this reason, the Project would primarily affect change in the DRW LE.

In the DRW and the JPB Landscape Ecosystems, more aspen exists than would have existed under natural conditions. In addition old aspen is more prevalent than desired while young jack pine and red and white pine forests are less prevalent than desired. For both LEs, this project identified timber harvest of old aspen and conversion of aspen to conifer as the priority need/opportunity to address these imbalances.

In the DRW there is currently some upland conifer forest types (spruce fir, red and white pine) that are above desired levels in the mature age class but these could eventually grow into the older age classes and help meet desired objectives for increases there. While there may be some treatments proposed in these mature stands it was not seen as a priority need.

In the JPB more old aspen and jack pine exists than is desired while young jack pine and aspen forests are less prevalent than desired. For the JPB, timber harvest of old jack pine and aspen was identified as a need/opportunity to address these imbalances. Mature spruce-fir exceeds desired levels but could eventually grow into the older age classes and help meet desired objectives for increases there. While there may be some treatments proposed in these mature stands it was not seen as a priority need

In general, the current conditions mean that species such as spruce grouse, goshawk, pine marten and pileated woodpeckers have more access to needed habitat and species such as moose, deer, woodcock and a variety of song birds that use younger forest may have under-represented habitats.

To move towards Forest Plan objectives the Border Project focuses on the following:

In the DRW LE:
- Increase young jack pine
- decrease old aspen
- decrease old jack pine
- convert aspen to conifer

In the JPB LE:
- increase young jack pine
- increase young aspen
- decrease old aspen
- decrease old jack pine

Forest Spatial Pattern Indicators (MIH 11-13)

Site Level (see Table 3.8. 8)

MIH 11 –Currently in the Project area, there is 1.41 miles/square mile of management induced edge in the uplands, and 0.02 miles/square mile in the lowlands (Table 8). The higher number in the uplands is a result of, in part, increased harvest activity associated with past projects in the upland forest types within the Border Project. There has been very little management associated with lowland forest types in the recent past, therefore, creating less of an edge effect. Forest Plan objective for MIH 11 is to reduce the amount of forest edge created through vegetation management activities, while still retaining a range of small patches and edge habitat. This direction would result in a decrease in fragmentation and would benefit those species needing conditions such as interior forest habitat (MIH 12) and large areas of mature habitat (MIH 13).

MIH 12 - (See Table 3.8.8) The current amount of Mature Upland Forest Interior Habitat in the Project area is 8,410 acres. This is split between Zone 3 (7,897 acres) and Zone 1 (513 acres). Forest Plan direction for MIH 12 is broken down into three spatial management zones that have been identified across the forest. The Border Project falls within Zone 1 and 3 (see Forest Plan p.2-24 to 2-27 for more information on spatial zones), with the majority being in Zone 3. In Spatial Zone 1 Forest Plan direction is to maintain or increase amount of interior habitat. In Zone 3 Forest Plan direction is to strive to minimize decrease in interior habitat. Maintaining or increasing mature upland forest interior habitat would be a benefit to species that are known or thought to benefit from environmental conditions associated with interior forest conditions.

MIH 13 – Large mature upland forest patches are well represented and distributed at the site level. The Project area currently contains all or part of 18 large (> 300 acre) mature upland patches (17 in spatial Zone 3, and one in spatial zone 1), and no large (> 300 acre) mature lowland patches (Table 8). This Project area does not contain large patches or complexes of lowland habitat. Most lowland mature patches are less than 100 acres in size. However, these smaller patches are well distributed across the Project area. The lack of large mature lowland patches in the area has little to do with past management, but rather is tied to the landform that the Project area is found on (i.e. the geomorphology of the Project area does not lend itself to having large complexes of lowlands).

In Spatial Zone 1 Forest Plan direction is to maintain a minimum of 44,700 acres in patches > 300 acres. This project has little opportunity to affect spatial patterns in Zone 1, given land ownership patterns and forest age distribution. Border is currently contributing 1 (> 300 acre) patch toward this Zone 1 objective. However, analysis (during mid-level) shows that succession will change the age distribution and this patch will be reduced below 300 acres and the Border area will no longer contribute to this objective.

In Zone 3, Forest Plan direction is to strive to minimize decrease in acres and numbers of patches of mature or older upland forest in patches $\geq$ 300 acres.

Additional Information on Site Level Spatial Patterns

Beyond direction for MIH 11-13, the Forest Plan contains additional direction on spatial patterns (pgs. 2-24 to 2-27, 2-35). Below are some important features of the Border area which affect habitat suitability for wildlife species.

Young lowland patches are rare (only 1) and are not greater than 40 acres. The lowland conifer component of this Project is very small and contribution to forest plan objectives would be minimal. The Project area lacks large lowland patches; thus, can do little to effect patch habitat or lowland edge density. Therefore, lowland spatial pattern Management Indicator Habitats will not be discussed further.

There are two mature patches greater than 1000 acres in the Border area. Much of the eastern boundary of the Border area abuts the Boundary Waters Canoe Area Wilderness (BWCAW), and the entire northern boundary abuts Voyageurs National Park. One of the 1000+ acre patches is located along the boundary with the BWCAW (no treatments planned within). In general, this area and the western /northwestern part of the Project area (where the other 1000 acre patch is located) are dominated by larger patch sizes and contains the best quality interior forest habitat. Goshawk, black-throated blue warbler, bay-breasted warbler, boreal owl, Canada lynx and three-toed woodpecker are some of the species that benefit from this large patch habitat condition. The rest of the Project area is more fragmented so contains fewer and smaller mature patches these conditions favor species that do not require large patch conditions.

The Project area contains 16 mature red and white pine patches greater than 100 acres and three greater than 300 acres. All of the greater than 300 acre patches would be maintained.

Within the Project area, young patches are generally small with an average size of 26 acres. This lack of large patches of young habitats may negatively affect species such as olive-sided flycatcher, white-tailed deer, moose, red fox, and ruffed grouse. However, small patch conditions tend to inflate management induced edges which benefit American redstarts, chestnut-sided warblers and most game species. These young patches are not found in the northeast third of the Project area, but are well distributed throughout the remainder.

Priority needs/opportunities were identified by the Border area mid-level assessment to address Forest Plan desired conditions. These opportunities were used in the development of the alternatives. One opportunity was to reduce edge and create larger patches of young forest by harvesting smaller stands adjacent to recently cut areas. Other priorities identified included: maintaining the two 1000+ acre patches, all of the >300 acre red and white pine patches and most upland patches > 300 acres. Another opportunity was to maintain good distribution of existing large mature upland patches throughout the Project area (for species such as the goshawk and black-throated blue warbler). Also the IDT team targeted for harvest only those patches which analysis showed were going to succeed to younger forest within a ten year window anyway and also “fingers” of patches or long skinny patches which although model parameters identified as patches, in reality provided little to no interior forest habitat.

Landscape level (see Tables 3.8.9 and 3.8.10)

The Border Project area includes parts of Spatial Zones 1 and Zone 3 as described by the Forest Plan (see Forest Plan pgs. 2-24 to 2-27, 2-35, pg 2-25 for a Zone map). Zone 3 is proximate to the BWCAW and is ecologically similar. Zone 1 is physically distant from the BWCAW and has more interspersed ownership patterns.

Forest spatial patterns have been changed by past land use in these zones. Primarily due to the harvest of small blocks, lands have a high degree of forest fragmentation resulting in high levels of forest edge and smaller amounts of large mature patch and interior forest habitat. This created an abundance of habitat conditions which favor wildlife species that use edge habitat such as deer, heather voles, woodcock, red fox, American robin, rose-breasted grosbeak, brown-headed cowbirds, olive-sided flycatchers, American redstarts, chestnut-sided warblers, and other songbirds. In turn, habitat for species that require large patches of mature forest such as goshawks, boreal owl, lynx, black-throated blue warblers, bay-breasted warblers, three-toed woodpecker, Connecticut warbler and various other species is less well-distributed and is underrepresented on the landscape.

The desired Forest Plan condition is that forest spatial patterns emulate landscape scale patterns that would result from natural disturbances and other ecological processes. Forest Plan objectives include providing habitat connectivity, as well as large mature and older patches that provide interior forest habitat. In addition, the plan calls for the creation of temporary forest openings that range in size from one to one thousand acres, in order to maintain young forest on the landscape for those species that require it and to reduce forest fragmentation. Forest Plan objectives are to increase the average size of temporary openings and reduce the amount of forest edge. Large mature red and white pine patches are rare across the forest and there is an objective to maintain them.

Table 3.8.9 and Table 3.8.10 display the current conditions of MIHs 11-13 at the landscape level and the Forest Plan direction for each. In general, from Forest Plan condition in 2004 to existing condition, the amount of management-induced edge has decreased, Zone 3 interior habitat has increased and the acres of large mature patches ($\geq$ 300 acres) have increased. In other words, movement toward Forest Plan desired conditions for forest spatial patterns is occurring. In contrast, interior forest has decreased in Zone 1 which is not in accordance with Forest Plan direction.

3.8.1.4 Environmental Consequences

Site Level Direct, Indirect, and Cumulative Effects to MIHs 1-10

Alternative 1
No Action

The environmental consequences of the no action alternative would be that natural succession would reduce the amount of young Upland Forest in the Project area to about 2% of the Project area federal lands (Table 3.8.2). These declines would come mainly as a result of young aspen-birch (MIH 4) and red and white pine (MIH 7) growing into sapling /pole age, leaving both of these habitat types at around 1% of the federal lands in the Project area. Young jack pine (MIH 8) and spruce-fir (MIH 6) would continue to be rare or non-existent on federal lands in the Project area (see Table 3.8.5). This could negatively affect species that utilize young upland forest, such as deer and moose (foraging), ruffed grouse, woodcock, gray wolf, lynx (foraging), and various songbirds; and further favor species which utilize mature and older forest such as spruce grouse, goshawk, pine marten and pileated woodpeckers.

Table 3.8.2 Declines in Young Forest MIHs – Alternative 1				
Young Age Forest	2007 Border Area Existing Condition		Condition in 2014	
			Alternative 1 (no action)	
	Acres	%	Acres	%
Upland Forest – MIH 1	2,756	6.1	1,023	2.3
Aspen-birch Forest – MIH 4	1,331	3.0	588	1.3
Red and White Pine Forest – MIH 7	1,324	3.0	334	0.7

% = percent of forested upland

In addition to declines in young forest, mature and older Upland Forest would decline as old stands break apart and succeed into younger (sapling/pole-age) forest. This would mainly result in old aspen birch naturally converting to spruce-fir forest (Table 3.8.3). Long term as this forest matures this could favor species that utilize spruce-fir forest (Lynx, three-toed woodpecker, bay-breasted warbler, moose and deer (thermal cover), blackburnian warbler, Swainson's thrush etc.).

Table 3.8.3 Acres of Aspen-birch and Spruce-fir Habitat – Alternative 1				
Total Acres of the MIH	2007 Border Area Existing Condition		Condition in 2014	
			Alternative 1 (no action)	
	Acres	%	Acres	%
Aspen–birch – MIH 4	23,402	52.2	21,173	47.2
Spruce-fir – MIH 6	2,299	5.1	4,901	10.9

% = percent of forested upland

Alternatives 2 and 3

As a result of harvest, and the return of harvested areas to young aged habitat, the main effect of the action alternatives would be an increase in young upland forest and a decrease in mature and older uplands compared to the no action alternative (Table 3.8.4). Alternative 2 would result in the biggest change and alternative 3 the smallest. This would positively affect species that utilize young upland forest, such as deer and moose (foraging), ruffed grouse, woodcock, gray wolf, lynx (foraging), and various songbird; and negatively affect species which utilize mature and older forest, such as spruce grouse, goshawk, pine marten and pileated woodpeckers. However, in general with alternatives there would still be adequate and well-distributed habitat for the species which utilize mature and older forest.

Table 3.8.4. Management Indicator 1, Upland Forest Under all Alternatives						
Upland Forest (MIH 1)	Condition in 2014					
	Alternative 1 (no action)		Alternative 2 (proposed action)		Alternative 3	
	Acres	% *	Acres	%*	Acres	%*
Young	1,023	2.3	9,143	20.4	7,936	17.7
Mature+ (mature, old forest /OG)	26,960	60.1	19,696	43.9	20,703	46.1

* percent of forested upland

Both action alternatives would create young jack pine, aspen-birch, spruce-fir, and red and white pine forest, through harvest of mature and older forest (Table 3.8.5). Young aspen-birch stands would be created this way through natural regeneration after harvest. Young conifer forest would be created through natural regeneration after harvest and/or through planting. Alt. 2 would restore the most acres to conifer, thus favoring species who utilize young forest of this type such as Nabokov's blue butterfly, alder flycatcher, moose and deer, tiger beetle, spruce grouse and various songbirds. In the long-term, this alternative also provides the most benefit to species that use mature and older conifer the three-toed woodpecker and Connecticut warbler.

Table 3.8.5 Young Forest Under All Alternatives						
Young Forest MIH	Alternative 1 (no action)		Alternative 2 (proposed action)		Alternative 3	
	Acres	% *	Acres	%*	Acres	%*
Aspen-Birch Forest - MIH 4	588	1.3	4,353	9.7	3,700	8.2
Spruce-fir Forest - MIH 6	101	0.2	1,544	3.4	1,303	2.9
Red and White Pine Forest – MIH 7	334	0.7	1,824	4.1	1,720	3.8
Jack Pine Forest - MIH 8	0	0.0	1,423	3.2	1,212	2.7

* percent of forested upland

All other Management Indicator Habitat age groups would occur in roughly the same ratios and have the same effects to species as the no action alternative. Complete data on all Management Indicator Habitats is located in Appendix I, Table I-4. For more species specific effects analysis see also the Biological Evaluation (Section 3.8.4) for effects to sensitive species and Management Indicator Species, and the Biological Assessment (Section 3.8.5) for effects to threatened and endangered species

Site-level Cumulative Effects to MIH 1-10

Currently there is 4,914 acres of young forest in the Border area. There are approximately 754 acres on state land, 1,284 acres on St. Louis County land, 121 acres on private ownerships and 2,756 acres on federal lands within the young (zero to nine-year-old) age class. Non-federal lands also currently provide a mosaic of patch ages and sizes, and patch sizes remain relatively small due to the mix of ownerships.

Amount of young forest provided by other ownerships within the project boundary would decrease by almost 60% during the analysis timeframe, leaving only 890 acres of young on other ownerships (See Section 3.7 Vegetation, Tables 3.7-8 to 3.7-9). This

could have negative effects on species who utilize young forests; however, under the action alternatives any negative impacts would be more than offset by the considerable increase in young forest on federal lands. Harvests on non-federal lands are not expected to have adverse cumulative affects on the overall desired ecosystem conditions of Management Indicator Habitats in the Border Project area. By themselves, harvested areas on other ownership would continue to be small and tend to contribute to fragmentation in the Border area.

There is no projected change in species composition on other ownerships within the Project area during the analysis timeframe (Section 3.7 Vegetation).

The other projects listed in Appendix G, such as fuel treatment projects, land conveyances or changes resulting from the travel management project, would be unlikely to contribute to cumulative effects because these other projects do not propose to change the vegetation age classes or species composition.

Landscape Level (comparison to Forest Plan objectives and expected effects MIH 1-10)

Alternative 1
No Action

Dry-mesic Red and White Pine Landscape Ecosystem

Table 3.8.6 displays Forest Plan objectives and the effect of Alternative 1 (no action) on Forest-wide Management Indicator Habitat objectives for upland forest, aspen-birch forest, upland conifer, upland spruce-fir, red and white pine, and jack pine forest. These indicator habitats are displayed because they are the only MIHs that would be impacted by the Border Project. Table 3.8.6 also compares it to Alternative 2, the alternative with the greatest effects to indicator habitats.

Table 3.8.6. Forest-wide Status of Management Indicator Habitats in the Dry-mesic Red and White Pine Landscape Ecosystem

MIH Number and Description		Age Groups	2004 condition (Acres)[1]	FP Decade 1 (2014) Objective[2]	Projected 2014 acres[3] (with no action Alt.)	Projected 2014 Acres[4] (with Border Alt. 2)
1	Upland Forest	Young	21,400	-	9,430	16,617
		Mature	52,100	-	38,511	38,366
		Old/Old Growth and multi-aged	51,400	+	61,410	55,198
4	Aspen-birch	Young	11,900	-	4,641	7,991
		Mature	27,100	-	11,417	11,317
		Old/Old Growth and multi-aged	37,800	-	41,354	37,061
5	Upland Conifer	Young	9,500	-	4,789	8,626
		Mature	23,200	-	24,963	24,918
		Old/Old Growth and multi-aged	13,700	+	20,009	18,090
6	Upland Spruce-Fir	Young	3,100	-	1,120	2,414
		Mature	6,100	-	5,372	5,265
		Old/Old Growth and multi-aged	1,700	+	5,438	4,713
7	Red and White Pine	Young	5,300	-	2,521	3,919
		Mature	16,200	-	17,424	17,485
		Old/Old Growth and multi-aged	3,300	+	6,484	6,273
8	Jack Pine	Young	1,100	+	1,148	2,293
		Mature	1,000	+	2,167	2,167
		Old/Old Growth and multi-aged	8,700	-	8,088	7,104

footnotes:

Source: 2004 Forest Plan Condition based on Forest Plan and FEIS. No action and Alternative 2 condition from frozen CDS data August 2007 projected to 2014 with successional model applied and projected foreseeable future federal projects included. See Appendix G for projected future federal projects included.

* Objective from Forest Plan 2004: (+) = increase (-) = Decrease (m) = maintain

The main environmental consequence of the no action alternative would be an increase in older forest habitats while young habitats would decrease at the landscape scale.

In general, these increases in older forest are not contrary to Forest Plan objectives with the exception of aspen-birch forest. The increase in old/old growth aspen-birch in the no action alternative would make it difficult for the Forest to meet Forest Plan objectives for old aspen- birch in decade 1. Especially when one considers that there is only one other

Forest project (Upper Temperance) which could affect the DRW Landscape Ecosystem in this decade (scheduled to begin analysis in 2009). [Upper Temperance is not included in any analysis for this Project as there is no data available yet from this future project].

In addition, mature upland conifer (specifically, red and white pine) would be in greater abundance than Plan direction. This is not considered an issue since Forest Plan direction and 2014 (no action) condition would not be far apart and if allowed to grow these forests would succeed into old growth where objectives are to increase. Positive impacts to species which use this habitat would be minimal.

All other changes to MIHs 1-10 would be consistent with Forest Plan direction.

In general, the environmental consequences of these changes would mean less young habitat available for wildlife species and more old/old growth and multi aged habitats. This would negatively affect species that utilize young upland forest, such as deer and moose (foraging), ruffed grouse, woodcock, gray wolf, lynx (foraging), and various songbirds; and further favor species which utilize mature and older forest such as spruce grouse, goshawk, pine marten and pileated woodpeckers.

Jack Pine Black Spruce Landscape Ecosystem

This section serves as both the discussion of environmental consequences of Alternative 1 (no-action) as well as the effects of Alternative 2. This is appropriate because there is very little difference between alternatives in either acres of MIHs or impacts to associated wildlife species at the landscape scale.

Table 3.8.7 displays Forest Plan objectives and the effect of Alternative 1 (no action) on forest-wide Management Indicator Habitat objectives for upland forest, aspen-birch forest, upland conifer, spruce-fir, red and white pine and jack pine forest. These indicator habitats are displayed because they are the only MIHs that would be impacted by the Border Project. Table 7 also compares effects to Alternative 2 (the alternative with the greatest effects).

As Table 3.8.7 shows (by comparing no action conditions in 2014 to Alternative 2 conditions in 2014), this Project has little effect on Forest Type and Age Management Indicator Habitats in the JPB LE. This is because only 2% of this LE is represented in the Border area.

Table 3.8.7 Forest-wide Status of Management Indicator Habitats in the Jack Pine - Black Spruce Landscape Ecosystem

MIH Number and Description		Age Groups	2004 Forest Plan Condition (acres)	FP Decade 1 (2014) Objective*	Projected 2014 Acres (with no action Alt.)	Projected 2014 Acres (with Border Alt. 2)
1	Upland Forest	Young	21,236	+	25,380	26,218
		Mature	75,800	-	76,475	76,331
		Old/Old Growth and multi-aged	67,700	-	76,621	76,039
4	Aspen-birch	Young	12,200	+	7,106	7,424
		Mature	40,300	-	27,987	27,928
		Old/Old Growth and multi-aged	37,300	-	41,557	41,152
5	Upland Conifer	Young	16,900	+	18,275	18,795
		Mature	34,000	+	46,918	46,833
		Old/Old Growth and multi-aged	30,400	+	35,049	34,871
6	Upland Spruce-Fir	Young	5,700	-	3,381	3,532
		Mature	12,400	-	11,977	11,977
		Old/Old Growth and multi-aged	6,700	+	11,785	11,765
7	Red and White Pine	Young	4,300	-	3,197	3,288
		Mature	12,000	+	19,638	19,554
		Old/Old Growth and multi-aged	1,500	+	3,322	3,322
8	Jack Pine	Young	6,800	+	11,696	11,974
		Mature	9,600	+	15,302	15,302
		Old/Old Growth and multi-aged	22,200	-	19,942	19,784

footnotes:

Source: 2004 Forest Plan Condition based on Forest Plan and FEIS. No action and Alternative 2 condition from frozen CDS data August 2007 projected to 2014 with successional model applied and projected foreseeable future federal projects included. See Appendix G for projected future federal projects included.

* Objective from Forest Plan 2004: (+) = increase (-) = Decrease (m) = maintain

The main environmental consequence of the no action alternative at the landscape scale would be that young forest would increasingly be in the form of upland conifer (with the bulk in the form of jack pine) as young aspen-birch acres shrink. Increases in young upland conifer and jack pine are consistent with Plan direction, however, the decrease of young aspen-birch would be contrary to Forest Plan direction and may have negative environmental consequences to species that utilize young aspen-birch forest, such as deer and moose (foraging), ruffed grouse, woodcock,

gray wolf, lynx (foraging), and various songbirds; and favor species which utilize conifer such as spruce grouse, pine marten and pileated woodpeckers.

In addition, mature and old upland forest and old aspen birch would be more abundant than Plan direction which could favor species such as goshawk and black-throated blue warbler.

All other changes to MIHs 1-10 would be consistent with Forest Plan direction. The main consequences of which would include; more habitat for species which use upland conifer, mature and old red and white pine, mature jack pine and old spruce-fir. There would be fewer habitats for species which use young spruce-fir. Overall, this would further favor species which utilize conifer such as spruce grouse, pine marten and pileated woodpeckers.

Inconsistencies with the Forest Plan are not considered an issue as this Project affords little opportunity to effect change in the JPB LE and future projects in the JPB this decade are expected to move MIHs toward Forest Plan objectives.

Alternatives 2 and 3

Dry-Mesic Red and White Pine Landscape Ecosystem

Table 3.8.6 displays Forest Plan objectives for select Management Indicator Habitats and shows how Alternative 2 helps move them towards those objectives as compared to Alternative 1 (no action). Alternative 3 also would move MIHs toward Forest Plan objectives, however would do slightly less in achieving these objectives, leaving further changes in the DRW this decade up to future projects (Upper Temperance). Only those objectives that the Border Project would impact are displayed in Table 3.8.6. Forest-wide data on all MIHs was available to the planning team as part of the mid-level analysis and is part of the Project Record.

The main effects of the action alternatives would be to decrease old aspen-birch forest. This would meet the Plan objectives for this MIH. Under the no-action alternative this objective would not be met and any changes to aspen-birch in the DRW this decade would be solely up to the Upper Temperance Project. There is no data available for the Upper Temperance Project but it would be difficult for that Project alone to meet decade 1 objectives due to the size of that Project area and the amount of DRW contained within its' boundaries.

The associated effects of decreasing old aspen-birch forest are to increase young forest MIHs. Young aspen-birch, upland conifer, jack pine, spruce-fir, and red and white pine would all increase. Additionally, the project would contribute to decreasing old jack pine. These effects are consistent with Plan objectives and would benefit species that utilize these young forest habitats. This would also mean less available habitat for species that prefer older habitats of these types.

The only inconsistencies with Forest Plan direction in the action alternatives would be that mature upland conifer (specifically, red and white pine) would be in greater abundance than Plan direction (as with alternative 1). This is not considered an issue since Forest Plan direction and 2014 condition

would not be far apart and if allowed to grow these forests would succeed into old growth where objectives are to increase. Positive impacts to species which use this habitat would be minimal.

All other changes to MIHs 1-10 would be consistent with Forest Plan direction.

Jack Pine Black Spruce Landscape Ecosystem

See Jack Pine - Black Spruce Landscape_Ecosystem discussion under Alternative 1 above and Table 3.8.7 for of effects at the landscape level. This section serves as both the discussion of environmental consequences of Alternative 1 (no-action) as well as the effects of Alternative 2. This is appropriate because there is very little difference between alternatives in either acres of MIHs or impacts to associated wildlife species at the landscape scale.

Associated Species Trends

According to the Forest Plan FEIS (pg 3.3.1-2), an important element of the coarse filter approach of managing and monitoring MIHs is monitoring associated species to validate assumptions and predictions about populations and habitat links. The Superior NF and partners such as Minnesota DNR, Natural Resources Research Institute and other researchers work together and address the trends of individual species or guilds of species to provide insight into forest habitat conditions that may be affected by forest management. See the 2006 Monitoring and Evaluation report for some of the many species monitored in conjunction with MIH. On annual to five year timeframes the SNF and our partners continue to actively monitor or inventory a wide array of species. These include the four management indicator species, many breeding songbirds, sensitive species, numerous terrestrial and aquatic game species, and a variety of insects, amphibians, mussels, and non-native invasive species. The 2006 SNF Monitoring Report describes these efforts in more detail. The purpose of monitoring species associated with MIHs is to evaluate our assumptions and predictions about population and habitat links.

Understanding links between population trends of species on the SNF and management impacts is a difficult task. This is because species respond not only to land uses and habitat changes that the SNF affect, but also to factors outside the control of the Forest Service. For example, factors such as weather, climate, land uses in migratory or distant wintering habitat, introduced diseases and pests, hunting, forest fragmentation on other land ownerships can substantially impact populations. Nevertheless, monitoring as many species as reasonable increases the likelihood of detecting those relationships between habitat availability and species abundance that may be due to Plan implementation impacts. Monitoring species also may alert us to management issues of potential concern. The 2006 M&E report concludes that there has been no significant change in species' populations or to environmental impacts assessed in the 2004 Forest Plan revision FEIS due to our management in the first two years of implementation.

Site Level Direct, Indirect, and Cumulative Effects to MIHs 11-13

The direct and indirect effects to Management Indicator Habitats 11-13 as a result of each alternative are displayed in Table 3.8.8. The direct and indirect effects of changes in MIHs 11-13 can vary widely from beneficial to negative, depending on individual species needs and habitat requirements.

The following analysis of direct and indirect effects will briefly explain what the change in each indicator for landscape spatial patterns means to broad groups of species.

Alternative 1 – No Action
Direct and Indirect Effects

MIH 11 – As existing young stands grow older, the no action alternative would result in a reduction in the amount of management induced edge from an existing condition of 1.41 miles/square mile down to 0.60 miles/square mile (Table 3.8.8). This would mean:

1) Increased habitat for species that require interior forest
2) A reduction in edge habitat for those species that use edge, including most game species
3) A reduction in fragmentation across the Border Project.

While management induced edge would drop by over 50% under the no action alternative, one may expect it to drop further simply due to no management taking place over the projection period. Recent past management activity associated with the Holmes/Chipmunk EIS, which overlaps with the Border Project, is likely the reason why management induced edge does not drop lower under the No Action alternative.

Table 3.8.8 Project-wide Spatial Pattern Management Indicator Habitats (11-13)

	Existing Condition	Alt. 1	Alt. 2	Alt. 3
MIH 11 - Density of management induced edge (in mi/sq.mi.)				
Upland	1.41	0.60	3.36	2.99
Lowland	0.02	0.00	0.03	0.03
MIH 12 - Amount of Mature/Old Forest Interior Habitat (in acres)				
Zone 1 Upland	513	398	186	199
Zone 3 Upland	7,897	7,364	5,367	5,633
Total Upland	8,410	7,762	5,553	5.832
Lowland	N/A	N/A	N/A	N/A
MIH 13 - Large (≥300 ac.) Mature/Old Forest Patches (in # and acres)				
Upland	18 (12,842)	15 (10,944)	11 (8,559)	11 (8,913)
Zone 1	1 (406)	0 (0)	0 (0)	0 (0)
Zone 3	17 (12,436)	15 (10,944)	11 (8,559)	11 (8,913)
Lowland	0	0	0	0

***Data Source*:** Existing condition based on August 2007 frozen CDS data. Projected 2014 condition based on 2007 condition grown out for 7 years with successional rules applied and projected foreseeable future federal projects included. See Appendix G for projected future federal projects included. Data does *not* have roads subtracted from interior habitat.

Note on MIH 13: For this analysis the number before the ( ) represents the number of patches with all or a portion of the patch within the Project boundary. The number inside the ( ) displays the acres of those patches within the boundary of the Project area. *i.e.:* if a patch lies on the boundary, with some acres of the patch inside the boundary and some acres in the BWCAW, only the acres inside the Project boundary are counted.

MIH 12 – The no action alternative would result in a decrease of 648 acres of interior Forest habitat as compared to the existing condition (Table 3.8.8). The decrease in acres of interior forest habitat under the no action alternative would be attributed to the succession of some old forest types into younger forest types. An example of this is some of the old jack pine stands within the Project area that would succeed into a 10-20 year old forest of spruce-fir. Less interior habitat in the Project area would mean species that are known or thought to require interior forest conditions would potentially be negatively impacted.

MIH 13 – (See Table 3.8.8) The no action alternative would result in three fewer patches, 15 as opposed to 18, and actually, the total loss of patches is four, however, one large patch breaks apart to form two separate patches. The total amount of acres within these patches would also decrease, going from 12,842 under the existing condition to 10,944 under the no action alternative. The loss of the three patches and the acres associated with them would be due to forest succession as discussed above in MIH 12. Fewer acres within large patches in this alternative would mean fewer habitats for species of management concern that are known or thought to benefit from environmental conditions such as interior forest and connected habitats. Species associated with edge habitat, however, would potentially benefit from these patches succeeding to a younger forest. Also, as these older stands begin to break apart and a new cohort of trees is established underneath, species that benefit from this multi-story canopy structure would potentially benefit. Two species that could benefit from this include the northern goshawk and black-throated blue warbler.

Alternatives 2 and 3
Direct and Indirect Effects

MIH 11 – When compared to the existing condition and the no action alternative, both action alternatives would increase the amount of Upland Management Induced Edge (Table 3.8.8). Management induced edge would be 3.36 miles/square mile for Alternative 2, and 2.99 miles/square mile under Alternative 3. This would benefit species that use edge habitats and young forest, including game species, and could have negative effects to species that require interior forest and mature patches. There could be an increased potential of brown-headed cow bird nest parasitism on forest nesting song birds, or increased competition or exclusion of interior species (i.e. black-throated blue warbler) from species that benefit from fragmented habitats (i.e. American redstarts and chestnut sided warbler).

Management induced edge in lowland forests would increase from 0.02 miles/square mile in the existing condition to 0.03 miles/square mile under both Alternatives 2 and 3. This relatively small increase is due to only 63 acres and 57 acres being proposed for clearcutting under Alternatives 2 and 3, respectively.

MIH 12 – Both action alternatives would lower the amount of acres in interior forest habitat for the Project area (Table 3.8.8). Interior habitat would go from an existing condition of 8,410 acres, to 5,553 acres in Alternative 2, and 5,832 acres in Alternative 3. While Alternative 2 actually harvests more acres than Alternative 3, the configuration of harvests under Alternative 3 is what would lead to fewer acres in interior forest habitat as compared to Alternative 2. As with MIH 11, this loss of acres in interior forest habitat (MIH 12) would benefit species that prefer edge habitat, and would be most detrimental to species that require interior forest habitat.

While there would be a loss of mature interior forest habitat in the near term due to management activities, the interdisciplinary team strived to configure timber harvest units so that **1)** combined harvest units would make for larger upland young patches, and **2)** these combined units would make for a larger patch as they mature, and thus create more nterior forest habitat in the future as opposed to if they were harvested at separate times. This approach will also be discussed below for MIH 13.

MIH 13 – The number of patches, and the acres associated with them would be decreased under both Alternatives 2 and 3 (Table 3.8.8). The number of patches would go from 18 under the existing condition, to 11 under both action alternatives.
Of the seven patches that are lost under Alternatives 2 and 3 as compared to the existing condition, one patch goes away due to succession, while six are harvested. However, of the six that are harvested, three of these would have been lost due to forest succession anyway. The net result is that three patches were lost directly due to management action. The interdisciplinary team strived to minimize the reduction of patches as per Forest Plan direction (Forest Plan, O-VG-23&24, p.2-26 & 2-27), however, it was felt that two patches that were long and skinny in shape, didn't function well as a patch, or provide for interior habitat, and therefore were harvested with some adjacent units in order to provide better habitat in the future. The other patch that was eliminated as a direct result of management activity would have succeeded into a younger age class shortly after the projection period of 2014 ended (would have succeeded by 1017), and therefore was harvested.

Numerous pieces of intact patches were also harvested. These were mainly forest stands that were odd in shape and size, and did not really contribute to the overall patch, or interior forest habitat. These stands often jutted out into adjacent regenerating stands. By harvesting the stands that jut out into regenerating stands, they can later be combined into a more functional patch than what currently exists. By eliminating some of these odd shapes and combining them with other forest stands, they will provide for better patch habitat (i.e. interior forest habitat) in the long term. Acres associated with the patches in the Project area would be reduced from 12,842 under the existing condition, to 8,559 acres for Alternative 2, and 8,913 for Alternative 3. The reduction in acres would be attributed to both the loss of patches and pieces of patches through succession, as well as the harvest of patches and pieces of patches.

Cumulative Effects to MIH 11-13

Before the advent of large-scale logging and fire suppression in the twentieth century, the forests in this area historically consisted of very large patches. Fires created large, even-aged stands of trees, although pockets of surviving trees were common within the large fires, especially along lakeshores. The patch size of disturbances in the Superior National Forest, with the exception of the 1999 blowdown event, and the Cavity and Ham Lake fires, has been getting smaller over the last century. The acreage burned by wildfire during the twentieth century was about one-tenth of that which occurred during the period from 1600 to 1900. In the Project area, logging has been the primary disturbance factor, and has occurred on a much smaller scale than historic fires, thus fragmenting the landscape. This pattern is exacerbated by the interspersed pattern of land ownership in the Analysis Area, with many 40-acre parcels of state, county or private land occurring within the National Forest boundary, and areas of federal ownership occurring as isolated parcels.

Since implementation of the 2004 Forest Plan, the Superior National Forest has focused on a landscape level planning approach to projects and to vegetation management. Practices and policies that once restricted harvest to an artificially small scale and created fragmentation have given way to policies that allow for larger scale management. This approach allows for harvesting of larger patches, and less fragmentation upon the landscape.

Past, present, and reasonably foreseeable future actions across the Superior National Forest are considered in this analysis. See Appendix G for a list of actions accounted for and/or considered in this EIS. Foreseeable future federal actions are incorporated into Tables 3.8.8 – 3.8.10.

Effects on Federal Land

MIH 11 – Table 3.8.9 displays the forest-wide cumulative effects of federal projects on the Superior National Forest to Management Induced Edge (MIH 11) and Mature Interior Forest (MIH 12). On National Forest System lands within the Superior National Forest, the amount of Management Induced Edge in both the uplands and the lowlands has shown a decrease since the Forest Plan was adopted in 2004. In the uplands, MIH 11 has gone from 2.10 miles/square mile when the Forest Plan was enacted, to an existing condition of 0.68 miles/square mile. Projections show that by 2014, this number will increase slightly to 0.72 miles/square mile. While this is an increase over the existing condition, it is still consistent with the Forest Plan. Forest Plan direction is to "reduce amount of forest edge created through vegetation management activities" from 2004 levels.

In lowlands, the MIH 11 has gone from 0.20 miles/square mile in 2004, to an existing condition of 0.06 miles/square mile, and is projected to be down to 0.04 miles/square mile in 2014. This low number would be attributed to the lack of active management in the lowland forest types on the Superior National Forest.

Table 3.8.9 Forest-wide Effects to Large Patch Condition (Management Induced Edge – MIH 11, and Interior Forest – MIH 12)				
	2004 Forest Plan Condition	**Existing Forest Condition (2007)**	**Projected 2014 Cumulative Effect (Alt 2)**	**Plan Direction** (**Forest Plan O-WL-35, p. 2-35, O-VG-22, p 2-26 and O-VG-24 p. 2-27)**
MIH 11- Management-Induced Edge Density (mi/mi^2) of Young				
Uplands	2.10	0.68	0.72	Reduce amount of forest edge created through vegetation management
Lowlands	0.20	0.06	0.04	
MIH 12 - Amount of Mature/Old Forest Interior Habitat (in acres)				
Zone 1	30,800	27,864	28,205	Maintain or increase the amount of interior habitat.
Zone 3	79,300	84,415	76,028	Strive to minimize the decrease in interior forest habitat in a variety of upland and lowland communities
Forest-wide All Zones	141,400	145,153	137,281	
***Data Source*:** Condition 2004 based on Forest Plan and FEIS. Condition 2007 based on August frozen CDS data. Projected 2014 condition based on 2007 condition grown out for 7 years with successional rules applied and projected foreseeable future federal projects included. See Appendix G for projected future federal projects included. Data does *not* have roads subtracted from interior habitat. Forest Plan 2004 figures for MIH 12 from Forest Plan Planning Record.				

MIH 12 - The Forest Plan seeks to maintain or increase the amount of interior forest habitat (MIH 12) in Zone 1 (Forest Plan, O-VG-22, p.2-26). As shown in Table 3.8.9, Zone 1 figures are currently inconsistent with this direction; however, interior forest habitat would increase from 27,864 acres to 28,205 acres by 2014, helping to reverse this trend.

In Zone 3, Forest Plan direction is to strive to minimize the decrease in interior forest habitat. The existing condition of 84,415 acres would be reduced to 76,028 acres by 2014. In the case of this Project, there is a large amount of harvesting taking place, with one of its goals being to consolidate fragmented patches across the landscape. In the near term, there would be a reduction to interior forest habitat conditions. This is shown in the reduction of interior forest habitat for Zone 3. In the long term, 40 years, these harvested areas will mature as larger patches, thus providing a larger amount of interior forest habitat. It would be expected that after the projection period of 2014, the amount of acres in interior forest habitat would begin to increase again. Over time, there will be fluctuations associated with vegetation management in the amount of acres of interior forest habitat. As policy and practice has evolved towards larger patch management however, the overall trend of acres in interior forest habitat should be positive.

MIH 13 – Table 3.8.10 displays the forest-wide cumulative effects of federal projects on the Superior National Forest to large, mature patches (MIH 13). On National Forest System lands, the number and acreage of lowland forest patches greater than 300 acres is projected to increase from the existing condition. This increase in lowland patches and acres could be attributed to the lack of vegetation management in lowland forest types on the Superior National Forest.

Table 3.8.10 Forest-wide Effects to Large Patch Condition (MIH 13) (Acres and Number)

	2004 Forest Plan Condition		Existing Forest Condition 2007		Projected 2014 Cumulative Effect (Alt. 2)		Plan Direction (Forest Plan O-VG-19, S-VG-6, G-VG-5, O-VG-24, pp. 2-26 to 2-27)	
	Acres	#	Acres	#	Acres	#	Acres	#
Mature Lowland Forest Patches								
300 ac+	Not measured		45,283	79	48,282	82	Maintain an array of 300 ac+ mature patches	
All Upland Mature Patches – Zone 1								
300 ac+	51,500	86	45,285	79	47,695	81	≥ 44,700	n/a
1000 ac+	13,200	8	9,406	**5**	9,746	**5**	n/a	≥ 8
All Upland Mature Patches – Zone 3								
300 ac+	185,200	177	199,291	168	181,893	166	Strive to minimize the decrease in acres and number of mature patches 300 ac+	

***Data Source*:** Condition 2004 based on Forest Plan and FEIS. Condition 2007 based on Fall 2007 frozen CDS data. Projected 2014 condition based on 2007 condition grown out for 7 years with successional rules applied and projected foreseeable future federal projects included. See Appendix G for projected future federal projects included.

* Objective from 2004 Forest Plan condition: (+) = increase (-) = Decrease (m) = maintain

In Zone 1 of the upland forest types, Forest Plan direction seeks to maintain or increase the acres and number of patches greater than 300 acres (Forest Plan, O-VG-23, p.2-26). Table 3.8.10 shows that while the acres and number of patches has decreased from the time of Forest Plan implementation to today's existing condition, it is projected to increase by 2014. Also, even though the existing condition of patches has decreased from enactment of the Forest Plan, the total acres in patches is still above the goal of 44,700 acres (Forest Plan, S-VG-6, p.2-26). Zone 1 goals for patches greater than 1000 acres are not currently being met on the forest. The existing condition shows that the Superior National Forest has 5 patches of mature upland forest greaterthan 1000 acres, while the Forest Plan seeks to have a minimum of 8 patches in this category. The projection for 2014 also shows that there will still be 5 of these patches across the landscape, while the acres in these patches do increase slightly. Managing for patches this large takes more long term planning than it would take to achieve patches that are greater than 300 acres. While the Superior National Forest has undertaken long term steps to initiate development of these large (1000 acre+) patches, more time is required to achieve desired results.

This process is further complicated by existing patches that dissolve through forest succession.

Spatial Zone 3 in the Forest Plan only has management goals for patches that are greater than 300 acres in size (Forest Plan, O-VG-24, p.2-27). The number of patches greater than 300 acres has slowly decreased from 177 patches in 2004 (Forest Plan enactment) to 168 under the existing condition, to 166 in projections for 2014. While this loss of patches could be indirectly attributed to active vegetation management, many of these patches would have dissolved through forest succession anyway. Many of these patches are old, and are succeeding on to younger forest types. At the same time, past practices of harvest created fragmentation has slowed the creation of new patches to take the place of the existing patches that are being lost. New direction which allows larger harvests and careful planning could correct this loss of patches, but it will take time to evolve. In the near term there would be a loss of patches, but in the long term patches could increase in number across the landscape.

Effects on Non-Federal Land

On non-federal lands, activities such as large and small scale harvests that affect landscape spatial patterns would continue. The landscape assessment committee for the Northeast Landscape has established desired conditions that would guide forest vegetation and spatial patterns of all ownerships. These desired conditions include spatial patterns that are consistent with ecology of northeastern Minnesota. Wolter & White (2002) show that ownership strongly influences landscape patterns on the Superior National Forest, and they predict a trend toward less interior forest and decreased connectivity across all ownership on the Superior National Forest.

Ownership patterns, current and predicted disturbance rates on forest lands, recent trends, and desired conditions of landscapes help to place into context foreseeable effects to landscape patterns. When considering past, present, and reasonably foreseeable future federal actions in combination with non-federal actions, cumulative effects predicated by the Forest Plan FEIS (Sections 3.2.2, 3.3.2 – Alternative Modified E) are likely. The Forest Plan FEIS (p.3.2-75) states that projected drops in large patches and interior forest would be limited on NFS lands by management standards and guidelines which may allow these lands to move towards desired conditions. However, landscape changes inferred by rates of disturbance in mature or older forest (also indicated by trends in patches, interior forest, and edge density) combined with similar or greater recent rates on other ownerships would create large gaps in connectivity and spatial diversity. Rates of disturbance predicated combined with landscape trends would perpetuate recent past effects on forest spatial patterns within the Superior National Forest.

White Pine (Management Indicator Species)

There is no specific MIH for white pine; however, MIH 7 includes red and white pine forest. Effects to MIH 7 have been discussed above and are displayed in Tables 3.8.6 and 3.8.7. Further discussion of white pine can be found in Vegetation section 3.7.

According to the FEIS for the Forest Plan white pine was identified as a management indicator species because its population changes are believed to indicate effects of forest management. It is a species of high public interest because of its many social, economic, and ecological values. It addresses major management issues about how much and where to promote white pine for its important wildlife habitat features, timber value, scenic quality, and role in maintaining ecologically healthy forest composition and structure. (Forest Plan FEIS section 3.3.6.2). Key findings from the draft 2007 Monitoring and Evaluation Report show that with 3 years of Forest Plan implementation:

- Through management activities such as planting, forest succession, white pine acreages continue to increase when compared to 2003.
- Since the Forest Plan was revised, approximately 1,700,000 white pine seedlings have been planted in 3,060 acres outside the BWCAW for of restoring white pine on different forest types such as aspen-conifer mix.
- White pine were also planted on 570 acres of other forest types to restore diversity of tree species to conditions more representative of native plant communities. Survival surveys since 2005 indicate an average third year survival rate of 70 percent.
- 1,653 acres of white pine were pruned minimizing the likelihood of blister rust.

- 10,500 acres of white pine were released. Release is the cutting or removal of unwanted tree species to reduce competition for water, nutrients, and sunlight. This also reduces the cooler and moister microclimate that favors blister rust.
- 257 acres of white pine growing on nutrient poor sites were fertilized to improve growing conditions.

All the Border Project alternatives meet or contribute to Forest Plan direction for white pine through managing for white pine and/or allowing natural succession. Alternative 1 would rely solely on natural succession and naturally regenerating white pine and would do less to promote white pine than the action alternatives.

In either action alternative, just over 1,000 acres of aspen forest types would be converted to white pine through harvest followed by site preparation activities and planting. White pine would also be included (where site-appropriate) as a diversity species in many of the other planned planting acres (over 4,500 total acres planned). Over 1,500 acres would undergo non-harvest treatments including releasing desired species, diversity planting, fuel reduction, and mechanical disturbance for the purpose of increasing species diversity, including white pine. In addition, a decision was made during mid-level analysis not to propose harvest in many stands where white pine is naturally regenerating in the understory. These stands that contain natural regeneration of white pine will contribute to the overall objective for increasing white pine.

3.8.2 Biological Evaluation of Regional Forester Sensitive Species/ Management Indicator Species

This section includes the following

Summary of Determination
Analysis Methods
Analysis Area
Affected Species
- Terrestrial Wildlife
  - Gray wolf
  - Heater vole
  - Northern goshawk
  - Boreal owl
  - Olive-sided flycatcher
  - Back-throated blue warbler
  - Bay-breasted warbler
  - Bald eagle
  - Connecticut warbler
  - Three-toed woodpecker
  - Great gray owl
- Insects
  - Laurentian tiger beetle
  - Mancinus alpine and Jutta arctic
  - Nabokov's blue and Freija's grizzled skipper
  - Red-disked alpine
  - Quebec emerald dragonfly
- Aquatic Wildlife
  - Northern brook lamprey
  - Creek heelsplitter and black sandshell mussel
- Vascular plants, Lichen, and Bryophytes
  - Habitat Group 1: RFSS plants of shallow water and non-forested wetlands and riparian areas
  - Habitat Group 2: RFSS plants of cliffs and talus slopes
  - Habitat Group 3: RFSS plants of upland disturbed areas
  - Habitat Group 4: RFSS plants of forested wetlands
  - Habitat Group 5: RFSS plants of northern hardwood forests
  - Habitat Group 6: RFSS plants of dry to mesic upland forests
- References

3.8.2.1 Summary of Determinations

Terrestrial Wildlife

Alternative 1 (no action) may impact olive-sided flycatcher and Laurentian tiger beetle but is not likely to result in a trend towards federal listing or a loss of viability. No impacts to all other terrestrial species are expected with this alternative. The action Alternatives (2, 3) may impact (direct, indirect or cumulative effects) individuals of heather vole, northern goshawk, boreal owl, olive-sided flycatcher, black-throated blue warbler, bay-breasted warbler, bald eagle, Connecticut warbler, three-toed woodpecker, great gray owl, tiger beetle, mancinus alpine butterfly, jutta artic butterfly, Nabokov's blue butterfly, Freija's grizzled skipper and Quebec emerald dragonfly but are not likely to result in a trend towards federal listing or a loss of viability. Impacts are not expected on any other sensitive species.

Aquatic Wildlife

All action alternatives may impact individuals of lake sturgeon, northern brook lamprey, black sandshell and creek heelsplitter mussel but is not likely to cause a trend toward federal listing or a loss of viability.

Vascular Plants, Lichens, and Byrophytes

Alternative 1 may impact individuals of pointed moonwort, common moonwort, Michigan moonwort, pale moonwort, ternate grape fern, and least moonwort but are not likely to cause a trend to federal listing or loss of viability.

Alternatives 2 and 3 may impact individuals of swamp beggar-ticks, floating marsh-marigold, Katahdin sedge, linear-leaved sundew, neat spike rush, moor rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, club-spur orchid, northern bur-reed, awlwort, lance-leaved violet, *Cladonia wainoi*, large-leaved sandwort, Appalachian fir club moss, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga*, pointed moonwort, common moonwort, Michigan moonwort, pale moonwort, ternate grape fern, least moonwort, small shinleaf, cloudberry, fairy slipper, western Jacob's ladder, ram's head ladyslipper, *Caloplaca parvula, Certraria aurescens, Menegazzia terebrata, Ramalina thrausta, Sticta fuliginosa*, *Usnea longissima, Pseudocyphellaria crocata*, Canada yew, barren strawberry, Canada ricegrass, or *Peltigera venosa* but are not likely to cause a trend to federal listing or loss of viability.

3.8.2.2 Introduction

This Biological Evaluation (BE) evaluates the effects of the proposed Border Project on Regional Forester Sensitive Species. (RFSS). Regional Forester Sensitive Species are species for which population viability is a concern due to one or more factors including: habitat and species rarity or poor distribution, population decline trend, risk to habitat integrity, and population vulnerability. Information on how species were screened and selected is provided in the Forest Plan FEIS (Vol. 2, pp. B-25-26) and on the Forest Service website for sensitive species (http://www.fs.fed.us/r9/wildlife/tes/tes_lists.htm Sensitive species are administratively designated by the Regional Forester. The species evaluated in this Biological Evaluation (BE) are from the Region 9 list dated January 10, 2007.

Table 3.8. displays all sensitive species listed on the Superior National Forest, provides a habitat summary and documents known presence of species or potential habitat in the Project area (which provides rationale for inclusion or exclusion of further detailed analysis in this BE).

Please note that the northern goshawk is also one of four designated management indicator species and is addressed in this section.

Forest Plan management objective is to maintain viable and well-distributed representation of all native species that occur on the Superior National Forest (National Forest Management Act Regulation 219.19 and 219.26, Secretary of Agriculture Regulation 9500-4, USDA Forest Service Manual 2670.12, 2670.22, and 2670.32, Forest Plan p. 3-4). The following working definitions were used for viability and well-distributed from Iverson and René (1997):

> **Viability**--the likelihood that habitat conditions will support persistent and well-distributed populations over time;
> **Well-distributed**--species and habitat distribution are based on the current and historic natural distribution and dispersal capabilities of individual species, and dispersal includes the concepts of metapopulation dynamics and gene flow.

Forest plan management direction related to all Regional Forester Sensitive Species is list below. Species specific direction is in found in the analysis of effect for each species.

- Populations: 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. (O-WL-1)
- Habitats: Move terrestrial and aquatic habitats in the direction of desired conditions and objectives for all native and desired non-native wildlife. (O-WL-2)
- Maintain, protect and improve habitat for all sensitive species, using both coarse filter and fine filter strategies (O-WL-18)
- Avoid or minimize negative impacts to known occurrences and disturbance of nesting pairs. (G-WL-11 and -12)
- Management activities must not result in a loss of species viability forest-wide or create significant trends toward federal listing. (S-WL-5)

3.8.2.3 Analysis Methods

Analysis of effects was conducted through the use of a variety of quantitative and qualitative indicators and other relevant scientific information. These were selected based on consideration of 1) species' environmental requirements (*e.g.,* habitat quantity, quality, and spatial pattern), life history, and distributional range and on 2) potential impacts of management activities. Analysis focused on the predominant risk factors pertinent to the species. Additionally, indicators were selected to highlight differences among alternatives. In many cases the analysis assumes that activities that increase amount or quality of habitat would likely benefit species and activities that decrease the amount or quality of habitat would likely negatively impact species.

The information used to develop analysis methods is based on currently accepted and applicable scientific literature and other scientific sources, as well as information from species experts and professional judgment of Forest Service biologists. The key sources for species information include those developed for the Forest Plan 2004 (summarized Forest Plan FEIS, vol. II, p. B-29; Forest Plan Biological Evaluation planning USDA Forest Service 2004a, Forest Plan record #20725) and new relevant information collected for the Border Project.

To briefly summarize the analysis methods of the Border Project Biological Evaluation the sensitive species that are known to occur or have suitable habitat in the Project area are addressed by:

- Coarse filter indicators of major biological communities (for example, Management Indicator Habitats)
- Indicators of species-specific habitats and microhabitats
- Indicators of ground disturbing and other human activities

The analysis of effects results in one of the following determinations:

- No impact
- Beneficial effects – used when proposed alternative is determined to be wholly beneficial without potential negative impacts.
- May impact individuals but is not likely to cause a trend to federal listing or loss of viability – used when it is determined the proposed alternative may cause some negative effects, even if overall effect to species may be beneficial
- High risk of loss of viability in the planning area (National Forest), but not likely to cause a trend toward federal listing or Likely to result in a loss of viability and a trend toward federal listing

The determination addresses the question of whether alternatives would be likely to maintain species viability or prevent a trend toward federal listing. However, it recognizes the uncertainty inherent in evaluating both future scenarios and many sensitive species whose environmental conditions are often not well understood.

The effects analysis and determinations are based on the assumption that all Project design criteria and mitigation measures outlined in Appendix C are followed during implementation.

3.8.2.4 Analysis Area and Time Scale

Analysis Area

The area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest within the Border Project area (see Border Project EIS for map). For cumulative effects discussion it also includes lands of all ownerships within these limits, and may also include effects at the Landscape Ecosystem and/or Spatial Management Zone level (see figure NSU-1 in the Forest Plan for a map of Landscape Ecosystems, and Figure VEG-1 in the Forest Plan for a map of spatial management zones). See the analysis for each RFSS for specific discussion. This is appropriate because the area's large size contains known or potential populations, individuals, and enough habitats of many sensitive species to evaluate the effects of proposed activities. The analysis boundaries include that area to which direct, indirect or cumulative effects would occur.

Direct and indirect effects to habitats and sensitive species located within the Boundary Waters Canoe Area (BWCAW) Wilderness or Voyageurs National Park (VNP) are generally not included in this analysis.

The reason for not including the BWCAW in the analysis is because no harvests are proposed adjacent to the BWCAW. Site-specific effects to edge-sensitive species may occur up to 100 meters from a management induced edge (Forest Plan EIS p. 3.3.2-1). In Alternative 2, harvest would not occur within 0.3 miles of the BWCAW. In Alternative 3, all harvest would take place over 1 mile from the BWCAW. Additionally, during Project planning it was decided to not harvest in a large area adjacent to the BWCAW because of the presence of a >1000 acre patch of mature/old forest which is helping to meet Zone 3 goals for mature/old forest patches. This decision means that along the majority of the BWCAW boundary there is no proposed harvest within two miles. Thus, harvest in any of the alternatives would occur at a distance greater than 100 meters from the BWCAW.

However, Alternative 2 would include a cooperative (with the MN DNR) brush shearing project adjacent (within about 200 feet at the closest point) to the BWCAW. This Project would shear approximately 125 acres of riparian brush along the Echo River near the BWCAW and is aimed at providing foraging habitat for moose and singing grounds for woodcock. This Project would not involve the creation of young forest. This Project could cause short term (several days under frozen ground conditions), localized effects to wildlife from disturbance (shearing equipment) on the BWCAW. These effects are expected to be minimal. Long term effects of the Project on the BWCAW should be beneficial by providing young brush habitat (a rarity on the Superior NF) for wildlife in the area.

The reasons for not including Voyageurs National Park in the analysis are similar to those stated above as the effects of the Project on RFSS in the park would be insignificant and discountable. Alternative 3 should have little effect on the park as no harvest would occur within 1.5 miles of the boundary. Alternative 2 effects would be slightly more as one stand (85 acres along 0.5 miles of shared boundary) is proposed for harvest. This stand along with 3 others either adjacent or close by would create about 190 acres of young forest near the park. This could cause short term (1-2 weeks under frozen ground conditions), localized effects to wildlife from disturbance (timber harvesting equipment) on the park. Potential long term negative effects could come in the form of invasive species encroachment into the park, unauthorized access into the park on winter roads (snowmobilers) and changes to the local patch or interior forest conditions. Agreements with the Park to "feather" the harvest edge up to the park boundary and to monitor

and treat (if found) invasive species in the second summer post-harvest would mitigate these concerns. Wildlife species that use young forest habitat may benefit in the short term (10 years). Site-specific effects to edge-sensitive species which may occur up to 100 meters from a management induced edge would be insignificant and discountable due to "feathering" the harvest edge, the small portion of the VNP boundary affected (0.016% of the shared boundary), the use of winter harvest (when animals are not denning, nesting or raising young) and the presence of natural disturbance such as fire and the 1999 blowdown which have created similar disturbance to what would occur from this project. Some tree planting (long lived species) would occur adjacent to the park in both alternatives along about 500 ft of shared boundary and including 47 acres of shoreline along Johnson Lake. This would have minimal impacts on wildlife species.

3.8.2.5 Affected Species

Table BE 1 displays all Region 9 Regional Forester Sensitive Species (RFSS) known or expected to occur on the Superior National Forest (listed dated January 10, 2007). Some species listed below will not be analyzed further in this BE because they do not have potential habitat present, are not known or expected to occur within the Project area or little to no effects are predicted as a result of the proposed project.

Table BE 1: Sensitive Species Known or Suspected Occurrence in the Border Project Area

Regional Forester Sensitive Species			
Common name **Scientific name**	**Potential Habitat Present in Project area**	**Known Species Presence in Project area**	**Habitat Summary**
Terrestrial Wildlife			
Gray wolf (also MIS) *Canis lupus*	Yes	Yes	Variety of habitats, adequate prey, low human disturbance
Heather vole *Phenacomys intermedius*	Yes	No	Forest, brushland or clearcuts with *Vaccinium* spp. And rocks.
Northern goshawk (also MIS) *Accipiter gentilis*	Yes	Yes	Large patch of older trees with closed canopy and open understory. One known territory within the Project area.
Boreal owl *Aegolius funereus*	Yes	Yes	Secondary cavity nester. Old boreal forest (inc. aspen) next to lowland conifer foraging areas. Detected during owl surveys.
LeConte's sparrow *Ammodramus leconteii*	No	No	Uplands and lowlands with dense, tall, grass/sedge vegetation and thick ground litter. No impact to habitat and no records in Project area.

Table BE 1: Sensitive Species Known or Suspected Occurrence in the Border Project Area			
Regional Forester Sensitive Species			
Common name **Scientific name**	**Potential Habitat Present in Project area**	**Known Species Presence in Project area**	**Habitat Summary**
Olive-sided flycatcher *Contopus cooperi*	Yes	Yes	Snags, low density conifer lowlands, riverine/riparian areas. NRRI bird plot detections and personal observation
Yellow rail *Conturnicops noveboracensis*	No	No	Lowland sedge meadows with specific characteristics such as overhead mat of dead sedge. Nearest detection Zim bog.
Black-throated blue warbler *Dendroica caerulescens*	Yes	Yes	Large contiguous mature forests, probably associated with small canopy gaps and a well-developed shrub understory. NRRI bird plot detections.
Bay-breasted warbler *Dendroica castanea*	Yes	Yes	Mature upland and lowland spruce/fir forests.
Peregrine falcon *Falco peregrinus anatum*	No	No	Nest: cliff/ledges; Hunt: forest openings, lakes, wetlands
Bald Eagle (also a MIS) *Haliaeetus leucocephalus*	Yes	Yes	Large lakes & rivers with large trees for nesting and roosting. There are 14 known nests within the Project area or within ½ mile of the boundary.
Connecticut warbler *Oporornis agilis*	Yes	Yes	Jack pine or lowland conifer with a thick ericaceous understory. Personal observations
Three-toed woodpecker *Picoides tridactylus*	Yes	Yes	Coniferous forests with snags. Personal observation
Great gray owl *Strix nebulosa*	Yes	Yes	Nesting habitat of mature trees on wet soil with >60% canopy closure near open foraging areas. Detected during owl surveys. Nesting documented
Sharp-tailed grouse *Tympanuchus phasianellus*	No	No	Brushland complexes (>5,000 acres) with open areas, brush and small trees, as well as large open agricultural hay or pasture with associated brush habitat.

Table BE 1: Sensitive Species Known or Suspected Occurrence in the Border Project Area			
Regional Forester Sensitive Species			
Common name **Scientific name**	**Potential Habitat Present in Project area**	**Known Species Presence in Project area**	**Habitat Summary**
Wood turtle *Clemmys insculpta*	Yes	No	Upland and lowland habitats with suitable shade and insects for forage. Riparian habitats with open sandy areas for nesting. Nearest known location in the Partridge river southwest of the Project area
Aquatic Wildlife			
Lake sturgeon *Acipenser fulvescens*	Yes	Yes	On SNF: Large lakes and rivers in the Hudson Bay drainage. No habitat present.
Shortjaw cisco *Coregonus zenithicus*	No	No	Lake Superior, Saganaga and Gunflint Lakes, possibly others. No habitat present.
Northern brook lamprey *Ichthyomyzon fossor*	Yes	Yes	Medium-sized, low-gradient streams with sections of higher gradient reaches suitable for spawning. Ammocoete's require organically enriched, sandy substrate until metamorphosis.
Creek heelsplitter *Lasmigona compressa*	Yes	No	Headwaters of larger rivers. St. Louis river and tributaries. Lake of the Woods tributaries.
Black sandshell *Ligumia recta*	Yes	Yes	Medium to large rivers.
Insects			
Tiger beetle sp. *Cicindela denikei*	Yes	Yes	Sandy or rocky openings in northern hardwood forest communities.
Mancinus alpine *Erebia disa mancinus*	Yes	No	Shady black spruce swamp. Found in McNair management area adjacent to Project area and near Greenwood Lake.
Red-disked alpine *Erebia discoidalis discoidalis*	Yes	No	Grassy areas on the margins of bogs. Large open bogs, grassy meadows. Closest known location is the McNair site
Nabokov's (or Northern) blue *Lycaeides idas nabokovi*	Yes	No	*Vaccinium cespitosum* host in open sandy jack pine areas. Found in McNair management area.
Jutta arctic *Oeneis jutta ascerta*	Yes	No	Moderately forested black spruce bogs with sedges. Found in McNair management area.
Freija's grizzled skipper *Pyrgus centaureae freija*	Yes	No	Upland acidic meadow Found in McNair management area.
Quebec Emerald dragonfly *Somatochlora brevicincta*	Yes	No	Predominantly bogs, fens, and heaths.

Table BE 1: Sensitive Species Known or Suspected Occurrence in the Border Project Area			
Regional Forester Sensitive Species			
Common name **Scientific name**	**Potential Habitat Present in Project area**	**Known Species Presence in Project area**	**Habitat Summary**
Vascular Plants *(Note: Unless cited otherwise, habitat descriptions are derived from information provided by the Minnesota Natural Heritage and Non-game Research Program [MNDNR 2006])*			
Moschatel *Adoxa moschatellina*	No	No	Shaded damp cliffs and slopes in upland mature northern hardwood forest on North Shore
Long-leaved arnica *Arnica lonchophylla*	No	No	Cool & moist cliffs and ledges on North Shore. Arctic disjunct
Maidenhair spleenwort *Asplenium trichomanes*	No	No	In crevices of moist, mostly east-facing cliffs, ledges, and talus, Rove formation
Alpine milkvetch *Astragalus alpinus*	No	No	Sandy, gravelly fluctuating shorelines with sparse vegetation. Inland strand beach - sparse vegetation
Swamp beggar-ticks *Bidens discoidea*	Yes	No	Wet habitats: silt shores, hummocks in floating mats and swamps, partly submerged logs
Pointed moonwort *Botrychium acuminatum*	Yes	No	Open habitats such as old log landing, old dirt roads, borrow pits
Triangle grape-fern *Botrychium lanceolatum* var *angustisegmentum*	Yes	No	Northern hardwood forest, old fields, old logging roads, trails
Common moonwort *Botrychium lunaria*	Yes	No	Open habitats such as old log landings, sawmill sites, old building sites
Michigan moonwort *Botrychium michiganense (hesperium)*	Yes	No	Open habitats such as old log landing, old dirt roads, gravel pits, power line corridors, borrow pits. Also beach ridges, old fields, trails, and dredge spoil dumps (Walton 2000a)
Goblin fern *Botrychium mormo*	No	No	Mesic northern hardwood forest with thick leaf litter layer
Pale moonwort *Botrychium pallidum*	Yes	No	Open, disturbed habitats, log landings, roadsides, dunes, sandy gravel pits.
Ternate grape-fern *Botrychium rugulosum (=ternatum)*	Yes	No	Generally open habitats, such as old log landings and edges of trails.
Least moonwort *Botrychium simplex*	Yes	No	Generally open habitats, such as old log landings, roadside ditch, trails, open fields, base of cliff, railroad rights of way
Floating marsh-marigold *Caltha natans*	Yes	No	Perennial herb; shallow water of pools, ditches, sheltered lake margins, slow moving creeks, sloughs and oxbows, pools in shrub swamps
Fairy slipper *Calypso bulbosa*	Yes	No	Hummocks in northern white cedar swamps, moist to wet lowland conifer swamps, and to lesser extent in upland coniferous forests (Smith 1993)

Table BE 1: Sensitive Species Known or Suspected Occurrence in the Border Project Area			
Regional Forester Sensitive Species			
Common name **Scientific name**	**Potential Habitat Present in Project area**	**Known Species Presence in Project area**	**Habitat Summary**
Katahdin sedge *Carex katahdinensis*	Yes	No	In seasonally moist, gravelly/sandy soil; along shores of large and small lakes; margins of ephemeral pools; associated with seasonal flooding
New England sedge *Carex novae-angliae*	Yes	No	Moist woods with sugar maple, also with birch, aspen, tall shrubs; yellow birch and white spruce dominated forest
Ross' sedge *Carex rossii*	No	No	Rocky summits, dry exposed cliff faces, rocky slopes, in east Border Lakes subsection
Douglas's hawthorn *Crataegus douglasii*	No	No	North Shore rocky, gravelly streambeds/banks and open areas; and rocky borders of woods
Ram's-head lady's slipper *Cypripedium arietinum*	Yes	No	Wide variety of forests, both upland and lowland, but in MN predominantly in white cedar swamps; also in forests dominated by jack pine, red pine, or white pine
Rough-fruited fairy bells *Disporum trachycarpum*	No	No	Semi-open jack pine forest with aspen, birch, shallow rocky soils, in east Border Lakes subsection
Linear leaved sundew *Drosera linearis*	Yes	No	Minerotrophic water tracks in patterned peatlands
Neat spike-rush *Eleocharis nitida*	Yes	No	Mineral soil of wetlands, often w/ open canopy and disturbance, such as logging roads/ditches through wetlands
Appalachian fir club moss *Huperzia appalachiana*	Yes	No	Shelves and crevices on cliff/talus/rock outcrops, and shrub dominated talus piles
Moor rush *Juncus stygius*	Yes	No	Shallow pools in non-forested peatlands, often in a sedge-dominated community
Creeping rush *Juncus subtilis*	No	No	Sandy lakeshore – only known occurrence in BWCAW (Gerdes 2005a)
Auricled twayblade *Listera auriculata*	Yes	No	On alluvial or lake-deposited sands or gravels, with occasional seasonal flooding, associated with riparian alder or spruce/fir forest
American shore-grass *Littorella uniflora*	Yes	No	Shallow margins of nutrient-poor lakes, see page lakes, sandy substrate, may have fine gravel/organic soil. Fluctuating water level up to about 1 meter.
Large-leaved sandwort *Moehringia macrophylla*	Yes	No	Cliffs/rock outcrops, talus, conifer sites on shallow soils, pine plantation with rocky outcrops; usually semi-open shrub or tree canopy

Table BE 1: Sensitive Species Known or Suspected Occurrence in the Border Project Area			
Regional Forester Sensitive Species			
Common name **Scientific name**	**Potential Habitat Present in Project area**	**Known Species Presence in Project area**	**Habitat Summary**
Fall dropseed muhly *Muhlenbergia uniflora*	Yes	No	Wet sandy beaches, floating peat mats
Dwarf water-lily *Nymphaea leibergii*	Yes	No	Slow moving streams, rivers, beaver impoundments 1-2 m deep. Occurs at outer margin of emergent vegetation.
Chilean sweet cicely *Osmorhiza berteroi*	No	No	Northern hardwood forest dominated by sugar maple on North Shore.
Sticky locoweed *Oxytropis borealis* var *viscida (=oxytropis viscida* var *viscida*	No	No	Slate cliffs and talus slopes in east Border Lakes subsection. Arctic/alpine disjunct
Canada Rice Grass *Piptatherum canadense (=Oryzopsis canadensis)*	Yes	No	Sandy/gravelly soil; red pine/jack pine plantations, borders, edges, trail sides, openings (Gerdes 2005)
Club spur orchid *Platanthera clavellata*	Yes	No	Floating bog mats, sphagnum, stunted conifer swamp, mixed spruce tamarack, borrow pits, winter logging roads
Western Jacob's ladder *Polemonium occidentale ssp. Lacustre*	Yes	No	Primarily white cedar swamps, also mixed conifer swamps; thrives in openings (Carlson and Sather 2001)
Braun's holly fern *Polystichum braunii*	No	No	Cool, shady cliffs and slopes in northern hardwoods in North Shore Highlands subsection
Lesser wintergreen or Small shinleaf *Pyrola minor*	Yes	No	Black spruce swamps, and ecotone between uplands and lowland alder/conifer swamp, prefers closed canopy.
Cloudberry *Rubus chamaemorus*	Yes	No	Black spruce/sphagnum forest, acidic. Superior NF at southern edge of species range
Nodding saxifrage *Saxifraga cernua*	No	No	Cliffs, ledges, diabase cliff (calcium based feldspars). Arctic/alpine disjunct. One location in MN on open cliff.
Encrusted saxifrage *Saxifraga paniculata*	No	No	Cliffs, sheltered crevices, and ledges of north-facing cliffs; Arctic/alpine disjunct
Northern bur-reed *Sparganium glomeratum*	Yes	No	Floating muck mats in emergent wetland habitat such as moats, pond margins, road ditches
Awlwort *Subularia aquatica*	Yes	No	Beach zone of sandy nutrient-poor lakes. Shallow lake margins. Submerged or emerged, or stranded. 15-45 cm deep water, but can occur deeper. Can flower while stranded, or under other conditions.

Table BE 1: Sensitive Species Known or Suspected Occurrence in the Border Project Area			
Regional Forester Sensitive Species			
Common name **Scientific name**	**Potential Habitat Present in Project area**	**Known Species Presence in Project area**	**Habitat Summary**
Canada yew *Taxus canadensis*	Yes	No	Wide variety of uplands and lowlands, including cedar/ash swamps, talus and cliffs, northern hardwoods, aspen/birch forest (USDA Forest Service 2006)
False-asphodel *Tofieldia pusilla*	No	No	Sedge mats at edges of shoreline rock pools along Lake Superior. Arctic disjunct.
Lance-leaved violet *Viola lanceolata*	Yes	No	Sandy to peaty lakeshores; borders of marshes and bogs, damp sand ditches (USDA Forest Service 2004g)
Barrenstrawberry *Waldsteinia fragarioides*	Yes	No	Upland coniferous and deciduous forests, in recently harvested areas, established plantations, and areas with no recent harvest
Smooth woodsia *Woodsia glabella*	No	No	Moist, north-facing cliffs along Lake Superior. Arctic disjunct.
Lichens and Bryophtyes (Habitat information from USDA Forest Service 2000a, and Wetmore 2000 and 2001, and as cited below)			
A lichen sp. *Arctoparmelia centrifuga*	Yes	No	Lichen; sunny rocks and open talus slopes (USDA Forest Service 2002a)
A lichen sp. *Arctoparmelia subcentrifuga*	Yes	No	Lichen; Sunny rocks and open talus slopes
a lichen sp. *Caloplaca parvula*	Yes	No, but found within 100 ft. of project boundary	Smooth bark of young black ash in moist, humid old growth black ash stand (USDA Forest Service 2002c)
a lichen sp. *Cetraria aurescens*	Yes	No	Conifer bark in lowland conifer swamps (old cedar/black spruce - USDA Forest Service 2002d)
a lichen sp. *Cladonia wainoi (= pseudorangiformis)*	Yes	No	On rock outcrops and thin soil – exposed sites with lots of light (USDA Forest Service 2002e)
A liverwort sp. *Frullania selwyniana*	Yes	No	Lowland cedar swamps on bark of white cedar (Janssens 2002)
Port-hole lichen *Menegazzia terebrata*	Yes	No	Cedar swamps, especially old growth; base of cedar trees (USDA Forest Service 2002h)
A Dog lichen *Peltigera venosa*	Yes	No	Soil and moist cliffs, exposed root wads (USDA Forest Service 2002i)
A lichen sp. *Pseudocyphellaria crocata*	Yes	No	Mossy rocks, trees in partially shaded, moist, frequently foggy habitats (USDA Forest Service 2002j)
A lichen sp. *Ramalina thrausta*	Yes	No	Cedar swamps, especially old growth (USDA Forest Service 2002k)

Table BE 1: Sensitive Species Known or Suspected Occurrence in the Border Project Area			
Regional Forester Sensitive Species			
Common name **Scientific name**	**Potential Habitat Present in Project area**	**Known Species Presence in Project area**	**Habitat Summary**
a lichen sp. *Sticta fuliginosa*	Yes	No	On hardwoods in humid, old growth cedar or ash bogs (USDA Forest Service 2002l)
a lichen sp. *Usnea longissima*	Yes	No	On old conifers in moist situations, often in or near a conifer or hardwood swamp (USDA Forest Service 2002m)

2.8.2.6 Terrestrial Wildlife

Gray Wolf (also a Management Indicator Species) See Forest Plan FEIS 2004 (Volume I, pg. 3.3.4-20) for rationale as a Management Indicator Species.

Existing Condition
Population and trend

Gray wolf populations in Northern Minnesota are stable or increasing as are subpopulations in Wisconsin and Michigan. As a result of the increasing Minnesota population and the development of viable populations in neighboring states, the U.S. Fish and Wildlife Service recently removed Endangered Species Act protection for the Gray Wolf Western Great Lakes Distinct Population Segment. The final rule to delist this Distinct Population Segment was published in the Federal Register on February 8, 2007 and took effect on March 12, 2007 (USDI 2007a). Management of the wolf then became governed by the Minnesota Wolf Management Plan (MN DNR 2001). Management objectives for gray wolves on the Superior National Forest changed from seeking to recover the species to seeking to maintain, protect and enhance its habitat and prevent federal listing.

On Sept 29, 2008 a federal court overturned this decision, returning gray wolves in the Western Great Lakes Region to their status as threatened. The USFWS is appealing this decision. This analysis was completed prior to the court finding and is left in this BE due to the uncertain future of the species' listing status. Analysis for wolf also was done for the Biological Assessment.

The Minnesota Wolf Management Plan (MN DNR 2001) establishes a minimum population of 1,600 wolves to ensure the long-term survival of the wolf in Minnesota. The Minnesota wolf population has grown from fewer than 750 animals in the 1950s to the current estimate of 2,921 (90% confidence interval: 2,192 - 3,525) (Erb, MN DNR 2008). Winter (2007) track detection surveys (targeting lynx) confirmed the presence of gray wolf throughout the Border Project area. Wolves in the Border Project area are a part of the Western Great Lakes Distinct Population Segment.

Habitat Needs and Limiting Factors

Wolves are habitat generalists; they can live anywhere prey is sufficiently abundant. Their main diet is large ungulates (deer and moose) and they supplement their diet with a variety of smaller

animals, such as snowshoe hares (*Lepus americanus*) and beavers (*Castor canadensis*). Wolf packs live in territories and home ranges defended constantly against intrusion by other packs. Territories may be as small as 25 square miles or as large as 200 square miles, depending on pack size and the density of ungulates (i.e., amount of food available).

Unless food is very abundant, up to one-half of wolf pups die before they reach 6 months of age. Mortality of adults also is relatively high with about 35 percent of adult wolves die each year. The most common natural causes of mortality to both pups and adults are starvation and intraspecific strife (i.e., wolves killing other wolves). This happens when food is scarce and when wolves must "trespass" into adjacent wolves' territories to hunt. Infrequently, disease may also be an important adult wolf mortality factor. On occasion, motor vehicles or trains accidentally hit and kill wolves. Wolves are also deliberately (illegally) killed by humans, but the frequency of these illegal actions is unknown. In addition, about 150 wolves are killed each year by Federal depredation control activities.

Forest Plan Direction

In addition to O-WL-1, O-WL-2, O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to gray wolf:

- Provide for the protection of known active gray wolf den sites during denning season. (G-WL-10)

Analysis Indicators
Impacts to Prey Habitat

This is measured by:

1) Acres and percent of Young Upland Forest (MIH 1 young) resulting from each alternative. This is a measure of potential foraging areas for deer and moose

2) Acres and percent Upland Conifer (spruce and pine) Forest, greater than 9 years old (MIH 5 pole +) resulting from each alternative. This is a measure of potential thermal cover for deer and moose

Impacts of Human Access/disturbance
This is measured by:

- Miles of Forest Service low standard roads (OML 1) and temporary roads resulting from each alternative

Direct/Indirect Effects
Alternative 1

The environmental consequences of Alternative 1 would be a decrease in young upland forest which would mean less foraging habitat for wolves main prey species (moose and deer). Natural disturbance events and previously planned management activities would continue to provide some young forest. Thermal cover for moose and deer, provided by spruce-fir forest types, would increase and remain in adequate supply and well distributed across the area (Table BE 2, Indicator 2b). Alternative 1 would have no impacts from human access/disturbance as a result of temporary roads or harvest activities. Long term, human access/disturbance would remain at current levels as no roads would be decommissioned.

Alternatives 2 and 3

One objective of the action alternatives is to create young forest; this would improve foraging habitat conditions for deer and moose. This would likely benefit wolves. Alternative 2 would result in the most young upland forest (Table BE 2, Indicator 1a) and thus, the most benefit to wolves. Thermal cover for moose and deer, provided by spruce-fir forest types, would remain in adequate supply and well distributed across the area in both action alternatives (Table BE 2, Indicator 2b). Moose and deer populations are not expected to be limiting factors for wolves under the Revised Forest Plans (USDA 2004a).

The larger impact to wolves would come from human access/disturbance. Alternatives 2 and 3 would result in an increased potential for negative wolf/human interactions during the life of the Project with a 38-44 mile increase in temporary roads. The impact of this increase in temporary roads is expected to be short term. Long term, Alternatives 2 and 3 may result in positive impacts to wolves through the decommissioning of roads, resulting in 7.2 fewer miles of low standard (OML-1) roads (Table BE 2, Indicator 2). Alternative 2 has slightly more miles of temporary roads than Alternative 3 but neither of the action alternatives are expected to negatively affect wolf populations. Low standard system roads and temporary roads are not intended for public access. All temporary roads needed to access harvest units would be obliterated and allowed to return to a more natural state once reforestation objectives have been met and new system roads would be closed to motorized uses when not needed for land management activities. Unauthorized use of temp roads by off-highway vehicles may increase with the increase of temporary roads, but effects of this unauthorized use are expected to minor and short term.

Prescribed fire, brush shearing, use and expansion of gravel pits and improvement of stream crossings would have little to no effect on wolves.

Table BE 2 - Gray Wolf - Effects to Suitable Habitat

Indicators	Existing Condition		Alt 1		Alt 2		Alt 3	
Prey Habitat	Acre	%	Acre	%	Acres	%	Acres	%
1a. Young upland forest <10 years old	2,756	6	1,023	2	9,143	20	7,936	18
1b. Upland conifer (spruce and pine) > 9 years old on all uplands	19,217	43	22,436	50	19,171	43	19,859	44
	Miles		Miles		Miles		Miles	
2. Miles of OML 1 and temporary roads	137.2, 0		137.2, 0		130, 44		130, 38	

Data Sources: Existing conditions for vegetation indicators are based on frozen August 2007 CDS data, all alternatives are based on projected CDS data in the year 2014. Roads indicator data for Existing Condition and alternatives are based on Aug 2008 Border roads data created by Erich Grebner.

Other Footnotes: Percentages are the percent of total upland forest on federal lands in the Project area (44,873 acres). Indicator 1a = MIH 1 young, Indicator 1b = MIH 5 pole +.

Cumulative Effects

There are no past, present or reasonably foreseeable Forest Service vegetation management actions (see EIS appendix G) in the Project area that would significantly affect prey habitat for wolves or lead to high levels of disturbance. Additional impacts could occur on lands outside of National Forest jurisdiction. Increases in the potential for human access into wolf territory would occur as people buy, subdivide, and develop private parcels of land. New road construction would be needed to access this property. Harvesting on State, county, and private land may also require additional road development. Not all of these roads would be effectively closed following harvest. Proposed Travel Management Project on the SNF once signed and implemented, would further reduce the number or open roads on federal lands. The density of higher standard roads (OML 3-5) in the Project area is currently .39 mile/square mile which is well below the one mile/square recommended for minimizing wolf mortality.

Nonfederal lands (48% of Project area) would continue to provide foraging and thermal habitat for deer and moose. Overall, more than adequate deer habitat is available in north central and northeastern Minnesota. This condition is not expected to change. Trends in edge habitat appear to be increasing (Wolter and White 2002).

Shooting, trapping, or other harassment of wolves would most likely continue to occur on all land ownerships at a minimal level. Additional mortality associated with vehicle collision would continue, especially if design speeds on non-federal roads increase. However, based on increasing wolf populations over the past two decades, cumulative impacts to wolf related to changes in habitat and human disturbance are not expected to have major impacts on wolf populations.

Determination

The proposed resource management activities planned in the Project area *may impact individuals but are not likely to cause a trend to federal listing or loss of viability* in gray wolves. Habitat conditions for deer and moose are likely to improve with all of these activities and lead to more prey opportunities for wolves. Project activities are not expected to lead to any changes in OHV use, and only slight changes in permanent roads therefore only minor direct, indirect or cumulative effects are expected. Temporary roads are proposed and disturbance to wolves from these would occur but be short term because they would be decommissioned after use. Habitat will remain well-distributed in the Project and cumulative effects area and I expect no negative trend in viability to wolf populations with any of the proposed activities.

Mitigations

- If a gray wolf's den or rendezvous site is found during planning layout or operations, activities would be temporarily halted in the area and the District Biologist should be notified. The biologist would assess the risk to species and where appropriate; mitigation measures would be implemented prior to restarting operations. The Forest Plan, recovery plans and conservation strategies will be used when making mitigation recommendations.

- Monitor temporary roads and new OML 1 roads for effectiveness of closures.

Heather Vole

Existing Condition
Population and Trend

In eastern North America, the range of the heather vole reaches its southern most point in the Upper Midwest on the Superior National Forest (Jannett 2006). Since 1987 the heather vole (Phenacomys intermedius) is documented in Minnesota Natural Heritage rare species database from six sites, all on the Superior NF in Lake and Cook Counties (MN DNR Natural Heritage and Non-Game Research Program 2007). Additionally, one specimen was taken in 1940 near Burntside Lake (St. Louis County), (Jannett and Oehlenschlager 1997). The Superior NF supports annual small mammal population monitoring and a total of 12 heather voles have been trapped at seven sites (Jannett 2005). A long-term (1995-2006) study of small mammal populations has documented 64 heather voles, all on the Superior National Forest. This is up from the three sites known at the time of the Forest Plan ROD (USDA Forest Service 2004a - Forest Plan BE, Table 3, p. 12). Statewide and Forest population trends are unknown: because of the rarity of the species it is not possible to detect trends (USDA Forest Service 2004a). In addition, small mammal surveys, coordinated by the 1854 Authority, have been conducted each fall from 2002 -2007 with no heather vole detections (SNF Annual Monitoring Report 2007, Appendix H). These routes are aimed at an attempt to track trends in small mammal populations within the forested and transition zones in northern Minnesota. Nine of the trapping routes are conducted on the SNF, one route is within the Border Project area.

There are no known occurrences of heather voles in the Analysis Area (MN DNR Natural Heritage and Non-Game Research Program 2007). The nearest known heather vole location is 50 miles southeast of the Project area (MN NHP 2007). No Project-specific surveys were conducted, but one 1854 Authority route is located in the Project area. The need for Project area-specific surveys was assessed and based on species' habitat requirements, distribution, and expected management impacts, I determined that surveys at the site level were not required adequately to assess impacts to the heather vole.

Habitat Needs and Limiting Factors

Coffin and Pfannmuller (1988, p. 308) and McAllister and Hofmann (1988) state that heather vole is found in a wide variety of northern habitats, including coniferous forests, and forest borders, heath shrublands, willow thickets, rocky hillsides, and moist meadows. Most sites where Jannett (2004) found heather voles contained jack pine and black spruce forest types. *Vaccinium* species (the blueberries et al.) are often present where heather voles are found. Naylor and Spires (1985) found high densities of heather voles in Ontario in jack pine monocultures with a dense, relatively continuous understory of ericaceous shrubs. Upland forests and openings with ericaceous ground cover and not far from water appear to be preferred habitat. Suitable habitat conditions historically were likely patchy in distribution across the forest (USDA Forest Service 2004a). In the Project area, mature jack pine forest habitat currently makes up about 10 percent of the upland forest and is very limited in the southwest 1/3.

Threats and limiting factors include direct mortality and timber harvest activities which encourage grass growth and/or provide habitat for meadow voles which can out-compete heather voles (USDA Forest Service 2006). Any activities that encourages grasses

encourages meadow voles, which are detrimental to the heather vole (USDA Forest Service 2006). Fire suppression has likely had a large negative impact to habitat conditions from historical conditions. Timber harvest potentially perpetuates habitat for this species, however an increase of aspen and a decrease of jack pine has likely reduced the amount of suitable habitat for the species (USDA Forest Service 2006). Harvest activities, or natural succession and fire suppression that close the canopy and discourage growth of *Vaccinium* sp. can be detrimental to the heather vole. This species is also vulnerable to predation (USDA Forest Service 2004b).

Forest Plan Direction

In addition to O-WL-1, O-WL-2, O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to heather vole:

- None

Analysis Indicators
Impacts to Suitable Habitat

This is measured by:

1. Acres and percent of mature jack pine (MIH 8 mature +) that would remain with each alternative

2. Acres of final harvest (any treatment that sets forest age to zero) on ELT 1, 2, and 14. These soil types are most vulnerable to the establishment of grass after natural or human caused disturbance.

No management activities are proposed that would likely improve or restore habitat for heather vole so no indictor was chosen to address this.

Direct/Indirect Effects

Alternative 1

The environmental consequences of the no action alternative would be slightly less mature jack pine forest habitat. Existing roads would continue to allow for the potential of direct mortality of heather voles.

Alternatives 2-3

The action alternatives could directly affect individuals by harvest activities or associated road building that destroys an active nest of young voles. These effects are expected to be minimal as most heather voles should be able to move away from disturbance or seek shelter. There is a relatively small (3%) difference between alternatives with regards to suitable habitat (Indicator 1), with alternative 1 providing the most and alternative 2 the least. Although both action alternatives result in less mature jack pine they would create ~1,200-1,400 acres of young jack pine. This may provide future habitat for the species. The action alternatives have similar effect on ELTs 1, 2, and 14 (Indicator 2), resulting in final harvest on about 21% of these ELTs in the Project area (federal lands). These ELTs are susceptible to grass establishment after harvest which could result in increased competition from meadow voles. Leave trees and reserve areas should help reduce

the establishment of grass by providing some shade. The reserve areas would also provide refugia for heather voles if grass does become established and meadow voles increase.

Table BE 3 - Heather Vole - Effect to Suitable Habitat				
Indicators	**Existing Condition Acre (%)**	**Alt 1 Acre (%)**	**Alt 2 Acre (%)**	**Alt 3 Acre (%)**
1. Mature and older jack pine forest	5,074 (11)	4,863 (11)	3,721 (8)	3,894 (9)
	Acres	**Acres**	**Acres**	**Acres**
2. Final harvest on ELT 1, 2 or 14	n/a	0	757	752
Data Sources: Existing conditions for vegetation indicators are based on frozen August 2007 CDS data, all alternatives are based on projected CDS data in the year 2014. . ***Other Footnotes:*** Percentages are the percent of total upland forest on federal lands in the Project area (44,873 acres). Indicator 1 = MIH 8 mature +. Data for indicator 2 was provided by Casey McQuiston Aug 2008.				

Cumulative Effects

The Border EIS Appendix G provides a list of past present and foreseeable future actions considered. Based on Forest-wide projected habitat trends on federal lands (USDA Forest Service 2006) the amount of mature jack pine forest (MIH 8) will increase in the Jack Pine Black Spruce and Mesic Birch Aspen Landscape Ecosystems in the next 10 years which at a coarse scale would benefit this species. On non-federal lands management for young forest of aspen and conifer will continue which may negatively impact heather voles by decreasing mature jack pine and upland conifer and increasing habitat for and competition from meadow voles. Goals established by the Minnesota Forest Resources Council Landscape Committee call for an increase in jack pine forest across all ownerships. Long term, heather voles may benefit from this increase.

The cumulative effects analysis for the Forest Plan Revision BE concludes that habitat conditions in the future from federal and non-federal lands are predicted to continue to provide a patchy distribution for heather vole. This Project and predicted cumulative actions fall within the analysis and effects that were predicted by the Forest Plan Revision BE. Likely habitat for the heather vole will be maintained in patchy distribution in the Project area and across the forest.

Determination

The proposed resource management activities planned in the Project area (Alternatives 2 and 3) may impact individuals but are not likely to cause a trend to federal listing or loss of viability. This determination is based on the assumption that heather vole is adaptable to a wide variety of habitats, can escape direct mortality from logging by burrowing in its nests or leaving the site, and, if present, source populations would be present in some of the Project area. There is an expected small decrease in mature jack pine forest which may negatively affect the species. This determination is consistent with the determination in the Forest Plan Programmatic BE. Alternative 1 would have no effect to the heather vole. All Alternatives are consistent with Forest Plan direction.

Mitigations

- Contact the district biologist immediately if heather voles are found in the Border area.

Northern Goshawk (Management Indicator Species)

See Forest Plan FEIS 2004 (Volume I, pg. 3.3.6-1) for rationale as a Management Indicator Species.

Existing Condition
Population and Trend

Northern goshawk (hereafter goshawk) is a large forest raptor, occupying boreal and temperate forests throughout the Holarctic (Brown and Amadon 1968, cited in Keane and Morrison 1994). *Accipter gentillis atricapillus*, the subspecies occurring in Minnesota, is widely distributed across the northern half of eastern North America and in many parts of western North America (Squires and Reynolds, 1997). Goshawks are generally uncommon throughout their range. Population productivity and nesting densities coincide with populations of snowshoe hare and grouse (Postupalsky 1997, Squires and Reynolds 1997). Goshawk populations in the Lakes States are perhaps less than prior to early logging and settlement, especially when passenger pigeons were available for prey (Kennedy 1997). Populations may be increasing with the recovery and maturing of forests in recent times in some parts of the United States (Postupalsky 1991, Squires and Reynolds 1997, Kennedy 1997, Rosenfield et al. 1998). Rosenfield et al. (1998) found no evidence of range contraction in Wisconsin. Such data are not available for Minnesota.

Forest-wide survey efforts show an increase of known breeding pairs over those known in 2003 (Annual Monitoring Report 2006). Based on the 2007 Statewide Goshawk monitoring effort there are 26 known territories on the Superior National Forest. Nine were known to be occupied in 2007. This is up from no known sites in 1999 and six known sites in 2002 and 2004 at the time the Forest Plan ROD was signed. Though these data do not allow detection of reliable trend data for the Superior NF, the increase shows progress toward the Forest Plan desired condition of 20-30 occupied nests (O-WL-31).

Because the goshawk is also a management indicator species, surveys for goshawk were conducted for this Project. Surveys consisting of approximately 178 individual calling points were conducted in the area in April 2007 with no detections. I nevertheless assume they occupy the area since surveys may miss individuals. One unoccupied stick nest (approximately the right size for goshawk) was found during surveys. Additionally, I saw one goshawk in the Project area in spring 2008.

Habitat Needs and Limiting Factors

Reynolds et al. (1992), Graham et al. (1994), Squires and Reynolds (1997), and others state that goshawk is a forest dwelling raptor whose habitat preferences are mature deciduous or mixed deciduous and coniferous forest in fairly contiguous blocks intermixed with younger forests and openings for prey species habitat. Across the range of the species, goshawks have demonstrated an ability to use a wide variety of habitat types that have high degree of canopy closure (Squires and Reynolds 1997). Goshawks are adapted to flying beneath the forest canopy and use primarily mature forest with sufficient open space between the bottom live tree branches

and understory for the birds to fly easily. Some understory (e.g., forbs) and down logs are needed for prey species habitat. Adults and fledglings use large down logs as feeding and plucking perches. Goshawks may use forest edge if large-bodied prey is more common there.

In eastern deciduous forests, goshawks prefer to nest in large forested areas containing more mature timber than generally present in the landscape, and nests are often close to wood roads or trails that serve as flight corridors (Speiser and Bosakowski 1987 cited in Squires and Reynolds 1997). In Michigan and Wisconsin, Postupalsky (1997) and Rosenfield *et al.* (1998) found that goshawks nested in a wide array of forest types, including aspen monotypes, pine plantations, sugar maple, maple-oak, and black ash with a mean canopy closure at the nest site of 82%. Boal *et al*. (2001) studied habitat use by nesting goshawks in northern Minnesota. Eighty-one percent of 46 nests were built in aspen, 11% in paper birch, 4% in white pine, and 2% each in red oak and red pine. Nesting stands in Minnesota had similar stand structures with 1.1m to 3.5 m between the bottom of the overstory and the top of the understory trees (Boal et al. 2001). On the Superior National Forest, aspen is the most common nest tree (23 nests) followed by birch (5 nests), Jack pine (4 nests) and red pine (2 nests). Goshawks do not generally use the same nest for more than a year, typically having two and up to nine alternate nest sites located within a square mile of the present nest (Estabrook 2000).

Goshawks are an opportunistic hunter preying on a wide variety of vertebrates and insects. Goshawks forage in mature forest habitats. In Minnesota, goshawks preferentially used older age classes for foraging with old (>50 years) upland deciduous and deciduous mixed stands. Boal *et al*. (2001) found that foraging stands, regardless of stand type, were consistent in having high stand densities of tall, large canopy trees, with horizontal open spaces of 3 to 12 feet between the bottom of the overstory and top of the understory trees, and up to 3 feet between the bottom of the understory canopy and top of the shrub layer. They suggested that these relatively unobstructed spaces between vegetation layers may serve as important flight paths through forest stands, and the heights in which they occurred was consistent among stand types.

Widén (cited in Niemi and Hanowski 1997) suggests that goshawk prefers larger tracts of forest for foraging and, therefore, is affected by fragmentation of forested areas. Goshawk seldom uses recently cut areas for foraging presumably because of the dense understory where prey is hard to detect. Creation of landscape patterns (e.g., large openings from clearcutting or increased edge habitat) that favor predators such as red-tailed hawk, great-horned owl, fisher or raccoon are a threat to goshawk. In one study, stands larger than 50 acres were used more consistently by goshawk than stands smaller than 25 acres (Estabrook 2000). In Wisconsin, Erdman *et al.* (1998) observed hat large clearcuts, selective cuts next to clearcuts, or canopy openings reducing cover to less than 40%, resulted in red-tailed hawks and great horned owl displacing woodland hawks.

Goshawks are sensitive to disturbance at nest and roost sites and nest abandonment has been documented within 300 feet of logging or recreational camping (Squires and Reynolds 1997). Range-wide, destruction or modification of habitat, including fragmentation, changes in vegetative structure and composition, and effects of activities associated with habitat modification are considered the primary threat to breeding goshawks (Squires and Reynolds 1997). In Michigan, Postupalsky (1991) states that the most significant threat to the species is habitat alteration through timber harvesting which affects the availability of suitable nest sites

and enhances the distribution of competitors (primarily red-tailed hawk and great horned owl). Increase in human activity in the form of road traffic, structures and communities may dampen some of the potential recovery from large-scale logging 100 years ago (Squires and Reynolds 1997). The reintroduced fisher is blamed for increased nest failure and adult female mortality in Wisconsin (Erdman *et al.* 1998). Fishers are known to occur in the Border area, however the impact that they have to goshawks in the Border area is unknown. Boal et al. (2001) summarize that mammalian predation is causing between zero and 30% of nest failures in the western Lakes States.

Reynolds et al. (1992) and Graham et al. (1994) state that the nesting home range of goshawks contains three components: the nest area, the post-fledging family area, and the foraging area. Table BE 4 illustrates some of the biological functions associated with these three habitat components. The Forest Plan directs us to maintain a minimum of 50 acres of suitable habitat (100% mature forest with >90% canopy closure) around known nest sites. Forest Plan direction for the post-fledging area is to maintain suitable habitat conditions within a minimum of 60% of 500 ac area encompassing the nest sites. The Forest Plan does not provide direction for management of the foraging area. Foraging areas for nesting goshawk can range from 21,000 to 27,200 acres surrounding the nest site. It is generally accepted that suitable foraging areas contain greater that 40% of the uplands in a mature condition.

Table BE 4 - Goshawk - Biological Function of the Three Components of Goshawk Home Range

Biological Function	Nest Area	Post-fledging	Foraging
Courtship and breeding	x		
Egg-laying and incubation	x		
Security for the female and young	x	X	
Foraging for young and female until dispersal occurs	x	X	
Alternate nest sites	x	X	
Nest and territory defense	x	X	
Foraging for adults and juveniles, and especially male during nesting			X
Security for adults and juveniles, and especially the male, while foraging			X

Forest Plan Direction

In addition to O-WL-1, O-WL-2, O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to goshawk:

- Provide habitat to provide for population goal minimum of 20-30 breeding pairs
- Protect, maintain or enhance high quality habitat conditions and minimize disturbance to nesting pairs in nesting sites (S-WL-10)
- Maintain suitable habitat condition on a minimum of 60% of the upland forested acres and minimize disturbance to nesting pairs in post-fledging areas (G-WL-22)
- In spatial Zone 3, strive to minimize the decrease in acres and number of patches of mature or older upland forest in patches 300 acres and greater (O-VG-24)

Analysis Indicators
Direct and indirect effects

1) **Impacts to Suitable habitat for Goshawk** is measured by:

   a) Acres and % of Mature Upland Forest (MIH 1 mature +) remaining with each alternative.
   b) Acres and number of mature upland patches 100 acres and greater remaining with each alternative.

2) **Improvements in future Stand Complexity** is measured by

   a) Acres of planting that would occur in suitable goshawk habitat.

Cumulative Effects
Impacts to Suitable habitat for Goshawk

This is measured by the number and acres of large (>300 acres) mature/old upland forest patches in patch Zone 3. This indicator utilizes spatial Management Indicator Habitat 13 – Large Patches of Upland Mature Forest. Note: The Analysis Area for this indicator goes beyond the Project area Analysis Area used for direct and indirect effects. I only look at effects to patch Zone 3 even though the Project area is in both Zone 1 and 3 because the Project will have no effect on patches in Zone 1. Forest Plan objectives for this zone are to:" strive too minimize the decrease in acres and number of older upland patches" and "to strive to minimize the decrease in interior forest habitat".

Direct/Indirect Effects
Effects Common to All Alternatives

Roads and trails (temporary and system) could impact nesting goshawks, however these effects are expected to be minimal because none are planned within known nesting areas and mitigations would protect nests if found. No new roads would be located within the 50 acre nest area. Gravel pits would have a minimal impact on goshawks since they will not be established in goshawk nesting habitat and would only impact a small portion of potential goshawk foraging habitat. Prescribed burning should have a minimal impact on goshawks as long as they don't kill existing or potential nest trees in quality habitat. Prescribed burn objectives should ensure this does not happen. Ongoing reforestation and restoration projects should benefit goshawks by providing future foraging and nesting habitat and by increasing within stand diversity, therefore increasing future habitat quality for goshawks.

Alternative 1
Effects to Goshawk Habitat

The environmental consequences of this alternative would be less suitable habitat (Indicator 1a) and fewer large mature patches (Indictor 1b) (Table BE 5) in the Project area. This alternative would not create any new young habitat on NF lands and will, through time, lose the intermixed habitat of young and mature forest that provide a variety of prey species. No management induced improvements to stand complexity would occur (Indictor 2). The short term effect

to this may be neutral because succession of the under stories of forest stands would occur, however the composition of the understory may be made up of less desirable species than Alternatives 2 and 3.

Alternatives 2 and 3

Both action alternatives would result in less upland habitat for goshawks than the no action alternative (Table BE 5). This could have negative effects on the goshawk. Likewise, negative effects could come from reduction in the number and acres of large mature patches. Alternative 2 would result in the least amount of upland forest habitat and fewest acres of mature patches.

Both action alternatives would maintain over 30% of the uplands in mature patches >100 acres. This would provide some large contiguous blocks of quality habitat for goshawks (Indicator 1b.). In addition, the young forest created by both action alternatives would provide habitat for important forage species such as ruffed grouse and snowshoe hares that may use the adjacent mature forest and be available to goshawks. Both action alternatives would increase future stand complexity (Indicator 2) with Alternative 2 providing twice the acres of stand complexity treatments as Alternative 3. Stand complexity would be improved through increasing the white pine and white spruce component of stand understories through planting and release which may enhance habitat conditions for goshawks. Also, mitigation will assure the maintenance of stand complexity in pine and spruce thinning units by requiring the operator to leave 6 to 12 live hardwood trees per acre when available. This will preserve possible future nest trees for goshawks.

Table BE 5 Goshawk
Indicators of Direct and Indirect Effects to Northern Goshawk

Indicators	Existing Condition			Alt. 1			Alt. 2			Alt. 3		
	Acre		%	Acre		%	Acres		%	Acres		%
1a. Upland Forest in Suitable Habitat[1]	28,646		64	26,960		60	19,696		44	20,703		46
	#	ac	%	#	ac	%	#	ac	%	#	ac	%
1b Patches	68	21,897	49	63	19,854	44	39	13,487	31	40	14,265	32
	Acres			Acres			Acres			Acres		
2. Stand Complexity[2]	n/a			0			2,152			1,036		

Data Sources: Existing condition for vegetation indicators is based on August 2007 CDS data, and all alternatives are based on projected CDS data in the year 2014.
Other Footnotes: Percentages are the percent of total upland forest on federal lands in the Project area (44,873 acres) [1]Suitable goshawk habitat = (MIH 1 Mature+). [2]Stand complexity release and weeding, control of understory vegetation, and fill-in planting that would occur in suitable goshawk habitat. ArcMap analysis Sept. 2008 Todd Stefanic

Cumulative Effects

Management of land under other ownership would probably reduce the present level of large blocks of mature upland forest found in the vicinity of Project area and in northeastern Minnesota under any of the alternative scenarios. Fragmentation of larger blocks of habitat

would make goshawks more vulnerable to predators and affect species distribution. As mentioned, Boal (2001) documented up to 30% nest predation in northern Minnesota. Wide ranging pairs may not successfully breed if they are forced to expand their home ranges to compensate for further loss of high quality foraging habitat. Reduction of goshawk suitable habitat by management of other owners will further increase the importance of maintaining suitable amounts of habitat on federal land. The State and counties plan to harvest timber in the Project area in the next ten years (see Draft EIS appendix G). This Project attempts to offset further fragmentation of the landscape by maintaining large, contiguous mature patches of forest and creating large, contiguous patches of young forest. Cooperative management should help maintain some large patches of forest by consolidating management across boundary lines.

The 2007 Monitoring and Evaluation report shows that forest-wide mature and older upland forest, a key indicator of suitable habitat for goshawk, was 56%, well above the 41% threshold and the 48% projected for the end of Decade 1 of Plan implementation. Data on forest-wide patches in Zone 3 (the Project has no effects to Zone 1) shows a slight (<2%) decrease in large mature patches Forest-wide for the first decade of the Forest Plan (Table BE 6 - Goshawk Indicator of Cumulative Effects to Goshawk Habitat). Suitable goshawk habitat will continue to be available in large portions of the Boundary Waters Canoe Area Wilderness. All of these conditions should ensure viability of goshawk on the forest.

Table BE 6 - Goshawk - Indicator of Cumulative Effects to Goshawk Habitat

Large Patches of Upland Mature Forest (MIH 13) Zone 3	Forest Plan ROD	Existing Condition	Alt. 1	Alt.	Alt. 3
Forest-wide	**2004**	**2007**	**2014**		
# (and acres) of ≥300-acre patches Zone 1	86 51,500	79 45,285	81 47,695	81 47,695	81 47,694
# (and acres) of ≥300-acre patches Zone 3	177 (185,200)	168 (199,291)	169 (184,078)	166 (181,893)	166 (182,140)

Data Sources: Existing condition for vegetation indicators is based on August 2007 CDS data, and all alternatives are based on projected CDS data in the year 2014.

Determination

Alternative 1 would have no effect. The proposed resource management activities planned in the Project area for Alternatives 2 and 3 may impact individuals but are not likely to cause a trend to federal listing or loss of viability. Sufficient habitat would remain in the Project area with any alternative. All alternatives would maintain over 44% suitable habitat. Both action alternatives would reduce fragmentation by positioning harvest adjacent to recent clearcuts on both Federal and nonfederal lands to increase stand size and increase future stand complexity. This determination is consistent with the determination in the Forest Plan Programmatic BE. All Alternatives are consistent with Forest Plan direction.

Mitigations/ Design Criteria

- Consult immediately with the District Wildlife Biologist if a large stick nest is found and suspend logging temporarily until a mitigation plan can be devised if the nest is used by goshawk.
- Monitor the (unoccupied) stick nest found in 2007 and surrounding area to see if it is used by goshawks.
- Harvest and temporary road construction should not be done between February 1 and August 31 within 2,885 feet of an active nest (S-WL-10).
- If a new goshawk territory is found, suspend harvest until a home range analysis can be conducted on the new site. If it is found that there is enough suitable habitat (using criteria above) remaining after the proposed harvest, continue with the operation. However, if the proposed harvest will lower the suitable upland habitat to levels below the threshold, defer the harvest unit.
- If a new active nest is found in a known goshawk territory, follow the time restrictions listed earlier for the new 500-acre post-fledging territory.
- In thinning units, leave 6 to 12 live hardwood trees per acre when available for potential nest sites. Specific units listed in Appendix C (Table C2, wildlife code: GOSH).

Boreal Owl
Existing Condition

Population and Trend

Hayward (1994) does state that boreal owls occupy boreal forests throughout the northern hemisphere. East of the Rocky Mountains, breeding has been confirmed only in Minnesota, and then primarily in northeastern Minnesota. Lane (1997) states that boreal owls appear to be widely distributed occurring at low densities as a regular breeding species in much of northeast Minnesota.

Nesting boreal owls have generally not been detected west of Highway 53 or the Vermillion River, or within eight miles of the shore of Lake Superior. The prime area for boreal owl appears to the eastern portion of the Laurentian RD (Ranger District), southern portion of Kawishwi RD, and the middle portion of the Tofte RD, but they are not confined to that area (Steve Wilson, Wildlife Biologist, Minnesota DNR and Bill Lane, Research Wildlife Biologist and consultant 2001). Detection probability decreases west of Highway 53 although a few have been observed in Koochiching County (Lisa Belmonte, research wildlife graduate student, University of Minnesota at Duluth Sep. 18, 2001).

The Minnesota Generic Environmental Impact Statement (Jaakko Poyry Consulting Inc. 1994) projected a decrease in the Minnesota boreal owl population if statewide timber harvest increased over one million cords overall or about 25% higher than at present. While attempts have been made to monitor boreal owl populations, present survey techniques are not sufficiently precise to detect population trends for northern Minnesota. Boreal owl populations fluctuate with winter snow depth and prey availability, and winter population irruptions occur periodically (Hayward 1994, Kirk 1994, Lane 1997). The population on the Superior National Forest is part of a larger Canadian population and may not be viable by itself at present (USD Forest Service 2006). Population trends are

difficult to detect given normal large population fluctuations and low precision of survey estimates. As with other northern owl species, populations are cyclical and tied to the abundance of prey (small mammals) in an area. Population estimates of boreal owls in Minnesota range between 100-600 individuals (Lane, 2001). Average home range size for four radio-tagged boreal owls on the Superior National Forest was 1,202 ha (Lane 2000). However, home range size is probably variable depending on prey density and other factors.

Boreal owl surveys were conducted for this Project. Seventeen routes were chosen (accessible routes in mature aspen-birch habitat near lowland foraging habitat) and surveyed in early to mid April 2008 using a call-response protocol. Three boreal owls were detected, however nest cavities were not confirmed for these owl detections (Ossman 2008).

Habitat Needs and Limiting Factors

Kirk (1994) states that boreal owls prefer forests dominated by black spruce, white spruce, balsam fir, balsam poplar, trembling aspen, and paper birch. Also, they favor mature forest during winter because snow conditions (uncrusted snow) facilitate ccess to prey; likewise, in summer, mature forest sites have less herbaceous cover than open sites, allowing greater access to prey. Following spring thaw, before herbaceous vegetation becomes dense, owls shift to openings where densities of voles exceed densities in forested stands (Hayward and Hayward, *in* The Birds of North America Online 2008).

Nesting habitat is mixed deciduous/conifer usually older than 70 years. Nest trees are typically aspen and birch with an average diameter of 16 to 17.5 inches. Cavities excavated by pileated woodpeckers are often used for nesting. Within eight acres centered on each nest site, another important habitat component is six or more dominant or co-dominant conifer that are used as song perches. Nest sites are usually within 200 yards of large areas of productive mature lowland conifer, primarily black spruce, which are preferred for foraging and roosting. Nests that are further than 200 yards from lowland conifer typically have a mature forest corridor to that lowland conifer. Populations are limited by availability of cavities for nesting and food supply (Hayward 1994, Kirk 1994). Limiting factors may be the right combination of nesting and foraging/roosting habitat, and possibly the distribution of these habitats and cavity trees. Fragmentation has been implicated in the isolation of boreal forest lowlands (USDA Forest Service 2004a). Other limiting factors include automobile collisions, and low prey density.

Within the Border area upland nesting habitat is prevalent, however large lowland complexes necessary for foraging habitat are very limited. Boreal owl habitat does exist in the Project area, but is not abundant or widespread with large complexes of lowland conifer habitat being the limiting factor.

Forest Plan Direction

In addition to O-WL-1, O-WL-2, O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to Boreal owl:

- In known or good potential breeding habitat, maintain or restore quality habitat conditions: suitable nesting habitat adjacent to or within ½ mile of foraging and roosting habitat. (O-WL-20)

Analysis Indicators

1) **Impacts to Suitable Habitat** is measured by:

1a. Acres and percent of mature aspen-birch forest (MIH 4 mature+) adjacent to foraging lowlands greater than ten acres in size that would remain with each alternative. This represents nesting habitat.
1b. Acres and percent of mature lowland black spruce forest (MIH 9+) greater than 10 acres in size that would remain with each alternative. This represents foraging habitat.

No management activities are proposed that will improve or restore habitat for boreal owl so no indictor was chosen to address this. However, it should be noted that in order to maintain existing potential nesting habitat, mitigations were applied to many proposed units. See mitigations below.

Direct/Indirect Effects
Effects Common to All Alternatives

Roads and trail (temporary, system, and special use) should have a minimal impact on boreal owls as long as they don't directly impact boreal owl nesting and foraging habitat. Many of the proposed roads use already existing road corridors which are not owl habitat. New construction would be located to avoid disturbance to as much wetland and mature forest as feasible and temporary roads would be decommissioned after use. Gravel pits would have a minimal impact on boreal owls since they are already existing and not located in quality owl habitat. Prescribed burning should have a minimal impact on boreal owls as long as they don't kill existing or potential nest trees in quality habitat. Prescribed burn objectives should ensure this does not happen.

Alternative 1

The environmental consequences of this alternative would be a slight negative effect on boreal owls due to a minor decline in nesting habitat. Stands would continue to grow into potential nesting and potential nest trees would continue to be created by pileated woodpeckers. This alternative would maintain the most suitable habitat (Table BE 7).

Alternatives 2 and 3

Both action alternatives would result in roughly a third less suitable nesting habitat as compared to Alternative 1 (Table BE 7). The action alternatives would maintain nearly the same amount of suitable foraging habitat as no action. Alternative 3 would maintain more nesting habitat than Alternative 2. The harvest of potential nesting areas in high quality habitat could have negative effects to boreal owls in the Border area. However, both alternatives would maintain over 2,000 acres of nesting habitat. Mitigation measures should help offset this loss of habitat. The harvested nesting habitat should continue to provide some level of nesting opportunities for boreal owls since large trees will be left that could provide cavities. Boreal owls will nest in

clearcuts as long as there are old trees left that provide cavities (Steve Wilson, personal communication with Dan Ryan March, 2006)

Table BE 7 - Boreal Owl - Effects to Suitable Habitat								
Indicators	Existing Condition		Alt. 1		Alt. 2		Alt. 3	
	Acre	%	Acre	%	Acres	%	Acres	%
1a. Nesting Habitat	3,742	15	3,305	14	2,098	9	2,303	10
1b. Foraging Habitat	2,267	87	2,275	87	2,221	85	2,228	85

Data Sources: Existing condition for vegetation indicators are based on frozen August 2007 CDS data, and all alternatives are based on projected CDS data in the year 2014. Foraging (mature lowland conifer > 10 acres) and Nesting habitat (Mature+ MIH 4 acres adjacent to mature lowland conifer > 10 acres) arrived at through Arc Map analysis by Todd Stefanic August 2008.
Other Footnotes: Percentage of nesting habitat is the percent of total upland deciduous forest on federal lands in the Project area (24,232). Percent of foraging habitat is the percent of total lowland black spruce forest (2,606).

Cumulative Effects

At the Landscape Ecosystems scale mature aspen-birch forest (MIH 4) is expected to decrease but the amount of Old aspen-birch forest is expected to increase. On federal lands within these LEs there is anticipated to be a reduction in mature upland patches (less than 300 acres) and a reduction in interior forest but an increase in mature lowland patches greater than 300 acres. Harvest by other landowners in the Project area (Appendix G) has the potential to further reduce boreal owl nesting, and to a lesser extent, foraging habitat. However, most of the other owners will follow the MFRC (2005) guidelines which will help retain possible nesting trees in their harvest units. Private land would continue to be bought and sold which could reduce boreal owl habitat.

2005 Forest-wide monitoring (Annual Monitoring Report 2006) showed a slight decrease in mature upland deciduous and a slight increase in upland mature conifer habitat which are both still above FEIS projected condition. It also showed a slight decrease in mature lowland conifer which is slightly below FEIS projected conditions.

This analysis is consistent with the cumulative effects expected in the Programmatic BE for the Forest Plan where habitat conditions are not anticipated to improve with implementation of the plan. Due to the location of this Project (not in prime boreal owl habitat) and the small amount of boreal owl habitat impacted by this, compare to the amounts available Forest-wide, implementation of Forest Plan Standards and Guidelines together with MFRC (2005) best management practices, including maintenance of leave trees and reserve islands in harvest areas should prevent a negative trend in viability.

Determination

There would be no actions in Alternative 1, therefore, no effects on boreal owls. The proposed resource management activities planned in the Project area for Alternative 2 and 3 may impact individuals but are not likely to cause a trend to federal listing or loss of viability. Alternative 2 would reduce more potential nesting habitat. The majority of this reduction comes from

harvesting older aspen greater than 70 years of age. Some harvest of this old aspen would regenerate to aspen for future nest habitat. Harvest units should continue to provide some nest habitat through mitigations, legacy patches and reserve trees/islands left along the wetland/upland interface. This should help offset the loss of nesting habitat. Reduction of fragmentation and the increase of the conifer component in the Project area may help provide better boreal owl habitat in the long-term. It is important that mitigation measures are followed. This determination is consistent with the determination in the Forest Plan Programmatic BE.

All Alternatives are consistent with Forest Plan O-WL-18, G-WL-11, G-WL-12, O-WL-20 and S-WL-5. Boreal owl specific Standards and Guidelines S-WL-6 and G-WL-13 do not apply since they pertain to known nest sites. Accordingly, if any nests are discovered they will then be implemented.

Mitigations/Design Criteria

- If a boreal owl nest site is discovered, immediately contact the District Wildlife Biologist.

- If any nesting pairs are discovered, avoid all activity that may disturb known nesting pairs during the nesting season (March 1 – June 1).

- In potential boreal owl nesting habitat, and/or in aspen forest type timber harvest units within ½ mile of Boreal owl detections (2008 spring surveys) reserve areas and trees should be concentrated along the wetland boundary to maintain potential nesting trees. Large (>12") aspen having or capable of producing nest cavities would be preferred reserve trees. Minimize activities that may disturb nesting pairs during critical nesting season (March 1-June1). See Appendix C (Table C2, Wildlife Code: BOOW) of the EIS for specific stands.

Olive-sided Flycatcher
Existing Condition

Population and Trend

MacLean (1999) summarizes that olive-sided flycatcher (*Contopus cooperi)* has a large breeding range that includes the wooded areas of Canada, Alaska, and the western and northeastern U.S. While secure in some places, a large and significant decline has occurred in many areas. Breeding Bird Survey data for North America shows the species declined 4% per year between 1966 and 1998, 5% per year between 1986 and 1998, and more than 1.5% per year in northern Minnesota between 1966 and 1996 (Sauer et al. 1999). A few individuals are detected each year on songbird monitoring plots in the Superior National Forest, but numbers are not large enough to estimate population trends (Danz *et al.* 2007). NRRI's Breeding Bird Monitoring effort surveys 169 stands (~ 490 points) on the Superior. It has been detected in 37 stands. However, detections are rare and irregular with only one detection in 20 of the stands during the period of 1991 thru 2005. A detection of a nesting olive-sided flycatcher was reported on the Gunflint Ranger District in 2005 (USDA Forest Service 2006). In 2008, NRRI Breeding Bird Monitoring survey points were added in lowlands in an effort to better detect and monitor species such as olive-sided flycatcher. In total there have been 94 observations on the Superior National Forest

documented during the NRRI bird monitoring from 1991 to 2007 (Danz *et al.* 2007). Five of these observations occurred in the Project area.

Portions of two USGS Breeding Bird Survey routes run through the Project area (36 total points in the Project area)(Grosshuesch 2008). The species has not been detected on the Glendale route (data 2004-2008) (Sauer *et al.* 2008, Grosshuesch 2008). On the Crane Lake route, the species has been detected 9 out of 16 survey years between 1969-2007, but not since 1989. (Sauer *et al.* 2008).

Habitat Needs and Limiting Factors

Olive-sided flycatchers nest most frequently in larger black spruce-tamarack bogs or in large openings with residuals (USDA Forest Service 2000b). MacLean (1999) states they use burned or cleared areas with standing trees, primarily conifers. Beaver ponds are also important habitat. Historically, fire regimes in upland conifers created and maintained foraging habitat that was widely distributed but had gaps (USDA Forest Service 2004a). Forage habitat structure of live and dead snags is the most important component in the breeding range. Reduction of fire frequency may have a greater impact on foraging habitat and may not be outweighed by habitat created through harvesting gaps (USDA Forest Service 2004a). Timber harvest does not provide habitat if it results in an even aged stand with little variation in canopy height, or few dead standing trees. At least 50 acres of habitat may be needed to support a single territorial pair (Niemi and Hanowski 1992, updated 2001). The primary threat to the species, however, appears to be exclusion of large scale fires in conifer stands and changes in wintering habitats in the Andes of South America (Nature Serve 2005).

Forest Plan Direction

In addition to O-WL-1, O-WL-2, O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to olive-sided flycatcher:

- Maintain, protect, or improve quality nesting and foraging habitat. This is defined as a variety of boreal forest (generally 10-20% canopy cover) including uplands, lowlands, edges, and beaver meadow with a preponderance of standing live or dead large trees used for perching and foraging, especially spruce or tamarack. High association with riparian and riverine area. (O-WL-25)

Analysis Indicators
Impacts to Suitable habitat

This is measured by acres and percent of young upland conifer forest (MIH 5 young) (Indicator 1) and by older riparian forest (MIH 10 mature+) (Indicator 2).

Older lowland black spruce-tamarack forest is discussed below but is not used as an indicator as differences between alternatives is negligible.

Table BE 8 - Olive-sided Flycatcher - Effect to Suitable Habitat								
Indicators	Existing Condition		Alt. 1		Alt. 2		Alt. 3	
Impacts to Suitable Habitat	Acre	%	Acre	%	Acres	%	Acres	%
1. Young Upland Conifer Forest	1,425	3	434	1	4,790	11	4,236	9
2. Mature+ Upland Riparian Forest	2,742	6	2,458	5	2,089	5	2,116	5
Data Sources: Existing condition for vegetation indicators are based on frozen August 2007 CDS data, and all alternatives are based on projected CDS data in the year 2014. ***Other Footnotes:*** Percentages are the percent of total upland and lowland forest on federal lands in the Project area (44,872 acres))								

Direct/Indirect Effects
Effects Common to All Alternatives

Roads and trails (temporary, system, and special use) should have a minimal impact on olive-sided flycatchers because they do not generally change the suitability of nesting and foraging habitat. Many of the proposed roads use already existing road corridors which are not flycatcher habitat. New construction would be located to avoid disturbance to as much wetland habitat as feasible. With all alternatives, low-density conifer lowlands and riverine/riparian areas would be maintained or enhanced through proper riparian management found in the State Best Management Practices (BMP's) and Forest Plan Standards and Guidelines, providing suitable habitat for the olive-sided flycatcher. All action alternatives would retain snags and leave islands via standards and guidelines but this is likely of lesser importance than fire regime. Gravel pits would have a minimal impact since they are already existing and not located in quality habitat. However, prescribed burning could have a positive impact on flycatchers due to the possible creation of snags.

Alternative 1

Environmental consequences may be negative for olive-sided flycatcher as few cleared acres would remain by 2014. Young upland conifer would decrease from 3 to 1 percent. (Table BE 8) . Mature+ riparian habitat would decline slightly (284 acres) as some stands succeed to younger age classes. Additionally, acres of mature+ lowland conifer would not change from existing condition.

Alternatives 2 and 3

The Project could enhance potential flycatcher habitat in upland forests that are harvested as residual trees would be left in all harvest units. Forest structure would be most varied in group selection and shelterwood cuts thus might be most beneficial to the species. Alternative 2 harvests more area to create temporary openings with residual trees than does Alternatives 3. Given the rarity of the species, both action alternatives create more than adequate temporary habitat for the species in the Project area.

Effects to lowland conifer habitat would be minimal. Mature+ lowland conifer would decline 57-63 acres compared to Alternative 1. Low-density conifer lowlands would not be harvested. Both action alternatives would result in slightly less mature+ upland riparian forest than Alternative 1. Most upland riparian forest would be maintained. Some riparian forest would be enhanced through salvage, or planting. Proper riparian management practices would be followed including; The Shipstead-Newton-Nolan Act, State Best Management Practices (BMP's) and Forest Plan Standards and Guidelines.

Cumulative Effects

Forest-wide young upland conifer (MIH5) is projected to increase from existing conditions in both the DRW and JPB Landscape Ecosystems (Section 3.81, Tables 3.8.6 and 3.8.7). This would provide more potential habitat as long as timber harvests that create this habitat include residual standing conifer trees that provide needed habitat structure. Forest-wide objectives, standards and guidelines will move more upland riparian forest (MIH 10) to a mature condition.

This Project, combined with other similar timber sales on the Superior National Forest as well as other ownerships could enhance habitat for this species if abundant conifer residuals are left, especially in large openings. MFRC (2005) Management Guidelines s hould be followed by the State, County and private landowners in the Project area during their harvest activities (Appendix G). These guidelines recommend maintaining an adequate amount of residual trees during harvest operations. It is recognized that historically, fire disturbance in upland conifer would have created abundant forage habitat that timber harvest may not be able to replicate. The result is lower quality and amount of habitat than would occur under natural conditions. This analysis is consistent with the cumulative effects analysis conducted for the Programmatic BE for the Forest Plan.

Determination

The no-action alternative may have negative environmental consequences to the s pecies as habitat would decrease. Overall, the action alternatives may have a beneficial impact to olive-sided flycatchers by creation of more temporary (ten yrs.) upland conifer young forest habitat. Individually, there may be minor negative effects to mature+ upland riparian habitat as habitat would decrease. Any activities in this habitat type would be mitigated by BMPs. Effects to lowland flycatcher habitat would be negligible under all alternatives. This determination is consistent with the determination in the Forest Plan Programmatic BE. All Alternatives are consistent with the Forest Plan direction.

Design Criteria (Forest Plan Operational Standards and Guidelines)

- Each harvest unit would have approximately 6 to 12 live trees left uncut per acre. These trees would be greater than 8 inches DBH and would be left individually, in clumps, or as reserve islands ranging from 0.25 to 2 acres in size. Emphasis would be placed on maintaining reserve clumps in areas of a unit which could serve as travel corridors for wildlife between adjacent forest cover patches and would meet visual quality objectives.

• Within clearcut stands larger than 20 acres, 5 percent or more of the total stand acreage would not be harvested, but would instead be retained as a "legacy patch" of live trees. Legacy patch vegetation would aid in the re-colonization of the adjacent managed area, and assist in the protection of organic matter and associated organisms in the soil. Where possible, each legacy patch would be at least two acres in size.

Mitigations

• None

Black-Throated Blue Warbler
Existing Condition

Population and Trend

This species is considered common, widespread, and abundant, but ppopulations may have decreased in some areas at margins of breeding range, e.g., southern Appalachians and Minnesota-western Ontario, but sample size (number of BBS routes) is not adequate in these areas for reliable statistical analysis (Nature Serve 2008). On the Superior National Forest this species has a very limited range where it is found nesting primarily in northeastern Minnesota in Cook and southeastern Lake Counties (outside the Project area) however, singing males are found across the forest.

The species has a significantly increasing (>9%) trend on the Superior National Forest between 1991 and 2007 but they were tested on 11 stands and their trends may be more susceptible to site-specific influences than other species (Danz *et al.*2007). NRRI's Breeding Bird Monitoring effort surveys have detected the species in 50 of 169 stands on the Superior (USDA Forest Service 2006). One hundred twenty-six individuals have been documented during the NRRI bird monitoring from 1991 to 2002 (Lind et al. 2006). There have been eight observations of the species in the Project area.

Portions of two USGS Breeding Bird Survey routes run through the Project area (36 total points in the Project area)(Grosshuesch 2008). The species has not been detected on the Glendale route (data 2004-2008) (Sauer *et al.* 2008, Grosshuesch 2008). On the Crane Lake route, the species has been detected 1 out of 16 survey years between 1969-2005, but not since 1971. (Sauer *et al.* 2008,).

Habitat Use and Limiting Factors

This species uses large contiguous northern hardwood forests, with areas of continuous canopy and is probably associated with small gaps and a well-developed under story. Research from the eastern parts if its range suggests that areas at least 2,500 acres in size and greater than 70% closed canopy are needed to support populations (Robbins et. al, 1989). It nests in small trees, saplings, or shrubs in dense undergrowth, within about a meter of the ground (Holmes et al. 1986, NatureServe 2005).

Vegetation management that reduces mature forest patches, removes structure and creates forest fragmentation in mature aspen-birch forest can reduce habitat suitability for the black-throated blue warbler. Fragmented habitats create conditions for American redstarts (*Setophaga ruticilla*) and chestnut-sided warblers (*Dendroica pensylvanica*) that compete with and can exclude

black-throated blue warblers from an area. Small amounts of fragmentation in otherwise interior forest result in moderate populations of American redstarts and chestnut-sided warblers. In such cases, the likelihood of these species invading adjacent interior patches after a disturbance event is relatively low. As fragmentation of interior forest increases and interior patches become smaller and more isolated, populations of American redstarts and chestnut-sided warblers become much higher and denser. In these situations, the likelihood of competing species invading interior patches after even a slight amount of disturbance is much greater. Risk factors include timber harvest (including thinning and partial harvest), forest fragmentation, reduction of mature forest patch size, and cultured forests that remove structure. The salvage of patchy blow-down can negatively impact the species, although patch harvest for stand management may improve conditions (USDA Forest Service 2004a).

Forest Plan Direction

In addition to O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to black-throated blue warbler.

- None

Analysis Indicators

Impacts to Suitable Habitat

This is measured by:

1) Acres and % of mature aspen-birch forest (MIH 4 mature +) remaining with each alternative
2) Number and acres of mature upland patches greater the 300 ac remaining with each alternative
3) Acres of interior habitat (MIH 12) remaining by alternative. This indicator in combination with indicator 4 is used to assess potential declines in habitat suitability and potential for increase in competition from American Redstarts and chestnut-sided warblers.

Table BE 9 - Black-Throated Blue Warbler Indicators of Direct and Indirect Effects

Indicators	Existing Condition		Alt. 1		Alt. 2		Alt. 3	
	Acre	%	Acre	%	Acres	%	Acres	%
1. Upland Forest in Suitable Habitat[1]	13,581	30	11,359	25	6,503	15	7,023	16
	Acres	#	Acres	#	Acres	#	Acres	#
2. 300+ Acre Patches	12,842	18	10,944	15	8,559	11	8,913	11
	Acres		Acres		Acres		Acres	
3. Acres of Interior Habitat	8,410		7,762		5,553		5,832	

Data Sources: Existing condition for vegetation indicators is based on August 2007 CDS data, and all alternatives are based on projected CDS data in the year 2014.
Other Footnotes: Percentages are the percent of total upland forest on federal lands in the Project area (44,872 acres), [1] Suitable Habitat = MIH 4 mature+

Direct and Indirect Effects
Effects Common to All Alternatives

Roads and trails (temporary, system, special use) should have a minimal impact on black-throated blue warblers as long as they don't directly impact nesting and foraging habitat. Many of the proposed routes use already existing road corridors which are not warbler habitat. Gravel pit management will have minimal effects on this species because pits already exist and limited habitat occurs in the vicinity of pits. Prescribed burning and release work could have a short-term negative impact by removing the understory vegetation. Long-term it could lead to a more diverse multi-layered stand creating better habitat quality.

Alternative 1

The environmental consequences of Alternative 1 would be a decrease of upland forest in suitable habitat as ~ 2,200 acres succeed from aspen-birch (MIH 4) forest type to other conifer (spruce-fir) dominated forest types. Likewise, the number and acres of large mature patches and interior habitat (Table BE 9) would decrease because of succession. Existing roads would continue to fragment some potential habitat and could have negative effects to black–throated blue warblers.

Positive environmental consequences could result as no management induced gaps would be created in mature upland aspen-birch forest which may lead to less competition from American Redstarts and chestnut-sided warblers.

Alternative 2 and 3

Direct effects could occur with all action alternatives in the form of disturbance from timber harvest and road construction during the nesting season. Since the species has a very limited range on the Superior National Forest; primarily in northeastern Minnesota in Cook and southeastern Lake Counties (outside the Project area) and few black-throated blue warblers have been documented in the Project area, the risk of these potential impacts is generally expected to be low and within acceptable risk levels. In addition, Forest Plan standards and guidelines would be implemented to protect (with a seasonal restriction) known stands with black-throated blue warbler locations. Table BE 9 the results of analysis indicators. Both action alternatives would result in less mature upland forest habitat (9-10% less than alternative 1); likewise, the number and acres of large mature patches and interior habitat (Table BE 9) would decrease compared to Alternative 1. This could have negative indirect effects to the black-throated blue warbler. Alternative 2 would result in the greatest negative effects to black-throated blue warbler habitat. Remaining habitat would continue to be well distributed in the Project area.

A goal of both action alternatives is to decrease management induced edge by maintaining large, contiguous mature patches of forest and creating large, contiguous patches of young forest to insure future interior habitat. This may benefit the species in the long term.

Cumulative Effects

It would be difficult for and unlikely that other ownerships, or combinations of ownerships, would provide very much suitable interior habitat for this species. Providing habitat for the black-throated blue warbler in the Project area is going to rely heavily

on national forest management in cooperation with state and county land managers. Habitat availability outside of the national forest boundaries would probably be scarce. Other ownership lands are generally in smaller units, less contiguous and more scattered than NFS lands. Therefore, management of these areas tends to fragment the forest, and decrease large mature patch and interior forest habitat conditions. This improves conditions for American redstarts and chestnut-sided warblers that compete with and exclude black-throated blue warblers.

On national forest lands, in both the JPB and DRW LEs the amount of mature and older aspen-birch (MIH 4) is predicted to decrease which could negatively affect the species. However, acres of aspen maintained would still be more than would have occurred under the range of natural variability and adequate amounts of habitat for the species would be retained.

The Project falls in Forest Plan Spatial Management Zones 1 and 3. Zone 3 is not generally considered prime black-throated blue warbler habitat on the forest. This Project would contribute to projected Zone-wide decreases in mature/old interior forest (MIH 12) and upland mature patches (MIH13) in Zone 3 (Section 3.81, Tables 3.8.9 and 3.810), which could negatively affect the species. This Project would have no effect on Zone 1 interior habitat or upland mature patches. Zone-wide, compared to existing condition, Zone 1 mature/old interior forest (MIH 12) and upland mature patch acres (MIH 13) are projected to increase, which could have positive effects on the species by providing more potential habitat.

This decrease in suitable habitat conditions is consistent with the cumulative effects analysis and predictions conducted in the programmatic BE for the Forest Plan. Despite the decrease in suitable habitat, adequate amounts should be maintained in prime range (patch Zones 1 and 2) in order to maintain viability. The BWCAW likely provides little suitable habitat for black-throated blue warblers due to the larger amounts of conifer forest that dominates.

Determination

Alternative 1 will have no effect on the black-throated blue warbler. The proposed resource management activities planned in the Project area may impact individuals but are not likely to cause a trend to federal listing or loss of viability for Alternatives 2 and 3. All alternatives will maintain well distributed habitat and some large mature patches and most interior forest habitat. This determination is consistent with the determination in the Forest Plan Programmatic BE. All Alternatives are consistent with Forest Plan direction.

Mitigations

- In timber harvest units of known or historic Black-throated blue warbler presence (DNR Heritage Database 2007) minimize activities that may disturb nesting pairs during critical nesting season (May 15 – August 15). See Appendix C for specific stands (Table C2, wildlife code: BTBW).

Bay-breasted Warbler

Existing Condition
Population and Trend

An estimated 90% of this species population is found in Canada with the Superior National Forest falling at the southern edge of the species range. The bay-breasted warbler breeds throughout the spruce-fir forest of Canada and the northern most parts of the U.S. following the range of spruce budworm (*Choristoneura fumiferana*) (Maxson 1999). The population does fluctuate in apparent response to outbreaks of spruce budworm its obligate prey species. Populations are decreasing range wide. Breeding Bird Survey data indicate a significant population decline in eastern North America, averaging 7.1 per cent/year, 1980 through 2000 (Sauer *et al.* 2001). This represents an overall decline of 77.1 per cent over the 21 year period. Trends in northeastern Minnesota are unknown because of the remote areas along the Minnesota/Canadian border and in the Boundary Waters Canoe Area Wilderness where they are primarily found (Jakko Poyry, 1992, USFS, 2004b).

Populations may have declined in the past 100 years with the replacement of conifer dominated stands by aspen. Loss of habitat, change in vegetation composition, management to control spruce-budworm, fire suppression, and deforestation in wintering habitat all contribute to the population decline (USFS 2002b, USFS 2004b). Twenty-five observations of the species have been documented on the Superior National Forest during the NRRI bird monitoring from 1991 to 2007, but none since 1999. This number is not enough to calculate trends in annual abundance (Danz *et al.* 2007). No bay-breasted warblers are documented to occur within the Project boundary, nonetheless, I assume that they are likely to occur in the area. Potential impacts to bay-breasted warbler can be adequately assessed based on species' habitat requirements, distribution, and expected management impacts to habitat.

Habitat Needs and Limiting Factors

Maxson (1999) summarizes that bay-breasted warbler breeds primarily in old upland and lowland spruce-fir forests, sometimes pine, and coniferous riparian areas. They breed in forests where the conifers are dominant or co-dominant trees. They need patches of spruce budworm outbreak over a large area enough area that the birds can find. Birds often move to such an area in large groups. Maintenance of a viable and well-distributed population may require patches of relatively un-fragmented old spruce-fir forest of more than 3,000 acres capable of hosting a large enough spruce budworm outbreak (Robbins 1989). Green (1995) states that conifer dominated stands have decreased and been replaced by aspen over the past 100 years, indicating that less habitat is available at present compared to 100 years ago. Today the landscape has more habitat fragmentation due to limits on size of timber harvests, and previous Forest Plan emphasis on management for edge species such as deer, and mixed ownership. USDA Forest Service data show that spruce budworm defoliation in the eastern United States dropped substantially in 1986 from 5-8 million acres per year prior to that to less than 1 million acres per year after 1985. In Minnesota, there were about 70,000 acres of spruce-budworm defoliation in 1999 compared to a million acres in 1958. Limiting factors including; loss of habitat, change in vegetation composition, management to control

spruce-budworm, fire suppression, and deforestation in wintering habitat all contribute to the population decline (USFS 2002b, USFS 2004b).

In the Border Project area, suitable habitat (mature and older spruce-fir) is currently not abundant and does not occur in patches larger than about 100 acres.

Forest Plan Direction

In addition to O-WL-1, O-WL-2, O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to bay-breasted warbler:

- None

Analysis Indicators
Impacts to Suitable Habitat

This is measured by:

1) Acres and % of mature spruce fir forest (MIH 6) because it represents most habitat requirements of the bay-breasted warbler that would be affected by this Project.

Table BE 10 Bay-Breasted Warbler Indicators of Direct and Indirect Effects

Indicators	Existing Condition		Alt. 1		Alt. 2		Alt. 3	
	Acre	%	Acre	%	Acres	%	Acres	%
1. Mature and older upland spruce fir forest	1,918	4.3	2,650	5.9	1,723	3.8	2,037	4.5

Data Sources: Existing condition for vegetation indicators is based on August 2007 CDS data, and all alternatives are based on projected CDS data in the year 2014.
Other Footnotes: Percentages are the percent of total upland forest on federal lands in the Project area (44,872 acres)

Direct/Indirect Effects - All Alternatives

While the analysis indicator chosen is mature and older spruce-fir, it should be noted that the Project area currently has very limited habitat (2,299 acres of spruce-fir forest type) for the bay-breasted warbler and none of the alternatives would likely provide large areas of mature spruce-fir habitat for this species during the life of this Project. In all alternatives, the total amount of spruce-fir forest type would at least double from existing condition (to 4,561 – 4,901 acres). The age structure of these spruce-fir stands would be the main difference between alternatives. Long term this increase in overall spruce-fir forest type could benefit this species in all alternatives.

Roads and trails (temporary, system, and special use) should have a minimal impact on bay-breasted warblers as long as they don't directly impact nesting and foraging habitat. Many of the proposed routes use already existing road corridors which are not bay-breasted habitat. Gravel pits would have a minimal impact since they are already existing and not located in quality

habitat. Prescribed burning may have a negative impact on bay-breasted warblers due to the killing of balsam fir within stands.

Alternative 1

Environmental consequences of Alternative 1 would be a slight increase (732 acres) in mature spruce-fir habitat as some stands reach mature age. Future spruce-fir habitat would be created as old aspen stands succeed to spruce-fir. There would be very little (101 acres) of young spruce-fir. Overall, this could have slight beneficial impacts on the species.

Alternatives 2 and 3

There would be slightly less (613- 927 acres) mature spruce-fir habitat with the action alternatives than in Alternative 1. This could result in slight negative effects to the species. Like Alternative 1, succession of aspen stands to spruce-fir would occur creating potential future habitat for the species. The action alternatives would also create young stands of spruce –fir (1,202 – 1,443 acres) through conversion. Due to the limited amount of habitat for this species in the Project area, negative impacts of both action alternatives would be minimal and long term, the increase in total spruce-fir type may benefit the species.

Cumulative Effects

This Project, combined with other similar timber sales on the Superior National Forest as well as other ownerships (Appendix G), will continue to maintain more aspen than existed prior to European settlement in the Project area. This translates to less habitat than would have been available for bay-breasted warbler 100 years ago.

Spruce-fir forest is currently below Forest Plan objectives in the DRW and JPB Landscape Ecosystems (USDA 2008). The Minnesota Forest Resources Council Landscape Committee set a goal to increase spruce-fir forest in Minnesota. These spruce-fir goals will also be used as a guideline, to varying extents, by other land management agencies in the Project area. Therefore, amounts of spruce-fir forest should increase and move closer to objectives in the Northern Superior Uplands and LE's through conversion to spruce-fir or through natural succession. Mature and older spruce-fir forest is projected to increase in both the DRW and JPB LEs in the first decade of the new Forest Plan (Section 3.8.1 Table 6 and 7) which may benefit this species.

Determination

Alternative 1 will have no effect to the bay-breasted warbler. The proposed resource management activities planned in the Project area may impact individuals but are not likely to cause a trend to federal listing or loss of viability in Alternative 2 and 3. There would be less bay-breasted warbler habitat under the action alternatives than no action but long term all alternatives result in more total spruce-fir forest. None of the alternative would provide large areas of habitat for the species during the life of this Project. Retention of some mature patches of forest greater than 300 acres and other spruce-fir forest deferred from harvest should provide an adequate amount of habitat to provide for the

viability of this species in the Project area. This determination is consistent with the determination in the Forest Plan Programmatic BE.

Mitigations - None identified.

Bald Eagle (Management Indicator Species)

See Forest Plan FEIS 2004 (Volume I, pg. 3.3.4-32) for rationale as a Management Indicator Species.

Existing Condition
Population and Trend

Recovery goals in the United States have been met. The final rule to de-list the bald eagle was published July 9, 2007 (USDI 2007). State-wide there appears to be a 28% increase in active nests from the 2000 to the 2005 survey (MN DNR 2006). On the Superior National Forest the 2005 survey shows a 15.4% increase in active nests (MN DNR 2006). On the Superior NF there were 90 active breeding territories in 2005, exceeding the Forest Plan goal of 85 (USDA 2008). There are eight known bald eagle nests in the Project area. During 2005 occupancy survey flights, four of these were active (USDA 2006).

Habitat Needs and Limiting Factor

Bald eagles are known to use suitable habitat in the Forest during the spring and summer for breeding, nesting, and raising young. The maintenance of successful reproducing eagles requires a balance of suitable habitat, low contaminants in prey, and low human disturbance. Suitable nesting habitat consists of stands dominated by mature and old growth timber or younger forest with a remnant component of older super (above) canopy trees located within 0.25 miles of streams and lakes bearing predominantly shallow water fish species. Nests are sometimes found further from water than 0.25 miles. On the Superior National Forest, 85% of nest trees selected by eagles are large-diameter, old age, white pine (Lindquist and Rogers 1992). Eagle habitat also includes foraging and roosting areas within 1.5 miles of nesting areas. Limiting factors for eagle appear to be suitable nesting and roosting sites and disturbance from humans during the nesting season.

Forest Plan Direction

With the delisting of the bald eagle, management objectives identified by the Forest Plan on the Superior National Forest have changed from seeking to recover the species to seeking to maintain, protect and enhance its habitat and prevent federal listing. The SNF management activities will be governed by The Northern Lake States Recovery Plan: 1983 (Grier *et al.* 1983) with consideration of the Fish and Wildlife Service National Bald Eagle Management Guidelines: May 2007 (USDI 2007) and MN DNR (2003) Recommendations for Avoiding and Minimizing Impacts. Where there are differences, generally the most restrictive guidelines of the three will be followed for this Project.

In addition to O-WL-1, O-WL-2, O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to bald eagle:

- O-WL-16 Promote the conservation and recovery of the bald eagle. Population goal minimum: 85 occupied breeding territories.
- S-WL-3 Management Activities for bald eagle will be governed by the Northern Lake States Recovery Plan: 1983.

Analysis Indicator

1) **Impacts to Suitable Habitat**. This is measured by:

1a. Acres and percent of White and Red Pine Forest (MIH 7), within potential eagle habitat (½ mile of fish bearing waters, greater than 20 ac) that would result with each alternative
1b**.** Acres of red and/or white pine planting within potential eagle habitat that would result with each alternative

2) **Impacts of Human Access/disturbance**. This is measured by:

2a**.** Miles of open roads within potential eagle habitat (½ miles of lakes and streams 20 acres or greater) that would result with each alternative. This indicator includes OML 1-5 roads.
2b. Nest sites that have activities planned within ¼ mile. (Grier 1983).

Direct/Indirect Effects
Alternative 1

The environmental consequences of this alternative would be that pine habitat for nesting and roosting would remain the same as is found on the landscape today (Table BE 10). No additional acres would be converted to red and white pine (MIH 7). No diversity planting or release of white pine (to improve survival rates) would take place. Nonetheless, white pine is currently found scattered throughout the Project area in the understory and it is expected that some of this would survive to provide future nesting and roosting areas. No sites would be disturbed by management activities. Amount of open roads on potential habitat would decrease by about 4 miles as a result of road decommissioning as part of the Travel Management Plan which might slightly lessen the potential for human disturbance.

Alternatives 2 and 3

Alternatives 2 and 3 could benefit the bald eagle by increased red and white pine in the landscape through conversion to these forest types and diversity planting within other forest types. In addition, large mature red and white pine trees would be reserved in final harvests, maintaining nesting and roosting trees. Both alternatives could further benefit eagle through a slight reduction (in addition to Travel Management) of open roads within potential eagle habitat.

Both alternatives propose vegetation management within 660 ft. of known nest sites. These activities could have negative effects to eagles if activities are conducted during the nesting period and the nests are active. As indicated by Fish and Wildlife Service National Bald Eagle Management Guidelines (USDI 2007) seasonal restrictions to these activities would be used to mitigate the potential negative effects.

Alternative 2 proposes vegetation management to that would involve overstory removal

in a stand within 330 ft. of a known nest. As indicated by Fish and Wildlife Service National Bald Eagle Management Guidelines (USDI 2007), these activities would be prohibited within 330 ft., along with the seasonal restriction to activities out to 660 ft. to mitigate the potential negative effects.

Use, expansion and rehabilitation of gravel pits, would have little to no effect on eagles in the Border area.

Table BE 11 - Bald Eagle
Indicators of Direct and Indirect Effects

Indicators	Existing Condition		Alt. 1 No Action		Alt. 2 Proposed		Alt. 3	
Impacts to Habitat	**Acre**	**%**	**Acre**	**%**	**Acres**	**%**	**Acres**	**%**
1a. Amount of white and red pine forest type, within potential eagle habitat.	6,139	17.7	6,139	17.7	6,707	19.3	6,604	19.0
	Acre		**Acre**		**Acres**		**Acres**	
1b. Amount of planting of pine planned within potential eagle habitat	n/a		0		2,571		2,224	
Disturbance	**Miles**		**Miles**		**Miles**		**Miles**	
2a. Amount of open roads within potential eagle habitat	171		167*		161*		161*	
	Sites		**Sites**		**Sites**		**Sites**	
2b. Number of nests sites that could be disturbed	n/a		None		3		2	

Data Sources: Existing condition for vegetation indicators are based on frozen August 2007 CDS data, and all alternatives are based on projected CDS data projected in the year 2014. Roads indicator data for Existing Condition and alternatives are based on Sept. 2008 road arcs coverage data and Border Project roads shape file created by Erich Grebner.
Other Footnotes: Percentages are the percent of total upland forest on federal lands in potential eagle habitat (½ mile of fish bearing waters, greater than 20 ac) (34,707 acres)
For indicator 2a, OML 1-5 roads are counted.
*Includes decommissioning 3.7 miles of roads as a result of Travel Management Plan.

Cumulative Effects
Additional impacts to eagle would occur on lands outside of National Forest jurisdiction. The activities considered in the cumulative effects analysis are listed in Appendix G of the EIS.

Based on Minnesota Generic Environmental Impact Statement Study on Timber Harvesting and Forest Management Practices (GEIS) (Jaakko Poyry 1994) red and white pine forest

acres are expected to increase. The amount of old forests in both these forest types is also expected to increase. Cumulative effects of forest management on all ownerships should benefit eagle by increasing preferred nesting, roosting, and perching habitat over the next four or more decades on both NFS and non-NFS lands.

Increases in the potential for human access near bald eagle territories may occur as people buy, subdivide, and develop private parcels of land. New road construction would be needed to access this property. Some of these roads may be developed near to current or future nesting habitat. Further, development of cabins and second homes next to lakeshores could also decrease high quality eagle habitat through actual destruction of potential nesting habitat or indirectly through increases in disturbance associated with motorized recreation such as ATVs and motorboats. Populations of fish, one of the primary types of prey species for eagle, may decrease on lakes with increased fishing pressure. Increasing fish populations through Minnesota DNR stocking would mitigate fish declines in some lakes. The Superior National Forest Travel Management Project may have beneficial impacts by decommissioning roads in eagle habitat. However, bald eagle mortality from highway collisions is expected to continue to be a problem as eagles take advantage of road-killed deer and other carrion.

Based on an increasing population of eagles, overall adverse cumulative impacts to eagle from human disturbance and habitat modification would not be significant enough to reverse its positive population trend.

Determination

Alternative 1 would have no effects to bald eagle. The proposed resource management activities in the action alternatives may impact individuals but are not likely to cause a trend to federal listing or loss of viability in bald eagle. Habitat conditions (red and white pine) would increase with the action alternatives. Action alternatives would result in a slight reduction of open roads within potential eagle habitat. Seasonal restriction on some management activities would mitigate potential negative effects from disturbance (see mitigations below).

Mitigations

- Within **330 ft.** of a Known Nest - See Appendix C (Table C2, wildlife code: BAEA-1) for specific stands.

  1) No clearcutting or removal of overstory trees at anytime (USDI 2007).

  2) All land use except actions necessary to protect or improve the nest site would be prohibited. Motorized access into this zone should be prohibited. Human entry should be prohibited during the most critical and moderately critical periods (Grier *et al.* 1983). MN DNR (2003) defines this period as Feb. 15 – June 15 for Northern Minnesota.

- Within **660 ft.** of a Known Nest **-** See Appendix C (Table C2, wildlife code: BAEA-2) for specific stands.

1) Restrict harvest and associated activities during bald eagle nesting period, when nests are active. Activities should not occur between February 15 and October 1 (USDI 2007).

2) Land-use activities that result in significant changes in the landscape, such as clearcutting should be prohibited. Actions such as thinning tree stands or maintenance of existing improvements can be permitted. Human entry should be prohibited during the most critical period. The MN DNR (2003) defines as this period as March 15 – May 15 in northern Minnesota.

3) Roads and trails in this zone should be obliterated, or at least closed during the most and moderately critical periods (Feb. 15 – June 15, MN DNR 2003) (Grier *et. al*. 1983).

- Protect and preserve three or more super-canopy red and white pine trees (preferably dead or with dead tops) within ¼ mile of nest locations for roosting and perching sites (Grier *et al.* 1983). See Appendix C (Table C2, wildlife code: BAEA-3) for specific stands.

- Retain at least 4-6 over mature (super-canopy) red and white pine trees for every 320 acres within 1/2 mile of water (Grier *et al.* 1983, USDI 2007). See Appendix C (Table C2, wildlife code: BAEA-4) for specific stands.

- If any new bald eagle nest were found during Project implementation, activities would be temporarily halted in the area. The District Biologist would be consulted and appropriate mitigation measure would be designed and carried out prior to restarting operations.

Connecticut Warbler

Existing Condition

Population and Trend

Rieck (1999) summarizes that the Connecticut warbler (*Oporornis agilis)* breeds from British Columbia to Quebec including the northern Lakes States. The bird is very secretive and difficult to detect. The trend for Connecticut Warbler in Minnesota from the North American Breeding Bird atlas is 1.0 during the period of 1966-1999 (a non-significant increasing trend) (Sauer et al. 2001).

NRRI songbird monitoring (Danz *et al.* 2007) over the past ten years in the Great Lakes National Forests shows a 13% annual decline on the Chippewa National Forest (down 200% since the survey began) but does not provide trend data for the Superior National Forest. NRRI's Breeding Bird Monitoring effort surveys 169 stands (~ 490 points) on the Superior. It has been detected in 41 stands during the period of 1991 thru 2005 (Annual Monitoring Report 2005). There have been 177 observations of the species on the SNF during NRRI bird monitoring from 1991 to 2007 (Danz *et al*. 2007).

Portions of two USGS Breeding Bird Survey routes run through the Project area (36 total points in the Project area)(Grosshuesch 2008). The species has been detected on the Crane Lake route 7 times (16 survey years) from 1969 -2005 (Sauer *et al.* 2008). The species has not been detected

on the Crane Lake route (3 survey years) from 2004-2008 (Sauer *et al.* 2008, Grosshuesch 2008).

Habitat Needs and Limiting Factors

USDA Forest Service (2000c) notes that Connecticut warbler breeds in short-needle conifer with low ericaceous shrubs (3 feet or less). They may also be in pine with a dense blueberry understory. These warblers forage on the ground and in low shrubs. Trees should be at least 15-30 feet tall. Typical habitat consists of wet areas with black spruce, tamarack, mosses, alder, dogwood, Labrador tea, bog rosemary, bog laurel, and leather leaf (Rieck 1999). They also use jack pine forests. The Conservation Assessment for Connecticut Warbler (USDA Forest Service 2002f) lists the "Superior National Forest Habitat of Connecticut Warbler occurrences: Primarily boreal bogs and jack pine (which is a rare habitat there)" (USDA 2000b). Lind *et al.* 2006 found Connecticut warblers most abundant in black spruce forest types, followed by saw-sized jack pine and then to a lesser degree in descending order of abundance: saw-sized jack pine, saw-size red pine, saw-size fir/aspen/paper birch, saw-size quaking aspen, saw-size white pine, regenerating jack pine, pole-size mixed conifer swamp, regenerating quaking aspen, pole-size fir/aspen/paper birch, and pole-size quaking aspen. This data is based on point count surveys conducted over a period of ten years in 168 stands on the Superior National Forest. Threats and limiting factors are not fully understood but include loss of breeding habitat, loss of wintering habitat, nest predation and parasitism, collision with towers, and possible habitat fragmentation (USFS 2002f, 2004b). Rieck (1999) and USDA Forest Service (2000b) state that wintering habitat in northern South America is declining and breeding habitat may also be in decline range wide.

Forest Plan Direction

In addition to O-WL-1, O-WL-2, O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to Connecticut warbler:

- None

Analysis Indicators

Impacts to Suitable Habitat - This is measured by:

1) Acres and % of mature jack pine forest (MIH 8).
2) acres and % of mature lowland black spruce forest (MIH 9).
   - ❖ 1 and 2 were chosen for analysis because they represent the most common nesting and cover habitat for Connecticut warblers. This analysis recognizes the limitation that not all mature jack pine provides suitable habitat.

3) Acres converted to jack pine will be measured and compared. This analysis is conducted to measure potential future habitat.

Table BE 12 - Connecticut Warbler - Direct and Indirect Effects								
Indicators	**Existing Condition**		**Alt. 1**		**Alt. 2**		**Alt. 3**	
	Acre	**%**	**Acre**	**%**	**Acres**	**%**	**Acres**	**%**
1. MIH 8 mature+ acres and (%) of MIH 1	5,074	11.3	4,863	10.8	3,721	8.3	3,894	8.7
2. MIH 9 mature+ acres and (%) of MIH 9	2,553	98	2,553	98	2,490	95.5	2,497	95.8
	Acres		**Acres**		**Acres**		**Acres**	
3. Acres of conversion to jack pine forest	n/a		none		121		121	
Data Sources: Existing condition for vegetation indicators are based on frozen August 2007 CDS data, and all alternatives are based on projected CDS data in the year 2017. ***Other Footnotes:*** Percentage of nesting habitat is the percent of total upland deciduous forest on federal lands in the Project area (37,185 acres). Percent of foraging habitat is the percent of total lowland black spruce forest (5,006 ac).								

Direct/Indirect Effects

There would be minimal impacts to boreal bogs under all alternatives. The primary impact to Connecticut warblers would presumably be from logging nesting habitat during the breeding season (May 15 to August 1). Roads and trails (temporary, system, and special use) should have a minimal impact on Connecticut warblers as long as they don't directly impact nesting and foraging habitat. Many of the proposed routes use already existing road corridors which are not bay-breasted habitat and wetlands will be avoided whenever possible. Gravel pits would have a minimal impact since they are already existing and not located in quality habitat. Prescribed burning may have a positive impact on Connecticut warblers if the burning stimulates growth of the understory within the pine stands.

Alternative 1

The environmental consequences of no action would be a slight loss of suitable habitat (Table BE 12 Connecticut Warbler). During the analysis timeframe small amounts of jack pine will succeed into other forest types providing less suitable habitat for this species. Acres of lowland black spruce-tamarack forest would remain unchanged.

Alternative 2 and 3

The action alternatives would have similar results (Table BE 12). There would be slightly less mature jack pine forest than with the no-action alternative. This could result in slight negative effect for this species, however, none of the alternatives would result in large quantities of jack pine habitat for this species. The action alternatives would result in mature lowland black spruce forest in amounts similar to the no-action alternative. Neither alternative would convert much forest to jack pine thus providing little increase in potential future habitat.

Cumulative Effects

This Project, combined with other similar timber sales on the Superior National Forest (Appendix G) as well as other ownerships could impact habitat for this species by altering understory vegetation or by directly impacting nest sites during the breeding season. The cumulative impact of the Project would be minimal since the primary habitat for the species (large boreal bogs) should not be impacted by the USFS or other ownerships in the Project area except for limited timber harvest. Forest-wide monitoring showed a slight increase in mature lowland conifer (Annual Monitoring Report 2006). Forest-wide in the JPB Landscape Ecosystems, mature and older jack pine is projected to increase (Section 3.8.1 Table 3.8.7) while these forests would decrease in the DRW (Section 3.8.1, Table 3.8.6) providing a minor net gain (~300 acres) in habitat for this species. Harvest on non-federal lands may provide slightly more acreage of Jack Pine thru conversion but probably not a large contribution. Project alternatives would have no impact on potential habitat available in the BWCAW.

Determination

Alternative 1 will have no effects on the species. The proposed resource management activities planned in the Project area may impact individuals but are not likely to cause a trend to federal listing or loss of viability under alternatives 2 and 3. There is very limited harvest in large boreal bogs and very small amounts of jack pine in the Project area. T his determination is consistent with the determination in the Forest Plan Programmatic BE.

Mitigations - None identified.

Three-toed Woodpecker

Existing Condition
Population and Trends

Drey (1999) summarizes that three-toed woodpecker (*Picoides tridactylus*) breed throughout coniferous forests in Canada and the western U.S., and in northern Minnesota and Wisconsin. Population trends are unknown but quite likely downward (Nature Serve 2008). It is considered very rare on the Superior NF (Green and Neimi 2002). Neither the Great Lakes National Forests Breeding Bird Monitoring effort (169 stands on the Superior monitored, Danz *et al.* 2007) nor the Fish and Wildlife Service Breeding Bird Survey (8 routes of 50 monitoring points each, Sauer *et al.* 2008) have detected three-toed woodpecker on the Superior National Forest. On the SNF, it is thought that inventory and monitoring population trend of this species is not practical due to its extreme rarity it would be costly to survey and results would be scientifically unreliable. Even if the bird is detected, there would not be enough information to calculate statistical trends in annual abundance. In part, it is likely that the timing of surveys are such that this species would not generally be detected. For these reasons, potential abundance and trend is evaluated with habitat indicators (Shedd 2006). Casual observations of this species have been made on the forest.

Habitat Needs and Limiting Factors

The three-toed woodpecker is a species of boreal and montane coniferous forests. It usually inhabits mature or old-growth coniferous stands with abundant insect-infected dead and dying trees (Leonard 2001). In Region 9, the woodpecker seems to nest mainly in spruce and balsam snags and mature trees. Dependence on insect-infected dead and dying timber frequently results in populations showing an association with forest disturbances such as fire, wind throw, floods, insect outbreaks and disease. In particular, three-toed woodpecker populations often show an increased abundance in early post-fire successional seres (USFS 2002n). According to Green and Niemi (2002), black spruce/tamarack stands are the vegetation community most likely to contain three-toed woodpeckers in Minnesota. Studies have also found that they are more likely to occur in larger areas of virgin forest vs. smaller patches (USFS 2002n) suggesting forest fragmentation may harm three-toed woodpeckers. In summary, three-toed woodpeckers generally inhabit larger patches of recently burned or decadent old growth coniferous (primarily spruce) stands (USFS 2002n). Threats facing this species include habitat loss, fire suppression, salvage logging, conifer conversion, beaver control and poor snag retention policies. Quality habitat on the Superior has been greatly reduced due to the above factors. Promotion of conifer and retaining residual trees (preferably long-lived, windfirm conifers) in large openings may maintain or enhance habitat conditions for three-toed woodpeckers.

Forest Plan Direction

In addition to O-WL-1, O-WL-2, O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to the three-toed woodpecker:

- Maintain or improve quality nesting and foraging habitat by managing toward the LE Vegetation Objectives for mature and older conifer forest. (O-WL-23)
- The amount and distribution of dead and dying trees should provide adequate representation of patterns and amounts that would result from natural disturbance. If natural disturbances do not provide adequate habitat, it may be necessary to emulate natural disturbance through management ignited fire or other treatments.
- Protect known nest sites within a 200-foot radius surrounding nest sites until young have fledged.
- Where ecologically appropriate, retain 6-10 jack pine per acre in even-aged regeneration harvests in mixed conifer stands.

Analysis Indicators

1) **Impacts to Suitable Habitat -** This is measured by acres and percent of mature and older jack pine forest (MIH 8 mature+) and spruce-fir forest (MIH 6 mature+) remaining with each alternative

2) **Enhancements in Habitat Condition** - This is measured by the acres of conversion to conifer. This measures a long-term enhancement.

Table BE 13 - Three–toed Woodpecker Direct and Indirect Effects								
Indicators	**Existing Condition**		**Alt. 1**		**Alt. 2**		**Alt. 3**	
Impact to Suitable Habitat	**Acre**	**%**	**Acre**	**%**	**Acres**	**%**	**Acres**	**%**
1. Amount of suitable habitat	6,992	15.6	7,513	16.7	5,444	12.1	5,931	13.2
Enhancement Indicator	**Acres**		**Acres**		**Acres**		**Acres**	
2. Amount of conifer conversion planned	n/a		0		2,218		2,223	
Data Sources: Existing condition for vegetation indicators are based on frozen August 2007 CDS data, and all alternatives are based on projected CDS data in the year 2014. ***Other Footnotes:*** Percentages are the percent of total upland forest on federal lands in the Project area (44,872 acres)								

Direct/Indirect Effects

Road system management and gravel pit use and expansion would have minimal effects on this species except where dead trees are removed within suitable habitat. The removal of foraging trees is anticipated to be relatively low with these activities.

Alternative 1

The environmental consequences of this alternative would be a slight increase in suitable habitat, however no conversion to conifer would take place possibly leading to less habitat available in the future. Additional habitat could continue to be provided by insect infestation, beaver flooding and wildfires. The no-action alternative would result in 15 mature upland patches over 300 acres in 2014. These large blocks could provide habitat for three-toed woodpeckers.

Alternatives 2 and 3

Both action alternatives would result in less mature forest habitat available for the species (Table BE 13). This could have negative effect on the species, however both action alternatives would convert over 2,200 acres to conifer, potentially improving conditions for the species long-term. There will be black spruce trees left in harvest areas which may help mitigate mature habitat loss and provide temporary foraging habitat for the three-toed woodpecker. Further, harvest was designed to reduce fragmentation (by harvesting adjacent to existing clearcuts) and provide for future large patches and interior habitat which may improve future habitat conditions for the species. Alternative 3 would retain the most suitable habitat in the analysis timeframe (2014).

Both action alternatives would result in 11 mature upland patches over 300 acres in 2014.This could have negative effect on the species as this is 4 fewer than the no-action alternative (Section 3.8.1, Table 3.1.8). These 11 remaining large blocks could provide habitat for three-toed woodpeckers. Long-term, (outside the analysis time frame) fragmentation would be reduced in the action alternatives as the average size of temporary opening is increased, thereby decreasing

management induced edge density. At the present time, this species is probably not common in the Project area. Timber harvest during the breeding season could result in reduced reproduction that year and loss of individuals, although it would be a very small chance given species rarity and the absence of large areas of standing conifers killed recently by fire, flood or windthrow.

Cumulative Effects

Habitat is decreasing range wide from historic conditions. Prior to European settlement, natural fire regimes in mature conifer and large amounts of old growth forest would have created abundant foraging habitat for three-toed woodpeckers. Fire suppression, salvage logging, clearcutting without abundant conifer reserve trees, maintenance of aspen, beaver and spruce budworm control, and habitat fragmentation threaten habitat for this s pecies. However, the windstorm of July 4th, 1999, and large fires in the past two years (Cavity Lake and Ham Lake) have created large areas of habitat for this species parts of the Superior National Forest.

On the Superior NF mature and older spruce-fir and jack pine forest are projected to increase in the JPB which could benefit the species by providing more potential habitat. On the DRW landscape ecosystem, mature and older spruce-fir is also projected to increase while mature and older jack pine decreases slightly (Section 3.8.1, Tables 3.8.6 and 3.8.7) which could have a neutral to slightly positive effect for the species . Mature a nd older lowland black spruce tamarack within the DRW and JPB Landscape Ecosystems is projected to increase ("Forest-wide Effects to Lowland Conifer", project file) which could benefit the species by providing more potential habitat

Forest management that removes conifers that have the potential to have high populations of insects, especially wood-boring beetles, is detrimental to the three-toed woodpecker. Other ownerships, especially the State, have started converting some aspen stands to conifer stands which should help increase habitat (Appendix C). Also, other ownerships follow Minnesota Forest Resources Council's Voluntary Site-Level Forest Management Guidelines (MFRC 2005) which would help to ensure that snags, reserve trees, and down wood are provided in harvests which could provide habitat for the species. Natural processes such as large scale fires and blow-downs may continue to provide habitat for the species in the future.

Determination

Alternative 1 would have no effects. The proposed resource management activities planned in the Project area may impact individuals but are not likely to cause a trend to federal listing or loss of viability under Alternatives 2 and 3. There is limited harvest in lowland black spruce habitat, most large mature patches will be protected and mitigation measures will provide habitat in harvest units. This determination is consistent with the determination in the Forest Plan Programmatic BE. Alternative 3 will have no effect. All Alternatives are consistent with the Forest Plan direction.

Mitigations

- (G-WL-18) Retain six to ten jack pine or spruce per acre (in addition to reserve trees) in even-aged regeneration harvests in jack pine and upland black spruce forest types. Leave trees evenly spaced when possible or in clumps on less windfirm sites. See Appendix C (Table C2, wildlife code: TTWO) for specific stands.
- Immediately contact Wildlife Biologist if a three-toed woodpecker nest is discovered.

Great Gray Owl

Existing Condition
Population and Trend

Kozie (1999) summarizes that great gray owl (*Strix nebulosa)* has a holarctic distribution and also breeds in the western United States and in the northern Lakes States. Available evidence does not indicate a decline in the United States. Populations are limited by the availability of pre-existing nest sites and prey. Population trends for the species are impossible to detect because of a lack of suitable monitoring program for the species. Winter invasions, suggests highs in the population cycle; however, the causes and source populations for these invasions is unclear (Jakko Poyry 1992).

Great gray owl surveys were conducted for this Project. Seventeen routes were chosen (accessible routes in mature aspen-birch habitat near lowland foraging habitat) and surveyed in early to mid April 2008 using a call-response protocol. One great gray owl was detected but a nest location was not confirmed (Ossman 2008). Although there a re no known nest sites in the Project area, I assume that they are likely to occur in the area. Potential impacts to great gray owl can be adequately assessed based on species' habitat requirements, distribution, and expected management impacts to habitat.

Habitat Needs and Limiting Factors

Kozie (1999) states that natural foraging habitat for great gray owl includes anywhere meadow voles (*Microtus pennsylvanicus*) are abundant and available to great gray owls. Meadow vole abundance is influenced by season (more numerous in late summer and fall), a 3-5 year cycle in Minnesota, and habitat capacity. The owls prefer moist soils and relatively open areas with high primary production of prey (meadow voles). Kozie (1999) summarizes that great gray owl breed in a variety of vegetation types. Nesting commonly occurs in mature aspen adjacent to muskegs. Minimum nest stand size in studies was 10 acres in Manitoba and 27 acres in Alberta. Foraging occurs in open habitat, including bogs, selective and clear-cut logged areas with residual perches, natural meadows, and open forests within 1.5 miles of the nest. Abundant perches are needed. Perches need not be tall; they can be high stumps, broken-off trees, and the short black spruce found in peatland bogs. Kozie (1999) states that great gray owls avoid jack pine, taller black spruce, dense forest cover, large open treeless areas without perches, and habitats with a dense shrub layer for nesting and foraging. They also avoid concentrations of predators such as great horned owl. Average home range size for breeding adults was 1.7 mile^2 in Oregon and a Minnesota study found 8 nests in 20 mile^2. Limiting factors include availability of suitable nesting sites,

foraging habitat, and prey abundance (Duncan and Hayward 1994, in Hayward 1994). Additional limiting factors include collisions with automobiles, development and disturbance during nesting (Natureserve 2006). Predation by great horned owl was greatest known mortality factor in northern Minnesota and southeastern Manitoba (Duncan 1987 in Natureserve 2008).

Within the Border area, both potential nesting and foraging habitats are abundant and well distributed.

Forest Plan Direction

In addition to O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to great gray owl:

- In known or good potential breeding habitat, maintain or restore high quality habitat conditions (O-WL-21)

Analysis Indicators

1) **Impacts to Suitable Habitat -**This is measured by:

   1a. Acres and % of mature upland forest (MIH 1 mature+) remaining with each alternative. This represents nesting habitat.

   1b. Acres and percent all lowland conifer forest and non-forest lowlands (all MIH 9 and non-forest lowland LEs), and young upland forest (MIH 1 young) remaining with each alternative. This represent foraging habitat.

2) **Temporary Foraging Habitat** -This is measured by the acres of young upland forest (MIH 1 young) created through treatment that is located within ½ mile of suitable nesting habitat (MIH 1 mature+). Any treatment that sets forest age to zero is included (clear-cut, coppice cut, seed-tree cut, and shelterwood harvest). This is a measure of potential short-term foraging habitat created by the alternatives.

Direct/Indirect Effects

Roads (temporary roads, and system roads and trails) should have a minimal impact on great gray owls. Owls forage readily along roadsides. Roads in all alternatives could cause direct mortality, however, this effect is thought to be minimal as many roads in suitable habitat are low standard and receive low traffic volume at slow speeds. Many of the proposed roads use already existing road corridors which are not owl nesting habitat and wetlands will be avoided whenever possible. Gravel pits would have a minimal impact since they are already existing and not located in quality habitat. Prescribed burning should not have an impact on great gray owls unless there was a nest present in the stand.

Logging in nesting habitat could impact the great gray owl in all alternatives, by removing suitable nesting structure. Consequently, harvest can also create temporary foraging habitat. Also, maintaining large mature patches of upland forest would help to ensure suitable interior nesting habitat would be available across the landscape. Implementation of Minnesota Forest Resources Council's Voluntary Site-Level Forest

Management Guidelines (MFRC 2005) would help to ensure that snags, reserve trees, and down wood are provided in all harvested stands.
The Project area contains natural habitats (lowland conifer, non-forest lowlands and temporary openings) that may serve as foraging habitat for great gray owl. The Project would create additional temporary openings through timber harvest.

Alternative 1

This alternative would have minimal environmental consequences to great gray owl habitat. No new temporary foraging habitat would be created on USFS land and no existing nesting habitat would be harvested. Through succession, nesting habitat and foraging habitat would decrease. After current young forest reaches 10 years, young uplands would largely disappear and foraging habitat will have to be provided solely by sedge meadows, shrub wetlands, sparsely stocked lowland forests and /or natural disturbance which creates young forest.

Alternatives 2 and 3

The effects of both action alternatives would be less nesting habitat and more foraging habitat than the no action alternative. Potential nesting habitat would be harvested, thus creating potential foraging habitat. Both alternatives maintain adequate foraging and nesting habitat (Table BE 14). Both action alternatives would follow the great gray owl specific Forest plan objectives and guidelines; O-WL-21, G-WL-14 and G-WL-15. Currently known nests and newly found nests would be protected.

Table BE 14 - Great Gray Owl Direct and Indirect Effects

Indicators	Existing Condition		Alt. 1		Alt. 2		Alt. 3	
Impacts to Habitat	**Acre**	**%**	**Acre**	**%**	**Acres**	**%**	**Acres**	**%**
1. Nesting habitat	28,646	64	26,960	60	19,696	44	20,703	46
2. Foraging Habitat	13,104	23	11,371	20	19,491	34	18,284	32
Habitat Enhancements								
Upland temporary foraging habitat	2,755		1,023		9,141		7,935	

Data Sources: Existing condition for vegetation indicators are based on frozen August 2007 CDS, and all alternatives are based on projected CDS data in the year 2014.
Other Footnotes: Percentage of nesting habitat is the percent of total upland forest on federal lands in the Project area (44,872 acres). Percentage of foraging habitat is the percent of total federal lands in the Project area (57,600 acres)

Cumulative Effects

This project, combined with other similar timber sales on the Superior National Forest as well as other ownerships (Appendix G) could impact habitat for this species, both positively and negatively. Potential nesting habitat would be harvested and additional temporary foraging areas would be created. The overall impact should not be significant considering that nesting habitat is not considered to be the limiting factor on the SNF. Leave tree (MFRC site-level guidelines) would provide foraging perches in harvested areas. Creation of temporary foraging habitat through harvest should assure that the remaining potential nest habitat (>59 years of age) will be

within 1.5 miles of some type of foraging habitat. Suitable habitat is also maintained in the BWCAW. Forest Plan Management for large mature patches and goshawk habitat would benefit this species as well.

Determination

Alternative 1 would have no effect on the great gray owl. Alternatives 2 and 3 may impact but not likely to cause a trend to federal listing or loss of viability of great gray owl. Adequate amount of suitable nesting and foraging habitat appear to be available with all alternatives. Site specific standards and guidelines would help to protect know and newly discovered nest sites from adverse affects of forest management. This determination is consistent with the determination in the Forest Plan Programmatic BE. All Alternatives are consistent with the forest plan direction.

Mitigations

- Immediately contact District Wildlife Biologist if a stick nest and/or great gray owl nest is discovered.

- Protect any known great gray owl nest and avoid disturbance of nesting pairs during the critical nesting season (March 1 – June 1).(G-WL-15)

- In timber harvest units adjacent to the lowland non-forest where a great gray owls were detected (2008 spring surveys) minimize activities that may disturb nesting pairs during critical nesting season (March 1-June1). See Appendix C (Table C2 code GGOW) for specific stands.

3.8.2.6 Insects

Laurentian Tiger Beetle – *Cicindela denikei*
Existing Condition

Population and Trend

While this species has a limited range it does not appear to be rare within the range (Nature Serve 2008). There are 90 documented sites in Minnesota, including at least 36 sites on the Superior National Forest and 3 sites in the Project area (MN DNR Heritage database 2007). This is up from the 13 known sites in the SNF at the time of the Forest Plan ROD (USDA Forest Service 2004a - Forest Plan BE, Table 3, p. 15.). Project level s urveys were not conducted. Potential impacts to the species can be adequately assessed based on species' habitat requirements, distribution, and expected management impacts to habitat.

Habitat Needs and Limiting Factors

Micro-site rather than overstory forest type is important. This species uses sandy or rocky openings, bedrock exposures, gravel pits, and abandoned or little-used gravel roads. Open sandy, gravelly substrate is critical for the larval stage of the tiger beetle. The larval

stage is most susceptible to environmental disturbance, as adults can probably disperse to new habitats if disturbance occurs (Steffens 2001). Activities that may negatively impact larva and larval habitat include gravel excavation, soil compaction by heavy machinery, vehicles, or RMVs (recreational motor vehicles), and alteration of soil moisture, vegetation, and sun exposure (Steffens 2001). Vegetation succession results in changes from suitable habitat to an unsuitable condition leading to adult abandonment or dispersal from these sites. Other threats to tiger beetles include fire suppression, logging, and road building. Gravel extraction can have both beneficial and negative impacts by destroying habitat and individuals and creating new suitable sites.

Habitat does exist in the Project area: although some of soils may be too coarse to provide quality habitat. Potential impacts to tiger beetle can be adequately assessed based on species' habitat requirements, distribution, and expected management impacts to habitat.

Forest Plan Direction:

In addition to O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to Laurentian tiger beetle:

- None

Analysis Indicators

For this analysis I used the acres of existing gravel pits and the proposed expansion acres to measure the impacts to tiger beetles thru changes is suitable habitat.

Direct/Indirect Effects

Alternative 1

This alternative would have minimal environmental consequences to tiger beetles. Existing gravel pits totaling about 24 acres would continue to be used which could both positively and negatively affect species. Overall, this should have minimal environmental consequences to tiger beetles as a small amount of habitat would be impacted, and mitigations to maintain portions of gravel pits undisturbed at all times should maintain some suitable habitat at each site. Vegetation succession may change some habitat to an unsuitable condition.

Alternatives 2/3

Direct and indirect effects could occur and would be similar under both action alternatives. Eleven of 12 existing gravel pits would be maintained and could continue to be used. Three of those existing pits have potential for expansion. The Project area existing gravel pits total 24 acres with the maximum potential expansion to 81acres.

Results of gravel pit use and/or expansion could have detrimental direct effects by crushing larva and indirect effects by destroying existing suitable habitat and beneficial effects by creating future suitable habitat. One pit would be rehabilitated and one new pit has the potential for development within the Project area. Mitigations will ensure that some portion of pits would not be active, to provide refugia for adult and larval tiger beetles. Considering there are ample amounts of potential suitable soils for the

species in the Project area, effects of any expansion are expected to be minor. Timber harvest and the associated road building (temporary and permanent) with the action alternatives could have additional impacts. The Project should have minimal direct impact to tiger beetles due to the minimal logging in ELT 18 (exposed bedrock). Road construction can also create future habitat for the species.

Cumulative Effects

Gravel pit management is likely to be similar on all ownership: pits would be expanded and eventually re-vegetated. The cumulative effect of these alternatives together with gravel pit expansion on non-federal land could degrade habitat as well as create future habitat. However, adequate habitat likely would be maintained and cumulative effects are expected to be minimal. This analysis is consistent with that predicted in the programmatic BE for the Forest Plan.

Determination

All alternatives may impact individuals of tiger beetles, but is not likely to cause a trend to federal listing or loss of viability because habitat will be both destroyed and created. All Alternatives are consistent with the Forest Plan O-WL-18, G-WL-11, G-WL-12 and S-WL-5.

Mitigations

- Maintain some portion of gravel pits in an inactive state at all times, so the area could act as a refugia for adult and larval tiger beetles and provide for re-colonization.

Mancinus Alpine – *Erebia disa mancinus*

Jutta Arctic – *Oeneis jutta ascerta*

Existing Condition
Population and Trend

These butterflies, while local, are fairly common over a large portion of Canada and Alaska. There are at least hundreds of documented occurrences for each species (Naturserve 2008).

Mancinus Alpine

Natureserve (2008) global status for *Erebia mancinus* is G5 – demonstrably widespread, abundant and secure, though it may be quite rare in parts of its range, especially at the periphery. Minnesota status is S3 - Vulnerable in the state or province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

The distribution throughout much of the Superior is largely unknown due to lack of extensive searches (FP BE 2004). Mancinus alpine is documented at 4 sites in Minnesota, including 2 sites on the Superior National Forest (MN DNR 2007b). All 4 records occur within the boundary of the Laurentian Ranger District. The Forest Plan BE reported four documented locations on the

SNF (USDA FS 2002b, planning record) and the Species Data Record (Forest Plan planning record 2000) reported 5 locations (3 in Lake County, and 1 each in Cook and St. Louis Counties).

Jutta Arctic

While there is little known about population status and habitat relationships for the species, *Jutta arctic* is of conservation concern primarily in the extreme southern periphery of the range in the northern USA and is considered apparently secure in Ontario (Holmes *et al.*, 1991, on Natureserve website 2008). Natureserve (2008) global status for *Oeneis jutta ascerta* is G5T4 – apparently secure, though it may be quite rare in parts of its range, especially at the periphery. State status is S4 - Uncommon but not rare; some cause for long-term concern due to declines or other factors.

The distribution throughout much of the Superior is largely unknown. While the Whyte Project BE (2007) reports that it has been located at the McNair area, no other location information is available for the species. Although there were 3 documented sites for jutta arctic on the SNF (2004) at the signing of the Forest Plan ROD (USDA Forest Service 2004a - Forest Plan BE, Table 3, p. 16), the Minnesota Natural Heritage Database contains zero records of the species.

Neither Mancinus Alpine or Jutta Arctic have been documented in the Project area however, suitable habitat exists. No Project level surveys were conducted for these species. Surveys were not deemed necessary due to the relatively small amounts of available habitat, very small amount of treatments proposed within that habitat. Potential impacts to the species can be adequately assessed based on species' habitat requirements, distribution, and expected management impacts to habitat.

Habitat Needs and Limiting Factors

These species prefer shady, mature black spruce-tamarack forest that is dense enough to be subject to logging or management-ignited fire (MacLean 2001). They may also occur in younger lowland conifer or more open lowland conifer that is not usually subject to logging because of low site productivity. Suitable habitat has likely always been widespread but patchy (USFS, 2004b). Threats included timber harvest, management ignited fire, or road construction and use in black spruce-tamarack forest or any other activity that may alter hydrologic conditions of wetland forest (USFS, 2004b).

Analysis Indicators

For this analysis I compare the acres of mature and older lowland conifer forest (MIH 9), by alternative to measure differences in potential impacts, acknowledging limitations of its use. Although MIH 9 is a key habitat type for these species, it is likely that these species occurs in other habitats as well. Until further surveying and study of population status and habitat relationships is conducted, this effect analysis retains uncertainty. I also look at temporary roads in and outside of suitable habitat to assess the potential for changes to hydrological condition.

Direct/Indirect Effects

Alternative 1

The environmental consequences of Alternative 1 would be that all currently mature lowland black-spruce-tamarack habitat would remain in suitable condition for these butterflies.

Alternative 2 and 3

There is little difference between the action alternatives in amount of suitable habitat available for these species (Table BE 15). Both action alternatives would affect suitable habitat through small amounts timber harvest in mature lowland black-spruce-tamarack and associated temporary road construction. These activities would change 2% (56-63 acres) of currently suitable habitat to unsuitable condition and have potential to alter hydrologic conditions of wetland forests habitat. Alternative 2 would result in the most temp roads thus may have the greatest chance of causing alteration to hydrological conditions. However, only 2% (about $^{3}/_{4}$ of a mile) of temp roads in either alternative would be built in suitable habitat (MIH 9) and road management activities are likely to result in adequate protection of hydrological processes, minimizing the potential for impact to the species and its habitat.

Table BE 15 - Mancinus Alpine and Jutta Arctic Direct and Indirect Effects

Indicators	Existing Condition		Alt. 1		Alt. 2		Alt. 3	
Impacts to Habitat	**Acre**	**%**	**Acre**	**%**	**Acres**	**%**	**Acres**	**%**
1. Suitable habitat	2,553	98	2,553	98	2,490	96	2,497	96
2. Temporary roads	0				44		38	

Data Sources: Existing condition for vegetation indicators are based on frozen August 2007 CDS data, and all alternatives are based on projected CDS data in the year 2014. ***Other Footnotes:*** Percentage of suitable habitat is the percent of total lowland forest in the Project area (2,606 acres)

Changes due to timber harvest are relatively long-term as lowland forests may take up to 60 years to become mature again. Hydrological changes can be either short-term (5-10 years) or long-term (greater than 10 years). Direct effects from gravel pit use and expansion are not expected because current or proposed gravel pits do not occur in suitable habitat and mitigations would be implemented to protect known sites from disturbance. Direct effects would not occur from winter roads as butterflies are in their dormant period. Decommissioning of 9.7 miles of road (0.2 miles in suitable habitat) may have some long-term beneficial effects as roads are re-vegetated.

Cumulative Effects

Similar activities will occur on other ownerships in the Project area. Timber harvest and road construction (Appendix G) will continue to have the biggest impact on mancinus alpine and jutta arctic habitat. However, a very small percentage of this habitat type would be affected on any ownership so effects should be minimal. The Travel Management Project Decommissioning of 5.8 miles of road may have some long term beneficial effects if lowland roads are closed and

allowed to re-vegetate. A small percentage of these roads would be in suitable habitat so benefits should be minimal. It is likely that the mancinus alpine and jutta arctic occur in habitats other than mature black spruce-tamarack forest and until further surveying and study of population status and habitat relationships is conducted, this cumulative effects analysis remains uncertain. Forest-wide habitat monitoring (Annual Monitoring Report 2006) showed a slight increase to mature lowland conifer which could benefit this species.

Determination

Alternative 1 will have no effect on these species. Alternatives 2 and 3 may impact individuals of Mancinus alpine and Jutta Arctic, but is not likely to cause a trend to federal listing or loss of viability on the Superior National Forest due to the limited amount of harvest and disturbance in lowland black spruce forest..

Mitigations

- If mancinus alpine or jutta arctic is found within a proposed harvest unit or road corridor, the district biologist should be consulted with for an appropriate mitigation (O-WL-26 and S-WL-7).

Nabokov's Blue – *Lycaeides idas nabokovi*

Freija's Grizzled Skipper – *Pyrgus centaureae freija*

Existing Condition
Population and Trend

These species have not been located in the Project area, but were found on other parts of the SNF in Cook and Lake Counties.

Nabokov's Blue

Species population is decreasing range-wide. Historic (approx. 1600-1800) global population of Great Lakes taxon which is specific to *Vaccinium caespitosum* was surely greater than 1,000,000 and probably exceeded 10,000,000 adults. Today it is probably represented by fewer than 1,000,000 adult butterflies. Number of populations is in the order of 100-1000 most consisting of 1000 or fewer adults (Forest Plan planning record, Species Data Record, Wolf and Howe 1999).

Natureserve (2008) global status for *Nabokov's Blue* is G5TU – Unrankable. The taxa as a whole is Secure - Common; widespread and abundant. (The status of infraspecific taxa (subspecies or varieties) is currently unrankable due to lack of information or due to substantially conflicting information about status or trends. Minnesota status is S3 - Vulnerable in the state or province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

There are 29 documented records for Nabokov's Blue in the MN Heritage Database (2007) this is up from 14 known occurrences in 1999 (USDA 2002g). Twenty-one of these records occur on SNF lands. This is up from eight known occurrences on the SNF in 2004 at the signing of the Forest Plan ROD.

Species population, habitat and food (larval host plant *V. caespitosum)* is decreasing in the Superior National Forest. Causes include; tree planting in sandy openings, fire suppression leading to canopy closure of natural openings, intensive forestry, failure to re-colonize in wake of local extinctions (USDA Forest Service 1999).

Freija's Grizzled Skipper

Freija's is documented to occur only at the McNair site, but hasn't been relocated for more than 20 years and there are no new locations. Nature Serve (2008) global status for Freija's Grizzled Skipper is G4T4T5 – Apparently secure. Globally not rare. At least around 100 occurrences have actually been documented (Layberry et. al 1998, Guppy and Shephard 2001) and many more obviously exist (Nature Serve 2007). Layberry (1998) reports that this species can be common [in Canada] and is found in most of the Canadian range from Labrador to Yukon. It is considered secure in Ontario (Holmes et. al 1991). It is of conservation concern in Minnesota where only one occurrence has been documented

Although no Project level surveys for butterflies were conducted, I assume that they are likely to occur in the area. Potential impacts to the butterflies can be adequately assessed based on species' habitat requirements, distribution, and expected management impacts to habitat.

Habitat Needs and Limiting Factors

The Nabokov's blue butterfly seems to prefer open sandy, grassy jack pine areas with abundant blueberry and dwarf bilberry (*Vaccinium ceespitosum*) (USDA Forest Service 2 002g, MacLean 2001). This habitat may be present in the Project area. Habitat needs for freija's grizzled skipper are less well understood on the Superior National Forest, but is thought to be provided by upland grasslands, acidic meadows and small grassy opening in boreal forest.

Threats to both species include; loss of habitat, decline in habitat quality, habitat fragmentation/loss of connectivity (populations are already quite fragmented), changes in vegetation composition and/or structure (woody invasion, canopy closure/shading), competition from non-native invasive species or from native species whose range has changed, predation (egg parasitism), disease, climate change (warming will lead to loss of *V. caespitosum*), loss of obligate associate, natural catastrophes (fire, drought), genetic drift, genetic homogeneity, collection (rare Lepidoptera are often in high demand), poisoning, pollution/toxics and interactions among threats (USDA FS 1999).

Encroachment of woody vegetation, overgrowth by grasses and other forbs, and active planting of conifers in openings represent immediate threats to *P. idas nabokovi* and *Vaccinium caespitosum* in the Lakes States, especially in the southern part of their geographic ranges (USDA FS 2002g).

Use of herbicides along railroad right-of-ways or road corridors also might be a threat. Other non-specific control measures for Lepidoptera pests, such as the spraying of *Bacillus thuringiensis* for control of gypsy moth (*Lymantria dispar*), may be a future concern at existing *P. idas nabokovi* sites. *Bacillus thuringiensis* (Bt) is non-specific for Lepidoptera and may kill *P. idas nabokovi* larvae just as it does target species like the gypsy moth (Johnson et al. 1995).

Non-native species are present at many existing *V. caespitosum* sites. Invasive weeds and grasses are dominant in some localities (e.g., .frost pockets. in Wisconsin) that appear to be otherwise suitable for *V. caespitosum*. Presumably, a disturbance has modified the vegetation at these sites, providing an opportunity for non-native plants to invade. These non-native species may prevent *V. caespitosum* from re-establishing or perhaps they have even played a role in the disappearance of *V. caespitosum* from some places (USDA FS 2002g).

Fire suppression has likely been responsible for loss of habitat for *V. caespitosum* during the past 50 years or longer. In general, fire has been demonstrated as having a negative effect on individuals, but a positive effect on populations by maintaining open habitat. The key issue is survival of one or more source populations during episodic fires. The national PLANTS database lists *V. caespitosum* as a species that is not resistant to fire (USDA, NRCS 2001f). The creation of openings by fire clearly provides opportunities for establishment and growth of *V. caespitosum*. Persistent fires at the same locality, however, might disadvantage *V. caespitosum* by favoring bracken fern (*Pteridium aquilinum*) and other highly fire resistant species. Fire can be a tool for controlling woody encroachment, but over-aggressive or poorly designed fire management plans could destroy an entire population of both *P. idas* and its host plant (USDA FS 2002g).

The attraction of adult northern blues (especially males) to puddles on roads makes them vulnerable to motorized vehicle traffic (USDA FS 2002g)

Threats to early life history stages are not well documented but deserve attention. Wolf (1993) found only 11% of the eggs that were followed reached the pupal stage, mostly because of parasitism by a small hymenopteran parasite.
Threats to potentially suitable habitat could occur from ATV use (trampling), and vegetation management (timber activities may directly and indirectly negatively or positively impact potential habitat by either creating or removing suitable habitat). Due to low likelihood of these activities in potentially suitable habitat, these threats would likely be minor (Forest Plan BE 2004).

Threats from global warming, parasitoids, and exotic species are not clearly understood and deserve future study (USDA FS 2002g)

Analysis Indicators

For this analysis I used acres of upland conifer forest (MIH 5), excluding pole-aged stands, to assess acres where potential habitat conditions may occur. This is intended to be an indicator of acres that could provide the right conditions for these species. This approach has inherent limitations as not all young and mature conifer forest is suitable for these species because of the patchy distribution of bilberry and grassy inclusions. Until further survey and study of population status and habitat relationships is conducted, this effects analysis retains uncertainty.

Table BE 16 – Nabokov's Blue Butterfly and Freija's Grizzled Skipper				
Indicators	**Existing Condition**	**Alt. 1**	**Alt. 2**	**Alt. 3**
	Acres	Acres	Acres	Acres
1. potential habitat	15,750	15,295	17,244	17,176
Data Sources: Data Sources: Existing condition for vegetation indicators are based on frozen August 2007 CDS, and all alternatives are based on projected CDS data in the year 2017.				

Direct/Indirect Effects
Alternative 1

The Environmental consequences of Alternative 1 would be slightly less potential habitat for the species. Existing roads would continue to be a possible source of direct mortality.

Alternative 2 and 3

Each action alternative would have similar effects to these species (Table BE 17). All action alternatives would result in an increase in potential habitat. Harvested units could provide a short-term (10-20 year) increase in potential suitable sites for these species. However, these temporary openings may not stay open long enough for these species to colonize, so any beneficial effects are expected to be minimal. The effects of establishing young upland conifer forest are relatively short-term, since most upland conifers grows into pole class at ten years and becomes less suitable for the species (USDA FS 2000b). Mature conifer would provide conditions suitable for these species however as conifer stands mature natural canopy gaps may form. Roads can be sources of direct mortality, however, these effects are expected to be relatively small as most roads within the project are receive lower levels of use and speeds.

Gravel pit use and expansion should have very little effect on these species because minimal amount of suitable habitat would be impacted. Due to rarity of the species and low likelihood of activities occurring in potentially suitable habitat, these threats would likely be minor. No other direct effects to these species are expected because mitigations would be implemented to protect known sites from disturbance and habitat change.

Cumulative Effects

Young conifer should continue to be created through timber harvest on other ownerships (EIS Appendix G). Timber harvest in suitable habitat would be expected to continue on all ownerships, which would maintain temporary openings and young conifer habitat for these species. Harvested units could provide a short-term (10-20 year) increase in potential suitable sites for these species. However, these temporary openings may not stay open long enough for these species to colonize, so any cumulative beneficial effects are expected to be minimal. This analysis is consistent with the cumulative effects predicted in the programmatic BE for the Forest Plan.

Determination

This Project may impact individuals of Nabokov's blue or freija's grizzled skipper but is not likely to cause a trend to federal listing or loss of viability on the Superior National Forest.

Amount of suitable habitat may increase over time with the increase in habitat suitability for *Vaccinium* spp. All Alternatives are consistent with the Forest Plan O-WL-18, G-WL-11, G-WL-12, S-WL-5, and O-WL-27.

Mitigations

- If Nabokov's blue or freija's grizzled skipper are found within a proposed harvest unit or road corridor, that District Biologist should be consulted with for an appropriate mitigation. (O-WL-27).

Red-disked Alpine - *Erebia discoidalis discoidalis*

Existing Condition
Population and Trend

The Superior National Forest is near the southern edge of the species' holarctic range in North America. Masters (1971) found that throughout much of its range the species is quite widespread, although uncommon and intensely local (Forest Plan BE 2004). Nature Serve (2008) global status for *Erebia discoidalis discoidalis* is G5T5 – demonstrably widespread, abundant and secure, though it may be quite rare in parts of its range, especially at the periphery. State status is S4 - Uncommon but not rare; some cause for long-term concern due to declines or other factors.

There are no documented records for red disked alpine in the Minnesota Heritage Database (2007). There were seven documented locations reported in the Forest Plan BE 2004. The Coffin et al. (1988) distribution map shows 8 counties (14 records) of northern and northeastern Minnesota as having records of the species.

This species has not been located in the Project area. But it has been found on other parts of the SNF in Cook and Lake County in 2001 by MacLean (2001) including the McNair Butterfly Management Area.

Habitat Needs and Limiting Factors

They have been found in black spruce bogs with typical bog plants such as bog laurel, Labrador tea, leather leaf and sedges including patches of cotton grass. They seemed to favor open bog conditions, grassy areas on the margins of bogs, or open grassy meadows.

Threats to the species include; predation (Krivda 1972), large-scale peat mining (Coffin 1988), timber harvest, management-ignited fire, road construction, and use in black spruce-tamarack forest or any other activity that may alter hydrologic conditions of wetland forest habitat (Forest Plan BE 2004). These activities may both decrease and increase suitable habitat. There appears to be fairly widespread unoccupied habitat thus it is unlikely that management activities would limit habitat availability at the landscape scale. Also, its apparent favored habitat is more open and less likely to be subject to vegetation management activities (Forest Plan BE 2004).

Habitat is present in the Border area and so the species could be present. Since it favors open bog conditions management activities proposed in this project would not likely affect the species or its habitat.

Forest Plan Direction

In addition to O-WL-1, O-WL-2, O-WL-18, G-WL-11, G-WL 12 and S-WL-5 discussed in the introduction to this document the following Forest Plan direction also applies to sensitive butterflies:

- In all known breeding locations, maintain or restore high quality habitat (O-WL-26)
- Allow only those management activities that protect, maintain or enhance known locations (S-WL-7)

Direct/Indirect Effects

Alternative 1 - No effects to the species or habitat.

Alternative 2 and 3

Activities would not affect open bogs in the Project area. Road construction and prescribed fire may impact this habitat type but will be avoided whenever possible. See also the mancinus alpine and jutta arctic discussion for more information on potential effects to lowland black spruce. No timber harvest would occur in suitable habitat type under any action alternatives. See mancinus alpine and jutta arctic discussion for details on road construction. A minimum of this habitat type should be affected by road construction since this type is avoided for summer roads and would only be used in the winter for a temporary road.

Road management activities and use are likely to result in adequate protection of hydrological processes in black spruce-tamarack and other wetlands, minimizing the potential for impact to the species and its habitat. In addition, road and trail building in lowland conifer forest may create suitable habitat and is unlikely to result in direct threats from snowmobile or vehicle use during breeding season. Therefore, road and trail management activities are not expected to have major impact on the species (Forest Plan BE 2004).

Cumulative Effects

There should be a minimal impact to open bog conditions by other ownerships in the Project area since this habitat does not provide adequate timber volume to harvest (Appendix G). The one activity that will affect this habitat type in the future is road construction. The Travel Management Project may have some impacts, both positive and negative, to this species habitat. It would be a small percentage of this habitat type affected in the Project area so cumulative impacts should be minimal.

Determination

This Project may impact individuals of taiga alpine, but is not likely to cause a trend to federal listing or loss of viability on the Superior National Forest under the action alternatives. Open bog conditions should remain relatively unchanged.

Mitigations

- If Red-disked alpine is found within a proposed harvest unit or road corridor, the District Biologist should be consulted with for an appropriate mitigation (O-WL-26 and S-WL-7).

Quebec Emerald Dragonfly – *Somatochlora brevicinct*a

Existing Condition

The Quebec emerald dragonfly (*Somatochlora brevicincta*) is known to occur on the Superior National Forest (Wayne Steffens, personal communication, 2006). Due to this species habitat requirements and existing habitat conditions, it is possible that it occurs in the Border Project area.

The Quebec emerald typically occurs in lentic environments. "Habitat is predominantly bogs, fens, and heaths. The microhabitat is water-suspended or water-saturated sphagnum, whether or not associated with open water, and typically showing graminaceous emergents indicating weak minerotrophism. Eggs are laid outside plant tissues on the moss or adjacent water surface, with the larvae likely living within the saturated moss itself rather than on its interface with open water. The species has not been observed at open-water peat land ponds. Landforms in which the habitat can develop will generally be of bedrock or surficial deposits with little mineralizing potential and…may also form adjacent to or within peat bogs or heaths which can form in low relief areas." (Nature Serve, 2006).

Analysis Indicators

The analysis indicator for the Quebec emerald is the acres of preferred habitat affected by new road construction. This is a useful indicator of potential habitat degradation in the form of inundation or desiccation of habitat due to water level changes or changes in flow regimes associated with roads. Wet meadow, shallow marsh, and bogs are potential suitable habitat for the Quebec emerald dragonfly (based on the national wetland inventory and Minnesota wetland type 2, 3 and 8). Acres were calculated based on these two wetland types by buffering new roads 20 meters and calculating the acres of potential habitat affected by each alternative (Table BE 17 Acres of Existing and Proposed Roads in Potential Quebec Emerald Habitat).

Table BE 17 – Acres of Existing and Proposed Roads in Potential Quebec Emerald Habitat			
Road/Route Type	**Alt. 1**	**Alt. 2**	**Alt. 3**
Existing System Road	52.3	52.3	52.3
Existing System Road (W)	183.9	170.1	170.1
Temporary Road	0.0	1.2	1.2
Temporary Road (W)	0.0	24.9	23.2
New Special Use	0.0	0.5	0.5
New System Road	0.0	0.4	0.4
New System Road (W)	0.0	2.3	2.3
Decommission Road	0.0	13.8	13.8
TMR Decommission	0.2	0.2	0.2
TMR System Road	1.1	1.1	1.1
TMR System Road (W)	0.3	0.3	0.3
Grand Total	237.5	253.0	251.2
Percent of Total Habitat Affected	1.8	1.9	1.9

Direct/Indirect Effects

Alternative 1

There would be no vegetative treatments and no new lowland roads under Alternative 1; therefore there would be no negative impacts to Quebec emerald dragonfly or their habitat.

Alternative 2 and 3

New road construction associated with lowland vegetation management may affect individuals, populations, and/or habitat of Quebec emerald within the Border Project area by potential inundation or desiccation of habitat due to water level changes or changes in flow regimes. Potential direct and indirect effects would be considered local and minor over the Project area. With all new roads, both new temporary and new system roads, the area of impact is 20 acres or less on wet meadow, shallow marsh and bogs within the Project area. These three wetland types are potential suitable habitat for the Quebec emerald dragonfly (based on the national wetland inventory and Minnesota wetland type 2, 3, and 8). The potential impact of 20 acres is approximately 0.1% of the total acres of these wetlands types in the Project area (13,108 total acres). Given high vagility (3 miles/day; Nature Serve, 2006) and prevalence of suitable habitat over its range, the overall population in not considered fragile; localized extirpations would likely be re-inhabited shortly after habitat recovery.

Alternative 2 and 3 each proposed to improve watershed conditions that have potential to benefit habitat for the Quebec emerald; this includes restoring more natural flow regimes and water levels associated with the decommissioning of existing roads and removing stream crossings (Table BE 17).

Cumulative Effects

Past, present, and reasonably foreseeable future actions of other land owners that could

potentially contribute to negative cumulative effects associated with new road construction and stream crossings include State, county, and private road construction projects associated with timber harvest, private development, and special use permits, as well as routine road maintenance and transportation activities. The Analysis Area has mixed ownership with roads crossing from one landowner to the next, and includes multiple jurisdictions. The analysis and discussions for cumulative effects takes into consideration all existing roads and stream crossings in the Analysis Area, including those owned by State and private parties. The known potential future harvest on State, county, and private land was provided by those landowners along with access needs. The associated road access needs were addressed through the proposed actions. Potential effects for these actions were also discussed under the direct and indirect effects. There are no known potential future private land developments in the Analysis Area. If private access requests were made, they would be analyzed separately. It can be assumed that the various nonfederal landowners in the Analysis Area would continue to maintain their roads in their existing condition.

Standards and guidelines in the 2004 Forest Plan will help to ensure that USFS activities will not contribute to cumulative effects. In addition to Federal standards and guidelines, State, private and local land owners and managers follow established best management practices that should contribute to minimizing cumulative effects. Provided that best management practices are implemented by all land owners and managers, there should minimal cumulative effects to Quebec emerald dragonfly and their habitat.

Determination

The determination of effects from the proposed alternatives is based upon the direct, indirect, and cumulative effects on populations and habitat of Quebec emerald dragonfly. Provided that all design criteria and mitigation measures are followed during implementation, there is a low risk that the activities associated with the action alternatives would affect this species. All action alternatives may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the populations or species

Mitigations

- If Quebec emerald dragonfly is found within a proposed road corridor, the District Biologist should be consulted with for an appropriate mitigation (O-WL-26 and S-WL-7).
- Follow all relevant design criteria and mitigation measures described in the Border EIS. In addition to required design criteria and mitigation measures, all Forest-wide desired conditions, objectives, standards and guidelines contained in the Superior National Forest Land and Resource Management Plan apply, including those established for: 1) Watershed Health, Riparian Areas, and Soil Resources, 2) Terrestrial and Aquatic Wildlife; and 3) Transportation System (USDA Forest Service 2004b).

3.8.2.8 Aquatic Wildlife

Three Regional Forester Sensitive Species (RFSS) fish and two RFSS mussels occur on the Superior National Forest including lake sturgeon, shortjaw cisco, northern brook lamprey, creek heelsplitter mussel, and black sandshell mussel.

Sensitive Fish:	Lake Sturgeon *Acipenser fulvescens* Shortjaw Cisco *Coregonus zenithicus* Northern Brook Lamprey *Ichthyomyzon fossor*
Sensitive Mussels:	Creek Heelsplitter *Lasmigona compresssa* Black Sandshell *Ligumia recta*

The known or likely occurrence of a RFSS species or its habitat within the Project area was first evaluated to determine the need for analysis. If a species was known or likely to occur within the Project area or if the suitable habitat is present in the Project area, additional analysis indicators were used to evaluate potential direct, indirect, and cumulative effects. Shortjaw Cisco are not known to be present or have appropriate habitat so they will not be further analyzed.

Analysis Indicators Aquatic RFSS

Indicator 1 - Miles of new (including new temporary and new temporary winter) road construction and road decommissioning

Indicator 1 assesses the miles of new road construction, including both new temporary and new temporary winter roads and road decommissioning that are proposed within the Project area for each alternative. This number may increase through new temporary road construction, or decrease due to road decommissioning.

Indicator 2 - Number of stream crossings

Indicator 2 assesses the total number of stream crossings resulting from either decommissioning and/or building new temporary roads that are proposed within the Project area for each alternative. This number may increase through new temporary road construction, or decrease due to road decommissioning.

Indicators 1 and 2 do a good job of highlighting differences among alternatives because it represents the potential effects to instream and riparian habitats, potential erosion and point source sediment input at stream crossing sites, as well as potential effects to stream flow, flood flow capacity, and sediment transport. Additionally, this indicator is very useful for determining potential effects to aquatic organism passage and stream connectivity. These potential changes can affect populations and habitat of aquatic RFSS if not properly mitigated.

Indicator 3 - Proportion of upland open and upland young forest within each 6th level watershed

Indicator 3 assesses the proportion of upland open and upland young forest within each 6th level

watershed that occurs within or intersects the Border Project area. This includes portions of those watersheds that occur within the BWCAW and VNP. Indicator 3 assesses all ownerships. The indicator was chosen for the analysis because potential effects associated with vegetation management and other activities associated with each alternative should be evident at the watershed scale. A proportion of upland open and upland young forest on all ownerships (<16 years old) of less than 60% of a 6th level watershed is considered acceptable to protect water quality and watershed health and, as a result, aquatic RFSS (see Forest Plan p. 2-13, S-WS-1). This indicator can assess direct and indirect effects from vegetation management proposed in the Border Project as well as cumulative effects as other vegetation management projects are considered.

A full description of these indicators, along with the defined spatial and temporal bounds of the analysis, can be found in the Water Quality Section of the effects analysis (Chapter 3.12).

Lake Sturgeon
Existing Condition

Lake sturgeon inhabits larger rivers and lakes in all drainages of Minnesota. They spawn at water depths from 0.3m to 4.6m in the shallows of lakes or, more typically, in rivers (Becker 1983). Spawning occurs from April to June in areas including: outside river bends with upwelling or boiling current and rock or cobble substrate, rapids with similar substrate, or often at the foot of migration barriers (Becker 1983). Hatching time is a function of water temperature, and usually occurs between 5d (at 17°C) and 8d (at 12.8°C-13.9°C) after eggs are laid (Becker 1983). Lake sturgeon require large areas of water less than 10m with abundant food and young feed on microcrustacea until a length of 178mm to 203mm; dults feed on midges, leeches, sphaeriidae (fingernail clams), and gastropods (snails), using their tubular mouth to filter food from the substrate (Becker 1983).

Females reach sexual maturity at 24-26y (140cm) and spawn every 4 to 6y. Males spawn after reaching a length of 114cm and usually spawn every other year (Becker, 1983). Historical populations of lake sturgeon have been documented in several watersheds that intersect the Superior National Forest including Rainy Lake, Rainy River, Little Indian Sioux River, Loon River, Lac la Croix, Loon Lake, Crane Lake, Little Fork River, Shannon River, and Sturgeon River drainages (USDA FS 2004a, Nature Serve 2005). Although extremely limited in distribution, lake sturgeon has been documented within the Border Project area in Crane Lake and the Vermillion Gorge as well as within adjacent and intersecting watersheds (MN NHR database 2004). It is possible that activities associated with the Border Project and its alternatives may indirectly or directly affect populations and habitat of this species unless properly mitigated.

Direct/Indirect Effects

Vegetative management activities, new road construction, and stream crossings associated with the Border Project alternatives may affect individuals, populations, and/or habitat of lake sturgeon within and outside the Project area by potentially affecting substrate quality, channel stability, migration opportunities, and stream temperatures

unless properly mitigated. Road and trail transportation systems, especially when stream crossings are not adequately designed for flood flows and fish passage, may have the greatest potential impact on lake sturgeon populations and habitat (USDA Forest Service 2004a). Alternatives 2 and 3 propose various levels of vegetative management and associated new road construction, road decommissioning, and stream crossings.

Alternative 1 – No Action Alternative

No vegetative treatments, new road construction, or road decommissioning are proposed under Alternative 1, therefore there would be no negative or positive impacts to lake sturgeon or their habitat from these activities. Under the no action alternative, improvement of watershed conditions and reduction in sediment sources would not occur from decommissioning existing system and unclassified roads. Continued use of unclassified roads and stream crossings by off-road vehicles, including ATV's, and ORV's may continue to contribute sediment into local streams and potentially affect watershed conditions as well as possible lake sturgeon and habitat, if present. Removal of unnecessary and/or poorly designed stream crossings that do not currently provide for flood flows, sediment transport, and fish passage would not occur under the no action alternative.

Alternatives 2 and 3

Proposed vegetative management associated with Alternatives 2 and 3 would not likely affect individuals, populations, and/or habitat of lake sturgeon provided that required design criteria and mitigation measures are followed during implementation (Appendix). These design criteria and mitigation measures have been developed to maintain or restore riparian ecological function within near-bank and remainder zone areas. Under these design criteria, no harvest of trees would occur within 100 feet of flowing streams except for the purpose of maintaining or restoring riparian ecological function. Remainder riparian management zones would also be established adjacent to near-bank zones depending upon floodplain and shoreline slope conditions where vegetative management would favor extended rotation of site appropriate tree species. These criteria will together serve to protect and enhance both riparian and within stream channel habitat conditions for lake sturgeon.

Alternatives 2 and 3 propose constructing new roads as well as decommissioning existing unclassified and newly constructed temporary roads (Chapter 3.12, Table 3.12.4). Under all alternatives, newly constructed temporary roads would be decommissioned after all use is completed (USDA Forest Service 2004b). Road decommissioning would render each road unusable by motorized vehicles, remove stream crossings and fill from flood prone and wetland areas, and require re-vegetating exposed soil surfaces (USDA Forest Service 2004b).

Alternatives 2 and 3 each propose a net decrease in the total number of non-temporary stream crossings within the Project area (Chapter 3.12, Table 3.12.6). Removal of these stream crossings would benefit lake sturgeon and their habitat, if present, by improving fish passage and flood flow capability as well as reducing potential sediment sources at existing stream crossing sites.

Alternatives 2 and 3 each propose to increase the total number of stream crossings associated with temporary winter roads (Chapter 3.12, Table 3.12.6). These roads would increase the number of stream crossings for Alternatives 2 and 3 by 14 and 13 crossings, respectively (Chapter 3.12, Table 3.12.6). Proposed temporary winter roads associated with each alternative may impact lake sturgeon and habitat unless properly designed and used. Typically, temporary winter roads are designed to reduce impacts to soils, streams, and wetlands by providing over-the-snow or ice travel for logging equipment during the winter. Negative impacts to lake sturgeon and habitat are not anticipated from the use of these roads provided that use is restricted to "frozen" conditions. Use of temporary winter roads and stream/wetland crossings during thaw conditions, rain-on-snow events, or "unfrozen" conditions could potentially have more impacts to lake sturgeon and habitat than other temporary roads and crossings because they are not designed for "unfrozen" condition use.

Cumulative Effects

It is likely that historical events have affected individuals and populations of lake sturgeon within the Border Project area, the Superior National Forest, and on adjacent non-federal lands. Prior to human disturbances, lake sturgeon populations were known to be widespread in the Rainy River Basin (USDA Forest Service 2004a). It is likely that dams, exploitation, historical timber harvest, road and trail construction, poorly designed stream crossings, and overall water quality degradation may have negatively affected substrate quality, channel stability, stream temperatures, and lake sturgeon migration opportunities. Standards and guidelines in the 2004 Forest Plan as well as Project design features and mitigation measures (Appendix) will help to ensure that USFS activities will not contribute to cumulative effects. In addition to Federal standards and guidelines, State, private and local land owners and managers are now required to follow established best management practices that should also contribute to minimizing cumulative effects within and adjacent to the Border Project area. Provided that best management practices are implemented by all land owners and managers, there should be no additional cumulative effects to lake sturgeon or their habitat within intersecting or adjacent watersheds to the Border Project area.

The portion of each watershed that is in upland open or upland young condition is also a good cumulative effects indictor for lake sturgeon. Research indicates that watersheds having more than 60 percent upland open and upland young forest conditions are susceptible to peak flows that can reshape channels, increase erosion and sedimentation, as well as decrease diversity within streams (Verry 2000). These increased peak flows could also affect individuals, populations, and habitat of lake sturgeon by increasing stream channel and road stream crossing erosion, increasing sedimentation, creating additional migration barriers, and likely influence survival of adults, juveniles, and eggs.

Based on a review and analysis of existing conditions as well as those conditions that would result from full implementation of alternatives 2 and 3, there are no watersheds within or intersecting the Border Project area that currently or would exceed the 60 percent threshold (Chapter 3.12, Table 3.12.8, Figure 3.12.4). Based on other watershed characteristics including the portion of each watershed in wetland, lowland, and water, portion of each watershed within the BWCAW, and the portion of each watershed within and outside the Project area, it is also not likely that proposed vegetative management associated

with alternatives 2 and 3 would result in an upland open and upland young value exceeding 60 percent for any watershed within or intersecting the Project area. (Chapter 3.12, Table 3.12.8, Figure 3.12.4).

Determination

The determination of effects from the proposed alternatives is based upon the direct, indirect, and cumulative effects on populations and habitat of lake sturgeon within the Border Project area described in the EIS. Provided that all design criteria and mitigation measures required by this BE and those included in the EIS as well as the 2006 Superior National Forest Land and Resource Management Plan (USDA Forest Service 2004b) are followed during Project implementation, there is a low risk that the activities associated with the action alternatives would affect lake sturgeon and/or their habitat. After considering the direct, indirect, and cumulative effects, it has been determined that all alternatives, including the no action alternative may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species.

Mitigations

- Follow all relevant design criteria and mitigation measures described in the Border EIS. In addition to required design criteria and mitigation measures, all Forest-wide desired conditions, objectives, standards and guidelines contained in the Superior National Forest Land and Resource Management Plan apply, including those established for: 1) Watershed Health, Riparian Areas, and Soil Resources, 2) Terrestrial and Aquatic Wildlife; and 3) Transportation System (USDA Forest Service 2004b).

Shortjaw Cisco
Existing Condition

Shortjaw cisco are known to occur on the Superior National Forest in Gunflint, Basswood, Saganaga, and Magnetic Lakes (USDA FS 2004a, Nature Serve 2005). This species occurs in deep water lakes that range from 60-600 feet but is most common at depths of 180-414 feet (Scott and Crossman 1973). There are no reported records of this species within the Project area (MN NHR database 2004). It is unlikely that individuals, populations, and/or habitat would be affected by the Border Project alternatives. No further analysis of effects is required for shortjaw cisco.

Determination

Upon evaluation of the existing conditions and species occurrence, it was determined that all alternatives would have No Impact on individuals, populations, or habitat of shortjaw cisco.

Northern Brook Lamprey
Existing Condition

Northern brook lamprey have been reported from several locations on the Superior National Forest including in the Echo River and Vermilion River within the Border Project area (MN NHR database 2004). Due to its presence in a variety of habitat conditions on the Forest, it is

likely that additional species may occur within the Project area. Northern brook lamprey occur in both small (1-3 meter wide) streams and large rivers (30-100 meters wide), although they are most common in medium size (19 meter wide) streams with sandy substrates and moderately warm water (used by developing amocoetes) (Becker, USDA FS 2004a). Adult brook lamprey are known to spawn in or near riffle areas with gravel and sandy substrates (Becker 1983). Because adult lamprey and their eggs require silt-free gravels and sand with adequate flow and stream temperature for spawning and rearing, it is possible that the activities associated with the Border Project alternatives could affect individuals, populations, and/or habitat of this species unless properly mitigated.

Direct/Indirect Effects

Vegetative management activities, new road construction, and stream crossings associated with the Border Project alternatives may affect individuals, populations, and/or habitat of northern brook lamprey within the Project area by potentially increasing inputs of fine sediment into local streams, increasing or rerouting stream flow, increasing stream temperatures, and disrupting existing and/or future habitat unless properly mitigated. Alternatives 2 and 3 propose various levels of vegetative management with associated new road construction, road decommissioning, and stream crossings.

Alternative 1
No Action Alternative

No vegetative treatments, new road construction, or road decommissioning are proposed under Alternative 1, therefore there would be no negative impacts to northern brook lamprey or their habitat from these activities. Under the no action alternative, improvement of watershed conditions and reduction in sediment sources would not occur from decommissioning existing system and unclassified roads. Continued use of unclassified roads and stream crossings by off-road vehicles, including ATV's, and ORV's may continue to contribute sediment into local streams and potentially affect brook lamprey spawning habitat as well as developing eggs and juveniles.

Alternatives 2 and 3

Proposed vegetative management associated with alternatives 2 and 3 would not likely affect individuals, populations, and/or habitat of northern brook lamprey provided that required design criteria and mitigation measures are followed during implementation (EIS Appendix B and C). These design criteria and mitigation measures have been developed to maintain or restore riparian ecological function within near-bank and remainder zone areas. Under these design criteria, no harvest of trees would occur within 100 feet of flowing treams except for the purpose of maintaining or restoring riparian ecological function. Also, remainder riparian management zones would be established adjacent to near-bank zones depending upon floodplain and shoreline slope conditions where vegetative management would favor extended rotation of site appropriate tree species. These criteria will together serve to protect and enhance both riparian and within stream channel habitat conditions for northern brook lamprey.

Alternatives 2 and 3 propose constructing new roads as well as decommissioning existing unclassified and newly constructed temporary roads (Chapter 3.12, Table 3.12.4). Under all alternatives, newly constructed temporary roads would be decommissioned after all use is completed (USDA Forest Service 2004b). Road decommissioning would render each road unusable by motorized vehicles, remove stream crossings and fill from flood prone and wetland areas, and require re-vegetating exposed soil surfaces (USDA Forest Service 2004b).

Alternatives 2 and 3 propose a net decrease in the total number of non-temporary stream crossings within the Project area (Chapter 3.12, Table 3.12.6). Removal of these stream crossings would benefit northern brook lamprey and their habitat, if present, by improving fish passage and flood flow capability as well as reducing potential sediment sources at existing stream crossing sites.

Further, Alternatives 2 and 3 propose to increase the total number of stream crossings associated with temporary winter roads (Chapter 3.12, Table 3.12.6). These roads would increase the number of stream crossings for alternatives 2 and 3 by 14 and 13 crossings, respectively (Chapter 3.12, Table 3.12.6). Proposed temporary winter roads associated with each alternative may impact lake sturgeon and habitat unless properly designed and used. Typically, temporary winter roads are designed to reduce impacts to soils, streams, and wetlands by providing over-the-snow or ice travel for logging equipment during the winter. Negative impacts to northern brook lamprey and habitat are not anticipated from the use of these roads provided that use is restricted to "frozen" conditions. Use of temporary winter roads and stream/wetland crossings during thaw conditions, rain-on-snow events, or "unfrozen" conditions could potentially have more impacts to northern brook lamprey and habitat than other temporary roads and crossings because they are not designed for "unfrozen" condition use.

Cumulative Effects

It is likely that historical events have affected individuals and populations of northern brook lamprey within the Border Project area, the Superior National Forest, and on adjacent non-federal lands. It is possible that historical timber harvest, road and trail construction, poorly designed stream crossings, floods, and fire may have affected lamprey habitat and ammocoete survival by contributing sediment, increasing stream temperatures, and altering stream flow (USDA Forest Service 2004a). Standards and guidelines in the 2004 Forest Plan will help to ensure that USFS activities will not contribute to cumulative effects. In addition to Federal standards and guidelines, State, private and local land owners and managers are now required to follow established best management practices that should also contribute to minimizing cumulative effects. Provided that best management practices are implemented by all land owners and managers, there should be no additional cumulative effects to northern brook lamprey and habitat.

The portion of each watershed that is in upland open or upland young condition is also a good cumulative effects indictor for northern brook lamprey. Research indicates that watersheds having more than 60 percent upland open and upland young forest conditions are susceptible to peak flows that can reshape channels, increase erosion and sedimentation, as well as decrease diversity within streams (Verry 2000). These increased peak flows could also affect individuals, populations, and habitat of northern brook lamprey by increasing stream channel and road

stream crossing erosion, increasing sedimentation, creating additional migration barriers, and likely influence survival of adults, juveniles, and eggs.

Based on a review and analysis of existing conditions as well as those conditions that would result from full implementation of Alternatives 2 and 3, there are no watersheds within or intersecting the Border Project area that currently or would exceed the 60 percent threshold (Chapter 3.12, Table 8, Figure 4). Based on other watershed characteristics including the portion of each watershed in wetland, lowland, and water, portion of each watershed within the BWCAW, and the portion of each watershed within and outside the Project area, it is also not likely that proposed vegetative management associated with alternatives 2 and 3 would result in an upland open and upland young value exceeding 60 percent for any watershed within or intersecting the Project area. (Chapter 3.12, Table 8, Figure 4).

Determination

The determination of effects from the proposed alternatives is based upon the direct, indirect, and cumulative effects on populations and habitat of northern brook lamprey within the Border Project area described in the EIS. Provided that all design criteria and mitigation measures required by this BE as well as those included in the EIS and Forest Plan are followed during implementation, there is a low risk that the activities associated with the action alternatives would affect northern brook lamprey and habitat. After considering the direct, indirect, and cumulative effects, it has been determined that all alternatives, including the no action alternative may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species.

Mitigations

- Follow all relevant design criteria and mitigation measures described in the Border EIS. In addition to required design criteria and mitigation measures, all Forest-wide desired conditions, objectives, standards and guidelines contained in the Superior National Forest Land and Resource Management Plan apply, including those established for: 1) Watershed Health, Riparian Areas, and Soil Resources, 2) Terrestrial and Aquatic Wildlife; and 3) Transportation System (USDA Forest Service 2004b).

Creek Heelsplitter and Black Sandshell Mussel

Existing Condition

Creek Heelsplitter

The creek heelsplitter mussel is known to occur on the Superior National Forest but not within the Border Project area (MN NHR database 2004). Due to this species habitat requirements and existing habitat conditions, it is possible that it occurs within the Border Project area but has not been documented.

The creek heelsplitter mussel typically occurs in small headwater streams and requires riverine habitat conditions to survive and proliferate (Anderson 2001). It has also been

documented at or near river inlets in lakes on the Superior National Forest (MNDNR 2002). Although the creek heelsplitter is capable of self-fertilization, it relies extensively on host fish species for its parasite life stage (glochidia larvae) and dispersal (Anderson 2001). Because of its habitat and host fish requirements, the creek heelsplitter may be affected by vegetative management and road construction activities that could potentially increase sedimentation and stream flow as well as create potential host fish migration barriers at road stream crossings, if not properly mitigated.

Black Sandshell Mussel

The black sandshell mussel is known to occur on the Superior National Forest and within the Border Project area on the Echo and Vermilion Rivers (MN NHR database 2004). It is possible that existing habitat conditions within the Project area may support additional locations, individuals, or populations of this RFSS.

The black sandshell mussel is primarily a riverine species that requires deep run or glide habitat in wide rivers with moderate current (USDA FS 2004a). Although the Superior National Forest is near the edge of this species range, it has been documented in several locations in the St. Louis River system (MN NHR 2004 database, MNDNR 2002). The black sandshell mussel also relies on host fish species for its parasitic stage and dispersal. Because of its habitat and host fish requirements, the black sandshell mussel may be affected by vegetative management and road construction activities associated with the Border Project that could potentially increase sedimentation and stream flow as well as create potential host fish migration barriers at road stream crossings.

Direct/Indirect Effects
Creek Heelsplitter and Black Sandshell Mussel

Vegetative management activities, new road construction, and stream crossings may affect individuals, populations, and/or habitat of creek heelsplitter and black sandshell mussels within the Border Project area by potentially increasing inputs of fine sediment into local streams, increasing or rerouting stream flow, increasing stream temperatures, and disrupting existing and/or future habitat unless properly mitigated. Activities at or near road stream crossings may also affect distribution of mussels and movement of their host fish species. Alternatives 2, 3M, and 4 propose various levels of vegetative management with associated new road construction, road decommissioning, and stream crossings.

Alternative 1
No Action Alternative

No vegetative treatments would occur under Alternative 1, therefore, there would be no potential impacts to creek heelsplitter or black sandshell mussels from these activities. Continued use of unclassified roads and stream crossings by off-road vehicles, including ATV's, and ORV's, may continue to contribute sediment into local streams and potentially threaten RFSS mussels and habitat. Under the no action alternative, improvement of watershed conditions and reduction in sediment sources would also not occur from decommissioning existing system and unclassified roads. Because this alternative does not include vegetative management activities, including removal of fuels and reduction of fire risk, there would be an increased potential for wildfire that could affect RFSS mussels and habitat.

Alternatives 2 and 3

Proposed vegetative management associated with Alternatives 2 and 3 would not likely affect individuals, populations, and/or habitat of creek heelsplitter or black sandshell mussels provided that required design criteria and mitigation measures are followed during implementation (EIS Appendix B and C). These design criteria and mitigation measures have been developed to maintain or restore riparian ecological function within near-bank and remainder zone areas. Under these design criteria, no harvest of trees would occur within 100 feet of flowing streams except for the purpose of maintaining or restoring riparian ecological function. Remainder riparian management zones would also be established adjacent to near-bank zones depending upon floodplain and shoreline slope conditions where vegetative management would favor extended rotation of site appropriate tree species. Together, these criteria will serve to protect and enhance both riparian and within stream channel habitat conditions for creek heelsplitter or black sandshell mussels.

Alternatives 2 and 3 propose constructing new roads as well as decommissioning existing unclassified and newly constructed temporary roads (Chapter 3.12, Table 3.12.4). Under all alternatives, newly constructed temporary roads would be decommissioned after all use is completed (USDA Forest Service 2004b). Road decommissioning would render each road unusable by motorized vehicles, remove stream crossings and fill from flood prone and wetland areas, and require re-vegetating exposed soil surfaces (USDA Forest Service 2004b).

Alternatives 2 and 3 each propose a net decrease in the total number of non-temporary stream crossings within the Project area (Chapter 3.12, Table 3.12.6). Removal of these stream crossings would benefit mussels and their habitat, if present, by improving fish passage and flood flow capability as well as reducing potential sediment sources at existing stream crossing sites.

Also, Alternatives 2 and 3 propose to increase the total number of stream crossings associated with temporary winter roads (Chapter 3.12, Table 3.12.6). These roads would increase the number of stream crossings for alternatives 2 and 3 by 14 and 13 crossings, respectively (Chapter 3.12, Table 3.12.6). Proposed temporary winter roads associated with each alternative may impact lake sturgeon and habitat unless properly designed and used. Typically, temporary winter roads are designed to reduce impacts to soils, streams, and wetlands by providing over-the-snow or ice travel for logging equipment during the winter. Negative impacts to creek heelsplitter or black sandshell mussels and habitat are not anticipated from the use of these roads provided that use is restricted to "frozen" conditions. Use of temporary winter roads and stream/wetland crossings during thaw conditions, rain-on-snow events, or "unfrozen" c onditions could potentially have more impacts to northern brook lamprey and habitat than other temporary roads and crossings because they are not designed for "unfrozen" condition use.

Cumulative Effects

It is likely that historical events have affected individuals and populations of creek heelsplitter and black sandshell mussels within the Border Project area, the Superior National Forest, and on adjacent non-federal lands. It is possible that historical timber harvest, road and trail construction, poorly designed stream crossings, floods, and fire may have affected mussel habitat and survival by contributing sediment, increasing

stream temperatures, and altering stream flow (USDA Forest Service 2004a). Standards and guidelines in the 2004 Forest Plan will help to ensure that USFS activities will not contribute to cumulative effects. In addition to Federal standards and guidelines, State, private and local land owners and managers are now required to follow established best management practices that should also contribute to minimizing cumulative effects. Provided that best management practices are implemented by all land owners and managers, there should be no additional cumulative effects to creek heelsplitter or black sandshell mussels and their habitat.

The portion of each watershed that is in upland open or upland young condition is also a good cumulative effects indictor for creek heelsplitter and black sandshell mussels. Research indicates that watersheds having more than 60 percent upland open and upland young forest conditions are susceptible to peak flows that can reshape channels, increase erosion and sedimentation, as well as decrease diversity within streams (Verry 2000). Also, these increased peak flows could affect individuals, populations, and habitat of creek heelsplitter or black sandshell mussels by increasing stream channel and road stream crossing erosion, increasing sedimentation, creating additional migration barriers for potential host fish, and likely influence survival of adults and juveniles.

Based on a review and analysis of existing conditions as well as those conditions that would result from full implementation of Alternatives 2 and 3, there are no watersheds within or intersecting the Border Project area that currently or would exceed the 60 percent threshold (Chapter 3.12, Table 8, Figure 4). Therefore, based on other watershed characteristics including the portion of each watershed in wetland, lowland, and water, portion of each watershed within the BWCAW and VNP, and the portion of each watershed within and outside the Project area, it is not likely that proposed vegetative management associated with Alternatives 2 and 3 would result in an upland open and upland young value exceeding 60 percent for any watershed within or intersecting the Project area. (Chapter 3.12, Table 3.12.8, Figure 3.12.4).

Determination
Creek Heelsplitter and Black Sandshell Mussel

The determination of effects from the proposed alternatives is based upon the direct, indirect, and cumulative effects on populations and habitat of creek heelsplitter and black sandshell mussels within the Border Project area described in the EIS. Provided that all design criteria and mitigation measures required by this BE are followed during implementation, there is a low risk that the activities associated with the action alternatives would affect either species. After considering the direct, indirect, and cumulative effects, it has been determined that all alternatives, including the no action alternative may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the populations or species.

Mitigations

- Follow all relevant design criteria and mitigation measures described in the Border EIS. In addition to required design criteria and mitigation measures, all Forest-wide desired conditions, objectives, standards and guidelines contained in the Superior National Forest Land and Resource Management Plan apply, including those established for: 1) Watershed Health, Riparian Areas, and Soil Resources, 2) Terrestrial and Aquatic Wildlife; and 3) Transportation System (USDA Forest Service 2004b).

3.8.2.8 Vascular Plants, Lichens and Bryophytes

Analysis Area and Methods

For sensitive plants, the area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest within the Border Project area. The area covered by the cumulative effects analysis includes lands of all ownerships within the Border Project area. This cumulative effects Analysis Area was selected because the adjacent non-Forest Service lands in the Project area share a number of physical characteristics (e.g. soils, landforms, etc.) which have influenced and constrained land uses in a similar manner. Furthermore, lands of other ownerships are often in close proximity to Forest Service lands. For these reasons, the Project area boundary makes a logical analysis unit for cumulative effects.

The time period covered by the direct, indirect, and cumulative effects analysis is from the 1870's to approximately 2018. The 1870's was chosen because that was when white settlement began to increase in northeastern Minnesota in association with the development of iron mines and timber production (MFRC 1999). 2018 was chosen because most Project activities should be completed within 10 years.

Indicators and habitat groups were used to help evaluate the potential effects of management activities on Regional Forester Sensitive Species (RFSS) plants (Table BE 18). Indicator 1 describes the number of known RFSS plant occurrences affected by Project activities. The remaining Indicators relate to the amount of a ground disturbing activity occurring in different RFSS plant habitats. The Indicators are described below for each of six RFSS plant habitat groups. RFSS plants are grouped by habitat to reduce the amount of repetition in the analysis. The habitat groups are described in more detail in the Biological Evaluation for the Superior National Forest Plan (USDA Forest Service 2004c)

- **Habitat Group 1** - RFSS plants of non-forested wetlands, shallow water, and riparian areas

  Indicator - Miles of new lowland road construction on FS lands

  This indicator highlights differences between Alternatives well because lowland road construction is one of the only proposed management activities that would have any direct effects to this habitat. Lowlands are considered lands classified as ELT 1, 2, 3, 4, 5, or 6.

- **Habitat Group 2** - RFSS plants of cliffs and talus slopes

  Indicator - Acres of ELT 18 in proposed treatment units

  This indicator highlights the difference between alternatives well because it measures the amount of potentially suitable habitat within treatment units. Rock outcrop areas were identified as mapped Ecological Landtype 18.

Many of the plants in this habitat group use a microhabitat within the rock outcrop, and these microhabitats are hard to quantify. The actual acres of suitable microhabitats affected by the alternatives are likely to be less than that shown for the indicator.

- **Habitat Group 3** - RFSS plants of upland disturbed areas (old landings, roadbeds, etc.)

  Indicators - Acres of upland commercial timber harvest and miles of unclassified road impacted by construction or reconstruction activities

  These Indicators highlight differences between alternatives well because each provides a rough indication of impacts to the types of habitats typically occupied by species in this habitat group. For example, not every acre of commercial timber harvest impacts an acre of disturbed upland areas, but 1000 acres of commercial timber harvest would likely impact more of this habitat than 500 acres of commercial timber harvest. For the last indicator in this group, the roads covered by the indicator are unclassified roads that are being converted to classified, special use, or temporary roads.

- **Habitat Group 4 -** RFSS plants of forested wetlands

  Indicators - Acres of lowland black spruce harvest, and miles of new lowland road construction on FS lands

  Acres of lowland black spruce harvest is a good indicator for this habitat since it provides a direct evaluation of how much lowland forest habitat is impacted by alternative. Miles of lowland road construction highlight differences between alternatives well because lowland road construction also causes direct impacts to this habitat.

- **Habitat Group 5** - RFSS plants of northern hardwood forests (sugar maple, basswood, yellow birch, red oak)

  Indicator - Acres of northern hardwood forest types (Forest Type 80's) proposed for treatments.

  Normally, this indicator is used to evaluate impacts to plants that use northern hardwood forests as suitable habitat. However, since very little of this habitat exists in the Project area and because no harvests are proposed for northern hardwood forest types, this indicator is not pertinent for the Border Project.

- **Habitat Group 6** - RFSS plants of dry to mesic upland forests

  Indicator - Acres of upland commercial timber harvest and miles of new upland road construction on FS lands.
  These Indicators highlight differences between Alternatives well because each provides an indication of the amount of potential impact to upland forest habitats. Miles of new upland road construction includes both temporary and classified roads.

Table BE 18 RFSS Plants Indicators 1-7 Used for RFSS Plants Effects Analysis			
Indicator	**Alt. 1**	**Alt. 2**	**Alt. 3**
1. Number of known sensitive plant occurrences in or next to proposed treatment units	0	0	0
2. Miles of new lowland road construction on FS lands	0	11.5	10.4
3. Miles of new upland road construction on FS lands	0	33.8	29.2
4. Miles of unclassified road impacted by construction and reconstruction	0	6.4	6.4
5. Acres of upland commercial timber harvest	0	10,988	9,955
6. Acres of lowland black spruce harvest	0	63	57
7. Acres of ELT 18 in proposed treatment units	0	997	934

Sensitive Plant Survey Results

Rare plant surveys were conducted in the Border mid-level area in 2007 by a botanist under contract to the Forest Service. Approximately 1510 acres of the Project area were surveyed, with surveys focusing on suitable timber stands, as well as some stands selected because they represent high quality rare plant habitat. Forest Service botanists surveyed 233 acres of the Project area for rare plants in summer 2007 as well. Lastly, portions of the Project area were surveyed for rare lichens by University of Minnesota lichenologist Cliff Wetmore in 1999 (Wetmore 2000).

Forest Service contract botanists did not find any new RFSS plant occurrences during 2007 surveys in the Border Project area (Schmoller 2007), and neither did Forest Service botanists (USDA Forest Service 2007). There are no federally threatened or endangered plants in the Project area. Known rare plant occurrences tracked in the MNDNR Natural Heritage Database (MN DNR 2007) were compared to planned vegetation management activities in the Border Project.

All sensitive vascular and non-vascular plant species known or suspected to occur in the Project area are displayed in Table BE-1. No known RFSS plant populations occur in stands or on roads proposed for management.

Habitat Group 1
RFSS Plants of Shallow Water and Non-forested Wetlands and Riparian areas

Existing Condition

The following sensitive plants use this habitat group and either occur in or have suitable habitat in the Analysis Area (Table BE1): swamp beggar-ticks, floating marsh-marigold, Katahdin sedge, linear-leaved sundew, neat spike rush, moor rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, club-spur orchid, northern bur-reed, awlwort, and lance-leaved violet. There are 7,262 acres of this type of wetland and riparian habitat scattered throughout the Border Project area.

Direct/Indirect Effects
Alternative 1

Indicator 2 - There would be no ground disturbance occurring under Alternative 1. Therefore, there would be no direct or indirect effects to any of these species or their suitable habitat.

Alternative 2
Indicator 2
Miles of New Lowland Road Construction on FS Lands

There would be no direct negative effect of timber harvesting under Alternative 2 since aquatic, non-forested wetland, and non-forested riparian habitats would not be treated. Some sedimentation may be an indirect negative effect of timber harvest, but the open water wetland and perennial/intermittent stream mitigations would help minimize sedimentation effects on suitable habitat for these species. Lowland roads constructed under this alternative would go through some suitable habitat for this suite of species and thus impact suitable habitat, but use would be during frozen conditions (see Appendix B of DEIS), so no long term negative impacts are expected to suitable habitat for these RFSS plants. Less than 1% of the acreage of all wetland types would be directly impacted by creation of lowland roads under this Alternative.

Alternative 3
Indicator 2
Miles of New Lowland Road Construction on FS Lands

The types of impacts of Alternative 3 to plants in this habitat group would be similar to the impacts of Alternative 2 described above. Alternative 2 would affect slightly less habitat than Alternative 3, based on the number of miles of new lowland road construction on Forest Service lands (Table BE 18).

Cumulative Effects

For Alternative 1, there would be no cumulative effects to these species since no ground disturbance would occur under this alternative.

There would be few cumulative effects of Alternatives 2 or 3 on these species since very little management is proposed in the habitats that they inhabit. In the past, construction and use of lowland roads and wetland draining were the two actions that probably had the biggest impacts on species in this habitat group within the cumulative effects Analysis Area. At present and in the future, construction and use of roads in lowlands proposed under these alternatives and elsewhere in the cumulative effects Analysis Area, including construction of non-jurisdictional roads for access to private land (Appendix G), and roads associated with county or state timber sales, would continue to impact suitable habitat, but the proportion of total suitable habitat affected by these activities would be very small.

Summary

Project activities associated with Alternatives 2 or 3 would have only minor negative direct, indirect, and cumulative effects on the suitable habitat for these species. Alternative 2 would impact the greatest amount of suitable habitat, followed by Alternative 3, based on the miles of new lowland road construction on FS lands by alternatives (Table BE 18).

Determination

For Alternative 1, the proposed activities would have no impact on swamp beggar-ticks, floating marsh-marigold, Katahdin sedge, linear-leaved sundew, neat spike rush, moor rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, club-spur orchid, northern bur-reed, awlwort, and lance-leaved violet.

For Alternatives 2 and 3, the proposed activities may impact individuals of swamp beggar-ticks, floating marsh-marigold, Katahdin sedge, linear-leaved sundew, neat spike rush, moor rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, club-spur orchid, northern bur-reed, awlwort, and lance-leaved violet, but are not likely to cause a trend to federal listing or loss of viability.

Habitat Group 2
RFSS Plants of Cliffs and Talus Slopes

Existing Condition

The following sensitive plants use this habitat group and have suitable habitat in the Analysis Area (Table BE-1): *Cladonia wainoi*, large-leaved sandwort, Appalachian fir clubmoss, *Arctoparmelia centrifuga*, and *Arctoparmelia subcentrifuga.* There is a large amount of apparently suitable habitat for species in this habitat group in the Project area. Rock outcrop areas were identified as mapped Ecological Landtype 18. Many of the plants in this habitat group use a microhabitat within the rock outcrop, and these microhabitats are hard to quantify. The actual acres of suitable microhabitats affected by the alternatives are likely to be less than that shown for the indicator.

Direct/Indirect Effects
Alternative 1

There would be no ground disturbance occurring under Alternative 1. Therefore, there would be no direct or indirect effects to any suitable habitat for species in this habitat group.

Alternative 2
Indicator 7
Acres of ELT 18 in Proposed Treatment Units

Alternative 2 proposes 997 acres of timber harvest on and adjacent to rock outcrop areas (Table BE 18). Some rock outcrop and cliff habitat could experience short term negative impacts as a result of Project activities. Ground disturbance from logging activities could cause short term direct impacts to suitable habitat. However, this would be minimized

because 65% of the stands covered by this indicator would be harvested during winter, when much less ground disturbance would occur. Moreover, mapped areas of ELT 18 would generally not be harvested under Forest Plan Guideline G-WS-8 (Appendix B).

One indirect effect of this alternative would be an increase in the amount of sunlight reaching the ground. Light levels could increase due to removal of the forest canopy on or next to rocky outcrops, but this would not cause any negative impacts to potential occurrences of these species, particularly *Cladonia wainoi*, which is known to occur on exposed sites with lots of sunlight (USDA Forest Service 2002e).
Another indirect effect of timber harvest in these sites with shallow bedrock would be potential spread of non-native invasive plants. Harvest activities could spread non-native invasive plants and thus degrade suitable habitat for plants in this habitat group. This spread would be minimized by the factors described in more detail in Chapter 3.14 of the DEIS: high proportion of winter harvest for stands with rock outcrops, no harvest on mapped Ecological Landtype 18, and operational standards and guides. None of the other proposed activities in Alternative 2 would impact habitat for these plants.

Alternative 3
Indicator 7
Acres of ELT 18 in Proposed Treatment Units

The types of impacts of Alternative 3 to suitable rock outcrop habitat would be similar to the impacts of Alternative 2 described above. Because Alternative 3 proposes slightly less timber harvest adjacent to rock outcrop sites (Table BE 18) than Alternative 2, the magnitude of effects of Alternative 3 would be slightly lower than Alternative 2. Impacts of Alternative 3 would be further reduced by the same factors described above for Alternative 2.

Cumulative Effects

For Alternative 1, there would be no cumulative effects to these species since no ground disturbance would occur under Alternative 1.

There would be few cumulative effects of Alternatives 2 and 3 on these species or their suitable habitat since very little management is proposed that would affect their suitable habitat. Since Europeans began settling the area, there have been relatively few past actions that have impacted this habitat within the cumulative effects Analysis Area except for road construction and occasional timber harvest. For example, past vegetation management projects may have had some small direct or indirect impacts on cliff or rock outcrop habitat as described above. Current and future actions in the cumulative effects Analysis Area that could affect this habitat include both road construction and timber harvest. Construction of logging roads for state, county, or private timber harvests, or non-jurisdictional roads for private developments (Appendix G) could impact a small amount of rock outcrop habitat. Timber harvest associated with the Holmes-Chipmunk EIS, as well as ongoing or future State, private, or county harvests could also impact a small amount of rock outcrop habitat. However, cumulative impacts of Alternatives 2 and 3 would be minimal because these habitats are quite dispersed and only a small proportion of this suitable habitat would be affected by management activities.

Summary

Project activities associated with these alternatives could have short term direct and indirect negative effects on the suitable habitat for these species. Alternative 2 would have a slightly greater impact on suitable habitat than Alternative 3 based on acres of Indicator 7 (Table BE 18).

Determination

For Alternative 1, the proposed activities would have no impact on *Cladonia wainoi*, large-leaved sandwort, Appalachian fir clubmoss, *Arctoparmelia centrifuga*, and *Arctoparmelia subcentrifuga*.

For Alternatives 2 and 3, the proposed activities may impact individuals of *Cladonia wainoi*, large-leaved sandwort, Appalachian fir clubmoss, *Arctoparmelia centrifuga*, and *Arctoparmelia subcentrifuga*, but are not likely to cause a trend to federal listing or loss of viability.

Habitat Group 3
RFSS Plants of Upland Disturbed Areas

Existing Condition

The following sensitive plants use this habitat group and either occur in or have suitable habitat in the Analysis Area (Table BE 4): pointed moonwort, common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, and least moonwort. It is difficult to quantify how much of this type of suitable habitat exists in the Project area.

Direct/Indirect Effects
Alternative 1

Indicators 4 and 5

There would be no ground disturbance occurring under Alternative 1. Therefore, there would be no direct impact to any of these species as a result of this Project. However, succession and lack of disturbance would probably diminish the amount of suitable habitat in the Project area over time under this alternative (USDA Forest Service 2001a, b, c, d, and e), which could lead to long-term downward population trends for any occurrences of these species in the Project area. These *Botrychium* species frequently occupy habitats where some disturbance occurred in the past, such as a log landing or old road, and they depend to some degree on disturbance to create suitable habitat.

Alternative 2

Indicator 4
Miles of Unclassified Road Impacted by Construction and Reconstruction

There are no known occurrences of species in this habitat group on or near unclassified roads proposed for construction or reconstruction, so direct impacts to known occurrences are not expected. However, there would be direct and indirect short-term negative impacts to suitable habitat for these *Botrychium* species from construction and

reconstruction activities on unclassified roads. Ground disturbance associated with road construction and reconstruction would cause short-term impacts to suitable habitat – some individuals could be destroyed, since they sometimes occur on old, infrequently used roadbeds. However, over the long term the majority of unclassified roads impacted by construction and reconstruction would still serve as suitable habitat, particularly if the unclassified road is converted to a temporary road or an OML-1 road. Any remaining individuals in treated or untreated portions of the Project area could colonize this habitat. Although the biology of these *Botrychium* species is poorly understood (USDA Forest Service 2001a, b, c, d, and e), the creation of new ruderal habitats through Project activities would likely perpetuate any populations of these species that may have been missed during Project inventories.

Indicator 5
Acres of Upland Commercial Timber Harvest

There would be direct and indirect short-term impacts to suitable habitat for these *Botrychium* species from timber harvest and related activities. Ground disturbance associated with timber harvest would cause short-term impacts to suitable habitat – some individuals could be destroyed. After several years, however, new suitable habitat would be available, such as log landings. Any remaining individuals in treated or untreated portions of the Project area could colonize these habitats. Although the biology of these *Botrychium* species is poorly understood (USDA Forest Service 2001a, b, c, d, and e), the creation of new ruderal habitats through Project activities would likely perpetuate any populations of these species that may have been missed during project inventories.

Gravel pit use and expansion could have direct and indirect short term impacts to suitable habitat for these *Botrychium* species. Some individuals could be destroyed by this activity. However, all of the areas affected by this activity would still serve as suitable habitat for these species in the long term. Any remaining individuals in treated or untreated portions of the Project area could colonize this habitat. Although the biology of these *Botrychium* species is poorly understood (USDA Forest Service 2001a, b, c, d, and e), the creation of new ruderal habitats through Project activities would likely perpetuate any populations of these species that may have been missed during Project inventories.

Alternative 3
Indicator 4
Miles of Unclassified Road Impacted by Construction and Reconstruction

The types of impacts of Alternative 3 to plants in this habitat group would be the same as the impacts of Alternative 2 described above, since Indicator 4 is the same for each alternative (Table BE 18)

Indicator 5
Acres of Upland Commercial Timber Harvest

The types of impacts of Alternative 3 to plants in this habitat group would be similar to the impacts of Alternative 2 described above for Indicator 5. Alternative 3 would affect 1,033 acres less habitat than Alternative 2, based on the acres of upland commercial timber harvest (Table BE 18) therefore, the impacts of Alternative 2 would be greater than Alternative 3 for this indicator.

The proposals for gravel pit use and expansion do not differ between Alternatives 2 and 3, so the impacts of gravel pit use and expansion under these alternatives would be identical.

Cumulative Effects

Very little is known about the distribution of these *Botrychium* species within the cumulative effects Analysis Area. However, it is unlikely that the lack of ground disturbance associated with Alternative 1 would have any cumulative effects on suitable habitat for these species in the Project area.

There would be few cumulative effects of the action alternatives on these species. Very little is known about the distribution of these *Botrychium* species within the cumulative effects Analysis Area. However, similar types of disturbance (for example, timber harvest, road building, and gravel pit development) have occurred within the cumulative effects Analysis Areas as have occurred within the direct/indirect effects Analysis Areas. These activities, while sometimes impacts suitable habitat, have also created suitable habitat at the same time. Because ground disturbing activities have created ample suitable habitat in the past and at present, and because similar types of activities will probably occur into the future, it is unlikely that there will be any cumulative effects to species in this habitat group.

Summary

Project activities would have short-term negative direct and indirect effects on suitable habitat for these species in the Analysis Area. Over the long-term, ground disturbance associated with these Alternatives would maintain or create suitable habitat for these species. Alternative 2 would have slightly greater impacts to suitable habitat for species in this group than Alternative 3, and both action alternatives would have greater impacts than Alternative 1, based on an analysis of Indicators 4 and 5 (Table BE 18).

Determination

For Alternatives 1, 2, and 3, the proposed activities may impact individuals of pointed moonwort, common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, and least moonwort but are not likely to cause a trend to federal listing or loss of viability.

Habitat Group 4
RFSS Plants of Forested Wetlands

Existing Condition

The following sensitive plants use this habitat group and either occur in or have suitable habitat in the Analysis Area (Table BE-1): small shinleaf, cloudberry, fairy slipper, ram's head ladyslipper, western Jacob's ladder, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Ramalina thrausta, Sticta fuliginosa*, and *Usnea longissima*. *Pseudocyphellaria crocata* is analyzed here as well because local occurrences are found in open and forested peatlands. There are approximately 3,115 acres of stands typed as forested wetlands habitat in the Project area.

Direct/Indirect Effects
Alternative 1
Indicators 2 and 6

There would be no ground disturbance occurring under Alternative 1. Therefore, there would be no direct or indirect effects to any of these species.

Alternative 2
Indicator 2
Miles of New Lowland Road Construction on FS lands

Alternative 2 proposes the greatest amount of lowland road construction at 11.5 miles, followed by Alternative 3 at 10.4 miles (Table BE 18). For Alternative 2, lowland roads constructed through forested wetlands would potentially cause direct negative impacts (i.e. burial under fill material if it is an all-season classified road) and indirect negative impacts (i.e. increased light levels or change in vegetative composition) to some suitable habitat for these species. For winter roads, impacts such as rutting would be minimized because construction and use would be during frozen conditions. For this alternative, less than 1% of the acreage of all forested wetlands would be directly impacted by creation of lowland roads, so impacts to this suitable habitat would be minimal. Road construction through lowland cedar and black ash stands would be avoided when possible, but when avoidance is not possible, another RFSS plant survey specific to the lowland road construction would be conducted.

Indicator 6
Acres of Lowland Black Spruce Harvest

For Alternative 2, approximately 63 acres of lowland black spruce harvest are proposed (Table BE 18), while 57 acres of lowland black spruce harvest are proposed under Alternative 3. These stands are good suitable habitat for small shinleaf, cloudberry, and *Pseudocyphellaria crocata* but poor habitat for the other species in this habitat group. No RFSS plants were found during surveys of lowland black spruce stands, so there would be no direct impacts to known populations. However, there could be indirect negative impacts to suitable habitat for small shinleaf, cloudberry, and *Pseudocyphellaria crocata* due to timber harvest of lowland black spruce stands. The likelihood of impacts is highest for small shinleaf and *P. crocata* because they are found in closed canopy forests, and the increased light levels resulting from timber harvest could have negative effects on these species. There is less risk for cloudberry which can be found in open tundra habitats. However, impacts to suitable habitat would be minimized because harvest would occur only during frozen conditions when plants are dormant. Only approximately 2% of lowland forest habitat would be affected by lowland black spruce harvest, which further demonstrates the minimal impacts to suitable habitat.

No lowland white cedar, black ash, or mixed conifer stands are proposed for harvest. These lowland forest types are suitable habitat for the other RFSS species in this habitat group (i.e. fairy slipper, ram's head ladyslipper, western Jacob's ladder, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Ramalina thrausta, Sticta fuliginosa*, and *Usnea longissima*.) There would be no timber harvest-related impacts to these species in Alternative 2.

There would be no impacts to species in this habitat group from other proposed Project activities associated with Alternative 2.

Alternative 3
Indicator 2
Miles of New Lowland Road Construction on FS lands

The types of impacts of Alternative 3 to plants in this habitat group would be similar to those described above for Alternative 2. However, the magnitude of impacts would be slightly less for Alternative 3, which proposes 10.4 miles of lowland road construction compared to 11.5 miles for Alternative 2 (Table BE 18).

Indicator 6
Acres of Lowland Black Spruce Harvest

The types of impacts of Alternative 3 to plants in this habitat group would be similar to those described above for Alternative 2. However, the magnitude of impacts would be slightly less for Alternative 3, which proposes 57 acres of lowland black spruce harvest compared to 63 acres for Alternative 2 (Table BE 18).

There would be no impacts to species in this habitat group from other proposed Project activities associated with Alternative 3.

Cumulative Effects

For Alternative 1, there would be no cumulative effects to these species since no ground disturbance would occur under this alternative.

There would be few cumulative effects of the action alternatives on these species since very little management is proposed in the habitats that they inhabit, and because such management affects a small proportion of the overall habitat. Since Europeans began settling the area, timber harvest, wetland drainage, and road construction have impacted forested wetlands and reduced the amount and distribution of this habitat within the cumulative effects Analysis Area (Bradof 1992, Heinselman 1996, Frelich 1998, MFRC 1999). More recently, timber sales on federal lands (for example those associated with the Holmes-Chipmunk EIS), State, county, and private lands have changed the age class distribution of lowland black spruce habitats, but have not altered the overall suitability of the habitat for species in this habitat group; see Appendix G in the DEIS for a summary of current and future timber harvest acres on federal, State, and county lands.

At present and in the future, construction and use of roads in lowlands proposed under these alternatives and elsewhere in the cumulative effects Analysis Area, including construction of non-jurisdictional roads for access to private developments (Appendix G), and roads associated with county, State, or private timber sales would continue to impact suitable habitat, but the proportion of total suitable habitat affected by these activities would be very small. Similarly, current and future timber sales affecting lowlands on State or county lands could change the age class of lowland black spruce forests in the Project area, temporarily making some stands less suitable for this suite of sensitive plants. However, the proportion of total suitable habitat affected by these activities would be very small. On the Superior National Forest, potential impacts of these activities would be mitigated by adherence to the Forest Plan standards and

guidelines, and on other ownerships, the impacts would be mitigated by voluntary adherence to the best management practices (MFRC 2005).

Summary

Project activities associated with these alternatives would have only minor direct, indirect, and cumulative negative effects on the suitable habitat for these species. Alternative 2 would have the greatest impacts to suitable habitat, followed by Alternative 3, based on an analysis of Indicators 2 and 6 (Table BE 18).

Determination

For Alternative 1, the proposed activities would have no impact on small shinleaf, cloudberry, fairy slipper, western Jacob's ladder, ram's head ladyslipper, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Ramalina thrausta, Sticta fuliginosa*, *Usnea longissima,* and *Pseudocyphellaria crocata.*

For Alternatives 2 and 3, the proposed activities may impact individuals of small shinleaf, cloudberry, fairy slipper, western Jacob's ladder, ram's head ladyslipper, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Ramalina thrausta, Sticta fuliginosa*, *Usnea longissima,* and *Pseudocyphellaria crocata*, but are not likely to cause a trend to federal listing or loss of viability.

Mitigations and Design Criteria

- Where possible, no roads would be placed in lowland cedar or black ash stands; in cases where this is unavoidable, a sensitive (RFSS) plant survey would be conducted prior to road construction.

Habitat Group 5
RFSS Plants of Northern Hardwood Forests
Existing Condition

The following sensitive plants use this habitat group and have a small amount of suitable habitat in the Analysis Area (Table BE-1): New England sedge and triangle grape-fern. Very little suitable habitat exists in the Analysis Area for plants in this habitat group, and only one activity is proposed for a northern hardwood forest type, a tree release project that is a Wildlife Habitat Improvement Project.

Direct/Indirect Effects
Alternative 1

There would be no ground disturbance occurring under Alternative 1. Therefore, there would be no direct or indirect effects to any of these species.

Alternative 2

There are no known occurrences of any species in this habitat group in the Border Project area, and the only project proposed for a northern hardwoods stand is a Wildlife Habitat Improvement Project involving release of established trees from shrub and sapling

competition. For Alternative 2, this activity would not cause any direct or indirect impacts to suitable habitat for plants in this habitat group, since there would be no overstory removal and shrub and saplings would be cut by hand which would involve very little ground disturbance.

Alternative 3

There are no known occurrences of any species in this habitat group in the Border Project area, and the only project proposed for a northern hardwoods stand is a Wildlife Habitat Improvement Project involving release of established trees from shrub and sapling competition. For Alternative 3, this activity would not cause any direct or indirect impacts to suitable habitat for plants in this habitat group, since there would be no overstory removal and shrub and saplings would be cut by hand which would involve very little ground disturbance.

Cumulative Effects

For Alternative 1, there would be no cumulative effects to these species since no ground disturbance would occur under this alternative.

For Alternatives 2 and 3, there would be no cumulative effects to these species since there are no direct or indirect effects caused by these alternatives.

Summary

Project activities associated with these Alternatives would have no direct, indirect, or cumulative effects on the suitable habitat for species in this habitat group.

Determination

For Alternatives 1, 2, and 3, the proposed activities would have no impact on New England sedge or triangle grape-fern.

Habitat Group 6
RFSS Plants of Dry to Mesic Upland Forests
Existing Condition

The following sensitive plants use this habitat group and either occur in or have suitable habitat in the Analysis Area (Table BE 1): Canada yew, barren strawberry, Canada ricegrass, and *Peltigera venosa*. *Peltigera venosa*, although not included as part of any habitat group in the Forest Plan BE, is analyzed with this habitat group in this BE because of its affinity for bare soil habitats such as rootwads. Based on the criteria in the Forest Plan BE, there are 36,033 acres of upland forest types that could serve as suitable habitat for barren strawberry in the Project area. There are 16,610 acres of forest that could serve as suitable habitat for Canada yew. There are 2,546 acres of uplands in ELT 9, 11, and 13 that could serve as suitable habitat for Canada ricegrass; this species, known from only ten occurrences in Minnesota, occurs in sandy and sandy/gravelly soils (Gerdes 2005a) such as is found in these three ELT's. It is difficult to quantify the number of acres of suitable bare soil habitat available for *Peltigera venosa*.

Direct/Indirect Effects
Alternative 1
Indicators 3 and 5

There would be no ground disturbance occurring under Alternative 1. Therefore, there would be no direct effects to any of these species, and there would be no indirect impacts to Canada ricegrass, barren strawberry, or *Peltigera venosa*. For Canada yew, the lack of ground disturbance would lead to an indirect benefit for the suitable habitat in the Analysis Area. Deer herbivory on Canada yew severely limits Canada yew growth and sexual reproduction, both in the Analysis Area (Greenlee pers. obs.) and elsewhere in the upper Midwest (Schmoller 1999). Lack of timber harvest in the Analysis Area under Alternative 1 would probably lead to a long term decrease in the whitetail deer population, which would be an indirect benefit to Canada yew.

Alternative 2
Indicator 3
Miles of New Upland Road Construction on FS lands

Alternative 2 proposes approximately 33.8 miles of new upland road construction. For Canada yew, barren strawberry, Canada ricegrass, and *Peltigera venosa*, upland road construction would have direct and indirect impacts to suitable habitat for these species, but sufficient suitable habitat would remain undisturbed to ensure there is no viability risk to these species. For this indicator, Alternative 2 would impact approximately 3% of suitable habitat in the Project area for Canada ricegrass, and less than 1% for other species in this group. New upland road construction would have minimal effects to suitable habitat for these species.

Indicator 5
Acres of Upland Commercial Timber Harvest

Approximately 10,988 acres of upland commercial timber harvest is proposed in Alternative 2. Timber harvesting would cause direct and indirect effects to suitable Canada yew upland habitat. Clearcuts would remove the overstory and create open conditions not favored by Canada yew. However, there would be no disturbance in lowland cedar forests in the Analysis Area, which are also an important habitat for Canada yew.

This alternative would, at a minimum, maintain the deer herd in the Analysis Area, so there would be continued browse pressure on Canada yew in the Analysis Area. There are 304 known occurrences of Canada yew on the Superior National Forest (USDA Forest Service 2006b). Because it is a sensitive species, Canada yew occurrences are generally avoided by Forest Service projects on the Superior (e.g. USDA Forest Service 2004e). Despite potential impacts to suitable habitat, the protection of known occurrences would ensure that there is no risk to the viability of this species due to Project activities.

For barren strawberry, ground disturbance caused by timber harvest and site preparation would have short term direct impacts to suitable habitat. However, in the long term timber harvest activities would probably have minimal effects on barren strawberry suitable habitat. Of the five known barren strawberry occurrences on the Superior, one was found in a clearcut, and another in a red pine plantation. These occurrences suggest that the species can tolerate some level of disturbance. The red pine plantation containing one occurrence was thinned in

2003, and preliminary monitoring results show no population decline as a result of the thinning (USDA Forest Service 2005a).

For *Peltigera venosa*, timber harvest could have direct and indirect impacts to suitable habitat in the short term. Over the long term however, blowdown at the edges of clearcuts would create suitable habitat for *Peltigera venosa* in the form of the exposed dirt of rootwads. Because there are no known occurrences in the Project area, and because recent surveys in the Project area or on the Forest did not locate this species (Wetmore 2000; Knowles pers. comm.), it is not likely that timber harvest in Alternative 2 would cause any viability risk for *Peltigera venosa*.

For Canada ricegrass, timber harvest could have direct short-term impacts to suitable habitat for this species. However, over the long term the effects of timber harvest to Canada ricegrass would probably be neutral to somewhat beneficial. In Michigan, the species occurs in logged areas and on road margins (Gerdes 2005a). In Minnesota, the species o ccurs in openings and clearings, along abandoned logging roads, thinned mixed pine-hardwood forest, young pine plantation, as well as unlogged red pine forest (Gerdes 2005a). Based o n the habitats of known occurrences, it seems likely that timber harvest proposed in Alternative 2 in the Project area would create some suitable habitat for Canada ricegrass in the long term.

There would be no impacts to TES plants in this habitat group from gravel pit use as proposed.

Alternative 3
Indicator 3
Miles of New Upland Road Construction on FS lands

Alternative 3 proposes approximately 29.2 miles of new upland road construction. The types of effects of this activity on Canada yew, barren strawberry, Canada ricegrass, and *Peltigera venosa* would be similar to those described for Alternative 2. However, the potential impacts of Alternative 3 to suitable habitat for these species would be lower than for Alternative 2, since fewer miles of new upland road would be constructed under Alternative 3. Alternative 3 would impact approximately 3% of suitable habitat in the Project area for Canada ricegrass, and less than 1% for other species in this group. New upland road construction would have minimal effects to suitable habitat for these species.

Indicator 5
Acres of Upland Commercial Timber Harvest

Approximately 9,955 acres of upland commercial timber harvest is proposed in Alternative 3. For Canada yew, barren strawberry, Canada ricegrass, and *Peltigera venosa*, the types of impacts would be similar to those described for Alternative 2 above. However, Alternative 3 would impact fewer acres of suitable habitat for each of these species than Alternative 2 based on analysis of indicator 5.

Cumulative Effects

For Alternative 1, there would be no cumulative effects to RFSS plants in this group since no ground disturbance would occur under Alternative 1.

There would be few cumulative effects of the action alternatives on these species. Since Europeans began settling the area, timber harvest (and subsequent forest type changes) and road construction are among the land uses that have most greatly impacted upland forests and altered the amount and distribution of this habitat in the cumulative effects Analysis Area. Some upland forest types like aspen have increased in acreage since pre-settlement times, while other forest types like red, white and jack pine have decreased (Frelich 1998). More recently, timber sales on federal (for example those associated with the Holmes-Chipmunk EIS), State, county, and private lands have changed the age class distribution of upland forest habitats; see Appendix G for a summary of past timber harvest on federal, private, State, and county lands.

Construction of roads in the Project area, such as federal, State, private, and county timber harvest roads, have also impacted a small proportion of suitable habitat for these species. For Canada ricegrass and barren strawberry, past, present, and reasonably foreseeable timber harvest would not have any long term cumulative impacts to suitable habitat for these species because they appear to be able to tolerate some levels of disturbance. Suitable habitat for *Peltigera venosa* (in the form of tip-ups) would continue to be created by future timber harvests. For Canada yew, future timber harvest on federal and non-federal lands would impact suitable habitat for this species, but negligible cumulative impacts would result and the viability of the species would be maintained by the existing known occurrences throughout the Superior.

Fuels reduction projects have resulted in the treatment of 361 acres in the Project area in the last five years. There are 1285 acres of fuels reduction treatments scheduled for the next 10 years in the Project area (Appendix G). These treatments have caused or will cause minor changes of the species composition of upland habitats, but negligible cumulative impacts would result and the viability of the species would be maintained by the existing known occurrences throughout the Superior.

Future road construction in the cumulative effects Analysis Area, including construction of non-jurisdictional roads for access to private developments (Appendix G), and roads associated with county, private, or state timber sales, would impact suitable habitats for this suite of rare plants, but would not result in cumulative impacts because these activities would affect only a small proportion of the available suitable habitat. On the Superior National Forest, potential impacts of these activities to this suitable habitat would be mitigated by adherence to the Forest Plan standards and guidelines, and on other ownerships, the impacts would be mitigated by voluntary adherence to the best management practices (MFRC 2005).

Summary

Project activities associated with these alternatives would have short-term negative direct and indirect effects on suitable habitat for these species. Over the long term, however, there would be only minor impacts to suitable habitat for these species. Based on analysis of Indicators 3 and 5, the effects to suitable habitat for species in this group would be greatest for Alternative 2, and slightly less Alternative 3.

Determination

For Alternative 1, the proposed activities would have no impact on Canada yew, barren strawberry, Canada ricegrass, or *Peltigera venosa*.

For Alternatives 2 and 3, the proposed activities may impact individuals of Canada yew, barren strawberry, Canada ricegrass, or *Peltigera venosa* but are not likely to cause a trend to federal listing or loss of viability.

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3.8.3 Biological Assessment of Threatened and Endangered Species/Management Indicator Species

Introduction

This Biological Assessment (BA) documents the potential effects on federally proposed, candidate, threatened or endangered species and designated critical habitat that could result from the proposed vegetation management project and associated activities as documented in the Border Project EIS. The BA tiers to the Programmatic Biological Assessment for the revision of the Forest Plan (USDA Forest Service 2004, pp. 6-7) and provides more specific information on site-specific effects of the Project to threatened and endangered species.

This BA was prepared in compliance with the requirements of Forest Service Manual Directives sections 2670.31, 2670.5(3), and 2672.4, the Endangered Species Act of 1973 as amended, and the National Forest Management Act of 1976.

Information provided by the USDI Fish and Wildlife Service (USDI FWS 2008, Letter from Field Supervisor Tony Sullins, Oct 10, 2008.) confirms the species and critical habitat that should be considered for projects conducted on the Superior National Forest:

- Canada lynx (*Lynx Canadensis)* (threatened)
- Canada lynx critical habitat (proposed)
- Gray wolf (*Canis lupis*) (threatened)
- Gray wolf critical habitat

Consultation with USDI Fish and Wildlife Service

The Forest Service has initiated consultation with the Fish and Wildlife Service seeking concurrence with the determination of effects in this BA, which concludes that the proposed action (Alternative 2) may affect, but is will not likely adversely affect Canada lynx or gray wolf.

In addition to consultation for Canada lynx and gray wolf requested for this Project, programmatic consultation was recently undertaken for Forest Plan revision. The history of this consultation is documented in the Programmatic Biological Assessment for the revision of the Forest plans (USDA Forest Service 2004, pp. 6-7). The relevance of program-level consultation to this Project includes those agreements between the Forest Service and the Fish and Wildlife Service reached on defining elements of species' ecology and biology, risk factors and general effects, analysis parameters, monitoring, and management direction in the revised Forest Plan. The BA provides more specific information on how relevant information in the program-level BA is incorporated. Additionally, other factors relevant to this project not discussed in detail in program-level consultation will be discussed in detail in this BA.

Although the Forest Plan Programmatic BA consultation or conference on Canada lynx proposed or designated critical habitat occurred prior to proposed designation in February 2008 (USDI Fish and Wildlife Service 2008b), most of the risk factors to lynx that were analyzed also address the primary constituent elements of proposed critical habitat. Therefore the Programmatic BA also has similar relevance to proposed

critical habitat as it does to lynx itself. See Section 4.0 below for additional information on recently proposed critical habitat.

Consultation specific to the Border Project is documented in the Project file. It includes emails, telephone calls, and meeting notes between Sept. 15, 2008 and the submission of the BA to the FWS on Oct. 8, 2008.

The Proposed Action

- **Location**: Superior National Forest, LaCroix Ranger District, St. Louis County, Minnesota (see Map 1 on p. 4 of the Border EIS for vicinity map).

  The Project area boundary encompasses about 93,700 acres of land with mixed ownership. Approximately 61 percent (57,600 acres) of the Project area is National Forest Service Land.

  The Border Project area encompasses National Forest System land south of Voyageurs National Park (VNP), west of the Boundary Waters Canoe Area Wilderness (BWCAW), north of the town of Buyck and east of the National Forest proclamation boundary. The Project area is outside the Boundary Waters Canoe Area Wilderness (BWCAW); actions are not proposed within the BWCAW.

  - **Ecological Setting**:

Table BA 1 - Ecological Setting		
Landscape Ecosystem	**Percent of Project area (NF Lands)**	**NF Acres**
Dry-mesic red and white pine	69	39,471
Jack Pine/Black Spruce	10	5,983
Lowland Conifer	4	2,210
Mesic red and white pine	1	386
Mesic birch-aspen-spruce-fir	<.001	52
Other*	16	9,328
*Other includes Lowland non-forest, Upland Non-forest, Lowland Hardwoods and Cedar. These LEs are lumped because the Forest Plan does not describe quantitative objectives for them.		
Terrestrial Ecological Units	**Percent of Project area (NF Lands)**	**NF Acres**
Border Lakes Subsection	100	57,600
Data source: Superior NF Landscape Ecosystem GIS cover 2005, ArcMap used to calculate acres		

Table BA 2 - Overview of Species' Affected Environment - Lynx			
LAU	**Gross Acres**	**Acres of LAU in Project area**	**% of LAU in Project area**
SNF 2	41,887	41,887	100
SNF 3	58,181	7,135	12
SNF 4	55,071	48,737	88
*1. **Data Sources:*** 2007 Superior NF Snapshot of LAU Existing Condition, Model run August 28, 2007, Acres and percent calculated through ArcMap 8/13/2008			

Table BA 3 - Overview of Species' Affected Environment Gray Wolf		
Wolf		**Percent of Project Area**
(Critical habitat)	Zone 1	86
(Critical habitat)	Zone 2	0
	Zone 3	0
	Zone 4	14

- ❖ **Other relevant setting features:** None

- **Proposed action summary**

The USDA Forest Service Superior National Forest proposes timber harvest, planting, prescribed burning and road system management associated with these actions as well as to provide for long-term federal, non-federal, and public access. The alternatives are described in Chapter 2 of The Border EIS. The proposed mitigations and design features are listed in Appendix C. The action alternatives include the following activities, in different amounts and locations:

- Timber harvest: A combination of clear cut with reserves, seed tree cuts, shelterwood cuts, group selection, commercial and pre-commercial thinning, and salvage.
- Reforestation: Includes natural regeneration, site prep, diversity planting, under planting, conversion planting (aspen to pine or spruce-fir), and release of advanced regeneration.
- Timber Stand Improvement outside of harvest units including diversity planting, release and planting to enhance scenery and aquatic habitat.
- Road management: Includes constructing OML-1 winter and all-season roads, decommissioning roads, trailhead/portage improvement projects, special-use temporary road authorizations, parking area expansions, stream crossing improvements and continued use of existing gravel pits.

- Wildlife habitat improvement projects: Includes lowland brush shearing for moose and woodcock, Upland oak release for improved mast production and associated blueberry understory, Lowland / riparian Bur oak release for improved mast production.
- Prescribed burning to reduce hazardous fuels

- **Purpose of the Action**

  The purpose of the action is to implement the Forest Plan by moving the Project area towards desired future conditions for vegetation and landscape ecosystem and is described in the Border EIS, Chapter 1.

- **Timeframe of the Action**

  Most management activities are expected to be implemented in the next 3-5 years with all harvest activities implemented by 2014 starting in late 2009. It is possible some activities may take longer to fully implement (some secondary treatments or reforestation activities and obliteration of their associated temp roads).

- **Project activities analyzed in program-level BA**

Table BA 4 Project Activities.					
Proposed Actions	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**	**Addressed in Program-level BA?**
Timber Harvest		**X**	**X**	**X**	Yes
Reforestation		**X**	**X**	**X**	Yes
Timber Stand Improvement		**X**	**X**	**X**	Yes
Road Management		**X**	**X**	**X**	Yes
Wildlife Habitat Improvement Projects		**X**	**X**	**X**	Yes
Prescribed burning		**X**	**X**	**X**	Yes

Status of the Species - Canada Lynx

Ecology (see section 4.3 of program-level BA)

Home Range and Dispersal

Burdett *et al.* 2007 (pg. 461-465) reports that home ranges were significantly larger for males than females. Mean annual home range size was larger (267 km^2) in males and smaller (21 km^2) for females than previous lynx home range estimates by Mech (1980) in Minnesota. However, the results for females represent the ranges of females with maternal dens or traveling with kittens $\leq$ 5 months old. Males had a tendency to increase their home ranges during breeding months while movements of females showed little change. Burdett also states that females generally exhibited less home-range overlap than males. He reports long-distance movement being more common in male lynx.

These long distance movements often are attributed to behavioral response to low hare abundance, however, from examinations of body mass of wide-ranging lynx and metabolic requirements he suggests the larger home ranges of males may be a response to the distribution of resident females. His data suggest male lynx may adjust their breeding season movements up or down based on female density. While some male lynx traveled widely throughout January-March, one male had a March home range of <10 km^2 when it had access to $\geq$ 2 females in the area. Female movements showed little change during the breeding months. Females with kittens consistently occupied small home-ranges. This was most evident during the May-June denning season.

The sizes of the Superior National Forest's LAUs were based on the approximate size of lynx home ranges defined in the Lynx Conservation Assessment and Strategy (Ruediger *et al.* 2000). Burdett *et al.* (2007) found that core area he defined for male and female lynx with GPS telemetry are generally within the spatial extent suggested by these LAU guidelines.

Diet and Habitat

A study by Hanson and Moen (2008, pg. i) of lynx diet based on scat analysis indicated that in northeastern Minnesota, as in all other parts of its range, snowshoe hare are the most important component of Canada lynx diet. Snowshoe hare remains were found in 76% of scats. If scats in which only white–tailed deer hair was found were eliminated, snowshoe hare remains were found in 97% of scats. (The belief is that most if not all deer hair found was from bait stations used during radio-telemetry project). Evidence was found of predation or scavenging on other species including deer, marten, grouse, and other birds. Also found was one instance of scavenging or possible predation on another lynx.

Hanson and Moen (2008, pg. 9) also found that snowshoe hare were the most important prey species from predation sites found while snow-tracking in Minnesota, 92% of predation events were snowshoe hare (Burdett 2008 *in Hanson and Moen 2008*). Even though snowshoe hare density in Minnesota is similar to density at low parts of the cycle in northern hare populations (McCann 2006 *in Hanson and Moen 2008*), the importance of alternate prey species in lynx diet has not increased relative to what has occurred in other lynx populations (Aubrey 2000 *in Hanson and Moen 2008*). The rarity with which evidence for killing other prey species with snow-tracking or scat analysis indicates that alternative prey would not be a significant component of lynx diets in winter (Hanson and Moen 2008).

Following 38 trails totaling 63.2 km from 6 (3 male, 3 female) GPS collared lynx Burdett (2008, pgs. 54-63, 102-108) reports lynx consistently selected against lowland conifer and selected for forest edges. Lynx did not use lowland-conifer forests for hunting or resting. This consistent selection against lowland-conifer forest was unexpected because lowland-conifer forests have traditionally been considered good habitat for snowshoe hares in the northern Great Lakes States (Buehler and Keith 1982, Pietz and Tester 1983, Fuller and Heisey 1986 *in Burdett*). This suggests that general statements about the relative quality of lowland-conifer forest for hares and lynx can be misleading.

Most lowland-conifer forests in the Burdett study area were black spruce dominated wetlands on actively accumulating peat formations. Discrepancies with previous studies may result from hares using more diverse lowland-conifer with denser under stories

containing cedar, tamarack, willow and alder or previous studies may have been conducted when hares were more abundant and using sub-optimal habitat.

Lynx increased their use of regenerating (10 -30 year old) and mixed forests when these forest types became more common. Lynx used upland-conifer and mixed forest and open areas in proportion to their availability. Burdett saw little response by lynx to upland conifer forest despite the previously reported association between coniferous forest and lynx and hares (Wolf 1980, Hoving *et al.* 2005 *in Burdett*). Lynx consistently selected for regenerating forests when hunting and resting, which Burdett suggests reflects the greater abundance of hares in these forests.

Most hare kills were short-distance chases that occurred during lynx movements and few kills originated from hunting beds. The increased use of hunting beds in mixed forests may indicate lynx used this hunting strategy in areas where hares were less abundant.

Lynx in the study rarely preyed on red squirrels, results suggest that red squirrels or their habitat have little effect on the distribution of lynx in Minnesota.

Results indicate that lynx locate their core areas and home ranges in areas with abundant regenerating (10-30 years old) forests and use these forests for hunting and resting. Therefore a key component of habitat management for lynx in Minnesota is the creation and maintenance of successional forest through timber harvest and natural or prescribed fire.

Den Site Selection

In Burdett's (2008, pg. 63) study area, although lynx selected against lowland conifer for foraging, these forests often provide denning habitat and breeding females continued to show increased use of these forests during summer and fall when kitten mobility remained limited.

In Minnesota, at the larger scale, it appears that potential den sites may be associated with wetland areas. There was an increase in lowland conifer cover type because dens were often located in low-lying wet areas. Dens themselves were on upland but this was surrounded by wetter low-lying areas (Moen and Burdett 2008, pg 10).

Moen and Burdett (2008, pg. 5) found that presence or absence of horizontal and vertical cover appears to be more important than whether a den site is located on mature or regenerating forest. Den sites in Minnesota were mostly found in blowdown areas. The size and intensity of the blowdown area varied. The range observed went from 1 stem to a cluster of 5-6. The common theme seemed to be dense vertical and horizontal cover which in Minnesota was often provided by the tops of trees. However, dense cover was in some cases limited to the blowdown tree which the den site was located under.

Stem density and basal area was usually lower at the den site because these sites are often located in blowdown areas. Usually there is a horizontal cover component that comes from dead blowdown trees or thick regeneration of balsam fir that would not be measured when measuring stems with dbh >5 cm. A subjective generalization for the dens that were found would be that vertical cover is very thick but does not extend more than 2 m above ground

level, and there is a range in horizontal cover from very little to dense, and that range can be seen within a den depending on direction one is looking away from the den (Moen and Burdett 2008, pg. 14).

The Forest Plan BA Model Parameters (USDA, 2004 appendix D) identifies old forest (generally 80+ for conifer and 60+ for hardwoods) as lynx denning habitat. Moen and Burdett's (2008) findings emphasize micro-site rather than the importance of age of the forest for denning habitat. Given this new information, the Model Parameters would seem to highly underestimate the amount of suitable denning habitat. However, the model would retain some credibility because it captures the forests most likely to blowdown thereby providing those micro-site locations.

Selection of den site location does not appear to occur very many days before parturition. Date of parturition in Minnesota was 7 may (± 2 days) for 3 adult females based on GPS collar locations, female and kittens left the den at about 7 weeks (Moen and Burdett 2008, pg. 8).

Mortality

The programmatic Biological Assessment (USDA FS 2004) identified paved roads as one of several factors contributing lynx mortality across its range. At that time, most documented lynx road mortality was in relocated animals suggesting that introduced animals may be more vulnerable to highway mortality than resident lynx (Brocke et al 1990 in USDA FS 2004). Since the writing of the programmatic BA, more information has become available on lynx road mortality. It is evident by the data that follows, paved and gravel roads are both factors that contribute to resident lynx mortality.

- In Minnesota, since 2001, five lynx are known to have been killed on roads (USDA FS 2007):
    - Two were on paved highways (speed limits 46-60+ mph)
    - Two were on paved secondary roads (speed limits?-60 mph)
    - One was on a gravel Forest Service Road (OML 3) (speed limits 26-45 mph)
- In Maine, since 2000, all lynx road mortality (6 animals) documented has occurred on (gravel) logging roads. Most mortality occurred on two-lane haul roads where higher traffic volume and speed would occur. These roads are open to the public, and public traffic volume exceeds logging traffic by several fold (McCollough in Delphey 2006).

Trapping, hunting, and other potential sources of human caused mortality are indirectly influenced by roads and are address in the programmatic BA. Since 2002, five lynx are known to have been shot and 17 lynx are known to have been trapped in Minnesota. Of the trapped lynx nine were released alive (MN DNR 2008).

Interspecific Relationships with Other Carnivores

Researchers and managers have suggested that the presence of compacted snowmobile trails may allow coyotes to access lynx habitat from which they were previously excluded by deep, unconsolidated snow. This could then allow coyotes to more effectively compete with lynx for snowshoe hares, the lynx's primary prey… Kolb *et al.* (2007, pg. 1409) reports coyotes did not travel closer to compacted snowmobile trails than random expectation (coyote *x* distance from

compacted trails =368 m, random expectation = 339 m) and the distance they traveled from these trails did not vary with daily, monthly, or yearly changes in snow supportiveness or depth. However, they strongly selected for naturally shallower and more supportive snow surfaces when traveling off compacted snowmobile trails. Coyotes were primarily scavengers in winter (snowshoe hare kills composed 3% of coyote feed sites) and did not forage closer to compacted snowmobile trails than random expectation. The overall influence of snowmobile trails on coyote movements and foraging success during winter appeared to be minimal in the study area (western Montana).

This study provides important information on lynx relationship with coyote but currently has few if any management implications for the SNF for two reasons; coyotes are not prevalent on the SNF due to the presence of wolves and the relationship between compacted snow trails and bobcats remains unknown.

Population Dynamics - No new information

Population Status (see section 4.4 of program-level BA)

North America - No new information

Minnesota - According to the MN DNR as of Nov. 14, 2006 (MN DNR Lynx sighting website accessed Sept. 20, 2008):

- 426 reports with location information have been received to date
- 63 (15%) reports have been verified as lynx
- 161 (38%) reports have had enough evidence to be considered "probable"
- 202 (47%) reports are unverified
- 35 (8%) reports are assumed to provide evidence of reproduction

Superior National Forest

The Natural Resources Research Institute (NRRI) study has captured and collared 33 lynx on the Superior NF. Adults and yearlings wore collars for over 15,000 radio-days, while kittens (animals radio-collared at < 1 year old) wore collars for about 3,500 days. Movements and habitat use have been documented including den locations. From 2004-2007 adult radio-collared females had 31 kittens in 10 litters. Status of eight kittens that were marked at the den site or radio-collared is 5 dead and 3 alive >2 years. Only one animal collared as a kitten still has a transmitting radio collar. Of the 33 lynx radio-collared 17 are dead. Mean duration of monitoring was 1.6 years, with 21 of 33 lynx monitored for 1 to 3 years. Lynx have maintained a continuous presence from 2003 to date. At least 78 unique individual lynx have been identified genetically through 3/4/2008 with additional samples to be submitted this year (Moen *et al.* 2008).

Minnesota's lynx-hare cycles: No new information

Population Status in Project area
Project Site-specific Surveys

Project level snow tracking surveys were conducted in December 2007. No lynx tracks were found. Two hare concentration areas were identified (Stefanic 2008, Border Wildlife Surveys Map)

Known Occurrences

There have been two separate sightings (unverified) in recent years (May 8, 2007 and June 15, 2008) of lynx swimming across narrow bays on the north end of Crane Lake. There are a few other reported sightings scattered around the periphery of the Project area (MN DNR 2006)

Factors Affecting Lynx Environment (see section 4.5 of program-level BA)

- Roads and trails: No new information
- Winter dispersed recreation**:** No new information
- Trapping and shooting**:** No new information
- Vehicle collisions: No new information
- Other factors: The most critical period for denning Canada lynx is late April through July (Moen 2005 *in* Dunka BA 2005).

Status of the Species - Gray Wolf

Ecology (see section 3.3 of program-level BA)
Breeding habitat: No new information

Home Range and Dispersal

The 2007-08 MN DNR survey (Erb 2008) indicates that the broad distribution of wolves in Minnesota has not changed since the mid to late 1990's. While the duration between surveys has recently been shortened from 10 years to 5 years, recent surveys nevertheless indicate that coarse-scale wolf distribution in Minnesota is now static. Since 1998, when total wolf range appears to have stabilized, there has been no consistent increasing or decreasing trend in the amount of occupied range.

Average territory size was essentially identical during the last two wolf surveys. Average pack size does appear to have slightly declined through time, likely due in part to space-use competition in an increasingly saturated wolf range (Erb 2008).

Diet - No new information

Population Status (see section 3.4 of program-level BA)
North America and Minnesota

Today, wolves live in areas with higher road and human densities than previously believed could be suitable for wolf survival, although these two factors still limit the areas suitable for wolf packs. Wolves continue to disperse to areas in west-central and east-central Minnesota (just north of Minneapolis/St. Paul), North and South Dakota, and Wisconsin. (USDI FWS 2008)

The Minnesota Wolf Management Plan (MN DNR 2001) establishes a minimum population of 1,600 wolves (in Zone A) to ensure the long-term survival of the wolf in Minnesota. The Minnesota wolf population has grown from fewer than 750 animals in the 1950s to the current estimate of 2,921 (90% confidence interval: 2,192 - 3,525) (Erb, MN DNR 2008).

Gray wolf populations in northern Minnesota are stable or increasing as are subpopulations in Wisconsin and Michigan. As a result of the increasing Minnesota population and the development of viable populations in neighboring states, the U.S. Fish and Wildlife Service removed Endangered Species Act protection for the Gray Wolf Western Great Lakes Distinct Population Segment in 2007. The final rule to delist this Distinct Population Segment was published in the Federal Register on February 8, 2007 and took effect on March 12, 2007 (USDI 2007a).

Management of the wolf on the SNF then became governed by the Minnesota Wolf Management Plan (MN DNR 2001). Management objectives for gray wolves on the Superior National Forest changed from seeking to recover the species to seeking to maintain, protect and enhance its habitat and prevent federal listing.

On Sept 29, 2008 a federal court overturned this decision, returning gray wolves in the western Great Lakes region to their status as threatened.

Superior National Forest

Population estimates indicate a 26% increase since 1997-98 (Erb and Benson 2004).

Summary of Wolf Mortality in Minnesota - No new information.

Population Status in Project area
Project site-specific surveys

Winter (2007) track detection surveys (targeting lynx) confirmed the presence of gray wolf throughout the Border Project area.

Known Occurrences

Wolves and wolf sign have been observed throughout the Project area. The exact number of individual or packs that use the Project area as well as the amount of occupied habitat is unavailable however; suitable foraging habitat is abundant and well distributed across the Project area and is assumed occupied. Abundant wolf tracks were detected in the Project area during winter (2007) lynx track survey routes.

Factors Affecting Wolf Environment

- Prey habitat: No new information
- Human access: The most critical period for denning wolves is late April through May (M. Nelson pers. comm. 7/12/2005, Dunka EA).
- Other factors: No new information

Affected Environment and Environmental Consequences
Canada Lynx

Analysis Area

Direct/Indirect Effects Analysis Area

The Analysis Area is federal lands and roads within LAUs SNF 2, 3 & 4. This is an appropriate Analysis Area because this is where proposed activities would occur, thus allowing for effects analysis to identify potential changes to habitat and the effects of human disturbance factors. It is also appropriate because it allows for the analysis of lynx movement and habitat use within LAUs and between LAUs and lynx refugia habitat in the Boundary Waters Canoe Area Wilderness and Voyageurs National Park.

Analysis Timeframe

The existing condition is considered: August 2007 is the date of the most current SNF data. For direct and indirect effects the analysis examines effects that could occur during or immediately after implementation activities until up to the year 2014. This timeframe is chosen because it is likely that proposed treatments (such as harvest, site prep, planting and road decommissioning) would take place within 3 to 5 years after a decision is made. [All harvesting data is run with the assumption of harvest occurring in 2011]. This would allow for analysis of the effects of treatments on lynx and hare habitat while all of the acres proposed to be set to age zero are in the unsuitable (for hare) condition, thus providing a look at the maximum possible effect.

Cumulative Effects Analysis Area (for both NEPA and ESA)

Cumulative effects consider all ownerships and roads within LAUs SNF 2, 3 and 4. This is an appropriate Analysis Area because this is where direct and indirect effects of the Project would occur, thus allowing for an analysis of the potential compounding effects of those activities with other activities planned or already occurring in the area regardless of ownership. This cumulative effects Analysis Area was selected because the LAU is the agreed upon unit of measure for lynx analysis between the USFS and USFWS. See Appendix G for the Border Forest Management Project Past, Present, and Reasonably Foreseeable Future Projects attachment for description of project considered in the Cumulative Effects analysis for this species.

Analysis Timeframe

The same timeframe (2014) as for direct and indirect effects is considered for cumulative effects. In addition to the reasons stated above, this time frame allows for a reasonable prediction of projects that could contribute to cumulative effects (past, present and reasonably foreseeable future). The data for each analysis indicator assumes that all activities would occur at nearly the same time (2011). It is unlikely that all activities would occur at the same time but more likely to occur over a 3 to 5 year period. It is possible a few activities may in fact occur beyond the 5 years. This means fewer acres may actually be in unsuitable condition (thus lessening the effects) than this analysis will show. Due to difficulty of predicting exactly which year stands would be harvested, conducting a worst case analysis is appropriate.

Effects Analysis

On February 28, 2008, the Fish and Wildlife Service proposed revising the Canada lynx critical habitat designation to include all of the Superior National Forest (and other lands in Northeastern Minnesota) as critical habitat (USDI FWS 2008b). Lynx analysis indicators also serve as appropriate indicators for analysis of effects to proposed critical habitat and its constituent elements. This is because the indicators address relevant *Primary Constituent Elements* of lynx habitat - those physical and biological features that are essential to the conservation of the species. Table BA 5 below crosswalks the lynx indicators to the Primary Constituent elements (PCE):

Proposed critical habitat for lynx is defined as boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:

a) Presence of snowshoe hares and their preferred habitat conditions, including dense understories of young trees or shrubs tall enough to protrude above the snow;
b) Winter snow conditions that are generally deep and fluffy for extended periods of time;
c) Sites for denning having abundant coarse, woody debris, such as downed trees and root wads; and
d) Matrix habitat (*e.g.,* hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range. The important aspect of matrix habitat for lynx is that these habitats retain the ability to allow unimpeded movement of lynx through them as lynx travel between patches of boreal forest.

Table BA 5 - Analysis Indicators Selection and Rationale for Exclusion Canada Lynx

Forest Plan BA Indicator	PCE	Use?	Rationale for Exclusion
1a. Snowshoe hare habitat acres	a	Y	
1b. Percent of unsuitable habitat on NFS land	a, b, c, d	Y*	*Covered under indicator 12
2. Acres of red squirrel habitat	d	N	Red squirrels or their habitat have little effect on the distribution of lynx in Minnesota (Burdett 2008). Alternative (to hare) prey would not be a significant component of lynx diets in winter (Hanson and Moen 2008). The SNF will continue to monitor red squirrel habitat on a annual basis but it will not be analyzed at the Project level.
3. Denning habitat in patches > 5 acres	c	Y	Denning habitat exists in abundance in the Project area as it does in most parts of the SNF. Using current model parameters,

Table BA 5 - Analysis Indicators Selection and Rationale for Exclusion Canada Lynx			
Forest Plan BA Indicator	**PCE**	**Use?**	**Rationale for Exclusion**
			the lowest possible denning habitat (in stands >5 ac.) would occur in LAU 3, Alt. 2 at 43%, well above the minimum 10% guideline in the Forest Plan. Recent research indicates that the use of cover type and age are less important than micro-site habitat for lynx denning (Moen and Burdett 2008, Burdett 2008). This means the current model parameters likely highly *underestimates* lynx denning habitat.
4. Percent of lynx habitat in LAUs with adequate canopy cover- upland forest > 4 years old and lowland forest > 9 years old	a, c, d	Y	
5. Miles of ATV trails allowed	b	N	There are currently 1.05 miles of designated ATV trails in the Project area. These will remain open and not vary by alternative.
6. Miles of snowmobile trails allowed	b	N	There are currently 36.56 miles of designated snowmobile trails in the Project area. These will remain open and not vary by alternative.
7. Miles of temp and OML 1&2 roads	b	Y	
8. Policy on cross-country use of ATVs and snowmobiles	b	N	This Project proposes no change to policy on cross-country use of ATVs and snowmobiles.
9. Policy on use of ATVs and Snowmobiles on OML 1&2 roads		N	This Project proposes no change to Policy on ATVs and snowmobile use of OML 1 and 2 roads.
Other Indicators			**Rationale for inclusion**
10. Acres of snowshoe hare habitat in which within stand structure will be increased thru diversity and under-planting of conifer on SNF lands.	a	Y	To compare effects of alternatives on quality of hare habitat (increasing small diameter conifers and stand structure). This will help assess O-WL-9
11. Acres and % of lynx habitat currently unsuitable on all ownerships	a, c, d	Y	Provides information to examine G-WL-3 (minimum of 30% unsuitable on all ownerships)
12. Cumulative change to unsuitable condition on NFS lands. (S-WL-1)	a, c, d	Y	Provides information to examine S-WL-1 (minimum of 15% unsuitable in 10 yr period on

Table BA 5 - Analysis Indicators Selection and Rationale for Exclusion Canada Lynx			
Forest Plan BA Indicator	**PCE**	**Use?**	**Rationale for Exclusion**
			NFS)
13. Road and compacted trail density on all ownership.	b	Y	Provides information to examine G-WL-8 (2 miles /square mile).

Existing Conditions and Effects
Indicator
Currently Unsuitable Lynx Habitat on all ownerships

This indicator (Table BA 6) provides a measure of G-WL-3 which states "limit disturbance within each LAU on NFS lands as follows: if more than 30% of the total lynx habitat (all ownerships) within an LAU is currently in unsuitable condition, no further reduction of suitable condition should occur as a result of vegetation management activities by National Forest.

Table BA 6 - Lynx Habitat In an Unsuitable Condition on All Ownerships (Indicator 11)							
Lynx Analysis Units	**Total Lynx Habitat on all Ownerships (Acres)**	**Currently Unsuitable On All Ownerships**		**Alternative 2***		**Alternative 3***	
		Acres	**%**	**Acres**	**%**	**Acres**	**%**
SNF 2	35,238	703	2.0	4,440	12.6	3,638	10.3
SNF 3	53,815	3,381	6.3	4,308	8.0	4,186	7.8
SNF 4	48,124	1,230	2.6	4,164	8.7	3,847	8.0
Data Sources: Existing Condition: 2007 SNF Snapshot of Lynx-LAU Habitat run August 28, 2007. Alternatives: Border harvests (treatments that set age to zero) plus currently unsuitable on all ownerships. *[This is a worst case scenario as it is highly unlikely that all these stands would be unsuitable (0-4 years old) at the same time]							

Indicator 12
Cumulative Change to Unsuitable Condition on NFS Lands

This indicator (Table BA 7) is used to measure S-WL-1 which states that management activities on NFS lands shall not change more than 15% of lynx habitat on NFS lands within an LAU to an unsuitable condition within a 10-year period. This indicator measures the cumulative change of lynx habitat within a decade such that, for example, a stand set to zero at Year X is counted toward this indicator until Year X + 10, regardless if the stand becomes suitable for lynx prior to Year X + 10. The baseline for each LAU was set to zero at the time of plan implementation (July 2004).

Table BA 7 Cumulative Change to Unsuitable (lynx) Habitat Condition in 10 Years on NFS lands (Indicator 12)(First Decade of Forest Plan Implementation, 2005-2014)									
LAU	Alternative 1 (no action)			Alternative 2			Alternative 3		
	Border Change to un suitable	Total change to unsuitable 2005-2014		Border Change to unsuitable	Total change to unsuitable 2005-2014		Border Change to unsuitable	Total change to unsuitable 2005-2014	
	Ac	Ac[1]	%[2]	Ac	Ac	%[2]	Ac	Ac	%[2]
SNF 2	0	214	0.8	3,737	3951	14.6	2,935	3,149	11.6
SNF 3	0	1,520	4.9	927	2,447	7.9	905	2,425	7.8
SNF 4	0	1,286	4.5	2,934	4,220	14.6	2,617	3,903	13.5

Data Sources: [1] based on April 19, 2008 update to August 2007 LAU data. Reflects past actions since Forest Plan implementation began that have resulted in change to unsuitable and future (non-Border) actions that would result in change to unsuitable (2005-2014).

Footnotes: [2]Percent of lynx habitat = unsuitable (for hare) divided by total Border area lynx habitat on NFS lands (SNF 2 = 27,099, SNF3 = 31,132, SNF4 = 28,838).

Lynx Habitat – Forest Condition Indicators (Tables 8-11)

Table BA 8 - Indicator 1a Snowshoe Hare Habitat on National Forest Lands in the Project area.								
Lynx Analysis Units	Existing Condition		Acres and Percent of habitat in 2014					
	Snowshoe Hare Habitat		Alt. 1 (no action)		Alt. 2		Alt. 3	
	Acres	%	Acres	%	Acres	%	Acres	%
SNF 2	20,604	76	19,599	72	17,655	65	18,068	67
SNF 3	22,485	72	22,600	73	21,650	70	21,708	70
SNF 4	22,013	76	20,882	72	19,356	67	19,447	67

Data Sources: [1] based on August, 2008 CDS data and all alternatives are based on projected CDS data in the year 2014. Data run by Erich Grebner.

Footnotes: percentage = snowshoe hare habitat divided by total Project area lynx habitat on NFS lands (SNF 2 = 27,099, SNF 3 = 31,132, SNF 4 = 28,838.

Table BA 9 Indicator 3 Denning Habitat in Patches > 5 Acres on National Forest Lands in the Project Area									
Lynx Analysis Units	Existing Condition			Acres of habitat patches (>5 ac) removed and % of habitat remaining					
	Forested Lynx Habitat	Denning habitat in patches > 5 acres		Alt. 1 (no action)		Alt. 2		Alt. 3	
	Acres	Acres	%	Acres	%	Acres	%	Acres	%
SNF 2	23,350	15,012	64	14,252	61	11,042	47	11,720	50
SNF 3	27,975	13,350	48	13,522	48	12,150	43	12,156	44
SNF 4	25,329	14,916	59	14,482	57	11,816	47	12,073	48

Data Sources: Based on August, 2008 CDS data and all alternatives are based on projected CDS data in the year 2014. Data run by Erich Grebner.

Table BA 10 Acres and Percent of Lynx Habitat with Adequate Canopy Cover on National Forest Lands in the Project Area (Indicator 4)								
Lynx Analysis Units	Existing Condition		Alternative 1 (no action)		Alternative 2		Alternative 3	
	Acres	%	Acres	%	Acres	%	Acres	%
SNF 2	22,831	84	23,349	86	19,631	72	20,434	75
SNF 3	24,667	79	27,975	90	26,479	85	26,551	85
SNF 4	24,610	85	25,329	88	22,359	76	22,698	79
total	72,108	83	76,653	88	68,469	79	69,683	80
Data Sources: Based on August, 2008 CDS data and all alternatives are based on projected CDS data in the year 2014. Data run by Erich Grebner. Percentage = acres divided by total Project area lynx habitat on NFS lands (SNF 2 = 27,099, SNF 3 = 31,132, SNF 4 = 28,838								

Table BA 11 Indicator 10 Acres in which Within Stand Structure that would be Increased within and Outside Harvest Units				
Lynx Analysis Units	Existing Condition	Alt. 1	Alt. 2	Alt. 3
SNF 2	n/a	0	1,066	853
SNF 3	n/a	0	1,148	1,091
SNF 4	n/a	0	2,497	2,591
total	n/a	0	4,711	4,535
Data Sources: Based on alternatives proposed units with treatment codes 4431 (full planting) and 4432 (fill-in planting). Sept., 2008. Data run by Todd Stefanic.				

Lynx Habitat
Human disturbance/Access Indicators (Tables 12-13)

Indicator 13 below is used to measure G-WL-8 which states that within LAUs generally maintain road and snow-compacting trail densities below two miles per square mile to maintain the natural competitive advantage of lynx in deep snow. Where total road and regularly-used snow-compacting trail densities are greater than two miles per square mile and coincide with lynx habitat, prioritize roads for seasonal restrictions or reclamation in those areas, where practical or feasible. In this guideline "roads" include all ownerships of classified and unclassified roads and "regularly-used trails" are those that are used most years for most of the snow season.

Table BA 12 Indicator 13 Road and Snow-Compacted Trail Density							
Lynx Analysis Units	Land Area	Existing Condition 2007		Alternative 1* 2014		Alt. 2 and Alt. 3 2014	
	sq. mi	Miles	mi/mi	Miles	mi/mi	Miles	mi/mi
SNF 2	41.0	135	3.3	131	3.2	128	3.1
SNF 3	47.7	229	4.8	224	4.7	223	4.7
SNF 4	43.9	211	4.8	211	4.8	207	4.7

*Alternative 1 shows the effects of roads decommissioned as proposed in the Travel Management Project. Alternatives 2 and 3 are arrived at by subtracting Border Project roads proposed for decommissioning and adding miles of new OML-1 roads, thus includes Travel Management decommissioning.

Miles of road proposed for decommissioning: SNF2 = 4.1, SNF3 = 1.1, SNF4 = 4.5, Miles of new OML-1 roads SNF2 = .17

Data Sources: Existing Condition and Alternative 1 come from Data run Sept. 18, 2007 (for Travel Mgt.), decommissioning road numbers from Border data run Sept 2008, both by Erich Grebner.

Table BA 13 Indicator 7 Temporary Roads, OML-1 and OML-2 Roads			
LAU	Temporary Road Miles		
	Existing Condition Alternative 1	Alternative 2	Alternative 3
SNF 2	0	20	16
SNF 3	0	7	7
SNF 4	0	17	15
Total	0	44	38
	Miles of OML-1 and OML -2 roads		
SNF 2	68, 10 (78)	64, 10 (74)	
SNF 3	16, 4 (20)	15, 4 (19)	
SNF 4	45, 18 (63)	41, 18 (59)	
Total	161	152	

Data Sources: Border roads data Sept 2008 run by Erich Grebner. Breakdown by LAU; Stefanic Oct. 2008, (in Project file). Both alternatives decommission 9.7 miles of OML-1 road and construct .17 miles of new OML-1 roads. [decommission miles by LAU: SNF2 = 4.1 miles, SNF3 = 1.1 miles, SNF4 = 4.5 miles, Miles of new OML-1 roads; SNF2 = .17]

Consistency with Forest Plan

Table BA 14 Compliance of Alternatives with Forest Plan Direction Canada Lynx			
Forest Plan Guidance	**Direction**	**Alts In Compliance**	**Basis for Compliance**
O-WL-4	Maintain or improve habitat	all	All alts. meet or exceed Forest Plan direction. All alts. maintain at least 65% snowshoe hare habitat (Table 11), 43% denning habitat (Table 12) and 72% canopy cover (Table 13). Alternative 1 maintains lynx habitat, any improvement would be due to natural succession. Alternatives 2 and 3 improve lynx habitat by increasing within stand diversity and structure with conifer planting (Table 14). Action alts. would slightly reduce snow-compacted trail density (15).
O-WL-5	Seek opportunities to benefit TE spp.	all	Alternative 1 maintains lynx habitat, any improvement would be due to natural succession. Alternatives 2 and 3 improve lynx habitat by increasing within stand diversity and structure with conifer planting (Table 14). Action alts. would slightly reduce snow-compacted trail density (Table 15).
O-WL-6	Reduce or eliminate adverse effects to TE	all	Adverse effects are not expected with any alternative.
O-WL-7	Minimize building or upgrading roads in TE areas	all	Temp. roads would be decommissioned when no longer needed. 0.17 miles of new road would be built but 9.7 miles would be decommissioned resulting in a net decrease in roads (Table 16).
O-WL-8	Promote the conservation and recovery of Canada lynx	all	All alternatives would maintain suitable habitat (Tables 9-13) and avoid negative impacts.
O-WL-9	Manage for hare and alt prey habitat	all	Prey habitat would be abundant and well-distributed in all alternatives. All alts. maintain at least 65% snowshoe hare habitat (Table 11).
O-WL-10	Provide foraging habitat in Proximity to denning	all	Foraging and denning habitat are and would remain well distributed through out the Project area in all alternatives. All alts. maintain at least 65% snowshoe hare habitat (Table 11) and 43%

Table BA 14 Compliance of Alternatives with Forest Plan Direction Canada Lynx			
Forest Plan Guidance	**Direction**	**Alts In Compliance**	**Basis for Compliance**
	habitat		denning habitat (Table 12) (denning habitat is likely under-estimated)
O-WL-11	Maintain habitat connectivity to reduce road mortality	all	Habitat connectivity would be maintained in all alternatives. A max. of 12.6 % of habitat could be in unsuitable condition at any one time (Table 9). Canopy cover remains at least 72% in all alternatives (13).
O-WL-12	Participate in efforts to identify, map, and maintain linkage areas	all	This effort is being conducted on a regional scale and is beyond the scope of this project. However, adequate connectivity is maintained. Within the Project area and neighboring habitat. There are no major barriers to lynx movement in the Project area, between LAUs or between the Project area and the BWCAW, Voyageurs National Park, or other ownership.
O-WL-13	Maintain competitive advantage of lynx in deep snow	all	Action alternatives decommission 9 miles of road resulting in a slight decrease in snow-compacted trail density (Table 15). Temp roads would be obliterated after use.
O-WL-14	Participate in cooperative efforts to reduce lynx mortality related to highways and other roads	n/a	There are no cooperative efforts to reduce the potential for lynx mortality related to highways and other roads as part of this project. The Project decommissions 9.7 miles of OML-1 roads but these roads are unlikely to allow for speeds that put lynx at great risk.
O-WL-15	In BWCAW, lynx habitat will result from natural processes	all	The Project area does not include the BWCAW and does not propose any management that would result in loss of connective habitat with the BWCAW.
G-WL-1	Moderate timing and intensity of mgt activities to maintain lynx habitat	all	Activities would take place over the course of 5 years. There is sufficient habitat to accommodate changes.

Table BA 14 Compliance of Alternatives with Forest Plan Direction Canada Lynx			
Forest Plan Guidance	**Direction**	**Alts In Compliance**	**Basis for Compliance**
G-WL-2	Provide protection of known den sites	all	No den sites are known in the Project area. If one is discovered it would be protected.
G-WL-3	No more than 30% of an LAU in unsuitable condition	all	At most 12.6 percent of any LAU would be in unsuitable condition at one time (Table 9).
S-WL-1	No more than 15% change to unsuitable in 10 years	all	All alternatives remain below the 15% threshold Table 1).
G-WL-4	Maintain at least 10% denning habitat	all	Denning habitat would remain abundant (at least 43%) and well distributed in all alternatives (Table 12)
G-WL-5	Following disturbance, (> 20 acres) retain at least 10%	n/a	This project does not propose any salvage in natural disturbance greater than 20 acres
S-WL-2	No net increase in groomed or designated over-the-snow trails	all	The project does not propose any increase in over-the-snow trails
G-WL-6	New over-the-snow routes should be designed to benefit lynx	n/a	The project does not propose any new over-the-snow trails
G-WL-7	Close trails and roads that intersect with new snow-Compacting trails.	n/a	The Project does not propose any new over-the-snow trails
G-WL-8	Maintain road density at or below	2-3	All Project area LAUs (SNF 2, 3 & 4) exceed this Guideline. SNF 3 and 4 are more than double 2mi/mi^2 (Table 15).

Table BA 14 Compliance of Alternatives with Forest Plan Direction Canada Lynx			
Forest Plan Guidance	**Direction**	**Alts In Compliance**	**Basis for Compliance**
	2mi/mi$^{2.}$ Where greater, prioritize roads for seasonal restriction or reclamation.		Higher than desired road density was identified during midlevel analysis as an area where there was an opportunity to help meet this guideline (G-WL-8). Alternative 1 would not address the high road densities in these LAUs. All action alternatives would result in a small net decrease in miles of road and snow compacted trails. The current density is so high and the net decrease in road miles is so small however, that decreases in LAU 2 and 4 would be only a tenth of mile and you would have to go to the hundredths place to see the decrease in LAU 3. I expect there would be little to no benefit to lynx (Table 15) from this small change.
G-WL-9	Do not upgrade or pave dirt or gravel roads	all	This Project does not propose to upgrade or pave gravel roads.

Determination of Effect

Table BA 15 Determination of Effect of the Alternatives on Lynx and Proposed Critical Habitat		
Management Activity	**Determination**	**Summary of Rationale**
Timber Harvest	Alt 1: NE Alts 2-4: NLAA	Timber management modifies the vegetation structure and mosaic of forested landscapes. It is recognized that this can have effects ranging from negative to beneficial on lynx and its habitat. No timber harvest is planned with Alternative 1 so there would be no effects from this management activity in Alternative 1. Harvest activities proposed in all action alternatives range from harvests that would regenerate stands to intermediate harvests that would maintain the stands age and in most cases the suitability of lynx habitat. Timber harvest in all action alternatives may affect but are not likely to adversely affect/modify the lynx/critical habitat because: • Known den sites would be protected from disturbance. • Regeneration harvests would temporarily reduce the amount of suitable denning, foraging and connective habitat, however all action alternatives maintain adequate amount of each with good distribution. • Connectivity within LAUs and between LAUs and refugia habitat would be maintained • All alternatives would comply with all applicable Forest Plan management direction related to Canada lynx and its habitat. • proposed Critical Habitat PCE's a, b, and c could be affected by timber harvest but indictors show that adequate amount of habitat for these PCE's would be maintained.
Reforestation	Alt 1: NE Alts 2-4: NLAA	In general reforestation activities including site-prep and planting could have both negative and positive effects. Direct effects could result in disturbance to denning lynx. Indirectly,

Table BA 15 Determination of Effect of the Alternatives on Lynx and Proposed Critical Habitat		
Management Activity	**Determination**	**Summary of Rationale**
		habitat conditions could be improved. No reforestation is planned with Alternative 1 so there would be no effects from this management activity in Alternative 1. Reforestation in all action alternatives may affect but are not likely to adversely affect/modify the lynx/critical habitat because: • Known den sites would be protected from disturbance. • Conversion and under planting of conifer would enhance habitat conditions for prey species by creating dense horizontal cover of conifer. • All alternatives would comply with all applicable Forest Plan management direction related to Canada lynx and its habitat. • Proposed Critical Habitat PCE related to snowshoe hare habitat would be positively affected by reforestation activities.
Timber or Wildlife Stand Improvement	Alt 1: NE Alts 2-4: NLAA	Stand Improvement in the context of the Border Project includes activities such as under planting and release of pine, oak and other long-lived tree species in mature stands that are not slated for timber harvest. These types of activities would generally improve habitat conditions for prey species. No TSI is planned with alternative 1 so there would be no effects from this management activity in alternative 1. TSI in all action alternatives may affect but are not likely to adversely affect/modify the lynx/critical habitat because: • Known den sites would be protected from disturbance. • Activities that increase conifer would enhance habitat conditions for prey species by creating dense horizontal cover of conifer. • Stand improvements for wildlife (aimed at increasing oak mast

Table BA 15 Determination of Effect of the Alternatives on Lynx and Proposed Critical Habitat		
Management Activity	**Determination**	**Summary of Rationale**
		production and blueberry understory) may diminish the quality of habitat in the short term. However, in the longer term understory vegetation would return to the site and may become more vigorous. In addition, ample habitat remains that would not be treated. • All alternatives would comply with all applicable Forest Plan management direction related to Canada lynx and its habitat. • Proposed Critical Habitat PCE related to snowshoe hare habitat would be positively affected by reforestation activities.
Road Management (Including special use permit roads, and stream crossing improvements)	All alts: NLAA	Road and trails may present several risks to lynx, including disturbance at den sites, shooting or trapping of lynx, lynx-vehicle collusions, and compaction of snow that may increase inter-species competition. Roads management proposed in all alternatives would impact lynx, however, all alternatives may affect but are not likely to adversely affect the lynx because: • Known densities would be protected from disturbance. • Indicators show that increases in compacted snow would come from temporary roads and be short term. Compacted road and trail density would decrease slightly with the action alternatives. • Action alternatives would comply with all applicable Forest Plan management direction related to Canada lynx and its habitat. • Alternative 1 would *not* address the current high road and snow-compacted trail densities in the affected LAUS. Information is not available on the effects of the current levels on lynx specific to the Project area. • Proposed Critical Habitat PCE

Table BA 15 Determination of Effect of the Alternatives on Lynx and Proposed Critical Habitat		
Management Activity	**Determination**	**Summary of Rationale**
		related to fluffy snow conditions in winter could be effected by roads. Indicators show that this PCE would be maintained with Project alternatives.
Fuels Reduction	Alt 1: NE Alts 2-4: NLAA	Fuels reduction projects would remove understory (and some canopy) vegetation and result in less structurally complex stands. Fuels reduction in all action alternatives may affect but are not likely to adversely affect/modify the lynx/critical habitat because: • Known densities would be protected from disturbance. • Activities, in the short term, would diminish the quality of habitat in some stands. However, in the longer term remaining vegetation may become more vigorous and dense vegetation would return to the understories. In addition, ample habitat remains that would not be treated for fuels reduction. • All alternatives would comply with all applicable Forest Plan management direction related to Canada lynx and its habitat
Brush Shearing	Alt 1and 3: NE Alts 2 NLAA	Brush shearing is a cooperative project with MN DNR intended to improve moose foraging habitat and provide woodcock singing grounds. Project would shear old-age brush in riparian areas of the Echo river during frozen ground condition leaving slash on site. Activities would only take place in Alternative 2 therefore there would be no effects in Alternatives 1 or 3. • Known den sites would not likely occur in brush habitat and activities would not take place during denning season. • Activities, in the short term, would diminish the quality of habitat. However, in the longer term remaining vegetation may become more vigorous and vegetation would return to the site. In addition, ample

Table BA 15 Determination of Effect of the Alternatives on Lynx and Proposed Critical Habitat		
Management Activity	**Determination**	**Summary of Rationale**
		habitat remains that would not be treated. • All alternatives would comply with all applicable Forest Plan management direction related to Canada lynx and its habitat
NE = No Effect **NLAA** = Not likely to adversely affect **LAA** = Likely to adversely affect **LAA** = Likely to adversely affect		

Gray Wolf
Analysis Area

Direct/Indirect Effects Analysis Area

- *Habitat indicators*: Analysis Area for all indicators is federal lands within the Project area.
- *Human Disturbance indicators:* Analysis Area for all indicators is federal roads within the Project area.

Cumulative Effects Analysis Area (for NEPA and ESA)

- Cumulative effects Analysis Area is the Project area. Past actions are reflected in the existing condition. Present and foreseeable future (to 2014) actions are considered in the effects of the actions. See Appendix G of the Border EIS for past, present, and reasonably foreseeable future projects considered in the cumulative effects analysis for this species.

Analysis Timeframe

- *Existing condition:* 2007
- *Direct/indirect and Cumulative effects:* 2014

Rationale for Analysis Areas and Timeframe

- *Direct and indirect effects Analysis Area:* The Analysis Area boundaries are appropriate because they are large enough to overlap potential territories of packs and are an appropriate size to address the impacts to these packs. Per ESA Section 7 Consultation Handbook, cumulative effects are to be considered in the action area (for purpose of this analysis action area = Project area).

- *Cumulative effects Analysis Area:* Cumulative effects Analysis Area is the Project area. The programmatic BA has done a complete job of considering cumulative effects to wolf habitat across a broad landscape, to which effects are similar at the project scale. It is not necessary to go out to the Wolf Zone scale because this project does not change the road density of OML 3-5 roads. The appropriate scale for cumulative effects is the pro scale because the concern for negative impacts comes primarily from human disturbance which is best measured at the site-specific scale. Human access effects of

this project will not go beyond the Project area scale. Therefore, cumulative effects should be measured at this scale.

Timeframe

The timeframe for analysis is 2014. This time frame allows for a reasonable prediction of projects that could contribute to cumulative effects (past, present and reasonably foreseeable future). The data for each analysis indicator assumes that all activities would occur at nearly the same time (2011). It is unlikely that all activities would occur at the same time but more likely to occur over a 3 to 5 year period. In fact, it is possible a few activities may occur beyond the five years. Due to difficulty of predicting exactly which year stands would be harvested, conducting a worst case analysis is appropriate. The year 2014 also allows analysis to account for and measure the natural replacement, in time, of one plant community with another (succession), this change was predicted based on modeling rules established for the Forest Plan Revision (see Forest Plan FEIS Appendix B pgs B-17 to B-18).

Effects Analysis
Indicators

Table BA 16 Analysis Indicators Selection and Rationale for Exclusion Gray Wolf		
Forest Plan BA Indicator	**Use?**	**Rationale for exclusion**
1. Acres and percent of young upland forest <10 years old (MIH 1 young)	Y	
2. Acres and percent of upland conifer (spruce and pine) > 9 years old on all uplands (MIH 5 pole+)	Y	
3. Proposed miles of RMV trails	N	There are currently 36.6 miles of designated snowmobile trails in the Project area. There are 1.1 miles of designated ATV trails. These will remain open and do not vary by alternative.
4. Cross-country use policy for RMVs	N	This project proposes no change on the RMV cross-country use policy.
5. Miles of temp and OML 1 roads	Y	
Other Indicators		**Rationale for Inclusion**
6. Miles of road open to the public and passable by two wheeled drive vehicle (OML 3-5 roads) in the Project area.	Y	To help assess O-WL-17, S-WL- 4, impacts to critical habitat and human access/ disturbance

Table BA 17 Existing Conditions and Effects to Gray Wolf								
Indicators	**Existing Condition**		**Alt 1 No Action**		**Alt. 2**		**Alt. 3**	
	Acre	**%**	**Acre**	**%**	**Acres**	**%**	**Acres**	**%**
1. Acres and percent of young upland forest <10 years old	2,756	6	1,023	2	9,143	20	7,936	18
2. Acres and percent of upland conifer (spruce and pine) > 9 years old on all uplands	19,216	43	22,436	50	19,171	43	19,859	44
	Miles		**Miles**		**Miles**		**Miles**	
5. Miles of temp and OML 1 roads	129 (0, 129)				164 (44, 120)		158 (38, 120)	
Other Indicators	**Miles**		**Miles**		**Miles**		**Miles**	
6. Miles and density of high standard roads (OML 3-5) in the Project area.	57.2				56.9			
	0.3 miles of road would be decommissioned in the action alternatives, decreasing density from 0.390 to 0.389 miles per square mile in the Project area.							
Data Sources: Existing condition frozen August 2007 CDS data, alternatives projected to the year 2014. Percent = percent of all upland forest (44,872 acres). Roads indicator data for Existing Condition and alternatives are based on Border roads arcs coverage data run Sept. 2008 (run by Erich Grebner). For indicator 5, numbers in parentheses are the miles of each road type that make up the total for that indicator, temporary roads listed first.								

Cumulative Effects

The FEIS for the Forest Plan identifies that additional impact to wolves would occur on lands outside of the National Forest jurisdiction. Specifically, the potential increase in human access into wolf territory could occur as private lands are subdivided and developed, and harvesting on non-federal ownership would require additional road development (USFS 2004a pg 3.3.4-31). Past land management activities on all ownerships (such as those listed in Appendix I) have shaped the habitat that exists today for wolf in the Project area.

When proposed timber harvests with the Border Area project are considered in combination with future non-federal timber management, resulting cumulative effects in the Project area could occur. Appendix G of the EIS identifies 770 acres of harvest from State and County lands that is likely to occur within the analysis timeframe. This even aged harvest will provide additional foraging habitat for deer which will further benefit wolf.

Cumulative effects could occur as a result of human access/disturbance. Appendix G identifies the potential for additional developments on private lands that may create more structures, roads, and special use access permits. Appendix G also notes that St. Louis County OHV planning is ongoing. In addition, access for timber harvest on private ownership could result in a greater number of low standard roads, which could have negative impacts on wolf. However, when these impacts are considered in combination with this project, the cumulative effects are expected to be minor because This Project would result in a decrease in open roads by decommissioning 9.7 miles of OML-1 roads.
This should help off-set increases in road density that could occur from non-federal lands. Also, based on increasing wolf populations over the past two decades, cumulative impacts to wolf related to changes in habitat and human disturbance are not expected to have major impacts on

wolf populations. Additionally, road density of higher standard roads (OML 3-5) open to public vehicles in this Project area is currently well below (and would decrease in the action alternatives) Eastern Timber Wolf Recovery Plan Road Management Guidelines (not to exceed 1 mile per square mile) (Table 17 Indicator 6).

Consistency with Forest Plan

Table BA 18 Compliance of Alternatives with Forest Plan Direction Gray Wolf			
Forest Plan Guidance	**Direction**	**Alts In Compliance**	**Basis for Compliance**
O-WL-4	Maintain or improve habitat	all	Prey habitat (foraging and/or thermal cover) for prey increases in all alts. (Table BA 17, Indicator 1 & 2) Alt 1 would have no effects from temporary roads. OML-1 and high standard (OML-3-5) roads would decrease in the action alts. through road decommissioning (Table BA 17, Indicator 5 &6).
O-WL-5	Seek opportunities to benefit TE spp.	2-3	Miles of OML-1 and high standard (OML 3-5) roads would decrease in action alts. (Table BA 17, Indicator 5 & 6).
O-WL-6	Reduce or eliminate adverse effects to TE	all	Alt 1 would have no effects from temporary roads or human disturbance related to proposed activities. Human access/disturbance may decrease from fewer miles of OML-1 roads in the action alts. (Table BA 17, Indicator 5). Mitigations, and logging and hauling restrictions during the most critical period for wolf denning (over spring break-up) would protect wolves and wolf dens if found.
O-WL-7	Minimize building or upgrading roads in TE areas	all	Alt 1 would have no effects from road building. The action alts would build a small amount of OML-1 road (.17 miles) but would decommission 9.7 miles.
O-WL-17	Promote the conservation and recovery of gray wolf	all	All alternatives provide adequate levels of suitable habitat (Table BA 17, Indicator 1 & 2). Action alts decrease miles of open roads

			(Table BA 17, Indicator 6). Mitigations/design features would protect den sites if found.
S-WL-3	Management will be governed by Eastern Timber Wolf Recovery Plan (ETWRP)	all	Current density of high standard roads in the Project area is 0.39, well below the desired future state (not to exceed 1 mile per square mile). Project meets Eastern Timber Wolf Recovery Plan objectives (pgs 29-32): 142, 144, 145, 146, 151, 152, 152-1.
G-WL-10	Provide for the protection of known active den sites	all	If a gray wolf den or rendezvous site is found during planning, layout or operations, activities would be halted in the area and the District Biologist would be notified. The biologist would assess the risk to species and where appropriate; mitigation measures (restricting activities within up to 880 yards (MN Wolf Mgt. Plan 2001) of site and/or imposing seasonal restrictions*) would be implemented prior to restarting operations. The Forest Plan, (ETWRP) and conservation strategies would be used when making mitigation recommendations. Logging and hauling restrictions also would provide protection to wolves as the most critical period for wolf denning coincides with spring breakup when restrictions to these activities are in place. *Seasonal restrictions – for den sites consider pups usually born early to mid April and stay in the den 6-8 weeks (restrict activities April-May). Rendezvous sites used from time pups leave the den through Sept (Forest Plan BA, section 3.3 Wolf Ecology).

Determination of Effect

Table BA 19 Effect of the Alternatives on Gray Wolf		
Alternative	**Determination**	**Summary of Rationale**
1	Not Likely to Adversely Affect	This alternative will provide adequate prey habitat. There would be no effects from temporary roads and no potential beneficial effect from roads decommissioning. Effects will not change from existing condition which is not currently an adverse situation.
2 and 3	Not Likely to Adversely Affect	Direct effects could occur with continued human access into wolf habitat. In the short-term (10 years) all action alternatives would result in an increase of low standard roads (Table BA 17, indicator 5), with Alternative 2 resulting in the highest increase (plus 35 miles) and Alternative 3 resulting in the lowest increase (plus 29 miles). However, the increase would be in temporary roads which would not be open for public use. In the long-term, when activities have been completed and temporary roads decommissioned, there would be nine fewer miles of low standard roads then exists today. Due to the high level of proposed temporary road miles in all action alternatives it is important that these roads do not become public use roads. High standard roads would not be affected but densities remain low. Known wolf dens will be protected. Habitat for prey (Table BA 17, Indicators 1 and 2) would increase with both action alternatives which would benefit wolves. Use and development of gravel sources may have direct effects on wolf in the form of irregular disturbance. However, wolves are known to use gravel pits as rendezvous sites so adverse effects are not expected. Cumulative effects could occur but based on increasing wolf populations over the past decade, cumulative impacts are not expected to impact wolf populations on the SNF.

Table 20 Effects to Wolf Critical Habitat		
Alternatives	**Determination**	**Summary of Rationale**
All	Not Likely to Adversely Affect	Within critical habitat, the Recovery Plan emphasizes the need for space (for growth and movement of packs), food, and cover sufficient to assure the survival of gray wolves (USDI FWS 1992). Specifically, the Plan encourages management activities that maintain or develop these factors in critical habitat and minimize activities that would permanently remove forest cover, such as road construction and human development. All alternatives would not alter the factors discussed above. Road density would remain below 1 mi/sq. mi, mitigating potential negative impacts of human development and roads in wolf recovery Zone 1.

Operational Standards and Guideline (See Appendix B and C)

Table BA 21 Mitigation and Design Features	Alternatives	Risk Factor Addressed
All species		
Due to the high level of temporary road construction, monitor the effectiveness closure during use and decommissioning after use to minimize impact from temporary roads on lynx and wolf. (O-TS-3 and O-WL-7)	All action alternatives	Human disturbance
All new temporary and low standard roads will be closed to the public unless designated as recreation trails (Forest Plan FEIS, pg. 3.3.4-20).	All action alternatives	Human disturbance
Canada Lynx		
Protect known active den sites during the denning season (G-WL-2). If a lynx den is discovered in the Project area planning, layout, or operations, activities would be temporarily halted until the end of the denning season (denning season is typically April through July).	All action alternatives	Human disturbance
Gray wolf		
Provide for the protection of known active gray wolf den sites during denning season (G-WL-10). If a gray wolf den or rendezvous site is found during planning, layout or operations, activities would be halted in the area and the District Biologist would be notified. The biologist would assess the risk to species and where appropriate; mitigation measures [restricting activities within up to 880 yards (MN Wolf Mgt. Plan 2001) of site and/or imposing seasonal restrictions*] would be implemented prior to restarting operations. The Forest Plan, (ETWRP) and conservation strategies would be used when making mitigation recommendations. *Seasonal restrictions – for den sites consider pups usually born early to mid April and stay in the den 6-8 weeks (restrict activities April-May). Rendezvous sites used from time pups leave the den through Sept (Forest Plan BA, section 3.3 Wolf Ecology).	All action alternatives	Human disturbance

Monitoring

The Forest Plan identifies three monitoring elements related to threatened and endangered species (Chapter 4, Table MON-4):

- To what extent is Forest management contributing to the conservation of threatened and endangered species and moving toward short term (10-20 years) and long-term (100 years) objectives for their habitat conditions and population trends?
- To what extent are road and trail closures effective in prohibiting unauthorized motor vehicle use?
- To what extent is the Forest maintaining no net increase in groomed or designated over-the-snow trail routes unless the designation effectively consolidates use and improves lynx habitat through a net reduction of compacted snow areas?

Additional Monitoring Elements - None

SIGNATURE:

Biological Assessment Conducted by: /s/ Todd C. Stefanic, LaCroix Wildlife Biologist 10/30/08

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