Forest Plan Revision

Chippewa and Superior National Forests

Regional Forester Sensitive Animals Biological Evaluation

Prepared by: Forest Service Biologists Date: June 2004

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Table of Contents

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Executive Summary

This Biological Evaluation (BE) documents the likely direct, indirect, and cumulative impacts on 41 sensitive animals from forest management activities and programs proposed under seven alternatives in the Final Environmental Impact Statement for Forest Plan Revision on the Chippewa and Superior National Forests (USDA FS 2003). It also provides the Forest Service's judgment on the likelihood of each alternative to maintain species viability, well-distributed habitats, and to prevent a trend toward federal listing of any species. The findings of the BE are summarized below in two complementary evaluations of impacts:

- Table 1: Outcomes of Ecological Conditions
- Table 2: Determination of effect of Alternatives

Outcomes

The estimated historical (~1600-1900 AD), current, and projected future abundance and distribution of suitable ecological conditions for each sensitive animal for each alternative is displayed in Table 1 as an "outcome". Outcomes are an index of the capability of the environment to support population abundance and distribution, not an actual prediction of population occurrence, size, density, or other demographic characteristics (Schenck *et al*. 2002). Outcomes range from "A": *broadly distributed and high abundance* to "E": *highly isolated and very low abundance.* See Section **Existing Conditions: Ecological Outcomes** below for detailed outcome definitions. Ecological conditions are defined as the components of the biological and physical environment that can affect the diversity of plants and animal communities and the productive capacity of ecological systems. These can include the abundance and distribution of aquatic and terrestrial habitats, roads and other developments, human uses, and non-native invasive species.

Analysis focused on the predominant risk factors pertinent to each species. Additionally the evaluation of environmental conditions, outcomes, and habitat quality is based on knowledge of species' distribution and life history. For example, some species occur naturally in a localized or patchy distribution, and thus, never would occur in the conditions described as Outcome A, B or C: their natural condition may be D or E. Comparison of historical and current outcomes provides a reference or context with which to evaluate the impacts of the alternatives.

Table 1 below summarizes the outcomes for sensitive animals based on the direct and indirect effects of alternatives for Forest Plan Revision on the Chippewa and Superior National Forests. Cumulative effects of the alternatives are generally similar to these effects and are found in the **Environmental Consequences** Section for each individual species.

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Table 1. Historical, current, and future (Decades 2, 5, and 10) outcomes for RFSS animals on National Forest Lands.

Species	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
MAMMALS																							
Heather vole (SNF)	C	D	E	E	E	C	C	C	D	D	D	C	C	C	C	C	C	C	C	C	C	C	C
Northern bog lemming (CNF)	C	D	E	D	D	D	D	D	E	D	D	D	D	D	D	D	D	D	D	D	D	D	D
BIRDS																							
Trumpeter swan (CNF)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Northern goshawk (SNF)	A	C	D	D	D	C	A	A	D	D	D	C	A	A	D	C	C	C	C	C	C	C	C
Northern goshawk (CNF)	A	D	E	E	E	C	A	A	E	E	E	C	A	B	D	C	C	C	B	A	D	B	B
Red-shouldered hawk (CNF)	B	D	D	C	C	B	B	B	D	C	C	B	B	B	D	C	B	B	B	B	C	B	B
Peregrine falcon (SNF)	D	E	E	E	D	E	E	D	E	E	D	E	E	D	E	E	D	E	E	D	E	E	D
Sharp-tailed grouse (SNF)	C	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Sharp-tailed grouse (CNF)	C	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Spruce grouse (CNF)	B	E	E	E	E	D	D	D	E	E	E	D	D	D	E	E	E	D	D	D	E	E	E
Yellow rail (SNF)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Yellow rail (CNF)	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Wilson's phalarope (SNF)	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Wilson's phalarope (CNF)	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Common tern (CNF)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Caspian tern (CNF)	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Black tern (SNF)	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Black tern (CNF)	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Great gray owl (SNF)	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Great gray owl (CNF)	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Boreal owl (SNF)	C	D	D	D	D	C	C	C	D	D	D	C	C	C	D	D	D	D	D	D	D	D	D
Black-backed woodpecker (CNF)	C	D	D	D	D	C	C	C	D	D	C	C	C	C	C	C	C	C	C	C	C	C	C
Three-toed woodpecker (SNF)	C	D	C	D	C	C	C	C	D	D	C	C	C	C	C	C	C	C	C	C	C	C	C
Olive-sided flycatcher (SNF)	B	D	D	D	D	C	C	C	D	D	D	C	C	C	D	D	D	C	C	C	D	C	C
Olive-sided flycatcher (CNF)	C	D	D	D	D	C	C	C	D	D	C	C	C	C	D	D	D	C	C	C	D	C	C
Black-throated blue warbler (SNF)	B	C	E	D	D	C	B	B	E	E	D	C	B	B	D	D	D	C	C	C	C	C	C

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Table 1. Historical, current, and future (Decades 2, 5, and 10) outcomes for RFSS animals on National Forest Lands.

Species	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Black-throated blue warbler (CNF)	B	D	E	D	D	C	B	B	E	D	D	C	B	B	D	D	C	C	B	B	D	C	C
Bay-breasted warbler (SNF)	B	C	C	C	B	C	B	B	C	C	B	C	B	B	C	C	B	C	C	B	C	C	B
Bay-breasted warbler (CNF)	D	E	E	E	E	E	E	D	E	E	E	E	E	D	E	E	E	E	E	D	E	E	D
Connecticut warbler (SNF)	B	C	C	C	B	C	C	C	C	C	C	B	B	B	C	C	C	C	C	C	C	C	C
Connecticut warbler (CNF)	B	C	D	D	C	C	C	C	D	D	C	B	B	B	C	D	C	C	D	C	C	C	C
LeConte's sparrow (SNF)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
LeConte's sparrow (CNF)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Nelson's sharp-tailed sparrow (CNF)	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
HERPS																							
Wood turtle (SNF)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Blanding's turtle (CNF)	C	C	C	D	D	C	C	C	C	D	D	C	C	C	C	D	D	C	C	C	C	C	C
Four-toed salamander (CNF)	C	D	E	E	D	D	C	C	E	E	D	D	C	C	E	D	C	D	C	C	D	D	C
FISH																							
Lake Sturgeon (SNF)	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Shortjaw cisco (SNF)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Least darter (CNF)	A	C	C	C	C	B	B	B	C	C	C	B	B	B	C	C	C	C	B	B	C	B	B
Northern brook lamprey (SNF)	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Greater redhorse (CNF)	B	C	C	D	D	C	B	B	C	D	D	B	B	B	C	D	D	C	C	C	C	B	B
Pugnose shiner (CNF)	B	C	C	D	D	C	C	C	C	D	D	C	C	C	C	D	D	C	D	D	C	C	C
MOLLUSKS																							
Creek heelsplitter (SNF)	B	C	C	D	E	B	B	B	D	E	E	B	B	B	C	C	C	C	D	E	C	C	C
Creek heelsplitter (CNF)	B	C	D	E	E	B	B	B	D	E	E	B	B	B	C	C	C	C	D	E	C	C	C
Fluted-shell mussel (SNF)	C	E	E	E	E	D	C	C	E	E	E	D	C	C	D	E	E	D	C	C	D	C	C
Fluted-shell mussel (CNF)	C	E	E	E	E	D	C	C	E	E	E	D	C	C	D	E	E	D	C	C	D	C	C
Black sandshell (SNF)	B	D	D	D	E	B	B	B	D	D	E	B	B	B	C	C	C	C	C	C	C	B	B
Black sandshell (CNF)	B	D	D	D	E	B	B	B	D	D	E	B	B	B	C	C	C	C	C	C	C	B	B
BUTTERFLIES																							
Taiga alpine (SNF)	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Red-disked alpine	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

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Table 1. Historical, current, and future (Decades 2, 5, and 10) outcomes for RFSS animals on National Forest Lands.

Species	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
(SNF)																							
Nabokov's northern blue (SNF)	D	E	E	E	E	E	E	D	E	E	D	D	D	D	E	D	D	E	D	D	E	D	D
Jutta arctic (SNF)	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Grizzled skipper (SNF)	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
OTHER INSECTS																							
Vertrees's caddisfly (CNF)	C	D	D	D	D	D	D	D	D	D	D	C	C	C	D	D	D	D	D	D	D	D	D
Tiger beetle species (SNF)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

Source: Biological Evaluation for RFSS animals
‡Notes:Outcomes in underlined text are those that differ from the current outcome.

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Determination of Effect

Table 2 displays the *determination of effects* of the alternatives. This determination specifically provides the judgment of the Forest Service on which of five conditions (see definitions in bottom row of Table 2 below) would be most likely from the impacts of the alternatives. The determination addresses the question of whether alternatives would be likely to maintain species viability or prevent a trend toward federal listing during the next 20 years (plan implementation period and reasonably foreseeable future). Determinations are expressed as "likelihood" or "risk" because of the uncertainty inherent in evaluating future scenarios and because, for many sensitive species, environmental conditions or habitat requirements are often not well understood. All the alternatives may impact individuals but are not likely to cause a trend to federal listing.

For all 41 sensitive animals, the Forest Service determined that alternatives would not result in a trend toward federal listing (Condition 4b). For 36 of 41 species, the Forest Service determined that alternatives would either: 1) have no impact (Condition 1); 2) have beneficial impacts (Condition 2); 3) impact individuals but not be likely to cause a loss of viability on the National Forests or trend toward federal listing (Condition 3). Five of 41 species were determined to be at risk of a loss of viability (Condition 4a) in one or more alternatives.

Table 2. Summary of Determination of Effect for Sensitive Animals.

SPECIES	NF	Alternative						
		A	B	C	D	E*	F	G
Sensitive Species - Animals								
Northern goshawk	Chip	4a	2	4a	2	3	2	3
Northern goshawk	Sup	3	2	4a	2	3	2	3
Red-shouldered hawk	Chip	3	2	3	2	3	2	2
Peregrine falcon	Sup	1	1	1	1	1	1	1
Sharp-tailed grouse	Both	1	1	1	1	1	1	1
Spruce Grouse	Chip	4a	2	4a	2	3	2	3
Boreal owl	Sup	4a	3	4a	3	3	3	3
Black-backed woodpecker	Chip	3	3	3	2	3	3	3
Three-toed woodpecker	Sup	3	3	3	2	3	3	3
Black-throated blue warbler	Chip	4a	2	4a	2	3	2	3
Black-throated blue warbler	Sup	4a	3	4a	3	3	3	3
Bay-breasted warbler	Chip	4a	3	3	3	3	3	3
Connecticut warbler	Both	3	3	3	2	3	3	3
Least darter	Chip	3	2	3	2	3	3	3
Creek heelsplitter	Both	3	3	3	2	3	3	3
Fluted-shell mussel	Both	3	3	3	2	3	3	3
Black sandshell	Both	3	2	3	2	3	3	3
All other Sensitive Animals	Both	3	3	3	3	3	3	3

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Table 2. Summary of Determination of Effect for Sensitive Animals.								
SPECIES	**NF**	**Alternative**						
		A	**B**	**C**	**D**	**E***	**F**	**G**

* Modified Alternative E
Definitions
1. = No impacts
2. = Beneficial effects
3. = May impact individuals but is not likely to cause a trend to federal listing or loss of viability. *(This condition may be used when it is determined the proposed alternative may cause some adverse effects, even if overall effects to species may be beneficial.)*
4a. = High risk of loss of loss of viability in the planning area, but not likely to cause a trend toward federal listing.
4b. = Likely to result in a loss of viability and a trend toward federal listing

Biological Evaluation

INTRODUCTION

Definition of sensitive species (FSM 2670.5): Those plant and animal species identified by a Regional Forester for which population viability is a concern as evidenced by:

- Significant current or predicted downward trends in population numbers or density.
- Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

This Biological Evaluation (BE) documents the likely direct, indirect, and cumulative impacts on 41 sensitive animal species from forest management activities of seven alternatives proposed in the Final Environmental Impact Statement (Final EIS) for Forest Plan Revision on the Chippewa and Superior National Forests.

This BE was prepared in compliance with direction in Forest Service Manual 2671.1 through 2672.43 and the requirements of the Endangered Species Act of 1973 as amended and the National Forest Management Act of 1976. FSM 2672.42 objectives for completing Biological Evaluations for proposed Forest Service programs and activities are to:

1) Ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or animal species,
2) Ensure that Forest Service activities do not cause any species to move toward federal listing, and
3) Incorporate concerns for sensitive species throughout the planning process, reducing negative impacts to species and enhancing opportunities for mitigation.

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Analysis Area

The area covered by the analysis of direct and indirect effects includes all lands administered by the Chippewa and Superior National Forests. Unless otherwise noted, the area covered by the cumulative effects analysis for the Chippewa is land of all ownerships within the Drift and Lake Plains Section, and land of all ownerships within the Northern Superior Uplands for the Superior.

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Description of the Alternatives

A detailed description of the alternatives can be found in Chapter 2 of the Final EIS and the Forest Plan.

Consultation with US Fish and Wildlife Service

Interagency cooperation between the Forest Service and US Fish and Wildlife Service regarding proposed, endangered, or threatened species is described in Section 7 of the Endangered Species Act. Three federally threatened (and no proposed or endangered) species are known to occur on the Forests: Canada lynx, gray wolf, and bald eagle. Consultation on these species is on going and is documented in the Biological Assessment (planning record). No consultation is required and none has been conducted on sensitive species.

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EXISTING CONDITION – SPECIES EVALUATED AND ENVIRONMENTAL BASELINE

Animals

Table 3 displays all the sensitive animal species known to occur within the proclamation boundaries of the Chippewa and Superior National Forests (USDA Forest Service 2002a). Forest Service proposed programs or activities potentially impact – either positively or negatively - these species and therefore they are considered in this BE. Several sources of information, documented in the Planning Record, were used for Table 3 to develop and summarize species status, distribution, analysis indicators, habitat, and life history. The following key sources were used:

- Minnesota Natural Heritage Program data (MN DNR 2002)
- Fish and Wildlife Service Birds of Conservation Concern (USDI 2002)
- Species literature reviews conducted by the Forest Service between October 1999 and March 2000 (USDA Forest Service 2002b, planning record)
- Information collected from species experts at Species Viability Evaluation panels conducted in 2000 and 2002 (USDA Forest Service 2000b, planning record)
- Conservation Assessments conducted by the Forest Service for:
  - red-shouldered hawk (Jacobs and Jacobs 2002) ,
  - common tern (Kudell-Ekstrum 2001a)
  - Caspian tern (Kudell-Ekstrum 2001b)
  - black-backed woodpecker (Corace *et al.* 2001)
  - three-toed woodpecker (Burdette and Niemi 2002a)
  - black-throated blue warbler (Burdette and Niemi 2002b)
  - Connecticut warbler (Kudell-Ekstrum 2002)
  - greater redhorse (Healy 2002)
  - northern blue butterfly (Wolf and Brzeskiewicz 2002)
- Sensitive species survey reports (referenced where applicable in species' evaluation).

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Table 3. Sensitive animals on Chippewa and Superior National Forests: status, habitat summary, and key analysis indicators.

Common name/ Scientific name	Global [1] rank	State[2] Rank	National Forest Distribution	Number of Occurrences (Sup/Chip)[3]	Key Analysis Indicators[4] (MIH = management indicator habitat)	Life History & Habitat Summary
MAMMALS						
Heather vole *Phenocomys ungava* (aka *intermedius)*	G5	SC	Superior	3/0	MIH 8b: Jack pine forest, mature+	Wide variety of moist to dry forest, forest edge and openings, meadows, shrublands with *Vaccinium* and other heath family spp. and rocks.
Northern bog lemming *Synaptomys borealis*	G5	SC	Chippewa	0/1	MIH 9a,b: lowland black spruce-tamarack, seedling through mature+; Non-forest wetlands; temporary roads in wetlands.	Labrador tea and sphagnum moss in lowland black spruce/tamarack forest , bogs, peatlands with grasses and sedges in conjuction with sphagnum moss and heath shrub layer
BIRDS						
Trumpeter swan *Cygnus buccinator*	G4	T	Chippewa	Nesting: 0/1	Non-forest wetlands.	Small ponds and lakes or bays with extensive beds of cattails, bulrushes, sedges, horsetail
Northern goshawk *Accipiter gentilis*	G5	NON (nest)	Chippewa Superior	Current Status described under species evaluation	MIH 1b: Upland mature+ forest. MIH 13: Large patches of upland mature+ forest. Stand complexity (based on vegetation treatments).	Carnivore. Nesting: Large trees. Large tracts of mature and older deciduous, coniferous, and mixed forests with closed canopy and open understory.
Red-shouldered hawk *Buteo lineatus*	G5	SC	Chippewa	Current Status described under species evaluation	Upland Northern Hardwood mature+ in patches larger than 300 acres.	Carnivore. Nesting: Large trees. Large tracts of mature, closed canopy deciduous and mixed-deciduous forests with minimal shrub component and interspersed with riparian areas small wetlands.
Peregrine falcon[5] *Falco peregrinus anatum*	G4	T	Superior	Nesting: 2/0	Non-forest nesting habitat.	Carnivore. Nesting: cliff/ledges. Hunting: forest openings, lakes, wetlands.
Sharp-tailed grouse *Tympanuchus phasianellus*	G4		Chippewa Superior	Leks: 0/0 Current Status described under species evaluation	Large patches of temporary non-forested uplands. Management-ignited fire opportunities.	Ominvore. Ground nester. Brushland complexes (>5,000 acres) with open areas, brush, grass/sedges, and small trees, as well as large open agricultural hay or pasture with associated brush habitat. Habitat niche is between grasslands and forests, usually created and maintained by fire
Spruce grouse *Falcipennis canadensis*	G5		Chippewa	Current Status described under species evaluation	MIH 9b: Lowland black spruce-tamarack mature+ forest. MIH 5b: Upland conifer mature+ forest. Management-ignited fire opportunities.	Ominvore – forager. Ground nester. Coniferous forest of Jack pine, black spruce and tamarack; habitat always includes short needle component and branches that extend to the ground.
Yellow rail[5] *Coturnicops noveboracensis*	G4	SC	Chippewa Superior	Current Status described under species evaluation	Non-forest wetlands.	Omnivore – mainly snails. Ground nester on small hummocks. Lowland sedge meadows with specific characteristics such as overhead mat of dead sedge, water 1-10" deep for feeding.
Wilson's phalarope[5] *Phalaropus tricolor*	G5	T	Chippewa Superior	Current Status described under species	Non-forest wetlands.	Invertivore. Ground nester. Large open wet meadows and quiet shallow pools/shores.

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Table 3. Sensitive animals on Chippewa and Superior National Forests: status, habitat summary, and key analysis indicators.

Common name/ *Scientific name*	Global [1] rank	State[2] Rank	National Forest Distribution	Number of Occurrences (Sup/Chip)[3]	Key Analysis Indicators[4] (MIH = management indicator habitat)	Life History & Habitat Summary
				evaluation		
Common tern[5] *Sterna hirundo*	G5	T	Chippewa	Nesting colony: 0/2	Large lake nesting beaches. Water access improvements.	Isolated, sparsely vegetated-sandy/gravelly islands in large lakes.
Caspian tern *Sterna caspia*	G5		Chippewa	Current Status described under species evaluation	Large lake nesting beaches. Water access improvements.	Fish-eater. Nests on islands in very large lakes in sparsely vegetated sandy-gravelly beach habitat.
Black tern[5] *Chlidonias niger*	G4		Chippewa Superior	Current Status described under species evaluation	Non-forest wetland marshes and wet meadows. Road and trail construction. Water access improvements.	Inesectivore/piscivore. Lakes, marshes and wet meadows interspersed with floating and emergent aquatic vegetation and open water.
Great gray owl *Strix nebulosa*	G5	NON (nest)	Chippewa Superior	Current Status described under species evaluation	Nesting MIH 4b: Upland aspen-birch forest, mature+. MIH 5b: Upland conifer forest, mature+. Foraging MIH 5a: Upland conifer forest, young. MIH 9a: Lowland Black-Spruce-Tamarack young forest.	Carnivore. Tree nester. Mature forested patches of upland forested nesting habitat near open or sparsely forested foraging areas.
Boreal owl *Aegiolus funereus*	G5	NON (nest)	Superior	Current Status described under species evaluation	Nesting MIH 4b: Upland Aspen-Birch mature+ MIH 5b: Upland conifer forest, mature+ . Foraging, cover MIH 9b: Lowland Black-Spruce Tamarack mature+ forest. MIH 9b in patches of 100 acres or greater.	Carnivore. Secondary cavity nester in large trees. Mature and older mixed conifer-deciduous forest (inc. aspen) next to mature lowland conifer forest feeding areas.
Black-backed woodpecker *Picoides arcticus*	G5		Chippewa	Current Status described under species evaluation	MIH 5b: Upland conifer mature+ forest. MIH 9b: Lowland black spruce-tamarack mature+ forest. Management-ignited fire opportunities.	Insectivore - scaler. Cavity nester. Mature coniferous forests which include dead and dying tamarack or spruce bogs, white cedar infested with wood boring beetle larvae
Three-toed woodpecker *Picoides tridactylus*	G5		Superior	Current Status described under species evaluation	MIH 9b: Lowland black spruce-tamarack mature+ forest. Management-ignited fire opportunities. MIH 12: Upland interior forest, mature+.	Insectivore. Cavity nester. Large tracts of coniferous (primarily spruce/fir) forests with abundant dead and dying trees infested with wood boring beetle larvae.

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Table 3. Sensitive animals on Chippewa and Superior National Forests: status, habitat summary, and key analysis indicators.

Common name/ *Scientific name*	Global [1] rank	State[2] Rank	National Forest Distribution	Number of Occurrences (Sup/Chip)[3]	Key Analysis Indicators[4] (MIH = management indicator habitat)	Life History & Habitat Summary
Olive-sided flycatcher *Contopus cooperi*	G4		Chippewa Superior	Current Status described under species evaluation	MIH 5b: Upland mature+ MIH 9b: lowland black spruce-tamarack mature+ Management-ignited fire opportunities.	Insectivore. Tree nester. Snags, low density conifer lowlands, riverine/riparian areas. Variety of 10-20% canopy boreal forests including uplands, lowlands, edges and beaver meadows with a preponderance of standing live or dead large trees; spruce or tamarack trees used for foraging.
Black-throated blue warbler *Dendroica caerulescens*	G5	NON (nests)	Chippewa Superior	Current Status described under species evaluation	MIH 1b: Upland mature+ forest. MIH 1b in patches 2500 acres or greater.	Insectivore. Shrub nester. Large contiguous mature forests, especially sugar maple, and probably associated with small gaps and a well-developed deciduous shrub understory.
Bay-breasted warbler *Dendroica castanea*	G5		Chippewa Superior	Current Status described under species evaluation	MIH 6b: Spruce/fir upland forest, mature+. MIH 9b: Lowland black spruce-tamarack forest, mature+. MIH 13: Upland and lowland mature+ forest patches (40-10,00 acres).	Insectivore. Mid-age to mature and older upland and lowland spruce/fir forests, especially those infested with spruce budworm and tent caterpillars.
Connecticut warbler *Oporornis agilis*	G4		Chippewa Superior	Current Status described under species evaluation	MIH 9b: Lowland black spruce-tamarack mature+ forest MIH 8b: Jack pine forest, mature+.	Insectivore. Ground nester. Mature and older lowland conifer and jack pine forest with a thick ericaceous understory.
LeConte's sparrow *Ammodramus leconteii*	G4		Chippewa Superior	Current Status described under species evaluation	Non-forest wetlands MIH 1a: Upland young forest. MIH 9a: Lowland black spruce-tamarack young forest. MIH 11: management-induced edge habitat in upland and lowland forest. Management-ignited fire opportunities. Road and trail construction.	Omnivore. Ground nester. Open lowland habitat, sedge-dominated wetlands and wet meadows.
Nelson's sharp-tailed sparrow *Ammondramus nelsoni*	G5	T	Chippewa	Current Status described under species evaluation	Non-forest wetland. Management-ignited fire opportunities Amounts of road and trail construction	Granivore. Ground nester. Sedge-dominated wet meadows, marshes, and open peatlands with minimal open water.
REPTILES AMPHIBIANS						
Wood turtle *Clemmys insculpta*	G4	T	Superior	8/0	Riparian disturbances. Road and trail construction.	Omivore. Nests in riparian habitats with open sandy areas for nesting. Forages in upland and lowland habitats with suitable shade, security cover wood, and insects for forage. Aquatic riverine habitat log jams, down logs, woody debris

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Table 3. Sensitive animals on Chippewa and Superior National Forests: status, habitat summary, and key analysis indicators.

Common name/ *Scientific name*	Global [1] rank	State[2] Rank	National Forest Distribution	Number of Occurrences (Sup/Chip)[3]	Key Analysis Indicators[4] (MIH = management indicator habitat)	Life History & Habitat Summary
Blanding's turtle *Emydoidea blandingii*	G4	T	Chippewa	0/2	Riparian disturbances. Road and trail construction.	Omnivore. Nests mostly in upland grasslands with sandy soil. Calm, shallow water and marsh areas with soft bottoms with abundant aquatic vegetation.
Four-toed salamander *Hemidactylium scutatum*	G5	SC	Chippewa	0/5	Even-aged harvest.	Nests in clumps of mosses. Adults prefer cool, moist closed-canopy northern hardwoods with abundant coarse woody debris and vegetation litter/moss for security cover adjacent to breeding wetlands: swamps, boggy streams, and wet, wooded or open areas near fish-free ponds (the larval habitat).
FISH						
Lake Sturgeon *Acipenser fulvescens*	G3	SC	Superior	4/0	Road and trail construction and associated stream crossings.	On SNF: Large lakes and rivers in the Hudson Bay drainage. Large areas of water less than 10m with abundant food (microcrustacea, midges, leeches, clams). Spawning habitat shallow (0.3-0.4m) lakes and rivers with rock substrate, rapids.
Shortjaw cisco *Coregonus zenithicus*	G3		Superior	3/0	Road and trail construction.	Lake Superior, Saganaga and Gunflint Lakes, possibly others. Deepwater lakes (species generally captured at depths greater than 200 feet). Spawns in 18-45m over sand or clay bottoms.
Least darter *Etheostoma microperca*	G5	SC	Chippewa	0/4	Forest management activities in riparian zones. Road and trail construction and associated stream crossings. % open in watershed.	Quiet water with dense aquatic vegetation, soft bottoms of sand, silt , or organic sediment. Spawn in shallow water and then move back to deeper water.
Northern brook lamprey *Ichthyomyzon fossor*	G4	SC	Superior	8/0	Road and trail construction and associated stream crossings.	Warm, medium-sized, low-gradient streams with Sections of higher gradient reaches suitable for spawning. Spawning areas with current and suitable water temperature over shallow silt-free sand or gravel bottoms. Ammocoetes require organically enriched, sandy substrate until metamorphosis.
Greater redhorse *Moxostoma valenciennsi*	G3	SC	Chippewa	0/6	Forest management activities in riparian zones. Road and trail construction and associated stream crossings.	Moderate to fast-flowing, medium-sized to large rivers with sand, gravel or boulder substrates. Prefers clear water. Spawning habitat similar, includes shallow runs and sand and gravel substrates.
Pugnose shiner *Notropis anogenus*	G3	SC	Chippewa	0/5	Forest management activities in riparian zones. Road and trail construction and associated stream crossings.	Clear, lakes and streams with bottoms of sand and gravel or marl and abundant submerged aquatic vegetation

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Table 3. Sensitive animals on Chippewa and Superior National Forests: status, habitat summary, and key analysis indicators.

Common name/ Scientific name	Global[1] rank	State[2] Rank	National Forest Distribution	Number of Occurrences (Sup/Chip)[3]	Key Analysis Indicators[4] (MIH = management indicator habitat)	Life History & Habitat Summary
					% open in watershed.	
MOLLUSKS						
Creek heelsplitter *Lasmigona compressa*	G5	SC	Chippewa Superior	2/17	Forest management activities in riparian zones. Road and trail construction and associated stream crossings. % open in watershed.	Creeks and the headwaters of small to medium rivers in fine gravel or sand or sandy mud areas.
Fluted-shell mussel *Lasmigona costata*	G5	SC	Chippewa Superior	1/1	Forest management activities in riparian zones. Road and trail construction and associated stream crossings. % open in watershed.	Medium to large clean water rivers in sand, mud or fine gravel in areas with slow to moderate flow.
Black sandshell *Ligumia recta*	G5	SC	Chippewa Superior	1/16	Forest management activities in riparian zones. Road and trail construction and associated stream crossings. % open in watershed.	Medium to large rivers in riffles or raceways in gravel or firm sand
INSECTS						
Taiga alpine (aka disa) *Erebia mancinus (aka E. disa alpinus)*	G5	SC	Superior	4/0	MIH 9b: Lowland Black-Spruce-Tamarack mature+ forest	Semi-open to well-forested black spruce-tamarack sphagnum bogs.
Red-disked alpine *Erebia discoidalis*	G5		Superior	7/0	MIH 9b: Lowland Black-Spruce-Tamarack mature+ forest; Nonforest wetland	Open ericaceous, cottongrass, or sphagnum bogs, open meadows, semi-open black spruce-tamarack bogs ranging from young to mature and older.
Nabokov's northern blue *Lycaeides idas nabokovi*	G5	SC	Superior	8/0	MIH 6a: Jack pine forest - young	Associated with its exclusive larval host plant dwarf bilberry (*Vaccinium cespitosum*) in cool, well-drained sandy gravelly areas under fairly open coniferous forests, especially jack pine of the Vermilion Moraine (narrow band that extends through western Cook and central St. Louis Counties) Greatest concentrations of bilberry are in young, open or disturbed areas such as clearcuts or burned areas.
Jutta arctic *Oenis jutta ascerta*	G5		Superior	3/0	MIH 9b: Lowland Black-Spruce-Tamarack mature+ forest Non-forest wetland.	Moderately forested black spruce bogs with sedges, bog forest openings and edges.
Grizzled skipper *Pygus centaureae freija*	G5T4T5	SC	Superior	1/0	Non-forest.	Known only from the McNair special management area. Upland acid meadow.

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Table 3. Sensitive animals on Chippewa and Superior National Forests: status, habitat summary, and key analysis indicators.

Common name/ *Scientific name*	Global [1] rank	State[2] Rank	National Forest Distribution	Number of Occurrences (Sup/Chip)[3]	Key Analysis Indicators[4] (MIH = management indicator habitat)	Life History & Habitat Summary
Vertrees's caddisfly *Ceraclea vertreesi*	G3? Incmpl dist. Data	NON	Chippewa	0/1	Forest management activities in riparian zones. Road and trail construction and associated stream crossings. % open in watershed.	Probably eats sponges. Larval case on bottom of lake or stream. Medium to large-sized rivers or lakes that are directly connected to a medium or large-sized river. Typically in spring fed streams. Clean sand/silt bottoms with clean water.
Tiger beetle species *Cicindela denikei*	G4	T	Superior	13/0	Forest openings. Roads, trails, gravel pits.	Invertivore. Nest in soil/burrow. Sandy or rocky openings or semi-open areas in predominantly pine or mixed conifer forest, gravel pits.

1. Global rankings as assigned by Natural Heritage Network (NatureServe 2002). G1=critically imperiled, G2=imperiled, G3=vulnerable, G4=apparently secure, G5=secure, T=ranks for subspecies, ?= inexact numeric rank, Q=questionable taxonomy, G#G#= range of ranks. See NatureServe website for complete definitions. "---" indicates the plant is not tracked on NatureServe website.

2. Minnesota state rankings (Minnesota Department of Natural Resources [DNR] 1996). E=endangered, T=threatened, SC=special concern. , NON=tracked but not listed, "---"indicates the species in not tracked by MN DNR.

3. The number of occurrences includes only those presumed to be extant, and does not include those occurrences found before 1960. This is the number of occurrences within proclamation boundaries.

4. Key Indicators. Management Indicator Habitats (MIHs): for specific ages and forest types associated with each MIH and age class, see Appendix A: **a.** = Young, seedling/sapling stage of forest vegetation, **b**. mature+ = mature and older stages of forest vegetation.

5. Species also has Fish and Wildlife status with as bird species of conservation concern (USDI 2002).

Final

Analysis process

The analysis process for evaluating effects of Alternatives A through G on sensitive animals is described in USDA Forest Service (USDA FS 2002b, planning record) and is also summarized in Appendix B (Wildlife Section) of the Final EIS. Briefly, the Forest Service:

- Collected and solicited applicable scientific information (both current and historical) and expert opinions about species' occurrences on the National Forests, habitat needs, biology, population, landscape structure, risk factors, management impacts of alternatives, and potential mitigations for all sensitive species through:
  - Literature reviews.
  - Database searches of Minnesota Natural Heritage Program, Minnesota National Forests, Natural Resources Research Institute, NatureServe, The Nature Conservancy and other sources.
  - Species expert panels held in Jan-Mar 2000 and April-May 2002.

- Identified or developed indicators or other measures to focus analysis on environmental conditions that would contribute to the long-term viability of these species on Forest Service lands from planned management. Species were evaluated using a wide variety of quantitative and qualitative indicators and information. Refer to Section on **Indicators** below for more detail on selection of indicators.

- After collecting information and identifying analysis indicators, Forest Service biologists analyzed the alternatives and used professional judgment to provide two kinds of assessments of impacts to species that are explained below:

  - **Ecological Outcomes**
  - **Determination of Effects**

Ecological Outcomes

Through analysis of alternatives, the Forest Service determined ecological "outcomes" for historical, current, and likely future environmental conditions for each sensitive species. Environmental conditions are defined as the components of the biological and physical environment that can affect the diversity of plants and animal communities and the productive capacity of ecological systems. These can include the abundance and distribution of aquatic and terrestrial habitats, roads and other developments, human uses, and non-native invasive species. As used in this BE, environmental conditions for species are synonymous with species' habitat or ecological conditions.

An outcome for ecological conditions is an index of the capability of the environment to support population abundance and distribution. It is not an actual prediction of population occurrence, size, density, or other demographic characteristics (Schenck *et al.* 2002). Outcomes range from "A": *broadly distributed and high abundance* to "E": *highly isolated and very low abundance.* See Table 4 below for outcome definitions.

Final

Outcomes were determined under the following parameters:

- Forest Service biologist assigned 100 likelihood points to continuum of five outcomes (A-E), spreading points when necessary to account for uncertainty involved in estimating outcomes (especially historical). (Schenck *et al.* 2002)
- For direct and indirect impacts, outcomes are based on conditions for sensitive species on National Forest lands.
- For cumulative impacts, outcomes are based on conditions in the cumulative effects analysis area for each species, generally the Northern Superior Uplands and Minnesota Drift and Lakes Plains Sections for the Superior and Chippewa National Forests, respectively.
- "Historical" is defined as approximately 1600-1900AD, the same time frame used to develop information on the range of natural variability of ecosystems (see Appendix G of the Final EIS).
- "Current" is generally defined as 2001-2002, though the BE may include some information on species collected in 2003.
- "Future" is defined as Decades 2, 5, and 10 of plan implementation.

Unless otherwise specifically stated, analysis focuses principally on those risk factors (activities or conditions known or reasonably suspected to have direct, indirect, or cumulative effects) to each species as a result of Forest Service management. Information on other risk factors that are beyond the control of the Forest Service, such as climate change, was collected and considered, but those factors are generally not analyzed.

Evaluation of environmental conditions, outcomes, and habitat quality is based on knowledge of species' distribution and life history. For example, some species occur naturally in a localized or patchy distribution, and thus, never would occur in the conditions described as Outcome A, B or C: their natural condition may be D or E. Comparison of historical and current outcomes provides a reference or context with which to evaluate the impacts of the alternatives.

The summary of direct/indirect effects and estimated historical, current, and projected future ecological outcomes for all each sensitive animal is presented in Table 1 in the Executive Summary above. Cumulative effects outcomes are found under each species' evaluation in the **Environmental Consequences** Section of this BE.

Table 4. Definitions of Outcome Statements

	Direct and Indirect Effects	Cumulative Effects
Outcome	**Based on Conditions on National Forest Lands**	**Based on Conditions on All Ownerships in Cumulative Effects Area**
A	Suitable ecological conditions are broadly distributed and of high abundance across the historical range of the species within the planning area. The combination of distribution and abundance of ecological conditions provides opportunity for continuous or nearly continuous intraspecific interactions for the species.	The combination of environmental and population conditions provides opportunity for the species to be broadly distributed and of high abundance across its historical range within the cumulative effects analysis area. There is potential for continuous or nearly continuous intraspecific interactions at high population size.

Final

Table 4. Definitions of Outcome Statements		
	Direct and Indirect Effects	**Cumulative Effects**
Outcome	**Based on Conditions on National Forest Lands**	**Based on Conditions on All Ownerships in Cumulative Effects Area**
B	Suitable ecological conditions are either broadly distributed or of high abundance across the historical range of the species within the planning area, but there are gaps where suitable ecological conditions are absent or only present in low abundance. However, the disjunct areas of suitable ecological conditions are typically large enough and close enough to permit dispersal among subpopulations and potentially to allow the species to interact as a metapopulation across its historical range within the planning area.	The combination of environmental and population conditions provide opportunity for the species to be broadly distributed and/or of high abundance across its historical range within the cumulative effects analysis area, but there are gaps where populations are potentially absent or present only in low density as a result of environmental or population conditions. However, the disjunct areas of higher potential population density are typically large enough and close enough to other subpopulations to permit dispersal among subpopulations and potentially to allow the species to interact as a metapopulation across its historical range within the cumulative effects analysis area.
C	Suitable ecological conditions are distributed frequently as patches and/or exist at low abundance. Gaps where suitable ecological conditions are either absent, or present in low abundance, are large enough that some subpopulations are isolated, limiting opportunity for species interactions. There is opportunity for subpopulations in most of the species range to interact as a metapopulation, but some subpopulations are so disjunct or of such low density that they are essentially isolated from other populations. For species for which this is not the historical condition, reduction in overall species range from historical within the planning area may have resulted from this isolation.	The combination of environmental and population conditions restrict the potential distribution of the species, which is characterized by patchiness and/or areas of low abundance. Gaps where the likelihood of population occurrence is low or zero are large enough that some subpopulations are isolated, limiting opportunity for species interactions. There is opportunity for subpopulations in most of the species range to interact as a metapopulation, but some subpopulations are so disjunct or of such low density that they are essentially isolated from other populations. For species for which this is not the historical condition within the planning area, reduction in overall species range from historical condition may have resulted from this isolation.

Final

Table 4. Definitions of Outcome Statements

	Direct and Indirect Effects	**Cumulative Effects**
Outcome	**Based on Conditions on National Forest Lands**	**Based on Conditions on All Ownerships in Cumulative Effects Area**
D	Suitable ecological conditions are frequently isolated and/or exist at very low abundance. While some of the subpopulations associated with these ecological conditions may be self-sustaining, there is limited opportunity for population interactions among many of the suitable environmental patches. For species for which this is not the historical condition within the planning area, reduction in overall species range from historical condition within the planning area may have resulted from this isolation.	The combination of environmental and population conditions restrict the potential distribution of the species, which is characterized by areas with high potential for population isolation and/or very low potential abundance. While some of these subpopulations may be self-sustaining, gaps where the likelihood of population occurrence is low or zero are large enough that there is limited opportunity for interactions among them. For species for which this is not the historical condition within the planning area, reduction in overall species range from historical has likely resulted from this isolation.
E	Suitable ecological conditions are highly isolated and exist at very low abundance, with little or no possibility of population interactions among suitable environmental patches, resulting in strong potential for extirpations within many of the patches, and little likelihood of re-colonization of such patches. There has likely been a reduction in overall species range from historical within the planning area, except for some rare, local endemics that may have persisted in this condition since the historical period.	The combination of environmental and population conditions restricts the potential distribution of the species, which is characterized by high levels of isolation and very low potential abundance. Gaps where the likelihood of population occurrence is low or zero are large enough there is little or no possibility of interactions, strong potential for extirpations, and little likelihood of recolonization. There has likely been a reduction in overall species range from historical within the planning area, except for some rare, local endemics that may have persisted in this condition since the historical period.

Final

Determination of Effect

The *determination of effect* specifically provides the judgment of the Forest Service on which condition listed in Table 5 below would be most likely from the impacts of the alternatives.

Table 5. Determination of Effects Definitions

Condition	Definition
1	No impacts
2	Beneficial effects
3	May impact individuals but is not likely to cause a trend to federal listing or loss of viability. (*This condition is also used when it is determined the proposed alternative may cause some adverse impacts, even if overall effects may be beneficial.)*
4a	High risk of loss of viability in the planning area, but not likely to cause a trend toward federal listing.
4b	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 during the next 20 years (plan implementation period and reasonably foreseeable future). Determinations are expressed as “likelihood” or “risk” because of the uncertainty inherent in evaluating future scenarios and because, for many sensitive species, environmental conditions or habitat requirements are often not well understood.

Indicators

Species were evaluated using a wide variety of quantitative and qualitative indicators and information. Analysis indicators were selected to evaluate the key factors affecting species long-term viability and display differences among the alternatives due to planned Forest Service management.

For species associated with forested habitats, Management Indicator Habitats (MIH) 1-13, where applicable, were key indicators used to analyze impacts on National Forest lands. MIHs are forest vegetation type- and age-based indicators that are combinations of forest type, age, and forest spatial patterns. Analysis of MIHs 1-13 was conducted using GIS covers, forest stand data, and Dualplan harvest model by alternatives for existing condition and decades 2, 5, and 10 for National Forest lands. The range of natural variability (RNV) of MIHs 1-13 was used to estimate historical conditions of MIHs for comparison to existing and future conditions. Refer to these additional sources for more information or data on MIHs:

- BE Appendix A: table with the definitions of each MIH 1-13.
- Final EIS Appendix B: further descriptions of MIHs, description of how range of natural variability was developed and analyzed for MIHs (pp. B-23, 30, 31); description of Dualplan (pp. B2-21).
- Final EIS Appendix D: data on acres of MIHs 1-10 at forest-wide scale.
- Final EIS Appendix G: information on range of natural variability
- Final EIS Chapter 3-2.2 Forest Spatial Patterns: additional data on MIHs 11-13 at forest-

Final

wide scale.

- Planning Record: additional data results for MIHs at individual Landscape Ecosystem scale and by five age groupings.

For species associated with aquatic habitats, non-forest habitats, micro-habitats, or other habitats that are difficult to measure at forest-wide scale, the amount and distribution of habitat was not modeled because its change could not be detected readily over the time frame of the analysis as the result of Forest Service actions. However, indicators that are closely related to threats faced by species were chosen to evaluate the effects of alternatives. These are highlighted for each species in the Environmental Consequences Section of this BE and commonly include predicted ecological conditions that are related to Forest Service management:

- Indicators of watershed management: Chapter 3.6 of Final EIS
- Road system projected management: Appendix F of Final EIS
- Recreational motorized and non-motorized trails projected management: Chapter 3.8.3 of Final EIS.
- Water access management: Chapter 3.8.4 of Final EIS.
- Qualitative indicators that would likely affect processes or conditions important to species viability.

Final

ENVIRONMENTAL CONSEQUENCES

Direct, indirect, and cumulative effects for all the species are discussed below. Information used to evaluate species includes the literature cited in species' evaluations below and also information collected for Forest Plan revision listed under **Existing Condition – Species Evaluated and Environmental Baseline: Animals** Section above. Evaluations include standard tables for each species for the following assessments (tables variously numbered):

Ecological Outcome rankings: See Table 4 (**Analysis** Section above) for definitions

- **Table:** Outcome rankings for each species on National Forest lands, representing estimated historical, current and projected outcomes at 20 years, 50 years, and 100 years in the future.
- **Table:** Outcome rankings for each species in the cumulative effects area, representing estimated historical, current and projected outcomes at 20 years, 50 years, and 100 years in the future.

Determination of effects:

- **Table:** Determinations of effect for species at 20 years in the future.

Mammals

Heather vole (*Phenocomys ungava*) (Formerly *intermedius*)

Regional Forester Sensitive Species: Superior

Historical Outcome -

Superior: C

The Superior is at the very southern edge of the species historical range that includes the forested regions of Canada and the western U.S. Mountains. Suitable ecological conditions likely had patchy distribution. It is known from a wide variety of vegetation conditions. Its habitat was likely perpetuated by disturbance such as fire.

Current Outcome -

Superior: D

The amount of habitat has changed slightly from historical conditions. Fire suppression has likely had the biggest negative impact to habitat conditions from historical conditions. This is

Final

reflected in the large decrease in the amount of jack pine from historical conditions on both forests. Timber harvest potentially perpetuates habitat for this species, however an increase of aspen and a decrease of jack pine from historical conditions has likely reduced the amount of suitable habitat for the species. Population trends are unknown.

General Effects

Disturbance that replaces shrubs with grass can lead to intra-specific composition with Meadow voles. Vegetative succession that closes the canopy and flood that encourages grass can make habitat unsuitable for the species. The species is vulnerable to predation.

Direct/Indirect Effects

Effects Common to All Alternatives
Standards and guidelines would protect this species from timber harvest and other management impacts, though little is known about this species distribution on either forest in order to predict this species presence at the project level. Burning and harvest may improve habitat conditions. Disturbance in upland pine potentially could benefit this species.

Effects by Alternative
Amounts of jack pine forest type (refer to Table FEIS-5 MIH 8 in Appendix D of Final EIS) increase in the first 2 decades in all alternatives except Alternative A. Habitat amounts combined with disturbance levels would move most quickly toward historical levels in Alternatives B, D, and F. Amounts of disturbance would be greatest in Alternative A and C, however actual habitat conditions for this species may be inferior to other alternatives without disturbances that produce the correct site level conditions.

Alternatives D, B, and F (in that order) have the highest level of prescribed fire for meeting ecological objectives in both decades 1 and 2 (see Final EIS Chapter 3.5.2b of the EIS for the full analysis of this Indicator). A high level of prescribed fire for meeting ecological objectives may be beneficial in maintaining or increasing suitable habitat types for heather vole on the Superior. Conversely, Alternatives C and A have the lowest level of prescribed fire for meeting ecological objectives.

Heather Vole Table 1: Historical, current, and future outcomes for the heather vole in 2, 5, and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	D	**E**	**E**	**E**	**C**	**C**	**C**	D	D	D	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Final

Cumulative Effects

Historical Outcome – Outcome C
Habitat conditions in the cumulative effects area was likely similar to that of Superior historically, though nothing is reported of its habitat or population range wide.

Current Outcome - Outcome D
Distribution is probably similar to what it was historically, however habitat conditions are more patchily distributed.

Effects Common to All Alternatives
Disturbance would likely occur across the cumulative effects area that may negatively and positively affect this species. Trends by alternative for the cumulative effects area are likely similar to that of the Superior, largely because the Superior has the potential to affect forest conditions on a large percentage of the cumulative effects area.

Heather Vole Table 2: Cumulative Historical, current, and future outcomes for the heather vole in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	D	**E**	**E**	**E**	**C**	**C**	**C**	D	D	D	**C**	**C**	**C**	D	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Determination of Effects

All alternatives 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.

Heather Vole Table 3: Determination of effects for the Heather vole.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Northern bog lemming (*Synaptomys borealis*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - C

There is one known population of northern bog lemming on the Chippewa (Jannett 2001). Suitable bog and black spruce/tamarack forest habitat for this species was probably historically of low abundance and patchily distributed (outcome C), especially considering that the Forest is at the extreme southern edge of the species' range, and that even in the center of its range in central Canada, the distribution of the species is apparently spotty (NatureServe 2003). Substantial uncertainty is involved in making this judgment, since little is known of the ecology of this species (NatureServe 2003).

Current Outcome - D

Since historical times, timber harvest, drainage, and road building have impacted suitable lowland conifer and bog habitat (Bradof 1992, Frelich 1998, Heinselman 1996) and reduced the amount and distribution of suitable ecological conditions for northern bog lemming. Road construction, drainage, and timber harvest have altered the hydrology of some forested wetland stands, resulting in a shift in dominance from trees to other species such as alder or cattails, thus reducing the acreage of this forest type and creating unsuitable habitat for this species.

Direct/Indirect Effects

Effects Common to All Alternatives
For all alternatives, the acres of unproductive lowland conifer and bog would not change, nor would the total acres of lowland black spruce/tamarack forest type. However, Alternatives A and C in the first two decades would have the greatest impacts to suitable habitat for this species because these two alternatives would have the greatest amount of timber harvest occurring (based on the acres of seedling/open age class in lowland black spruce/tamarack – refer to Table FAC-30 Chapter 3.2-34 of Final EIS) and the greatest amount of OML 1 and temporary roads constructed (refer to Table F-3 through F-7 of Appendix F of Final EIS). Lowland road construction could affect the hydrology of northern bog lemming's wetland habitat, and timber harvest could have direct impacts on individuals; consequently, Alternatives A and C would have lower outcomes in decade two than the remaining alternatives. All the alternatives for decades 5 and 10 would have increasing amounts of older forests, alternatives A and C would have OML 1 and temporary road construction levels similar to the other alternatives (except for alternative D which would have the least amount of road construction), and alternatives A and C would have lowland black spruce/tamarack timber harvest levels similar to the other alternatives (except for alternative D which would have no timber harvest). Therefore, all alternatives would have outcome D for decades 5 and 10. Factors such as climate change could affect the distribution of suitable habitat for northern bog lemming, but that is beyond the control Forest Service management.

Final

Northern Bog Lemming Table 1: Historical, current, and future outcomes for northern bog lemming in 2, 5 and 10 decades from present on National Forest lands.

Forest Decade	Historical	Current	Alt. A 2	Alt. A 5	Alt. A 10	Alt. B 2	Alt. B 5	Alt. B 10	Alt. C 2	Alt. C 5	Alt. C 10	Alt. D 2	Alt. D 5	Alt. D 10	Modified Alt. E 2	Modified Alt. E 5	Modified Alt. E 10	Alt. F 2	Alt. F 5	Alt. F 10	Alt. G 2	Alt. G 5	Alt. G 10
Chippewa	C	D	**<u>E</u>**	D	D	D	D	D	**<u>E</u>**	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Cumulative Effects

There are two additional populations of northern bog lemming known from the cumulative effects analysis area. Suitable ecological conditions for northern bog lemming in the cumulative effects analysis area historically would parallel those in the direct/indirect effects analysis area, so the historical outcomes would not differ between the two analysis areas. Suitable ecological conditions in the cumulative effects analysis area would currently be highly isolated and of very low abundance (outcome E), due to past actions such as timber harvest, road building, wetland drainage, peat harvest, and the fact that the cumulative effects analysis area extends farther to the south beyond the known range of the species. Future actions similar to those that occurred in the past could have moderate cumulative effects on northern bog lemming, and these effects would not be expected to differ by alternative. For all alternatives, the cumulative impacts to habitat would result in outcome E.

Northern Bog Lemming Table 2: Cumulative historical, current, and future outcomes for the Northern Bog Lemming in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	E	E	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	E	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**	**<u>D</u>**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Determination of Effects

It is expected that the distribution and abundance of suitable habitat under all alternatives would be sufficient for the continued persistence of northern bog lemming on the Chippewa. All the alternatives may impact individuals but are not likely to cause a trend to federal listing or loss of viability.

Final

Northern Bog Lemming Table 3: Determination of effects for the Northern Bog Lemming.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Birds

Trumpeter Swan (*Cygnus buccinator*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - D

Prior to the early 1800's, trumpeter swan was widespread, but an uncommon breeder, in the prairie and parkland regions of southern and western Minnesota. As new settlers moved west, the species declined, due to over-hunting (Minnesota Department of Natural Resources 1995). The last breeding record for a wild population dates back to about 1885 (Coffin and Pfannmuller 1988), and the species was considered extirpated in 1984. The species was reestablished from a captive flock in Hennepin County, Minnesota, in 1969. Some of the individuals were allowed to free-fly, and migrants of this flock have moved out of the area, successfully nesting as far north as the Chippewa National Forest (Coffin and Pfannmuller 1988). Historical presence within the Forest is unknown, but it is likely that Trumpeter swans were more abundant in the non-forested areas. In Wisconsin, the species may have nested in all but the northeastern forested regions (Wisconsin Department of Natural Resources 2003). Breeding habitat included a wide variety of freshwater marshes, ponds, lakes and occasionally, rivers.

Current Outcome - D

The primary habitat for this species includes ponds or bays of wetlands with extensive aquatic vegetation and with at least 300 feet of open water. Muskrat or beaver lodges are frequently used for nesting platforms (Coffin and Pfannmuller 1988). It appears that swans may prefer organic, less acidic substrates. Such sites are generally more productive, *i.e*., richer in food and nutrients. Ponds within the Chippewa National Forest are generally mesotrophic to oligotrophic, and may not have the preferred or adequate forage for trumpeter swans.

Trumpeter swans have large territories, and are intolerant of crowding and human disturbance. The Minnesota population is slowly growing, due to efforts by the Minnesota Department of Natural Resources and its partners to reestablish the species. There are now at least 900 trumpeter swans (more than 75 nesting pairs) living year round in Minnesota (Minnesota Department of Natural Resources 2003).

Within the planning area of the Chippewa National Forest, one pair has been observed. The species is currently classified as Threatened by the Minnesota Department of Natural Resources. Threats include illegal hunting, human disturbance during breeding season, pollution and loss of winter habitat.

Final

Direct/Indirect Effects

Effects Common to All Alternatives
Threats to the species' restoration include lead poisoning, illegal shooting, power lines, human disturbance, predation of cygnets, and wetland loss (Coffin and Pfannmuller 1988, Minnesota Department of Natural Resources 2003, Wisconsin Department of Natural Resources 2003). Coffin and Pfannmuller (1988) list the lack of adequate wintering habitat as the most critical limiting factor.

Effects by Alternative
All Alternatives would result in Outcome D for this species. Trumpeter swan distribution on the Chippewa National Forest is very limited, and forest management activities would have little, if any affect on the species. Major threats to the species are not regulated by the Forest Service and are outside the scope of this Forest Plan revision. Objectives to protect known nest sites or breeding territories and limit human disturbance would be implemented under all Alternatives.

Trumpeter Swan Table 1: Historical, current, and future outcomes for the trumpeter swan in 2, 5, and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Cumulative Effects

Trumpeter swan is especially sensitive to human disturbance. Shoreline development and water-based recreation pose greater threats to this species than Forest management. Clear, weedy wetland habitats are abundant on the Forest, but are generally nutrient-poor and may not be preferred habitat. Land ownership on the Chippewa National Forest is very fragmented. Continued high levels of private development on all ownerships may result in further disturbance to the species.

Trumpeter swan Table 2: Cumulative Historical, current, and future outcomes for the trumpeter swan in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Final

Determination of Effects

The presence of only one known location for trumpeter swan on the Forest makes this species highly vulnerable to human activity and habitat degradation. Nest and breeding territory protection would take place under all Alternatives. Forest management activities may impact individuals or their habitat, but they are not likely to cause a trend toward federal listing.

Trumpeter Swan Table 3: Determination of effects for the trumpeter swan.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

^JIM'S LATEST VERSION OF GOSHAWK NEEDS TO BE INCORP _ FORMATTING? This one below predates the final

Northern goshawk

(*Accipiter gentiles*)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome: **Chippewa: A**
Superior: A
Current Outcome: **Chippewa: D**
Superior: C

The northern goshawk appears to be uncommon in Minnesota and there are concerns about its population status throughout the Lake States. The Minnesota Natural Heritage Program (2002) lists 49 rare element occurrences for northern goshawk in Minnesota. Smithers *et al.* (2002) discussed 42 sites in Minnesota, but some known sites are missing from their discussion. Their monitoring of 39 sites in 2002 indicated that 17 of the sites were occupied, and 10 of those fledged young. This is consistent with previous nest search and monitoring efforts in Minnesota since the early 1990s that indicate a range of 10-20 known active nest sites in any given year. Due to variable knowledge or protection, nest sites have been lost on federal, state, county, and private ownerships in northern Minnesota due to forest management since the early 1990s.

The northern goshawk in the eastern United States may have been negatively affected by deforestation and heavy and widespread timber harvest in previous centuries, peaking around 1900 (Kennedy, 1997). It is speculated that these populations have since increased and continue to increase as forests in the eastern U.S. increase in acreage and maturity (Speiser and Bosakowski 1984 IN Squires and Reynolds 1997). Annual fall migration counts of northern goshawks in recent years at Hawk Ridge near Duluth, MN have shown a decline over that of previous decades. Various data sources and analyses provide variable conclusions on the status and trends of goshawk habitat and populations in the Lake States. Kennedy (1997) concluded that a more rigorous approach was needed than has been undertaken previously to determine this species population trend, whether it is stable, increasing, or decreasing.

The northern goshawk is considered a habitat generalist at range-wide scales. However, there is general commonality in nest site selection, foraging habitat, and prey selection. Habitat preferences for northern goshawk are considered to be mature deciduous or mixed deciduous/coniferous forest in fairly contiguous blocks intermixed with younger forest and openings for production of prey species. Like other members of the genus *Accipiter*, the goshawk's morphological characteristics for maneuverability in flight (short rounded wings and long tail) are considered adaptations for foraging beneath the forest canopy, and they suggest that this is an important part of this species' biology (Nature Conservancy Species Status Sheet, USDA FS 2000b, planning record). Goshawks eat mainly rabbits, hares, squirrels, ducks, gallinaceous and other birds; local diet partly depends on availability. Snags, downed logs, openings, large trees, shrubby understory, and interspersion of vegetation structural stages (grasses to old forests) are critical habitat for prey species used by the goshawk. Nest sites are usually in stands with large trees and well-developed canopies (Nature Conservancy Species Status Sheet, USDA FS 2000b, planning record). Several nest stands may be associated with a single pair of birds. Goshawks may use the same nest in successive years. Disturbance to the nesting pair may result in nest failure and abandonment.

Final

The effect of recent rates of harvest on forest spatial patterns is covered in detail in Ch. 3.2.2 Forest Spatial Patterns. Wolter and White (2002), Host and White (2002), and Host and White 2003 outline recent and historical changes to spatial patterns forest land in northern Minnesota that show a trend that has and may continue to impact the goshawk. These changes include a reduction in forest patch size, decreased interior forest, and increased forest edge. Rates of removal and growth from Forest Inventory and Analysis data (Leatherberry and Spencer 1996, Miles et al. 1995, Schmidt 1997) help to evaluate current conditions and predict habitat availability for the northern goshawk. Rates of removal on the Chippewa and Superior have been above the state-wide and Lakes States regional averages based on the 1990 FIA summary, exceeded only by private industrial forestland within Minnesota. This helps to place into context recent rates of disturbance of mature forest on National Forests in Minnesota, and thus, to goshawk habitat.

Harvest levels indicated by FIA data may be shifting to other ownership grouping based on an analysis of age and spatial pattern shifts from 1990 to 1995. Wolter and White (2002) identified a trend to increased impacts on state lands and on private non-industrial forest land that could influence other ownerships' ability to provide habitat in appropriate sized patches and distribution across the landscape.

Chapter 3.2.1. Forest Vegetation and the related appendix and planning record information covers in detail historical rates of disturbance and the resulting tree age and composition on the landscapes that include Minnesota's National Forests. Expressed as a range of conditions, this helps to define the ecological conditions in which the northern goshawk evolved.

Environmental Consequences

For management and analysis purposes, there are three components to goshawk habitat.

1) Nesting habitat is used for courtship and breeding, nesting, provisioning of young until fledged, and security for the female while nesting. It consists of the forest immediately around the nest tree or trees. This habitat is typically, older, closed canopy forest with few to no openings, in aspen, northern hardwood or pine forest types.

2) Post-fledging habitat is used for provisioning the young after fledging until dispersal occurs, security for the fledged young, foraging for the adult female during nesting, and territory defense. Post-fledging habitat typically surrounds the nesting habitat. It usually has similar characteristics to the nesting habitat, but may be partly lowland forest types.

3) Foraging habitat consists of the goshawks nesting home range. It is used for foraging by the male during nesting to feed himself and his mate, and after hatching, the young. Goshawks hunt in a variety of forest types, but tend to select foraging habitat that is a higher density of trees, higher canopy closure (Beier and Drennan 1997, Doyle and Smith 1994, Bright-Smith and Mannan 1994) and trees of larger diameter at breast height (Austin 1993, Hargis *et al.*1994) than may be randomly present. Foraging habitat in Minnesota has been defined by radio telemetry data as mature forest stands with a moderately closed to closed canopy on upland landforms (Boal *et al.* 2001). Goshawks were not found to hunt in lowland forest types. Foraging habitat is determined by the availability of prey, canopy cover for protection, and availability of sub-canopy perch sites to facilitate hunting. Prey availability is a factor of prey abundance and ability

Final

of goshawks to hunt and capture the prey. Stand complexity is important in meeting both of these factors. A mixed species forest with abundant defective, and dead trees, down logs and woody debris, some edge, dense stem densities and dense shrubs provides both abundant prey and goshawk hunting opportunities.

Telemetry data in Minnesota suggest that home ranges for goshawk pairs average approximately 15,948 acres in size (Boal *et al.* 2001). Home range in this context is synonymous with foraging habitat. The appropriate scale for analysis of alternatives for goshawk habitat is at the home range, or foraging habitat scale. As described above, foraging habitat is a combination of mature forest, stand complexity, early seral and young forest, and open habitats. The relative abundance of these elements, and how they are spatially arranged on the landscape are integral to defining the quality and quantity of goshawk habitat.

Effects Common to All Alternatives

Standards are established to manage for goshawk nesting and post-fledgling habitat conditions. Management of these habitat components would be the same between alternatives.

Direct and Indirect Effects

Goshawk Indicator 1: Mature Forest Availability

The relative abundance of different vegetative growth stages is important to determining the quality and quantity of goshawk foraging habitat. Evaluations of goshawk foraging habitat requirements on the Chippewa National Forest have been conducted by looking at the habitat requirements of key prey species (Casson 1996, Williamson *et. al* 2001). These evaluations concluded that optimum foraging habitat consists of three upland vegetative growth stages having a relative abundance of approximately 20% open habitat and seedling-sapling forest, 20% pole sized forest, and 60% mature and older forest. The mature and older forest growth stage is considered to be the factor most critical to defining foraging habitat. The Chippewa evaluations determined that if mature forest availability drops below 40% of the landscape, goshawk territories become unsustainable and populations would experience declines and uncertain futures. For this analysis we used 80% for both forests as an upper end for mature forest. Mature forest availability for an upper amount may be described in terms of the range of natural variation (RNV) for landscape ecosystems found on each forest. This amount, 80%, reflects an average between the DLP and NSU Sections for all landscape ecosystems for amounts of mature or older forest considering base rates of disturbance to produce young forest under the lower portion of the range of natural variation (RNV). This is a point, if exceeded, where prey availability may decline to a point where goshawk territories become unsustainable and populations may decline. This analysis uses these parameters to measure the quality and quantity of goshawk foraging habitat.

Goshawk Indicator 2: Patch size

Mature forest should be relatively contiguous, but interspersion of open habitat, young forest and edge are important for prey production. The actual spatial arrangement of these habitat elements to provide optimal foraging habitat is difficult to determine, and even more difficult to measure. Although goshawks are known to nest and forage in forest patches smaller than 100 acres, at the landscape scale, such conditions expose goshawks to negative energy balances because they have to travel further to acquire prey, and increased risk of predation as they travel through insecure habitat between patches of suitable foraging habitat. Patch sizes and forest spatial patterns are covered in more detail in Ch. 3.2.2. Forest Spatial Patterns. Therefore, this analysis looks at patch size, and selects 100 acres as the minimum patch size of mature or older forest, that reflects suitable goshawk foraging habitat.

Final

Goshawk Indicator 3: Stand Complexity

Prey availability is a factor of prey abundance and ability of goshawks to hunt and capture the prey. Stand complexity is important in meeting both of these factors. The amounts and variety of management options (such as harvest methods, prescribed fire) used to achieve vegetative objectives and the condition of the forest that result from achieving objectives help indicate the effectiveness of alternatives to maintain well distributed habitat. This indicator examines the amounts and variety of proposed harvest treatments methods, the amounts of prescribed fire, and the acres not harvested to predict general effects of planning alternatives to within-stand complexity and native plant communities. These effects would influence prey abundance and suitability of forest for foraging habitat. This indicator will help to qualify forest condition that would result from the planning alternatives. This analysis is covered in detail in Ch.3.2.1. under Indicator 3: Use of Management Treatments Which Increase Within-stand Complexity. Results and conclusions of that analysis are summarized below.

Northern Goshawk Table 1: Indicator 1 - Percentage of All Upland Forest in Mature/Older Upland Forest within the Chippewa and Superior National Forests for existing condition and decades 1, 2, 5, and 10 for each alternative.

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa 2002 Existing	49%	49%	49%	49%		49%	49%
2004 Existing					48%		
Decade 1	35%	47%	30%	46%	43%	46%	45%
2	31%	52%	28%	51%	45%	51%	47%
5	27%	78%	31%	79%	55%	75%	65%
10	28%	77%	36%	88%	58%	72%	64%
Superior 2002 Existing	56%	56%	56%	56%		56%	56%
2004 Existing					55%		
Decade 1	42%	52%	37%	51%	48%	50%	49%
2	38%	55%	32%	53%	46%	49%	47%
5	38%	72%	32%	76%	51%	60%	55%
10	37%	74%	38%	85%	58%	62%	58%
Superior 2002 Existing	51%	51%	51%	51%		51%	51%
2004 Existing					51%		
w/BWCAW Decade 1	45%	51%	42%	50%	47%	50%	49%
2	43%	53%	39%	52%	46%	49%	48%
5	49%	69%	47%	71%	48%	62%	60%
10	52%	74%	53%	80%	53%	67%	64%

Source: Based on existing data and harvest model output for decades 1, 2, 5, 10 for Federal ownership only. Superior in BWCAW, acres of mature/older upland from MIH report 1.
Definitions: A patch is defined as a contiguous grouping of similar vegetative conditions.
‡Notes: Chippewa NF: Total upland acres: 455,880 ac, Total federal ownership: 666,471 ac, Superior NF: Total upland acres: 1,666,569 (outside the wilderness 960,270 ac. 706,299 ac. within the wilderness) Total federal ownership: 2,171,660 acres.

Final

Northern Goshawk Table 2: Indicator 2 - Area and Number of 100 acre or Larger Mature/Older Upland Forest Patches within the Chippewa National Forest for existing condition and decades 1, 2, 5, and 10 for each alternative.

	Alt. A No Action	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Acres of Large Patches	Ac	Ac	Ac	Ac	Ac	Ac	Ac
2002 Existing	149,100	149,100	149,100	149,100		149,100	149,100
2004 Existing					141,400		
Decade 1	92,600	140,200	84,600	133,300	126700	136,800	129,200
2	86,100	166,000	87,500	158,200	139700	159,000	143,300
5	73,900	289,200	99,000	288,500	175500	268,500	216,700
10	79,200	285,700	112,700	337,900	197600	257,500	215,800
Numbers of Large Patches	#	#	#	#	#	#	#
2002 Existing	416	416	416	416		416	416
2004 Existing					405		
Decade 1	280	386	211	331	345	373	367
2	262	420	210	417	376	399	395
5	178	503	201	535	452	504	485
10	176	517	225	500	463	481	480

Source: Patch analysis based on existing data and harvest model output for decades 1,2,5,10 for Federal ownership only.
Definitions: A patch is defined as a contiguous grouping of similar vegetative conditions. Mature or older forest is based on forest type groupings for the mature, old growth, and old growth/multi-aged habitat groupings.
‡Notes: Chippewa NF: Total upland acres: 455,880 ac, Total federal ownership: 666,471 ac.

Northern Goshawk Table 3: Historical, current, and future outcomes for Northern Goshawk in 2, 5, and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	A	D	**E**	**E**	**E**	**C**	**A**	**A**	**E**	**E**	**E**	**C**	**A**	**B**	D	**C**	**C**	**C**	**B**	**A**	D	**B**	**B**
Superior	A	C	**D**	**D**	**D**	C	**A**	**A**	**D**	**D**	**D**	C	**A**	**A**	**D**	C	C	C	C	C	C	C	C

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Chippewa

Goshawk Indicator 1: Mature Forest Availability

Using 40% and 80% mature and older upland forest as the boundaries of a sustainable goshawk population, with 60% considered optimal, the existing condition on the Chippewa (Table Gos1) provides a suitable relative abundance of upland forest vegetative growth stages.

Alternatives A and C do not provide suitable amounts of mature and older forest in any decade analyzed, and would provide conditions that are high risk for maintaining viability within the forest for northern goshawks for the next century.

Modified Alternative E provides marginally suitable amounts through decade 2, but provides

Final

improved amounts in future decades.

Alternative D provides suitable amounts of old forest through decade 2 and 5, but becomes marginally suitable in decade 10 with an over abundance of older forest and not enough prey production vegetative stages on the National Forest alone.

Alternatives B, F, and G provide sustainable goshawk habitat throughout the analysis period. On the National Forest alone, Alternative B maintains amounts of mature forest near the upper limit identified.

All of the alternatives predict a decrease in this indicator during the first decade of implementation of the Forest Plan. Alternatives B, F, D, G, and Mod. E, in this order, provide the smallest drop from existing condition while remaining above the 40% minimum for habitat suitability forest-wide. Management direction in alternatives (G WL-8) would allow some goshawk foraging areas to drop below 40% mature forest and would result in higher risk to maintaining that breeding pair, and increased risk to maintaining viability within the planning unit. Spatial management of harvests and other management disturbances could potentially distribute these disturbances on the landscape to maintain foraging areas at or above the 40% minimum. Management standards and guides (S WL-4, G WL-9) would mitigate impacts closest to nest sites with regard to mature or older forest. Rates of disturbance in Alternatives B, F, and D would likely not adversely impact goshawk nest sites and make this management direction unnecessary.

Final

Northern Goshawk Table 4. Indicator 2 - Area and Number of 100 acre of Larger Mature/Older Upland Forest Patches within the Superior National Forest for existing condition and decades 1, 2, 5, and 10 for each alternative.

	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Mod. Alt. E**	**Alt. F**	**Alt. G**
Ac. Patches	Ac	Ac	Ac	Ac	Ac	Ac	Ac
Indicator 2002 Exist	411,000	411,000	411,000	411,000		411,000	411,000
Indicator 2004 Exist					399,700		
Forest-wide Exist	999,200	999,200	999,200	999,200	987900	999,200	999,200
Indicator Dec. 1	286,000	374,900	242,500	360,200	346,700	354,500	338,800
Forest-wide 1	874,200	963,100	830,700	948,400	934,900	942,700	927,000
Indicator Dec. 2	253,500	404,700	204,700	388,500	336,300	349,700	333,900
Forest-wide 2	841,700	992,900	792,900	976,700	924,500	937,900	922,100
Indicator Dec. 5	234,200	587,300	209,900	615,700	363,800	455,800	413,700
Forest-wide 5	822,400	1,175,500	798,100	1,203,900	952,000	1,044,000	1,001,900
Indicator Dec.10	244,300	612,600	254,500	724,700	439,600	480,700	427,800
Forest-wide 10	832,500	1,200,800	842,700	1,312,900	1,027,800	1,068,900	1,016,000
Numbers of Patches	#	#	#	#	#	#	#
Indicator 2002 Exist	922	922	922	922		922	922
Indicator 2004 Exist					911		
Forest-wide Exist	1,268	1,268	1,268	1,268	1,257	1,268	1,268
Indicator Dec. 1	727	854	653	867	834	850	835
Forest-wide 1	1,073	1,200	999	1,213	1,180	1,196	1,181
Indicator Dec. 2	654	861	589	875	818	836	807
Forest-wide 2	1,000	1,207	935	1,221	1,164	1,182	1,153
Indicator Dec. 5	690	911	613	962	879	929	839
Forest-wide 5	1,036	1,257	959	1,308	1,225	1,275	1,185
Indicator Dec.10	575	824	625	918	856	848	784
Forest-wide 10	921	1,170	971	1,264	1,202	1,194	1,130

Source: Patch analysis based on existing data and harvest model output for decades 1,2,5,10 for Federal ownership only. Indicator total is for the area outside the wilderness; Forest-wide totals include contribution of BWCAW.
Definitions: A patch is defined as a contiguous grouping of similar vegetative conditions. Mature or older forest is based on forest type groupings for the mature, old growth, and old growth/multi-aged habitat groupings.
‡Notes: Forest-wide total include wilderness and area outside the wilderness. Superior NF: Total upland acres: 1,666,569 (outside the wilderness 960,270 ac. 706,299 ac. within the wilderness)
Total federal ownership: 2,171,660 acres

Final

Northern Goshawk Table 5: Indicator 2 - Percentage of All Upland Forest within 100 acre of Larger Mature/Older Upland Forest Patches within the Chippewa and Superior National Forests for existing condition and decades 1, 2, 5, and 10 for each alternative.

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
	Ac (#)	Ac (#)	Ac (#)	Ac (#)	Ac (#)	Ac (#)	Ac (#)
Chippewa 2002 Existing	33%	33%	33%	33%		33%	33%
2004 Existing					31%		
Decade 1	20%	31%	19%	29%	28%	30%	28%
2	19%	36%	19%	35%	31%	35%	31%
5	16%	63%	22%	63%	38%	59%	48%
10	17%	63%	25%	74%	43%	56%	47%
Superior 2002 Existing	60%	60%	60%	60%		60%	60%
2004 Existing					59%		
Decade 1	52%	58%	50%	57%	56%	57%	56%
2	51%	60%	48%	59%	55%	56%	55%
5	49%	71%	48%	72%	57%	63%	60%
10	50%	72%	51%	79%	61%	64%	61%

Source: Patch analysis based on existing data and harvest model output for decades 1,2,5,10 for Federal ownership only. Superior includes 588199 acres existing in BWCAW 100 acre or larger mature upland patches.
Definitions: A patch is defined as a contiguous grouping of similar vegetative conditions.
‡Notes: Chippewa NF: Total upland acres: 455,880 ac, Total federal ownership: 666,471 ac, Superior NF: Total upland acres: 1,666,569 (outside the wilderness 960,270 ac. 706,299 ac. within the wilderness) Total federal ownership: 2,171,660 acres.

Goshawk Indicator 2: Patch size

Looking at the amount of this older upland forest in patches suitable for goshawks provides a clearer picture of the condition of goshawk habitat by alternative. For instance, while 48% of upland forest is currently in mature or older forest, only 31% is within 100 acres or larger patches (Tables Gos1 and Gos4, based on 2004 existing condition). The 17% of mature upland forest found in patches less than 100 acres may not be configured on the landscape to provide adequate security or connectivity for foraging goshawks. All alternatives for the first and second decades provide less than 40% of mature upland forest in 100 acre or larger patches. Only by the fifth decade in Alternatives B, D, F, and G or the tenth decade in Modified Alternative E does the amount of mature upland forest in 100 acre or larger patches exceed 40% (Table Gos4).

All alternatives predict a drop in this indicator in the first decade of plan. Alternatives B, F, D, and G or Modified E, in this order, show the smallest drops while maintaining at least the minimum amount of mature forest (40% in Goshawk Indicator 1). Alternative A and C show the greatest drops in this indicator and also do not maintain adequate amounts of mature or older forest (Goshawk Indicator 1). Management Objectives for Forest Vegetation Spatial Patterns have the potential to increase mature forest in large patches and interior forest conditions. However, achieving spatial management objectives while achieving age and composition objectives may be very difficult in alternatives with higher rates of harvest disturbance such as Alternative A and C. Spatial modeling for Modified E indicates that objectives to maintain or increase 300 acre or large mature/older upland patches and mature or older interior forest can be met during the implementation period for the Chippewa Forest Plan. Meeting multiple objectives of forest composition, age, and spatial patterns at the project level will take a concerted effort with multi-scale planning.

Final

Alternative B, D, and F recoup first decade declines in this indicator to exceed existing conditions for this indicator by the end of the second decade (Table Gos4). While spatial modeling was not conducted for these alternatives, the forest is most likely to achieve the Forest Vegetation Spatial Pattern Objectives in these alternatives and could effectively avoid first decade drops in this indicator. As a result, habitat patterns for the goshawk are better in these alternatives than others by the end of the second decade.

Superior

Goshawk Indicator 1: Mature Forest Availability

In terms of the relative abundance of mature and older upland forest on the Superior, the Forest is presently providing a suitable amount of this vegetative growth stage for northern goshawks (Table Gos1). The BWCAW will continue to provide a large amount of this habitat that is highly connected. The distribution of this habitat within the planning area (the entire national forest) remains at issue with regard to the goshawk. Well-distributed habitat is necessary to have individuals and breeding pairs well distributed within the planning area. Therefore, habitat is examined for the forest as a whole and the area outside the wilderness.

Alternatives A and C do not provide suitable amounts of mature and older forest by the end of the second decade, outside of the BWCAW. Alternative C shows a steeper rate of decline for this indicator, with decade 1 amounts below suitable levels. Considering the BWCAW, conditions are marginally suitable for goshawks, but habitat distribution is compromised and maintaining viable populations would be unlikely outside of the wilderness.

Alternatives B and D would provide suitable amounts of mature and older upland forest throughout all decades, except that Alternative D would exceed suitable amounts by decade 10. An over abundance of older forest would suppress prey production and may increase the risk to maintaining viable populations of goshawks when the National Forest is considered alone.

Alternatives Modified E, F, and G would both provide suitable goshawk habitat throughout the analysis period, both outside the BWCAW and including the BWCAW. Conditions approach optimal conditions for goshawks for much of the analysis period in Alternatives F and in decade 10 for Alternatives Modified E and G.

All of the alternatives predict a decrease from existing condition in this indicator during the first and second decades of the plan outside the wilderness. Alternatives B, D, F, G, and Modified E, in this order, provide the smallest drop from existing condition while remaining above the 40% minimum for habitat suitability forest-wide. Considering the BWCAW, only alternatives B and D would exceed existing levels of this indicator by the end of the second decade. All others would decrease from existing conditions.

Management direction to maintain goshawk foraging to at least 40% mature forest in a breeding territory is not included in the Forest Plan. This would result in higher risk to maintaining breeding pairs, and increased risk to maintaining viability within the planning unit. Spatial management of harvests and other management disturbances could potentially distribute these disturbances on the landscape to maintain foraging areas at or above the 40% minimum. Management standards and guides (S WL-4, G WL-9) would mitigate impacts closest to nest sites with regard to mature or older forest.

Goshawk Indicator 2: Patch size

Looking at the amounts of mature and older upland forest in patches suitable for goshawks gives

Final

a clearer perspective of goshawk habitat conditions by alternative (Tables Gos3 and Gos4). Table Gos4 reflects the Superior Forest within the proclamation boundary, including the BWCAW. While existing habitat conditions are different on the Superior, trends between the alternatives are relatively parallel between the Chippewa and Superior, except that Modified E has more large patches than Alternative G.

All alternatives predict a drop in this indicator in the first decade. Alternatives D, B, F, and G, in this order, eventually meet or exceed existing amounts of this indicator by decade 5.

Alternative A and C show the greatest drops in this indicator. Alternative C also would not maintain adequate amounts of mature or older forest (Goshawk Indicator 1) by the end of the second decade, either outside of the wilderness or the forest as a whole.

Management Objectives for Forest Vegetation Spatial Patterns have the potential to increase mature forest in large patches and interior forest conditions. However, achieving spatial management objectives while achieving age and composition objectives may be very difficult in alternatives with higher rates of harvest disturbance such as Alternative A, C, and Mod. E.

Only Alternative B would recoup first decade declines in this indicator to meet existing conditions for this indicator by the end of the second decade (Table Gos4). The forest is most likely to achieve the Forest Vegetation Spatial Pattern Objectives in Alternatives B and D. The forest could effectively avoid first decade drops in this indicator in these alternatives. As a result, habitat patterns for the goshawk are better in these alternatives than others by the end of the second decade.

Chippewa and Superior

Goshawk Indicator 3: Stand Complexity

Of the alternatives analyzed, Alternatives A and C alternatives propose to harvest on a relatively high amount of acres. The availability and proposed amounts of regeneration harvest cutting methods provides the least flexibility in terms of management practices for improving stand level compositional and structural components for both Forests. These alternatives would also provide the lowest potential to maintain habitat characteristics for the northern goshawk.

Overall, the regeneration harvest methods and prescribed fire uses in Alternative B provide both Forests with the ability to increase within-stand complexity and restore native plant communities through active management treatments. Of the alternatives analyzed, this alternative proposes to harvest on a relatively low amount of acres. The availability and proposed amounts of harvest cutting methods provides the best mix of management practices for improving stand level compositional and structural components for both Forests. This alternative has the greatest potential to maintain or increase habitat characteristics for the northern goshawk in managed forest stands.

Alternative D proposes to actively treat a relatively low amount of acres. The availability and proposed amounts of regeneration harvest cutting methods provides a limited mix of management practices for improving stand level compositional and structural components for both Forests.

Modified Alternative E proposes to harvest on a relatively moderate amount of acres. The availability and proposed amounts of regeneration harvest cutting methods provides limited flexibility for using management practices to improve stand level compositional and structural components for both Forests. This is especially true on the Superior, where clear-cutting is to be

Final

used for 75% of the regeneration harvests. Among alternatives that maintain adequate mature forest (Goshawk indicator 1), this alternative has the lowest potential to maintain habitat characteristics for the northern goshawk in managed forest stands.

Alternative F proposes to harvest on a relatively low to moderate amount of acres. The availability and proposed amounts of regeneration harvest cutting methods provides one of the best mixes of tools for improving stand level compositional and structural components on the Chippewa. This alternative on the Chippewa would improve habitat characteristics for the goshawk in managed forest stands. The predominant use of clearcutting as a regeneration method on the Superior limits the ability of that Forest to improve within-stand structural complexity through timber harvest. This alternative has a low potential for maintaining habitat characteristics for the northern goshawk in managed forest stands.

Alternative G proposes to harvest on a relatively moderate amount of acres. The availability and proposed amounts of regeneration harvest cutting methods provides one of the best mixes of management practices available for improving stand level compositional and structural components for the Chippewa. This alternative on the Chippewa would improve habitat characteristics for the goshawk in managed forest stands. On the Superior, the regeneration harvest methods proposed in this alternative reduce its ability to increase within-stand complexity through timber harvest; however, the availability of prescribed fire for ecological purposes provides some ability to increase stand complexity and restore native plant communities. On the Superior this alternative would have a higher potential to maintain or improve habitat characteristics for the goshawk than Alternatives Modified E or F, but less than Alternative B.

Cumulative Effects

The cumulative effects to the northern goshawk are conducted within the forest proclamation boundary and the relevant ecological Section. The lands within the proclamation boundary of each forest reflect the immediate role and context of each forest. Ecological Sections are the Northern Minnesota Drift and Lake Plains (DLP) Section for the Chippewa, and the Northern Superior Uplands (NSU) Section for the Superior. The ecological Section is an appropriate scale for characterizing and considering conditions to sustain populations of northern goshawks that occurred on landscape ecosystems operating within the range of natural variability (RNV). This scale provides important insights for evaluating the effectiveness of coarse filter strategies to ensure long-term viability of this species. Cumulative effects to Forest Vegetation (Final EIS Ch. 3.2.1.d.) and to Forest Spatial Patterns (Final EIS Ch. 3.2.2.d.) are useful in examining broader landscape patterns.

Each of the proposed alternatives to revising the Forest Plans for the Chippewa and Superior National Forests implements differing coarse filter strategies that produce varying habitat patterns and qualities over time.

For purposes of this analysis, the effect of National Forest-wide vegetation management strategies (alternatives) on goshawk habitat are compared to the existing conditions and trends on all forested lands within the appropriate ecological Section. The information can be used to evaluate how individual alternatives for National Forest lands contribute to the overall conditions across the ecological Section.

Final

Northern Goshawk Table 6: Cumulative Historical, current, and future outcomes for Northern Goshawk in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	A	D	**E**	**E**	**E**	**C**	**B**	**B**	**E**	**E**	**E**	**C**	**B**	**B**	**E**	**C**	**C**	**C**	**B**	**B**	D	**C**	**C**
Superior	A	C	**D**	**D**	**D**	C	**A**	**A**	**D**	**D**	**D**	C	**A**	**A**	**D**	C	C	C	C	C	C	C	C

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Chippewa

Rates of timber removal in the decade ending in 1990 (Miles et al. 1995) place the Chippewa among the most highly managed land ownership classes in Minnesota. Based on harvest rates, this status likely continued through 1995. Currently, amounts of young forest greatly exceed amounts predicted under RNV (Ch. 3.2.1.). Harvest rates have declined in recent years on the Chippewa and harvests may be shifting to other ownerships. Recent trends in forest spatial patterns and harvest intensity (Wolter and White 2002, Host and White 2003) indicate that state and private non-industrial ownerships may have forest conditions that provide less foraging habitat and likely fewer patches of suitable habitat as forestland continues to be fragmented across the NSU and DLP Sections. These past occurrences and current trends, combined with Alternative management strategies, helps to place into context the foreseeable effects to the northern goshawk.

Alternative A and C

These alternatives continue recent trends in changes to mature forest cover, forest spatial patterns, and stand complexity. Relatively high rates of disturbance, fragmentation of mature forest patches, and reliance on clear-cutting, combined with similar or greater trends on other ownerships within the forest and in the DLP Section would create habitat conditions that would be a very high risk to maintaining viable populations of the northern goshawk during the first and second decades of the forest plan.

Alternatives B, D and, F

These alternatives make the greatest short-term and long-term changes in indicators for the northern goshawk. These alternatives work towards Section-wide goals for landscape condition in the DLP to a greater degree than other alternatives. These conditions would benefit the northern goshawk. These alternatives would compensate for cumulative adverse effects on other ownerships within the proclamation boundary of the forest. For Alternative D, decade 10, amounts of mature forest higher than are thought to be sustainable for goshawks may be important refugia in a matrix of highly managed forest and where there is increased fragmentation due to mixed ownerships. In this context, this condition would be sustainable. Within the DLP Section, the habitat provided by these alternatives on the forest would be significant to the viability of goshawk in the Section.

Alternative G

This alternative makes significant long-term increases in habitat indicators for the northern goshawk. Projected drops in indicators for this species during the first 2 decades of the plan coupled with trends within the DLP Section indicate that there is an increased risk for this species' viability Section-wide than currently exists. Within the context of the proclamation boundary, management direction during the first 2 decades of the plan would maintain at least minimal conditions for most breeding pairs. Management direction along with management area allocations in this alternative would compensate for interspersed ownership patterns within the proclamation boundary.

Final

Modified Alternative E

This alternative makes long-term increases in habitat indicators for the northern goshawk, but these increases are realized at a relatively low rate. Projected drops in indicators for this species coupled with trends within the DLP Section indicate that there is increased risk for this species' viability Section-wide than currently exists. Within the context of the proclamation boundary, management direction during the first 2 decades of the plan would maintain at least minimal conditions for most breeding pairs. During the first 2 decades of the plan, management direction along with relatively few management area allocations in this alternative would allow for a limited amount of compensation for interspersed ownership patterns within the proclamation boundary. The indicators show that federal lands within the Chippewa, and to the Section as a whole, would contribute to a greater degree to goshawk viability in later decades as habitat conditions improve.

Superior

Rates of timber removal in the decade ending in 1990 (Miles et al. 1995) place the Superior above the State-wide average among land ownership classes in Minnesota. With the exception of some landscape ecosystems represented with the BWCAW, current amounts of young forest exceed amounts predicted under RNV (Ch. 3.2.1. of the Final EIS). The limited ability to manage forest within the wilderness for the goshawk (or other species habitat) coupled with LE-wide vegetation age and composition objections may be creating gaps in distribution of habitat. Areas adjacent to the wilderness in Spatial Zone 3 would be harvested and fragmented to a higher degree creating gaps in habitat that increase risk to foraging goshawks. Recent trends in forest spatial patterns and harvest intensity (Wolter and White 2002, Host and White 2003) indicate that state and private non-industrial ownerships may have forest conditions that provide less foraging habitat and likely fewer patches of suitable habitat as forestland continues to be fragmented across the NSU and DLP Sections. These past occurrences and current trends, combined with Alternative management strategies, helps to place into context the foreseeable effects to the northern goshawk.

Alternative A and C

These alternatives continue recent trends in changes to mature forest cover, forest spatial patterns, and stand complexity. Outside of the wilderness relatively high rates of disturbance, fragmentation of mature forest patches, and reliance on clear-cutting, combined with similar or greater trends on other ownerships within the forest and in the NSU Section would create habitat conditions that would be a high risk to maintaining a viable population of northern goshawk during the first 2 decades of the plan. Considering the wilderness, conditions within the Section and within the proclamation boundary improve marginally. However, these alternatives would create gaps between suitable habitat and would likely reduce the distribution of the goshawk on the forest.

Alternatives B, D, F, and G

These alternatives create short-term decreases and long-term increases to habitat conditions for the northern goshawk. The decreases predicted during the first 2 decades of the plan coupled with trends on other ownerships may increase risk to the goshawk outside of the wilderness. Only in Alternatives B and D are decreases recouped to existing conditions forest-wide by the end of the second decade.

These alternatives would work towards Section-wide goals for landscape condition in the NSU to a greater degree than other alternatives. These conditions would benefit the northern goshawk.

These alternatives, coupled with the contributions of the BWCAW, would compensate for cumulative adverse effects on other ownerships within the proclamation boundary of the forest. For Alternative D, decade 10 outside of the BWCAW, amounts of mature forest higher than are thought to be sustainable for goshawks may be important refugia in a matrix of highly managed forest and where there is increased fragmentation due to mixed ownerships and management. In this context, this condition would be sustainable for the goshawk. Within the NSU Section, the habitat provided by these alternatives on the forest would be significant to the viability of goshawk in the Section.

Modified Alternative E

Rates of forest disturbance outside of the BWCAW reduce habitat indicators below existing condition for all decades. The contribution of the BWCAW does not compensate for this effect during the first 2 decades of the plan. Amounts remain below existing condition. There does appear to be a compensatory effect by the BWCAW in later decades. Projected changes in spatial distribution of habitat coupled with similar or greater trends on other ownerships within the forest and in the NSU Section would create habitat conditions that would increase risk to maintaining a viable population of goshawk than currently exists. Management direction, predicted amounts of habitat, and other ownerships working towards Section-wide desired conditions within the NSU may reduce this risk.

Determination of Effects

Northern Goshawk Table 7: Determination of effects for Northern Goshawk.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	4a	2	4a	2	3	2	3
Superior	3	2	4a	2	3	2	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

^JIM'S LATEST VERSION OF GOSHAWK NEEDS TO BE INCORP _ FORMATTING?

Red-shouldered hawk (*Buteo lineatus*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome: Chippewa: B
Current Outcome: Chippewa: D

The red-shouldered hawk is a species of extensive, contiguous blocks of mature and older deciduous forest with interspersed small to medium sized open marshes and wet meadows where it forages for prey (USDA FS 2002b, planning record; Nature Conservancy Species Status Sheet). These conditions are typically found in bottomland hardwood forests but are also found in more upland habitats, particularly in northern Minnesota. Nesting habitat is characterized as having a

Final

taller than average closed canopy of large trees with well developed crowns. Nest sites are correlated with large tree diameter, lower levels of saplings and understory vegetation, large crotches with large diameter supporting branches (older trees), high basal area of larger trees, and a higher canopy height (USDA FS 2002b, planning record; Nature Conservancy Species Status Sheet).

Factors thought to be limiting to red-shouldered hawks include loss of habitat, loss of mature forest conditions, human disturbance, predation, and competition with red-tailed hawks (USDA FS 2002b, planning record; Nature Conservancy Species Status Sheet).

Prior to 1900, the red-shouldered hawk was one of the most common woodland hawks in the United States. Most literature suggests that populations throughout most of the species' range declined drastically as a result of human settlement, logging and agricultural development. Breeding bird survey data indicate a population decline of between 65% and 95% in the Great Lake States between 1950 and 1970 (The Nature Conservancy 1992). The species has been nearly extirpated from southern Michigan with the largest known breeding populations remaining located in the northern parts of the Lower Peninsula. This population was estimated to be 19 pairs by Ebbers (1987). Population estimates for Michigan are around 100 breeding pairs (Hands et. al, 1989). There is speculation that the red-shouldered hawk has expanded its range northward into more forested regions as its more southern habitats have been destroyed (The Nature Conservancy 1992). It is also suspected that these northern populations may not be as productive as their southern counterparts and may actually be population sinks, but there is little data to make conclusions.

The population trends in Minnesota parallel the situation described in Michigan. Much of this species' former habitat in southern and central Minnesota has been destroyed or highly fragmented with greatly reduced population levels. Coffin and Pfannmuller (1988) estimated the State's population at 200 breeding pairs. They discuss the northern range extension but are cautious and suggest that the data may be reflecting increased survey effort and observation reporting. There are presently approximately 429 known or suspected nesting sites in Minnesota (Minn. Natural Heritage Database, 2002). A majority of these sites are located within just a few meta-populations. One of these meta-populations occurs on the Chippewa National Forest (Ottertail Peninsula).

There is relatively little known about red-shouldered hawk populations and breeding habitats in Minnesota (McLeod, 1996). A two-year study located 20 nests on the Chippewa National Forest and described these nests as occurring in closed-canopy mature northern hardwoods (17 nests) or mature aspen (3 nests) with interspersed wetlands (McLeod and Anderson 1996). The study addressed nest site selection within mature hardwood stands, providing some understanding of the characteristics of individual nest trees. However, further analysis of landscape-level characteristics is needed to determine how characteristics such as patch size, degree of fragmentation, and forest composition influence selection of forest stands the birds nest in (McLeod, 1996).

Published research gives a thorough description of red-shouldered hawk breeding habitat and factors associated with habitat loss. The red-shouldered hawk is a species of extensive, contiguous blocks of mature and older deciduous forest with interspersed small to medium sized open marshes and wet meadows where it forages for prey (Bednarz and Dinsmore 1981, 1982). These conditions are typically found in bottomland hardwood forests but are also found in more

Final

upland habitats. Nesting habitat is characterized as having a taller than average closed canopy of large trees with well developed crowns. Nest sites are correlated with large tree diameter, lower levels of saplings and understory vegetation, large crotches with large diameter supporting branches (older trees), high basal area of larger trees, and a higher canopy height (Dijak *et. al.* 1990, Morris and Lemon 1983, Hands *et al*.1989). These are all old growth characteristics.

Although home range data for the red-shouldered hawk is sparse and is based mostly on the study of a few individuals or pairs, published studies recommend managing the species in home ranges estimated to be in the 500 to 800 acre range, depending on geographic location of the study and habitat quality. Robbins et al. (1989) suggested a minimum of 555 acres, Hands et al. (1989) 775 acres, and Bednarz and Dinsmore (1981, 1982) 482 acres (but they recommended a breeding home range with a 1 km. radius from the nest, or between 600 and 650 acres).

Bryant (1986) and Bednarz and Dinsmore (1982) investigated the specific mechanisms of habitat loss. Red-tailed hawk competition appears to be the primary process making habitat unsuitable for red-shouldered hawks. Red-tailed hawks are adapted to open habitats with scattered trees or smaller woodlots. Habitat fragmentation is well documented as a cause of increasing red-tailed hawk populations in forested environments. Bednarz and Dinsmore's work (1982) concluded that red-tailed hawks prefer smaller trees for nesting, less canopy cover and more exposure or openness in the nest area. Hands et al. (1989) concluded that a greater number of openings, and larger openings in forest habitats tend to increase red-tailed hawk competition. Bryant (1986) looked closer at forest structure where red-tailed hawks had replaced breeding red-shouldered hawks and found that areas supporting red-tailed hawks had fewer large trees and smaller tree crowns. This was typically the result of selective logging of nesting sites and often the cause of red-shouldered nesting territory loss. He concluded that red-shouldered hawks are replaced by red-tailed hawks when large tree crown closure drops below 70% and recommended no selective logging of red-shouldered hawk nesting territories. He also noted that red-tailed hawks were unable to replace red-shouldered hawks in mature forests with dense crowns. Morris and Lemon (1983) concluded that any reduction in mature tree density or in canopy height, or a trend towards more early successional species such as aspen or paper birch, resulted in loss of red-shouldered hawk nesting territories. Bosakowski and Smith (1989) concluded that to manage for red-shouldered hawks, forests need to be allowed to develop a mature canopy in large tracts. Closed canopy forest appears to be an important habitat component. Compatible timber management has yet to be demonstrated (The Nature Conservancy 1992).

The consensus of the research conducted on this species is that habitat loss through forest habitat fragmentation and loss of mature forest conditions and a resulting increase in red-tailed hawk competition and nest predation is the cause of the drastic declines in this species. In addition, all evidence strongly suggests that this species is very sensitive to timber management activities within its reproductive home range.

Although red-shouldered hawks can be found nesting in patches of old aspen and mixed aspen/hardwood forest on the Chippewa, northern hardwood forest is considered to be their primary habitat. Nesting sites in old aspen and mixed aspen hardwood forest tend to be isolated and scattered on the landscape, and are considered to be occupation of fringe habitat. There are 37 known nesting territories on the Chippewa National Forest. Red-shouldered hawks are not known to occur on the Superior National Forest. Therefore, this analysis concerns only the Chippewa National Forest.

Final

Environmental Consequences

Effects Common to All Alternatives

Standards and guides in the plan would protect red-shouldered hawk nest sites and maintain habitat conditions around nest sites in an area of 600 acres. Forest spatial patterns objectives would work towards increasing habitat for this species at the coarse filter landscape level. Standards and guides for forest spatial patterns would help to limit the impact of forest management to current habitat in large patches.

Direct and Indirect Effects

For analysis purposes, red-shouldered hawk habitat is defined as mature and older northern hardwood forest in patches at least 300 acres in size. Although most literature indicates that home ranges exceed 300 acres in size, red-shouldered hawks are known to nest in patches smaller than their home range size, particularly when adjacent to other relatively large forest patches. This analysis looks at northern hardwood patches greater than 300 acres in size, as well as patches greater than 500 acres in size, considered the optimum for supporting a nesting pair. Standards and guidelines have been established to manage and protect red-shouldered hawk nesting sites. These measures are the same between all alternatives.

Analysis has not been done to examine the amount of management occurring within hardwood stands that may serve as habitat. Rates of intermediate harvests in northern hardwood stands would affect habitat suitability, possibly making stands too open for use by this species. Because stand age does not change with intermediate harvests and because most of the canopy remains, a stand may still contribute to a large mature forest patch in theory. Fragmentation of suitable habitat may occur by a reduction of canopy closure or tree bole density (both as a result of intermediate harvests), even while a forest patch may apparently still be present on the landscape.

Red-shouldered Hawk Table 1: Historical, current, and future outcomes for Red-shouldered Hawk in 2, 5, and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	D	D	**C**	**C**	**B**	**B**	**B**	D	**C**	**C**	**B**	**B**	**B**	D	**C**	**B**	**B**	**B**	**B**	**C**	**B**	**B**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Final

Red-shouldered Hawk Table 2: Mature and older northern hardwood patches greater than 300 and greater than 500 acres per alternative by decade, Chippewa National Forest.

Dec.	Patch Size		Existing Condition	ALT A	ALT B	ALT C	ALT D	MOD. ALT E	ALT F	ALT G
2	>300 Acres	No. Patches	25	26	30	27	30	27	31	28
		Ac. in Patches	12,069	16,335	18,331	16,694	17,750	16,664	19,177	17,039
	>500 Acres	No. Patches	6	12	14	12	12	11	15	16
		Ac in Patches	5,313	11,262	12,777	11,520	11,265	10,600	13,593	11,265
5	>300 Acres	No. Patches		19	39	26	35	31	39	29
		Ac. in Patches		17,320	27,461	20,526	24,145	21,463	29,131	21,092
	>500 Acres	No. Patches		7	15	11	14	11	18	13
		Ac. in Patches		12,240	18,721	15,304	16,409	13,575	21,603	15,223
10	>300 Acres	No. Patches		21	57	29	63	39	62	39
		Ac in Patches		20,362	45,274	26,027	47,908	28,674	51,923	33,666
	>500 Acres	No. Patches		9	24	12	29	14	29	21
		Ac in Patches		16,010	32,604	19,925	34,375	19,177	39,194	26,593

Red-shouldered Hawk Table 2 above shows that in decade 2, all of the alternatives result in more mature and older northern hardwood patches, and acres of such for both >300 acre and >500 acre patches. Under all alternatives, decade 2 would result in improved habitat conditions for red-shouldered hawks on the Chippewa National Forest.

In decade 5, the same trend holds as in decade 2 with the exception of Alternative A, which would result in fewer mature and older northern hardwood patches between 300 and 500 acres in size. However, these patches would be larger on the average, than the existing condition since the acreage making up these patches would increase by over 5,000 acres.

Decade 10 has a similar outcome to decade 5.

Since mature and older northern hardwood patches greater than 500 acres in size represents closer to optimum habitat for red-shouldered hawks, this data indicates that habitat conditions for red-shouldered hawks on the Chippewa would improve under all of the alternatives. In addition, patches between 300 and 500 acres would increase in size and with the exception of Alternative A, would increase in numbers. All of this suggests that the Chippewa would experience improved habitat conditions for this species regardless of alternative.

Cumulative Effects

The Chippewa is the largest landowner in the Landscape Ecosystem (LE) that contains the majority of habitat for this species. The Chippewa owns 30% of the Mesic Northern Hardwood LE within the Drift and Lake Plains Section. Additionally, other northern hardwood habitat occurs at the stand level, multi-stand level, or native plant community level through the forest due to the natural heterogeneity of the landscape. The current condition of Mesic Northern Hardwood LE within the Chippewa is that it contains a comparatively high percentage of acres within large mature upland patches (20%) compared to percentage of the Chippewa land base within the LE (12%). Several of the largest patches on the Chippewa are found in this LE and are predominantly northern hardwood forest. According to the habitat patch analysis conducted for this species, conditions for the red-shouldered hawk are likely to improve under all of the evaluated alternatives on the Chippewa. Cumulatively, the interspersion of private non-industrial

Final

forest owners in the Section is likely to maintain the downward trend of habitat quality with increased fragmentation and an emphasis on early successional tree species (Wolter and White 2002). The Chippewa would likely be the primary core of habitat for this species in the DLP.

This LE contains highly productive soils and can support even-aged aspen forest for commercial purposes. It is unclear if trends in northern hardwood types would be the same as other forest types. Intermediate harvests in northern hardwoods could render otherwise suitable habitat unsuitable by disturbance and change of stand structure, effectively fragmenting habitat from within.

Red-shouldered Hawk Table 3: Cumulative Historical, current, and future outcomes for Red-shouldered Hawk in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	D	D	D	**C**	**B**	**B**	**B**	D	D	**C**	**B**	**B**	**B**	D	**C**	**C**	**B**	**B**	**B**	D	**C**	**B**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Determination of Effects

Red-shouldered Hawk Table 4: Determination of effects for Red-shouldered Hawk.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	3	2	3	2	3	2	2

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Peregrine falcon (*Falco peregrinus*)

Regional Forester Sensitive Species: Superior

Historical Outcome - D

Historically, peregrine falcon occurred across North America and bred on all continents except Antarctica (NatureServe 2003). In Minnesota, this species historically was represented by 30 to 40 breeding pairs, which occurred along the Mississippi River, St. Croix River, North Shore of Lake Superior ("perhaps half a dozen pairs", Coffin and Pfannmuller 1988), and BWCAW ("a few pairs", Coffin and Pfannmuller 1988). The species was extirpated from the state in the early 1960's by DDT poisoning. For peregrine falcon, nesting habitat is considered the limiting factor for the species (USDA FS 2002b, planning record). Cliff and ledge habitat on the Superior was historically frequently isolated and of very low abundance.

Current Outcome - E

Successful peregrine falcon reintroduction began in Minnesota in 1982 (Coffin and Pfannmuller 1988), and it was removed from the endangered species list in 1999. Currently two nesting sites can be found on the Forest on North Shore cliffs. The population of peregrine falcons in the state seems to be slowly increasing. However, it is still at lower levels than prior to its extirpation, and therefore has a lower outcome than historically

Direct/Indirect Effects

Effects Common to All Alternatives

For all alternatives there are few management-related threats to the rocky cliffs that peregrine falcons use for nesting, and sensitive species objectives, standards, and guidelines would prevent any management-related impacts from occurring. Foraging habitat typically consists of open areas (for example, over open water) where the peregrine falcon engages in high-speed aerial pursuit of its largely avian prey (Coffin and Pfannmuller 1988); such habitat would probably exist at levels similar to historical levels, as would prey availability. In the short term, outcomes for peregrine would remain similar to current outcomes, but for all alternatives by decade 10, the outcomes for peregrine falcon would increase because the species would probably have recovered to pre-extirpation levels on the Superior.

Peregrine Falcon Table 1: Historical, current, and future outcomes for peregrine falcon in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	D	E	E	E	**D**	E	E	**D**	E	E	**D**	E	E	**D**	E	E	**D**	E	E	**D**	E	E	**D**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Final

Cumulative Effects

There are several additional nesting records from the North Shore and a couple from mine pits on the Iron Range known from the last ten years within the cumulative effects analysis area. Suitable ecological conditions for peregrine falcon in the cumulative effects analysis area historically would parallel those in the direct/indirect effects analysis area, so the historical outcomes would not differ between the two analysis areas. Suitable ecological conditions in the cumulative effects analysis area would currently be highly isolated and of very low abundance (outcome E), due to the historical extirpation of the species from the state. Cumulative impacts to nesting habitat within the cumulative effects analysis area are expected to be minor. Mineral development and recreational use of cliffs for rock climbing could occur, but such use would be very localized and would probably only impact a minor amount of habitat. Other threats that are beyond the control of the Forest Service are those that peregrines might encounter during their migration or on their wintering grounds. For all alternatives, the cumulative impacts to habitat would result in outcome E in the short term and outcome D in the long term.

Peregrine Falcon Table 2: Cumulative Historical, current, and future outcomes for the Peregrine Falcon in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	D	E	E	E	**D**	E	E	**D**	E	E	**D**	E	E	**D**	E	E	**D**	E	E	**D**	E	E	**D**

Determination of Effects

It is expected that the distribution and abundance of suitable habitat under all alternatives would be sufficient for the continued persistence of peregrine falcon on the Superior. It is likely that all of the alternatives would have no impact on peregrine falcon.

Peregrine Falcon Table 3: Determination of effects for the Peregrine Falcon.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Superior	1	1	1	1	1	1	1

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Sharp-tailed grouse (*Tympanuchus phasianellus*)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome - Chippewa - C
Superior -C

Historically the population followed large fires in shifting among newly created large openings (Outcome C). However, in the context of the range of natural variability, the disturbances in northern Minnesota resulting from wide-spread logging, burning, and land clearing for agriculture that created habitat conditions that equate to Outcome C are well beyond the expected range of variability.

Current Outcome - Chippewa - E
Superior - E

Fire suppression, forest succession following turn-of-the-century disturbances, and farm abandonment has resulted in population reductions and likely elimination of some populations. This species is not currently found on the Chippewa (USDA FS 2002b, planning record) (Outcome E), but it does occur within the DLP ecological Sections used for cumulative effects analysis (Outcome D). On the Superior, sharp-tailed grouse are very rare with reports of individuals, though no leks, on National Forest land near the northwest border of the Virginia Unit of the proclamation boundary (Stevel Lerol, pers. communication). Sharp-tailed grouse and associated leks are found elsewhere in the NSU ecological Section (USDA FS 2002b, planning record). Range-wide the population has decreased from historical levels. It is believed that no source population exists within the planning areas, and suitable habitat is limited (USDA FS 2002b, planning record). Changes in numbers may reflect both a longer-term decline resulting from changes in habitat quality and periodic declines associated with population cycles. Today much of the remaining habitat occurs in wetter areas, where less change to habitat characteristics has occurred.

General Effects

Human activity including hunting and disturbance at leks, vegetative succession, fire suppression, road construction or other development within habitat patches, excessive grazing, ditching of peatland, and increased predation at leks and nest sites are the major factor effecting this species.

Direct/Indirect Effects

Effects Common to All Alternatives
Because of the apparent lack of a source population within planning areas coupled with the scarcity and isolation of ecological conditions suitable for this species, it is doubtful that the Sharp-tailed grouse can maintain viability under any alternative. The species is apparently not currently viable in either planning area. Standards and guidelines would avoid and minimize impacts to this species if it occurs anywhere on either forest and its habitat, and forest management and prescribed burning may have a positive impact to the species habitat.

Final

Effects by Alternative
All alternatives except Alternative A have the potential to create large temporary openings through harvests. These temporary openings could be as large as 1000 acres and would mimic disturbances consistent with the natural range of variability. Harvest size in Alternative A would generally be limited to 40 acres. Total amounts of temporary openings would be greatest in Alternative A, C, and Modified E where harvest levels are the greatest among all alternatives (Refer to MIH 1 Tables in Appendix D of Final EIS.)

Alternatives D, B, and F (in that order) have the highest level of prescribed fire for meeting ecological objectives (including maintaining open habitat conditions) in both decades 1 and 2 (see Final EIS Section 3.5.2b of the for the full analysis of this Indicator). A high level of prescribed fire for meeting ecological objectives may be beneficial in maintaining suitable habitat types for sharp-tailed grouse on the Chippewa and Superior. Conversely, Alternatives C and A have the lowest level of prescribed fire for meeting ecological objectives.

Sharp-tailed Grouse Table 1: Historical, current, and future outcomes for the sharp-tailed grouse in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Superior	C	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E

Cumulative Effects

Because this species does occur within the cumulative effects areas for both forests, current condition is likely Outcome D with patchy habitat and disjunct populations. Because this species generally does not occur on federal land, it is unlikely that management of federal lands would affect this species.

Sharp-tailed Grouse Table 2: Cumulative Historical, current, and future outcomes for the sharp-tailed grouse in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Superior	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

It is likely that all alternatives would have no impact on the sharp-tailed grouse. This is because neither Forest appears to have a source population and it is likely that the species is not currently viable. Additionally, management objectives, standards, and guidelines for all alternatives would

Final

protect, maintain, or improve habitat in lek areas if they are found.

The current amount and distribution of suitable habitat does not change much as a result of any of the alternatives. Habitat could be improved substantially under some alternatives, but without a source population actual viability would not be achieved. Based on the current and projected amounts and distribution of suitable habitat of the alternatives, if the species occurred it is likely all alternatives may impact individuals, but would not likely to cause a trend to federal listing or a loss of viability. .

Sharp-tailed Grouse Table 3: Determination of effects for the Sharp-tailed grouse.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	1	1	1	1	1	1	1
Superior	1	1	1	1	1	1	1
Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4 - Likely to result in a trend towards federal listing or a loss of viability.							

Spruce grouse (*Falcipennis canadensis*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - B

In Minnesota spruce grouse were found regularly as far south as Mille Lacs Lake (about 50 miles south of the Chippewa National Forest) and Wadena and Carlton Counties and were regularly found in both Minnesota National Forest areas (USDA FS 2002b, planning record).

The Chippewa was on the southern edge of the spruce grouse's range (outcome B). Catastrophic fires in conifer-dominated forests created and maintained habitat across the landscape. Large patch size of habitat allowed for metapopulation interaction. Climate determined short-needled conifer distribution, and hence, spruce grouse distribution. Spruce grouse were nearly extirpated during the 1920s when many conifer forests were logged and burned and the regenerating and replacing forests were dominated by aspen and birch. Maturing post-logging forests with an increasing conifer component created habitat and the spruce grouse began to recover (Jaakko Poyry 1992). Presettlement acreage of jack pine forest is estimated at 1,903,000 acres or 7.0 percent of the forest area in Minnesota and presettlement acreage of swamp conifer is estimated at 6,668,000 acres or 24.6 percent of forest in Minnesota (Jaakko Poyry 1992).

Current Outcome - E

The current outcome in the planning area is E because of the extremely low population, habitat fragmentation, range contraction, reduction of the conifer component of the forest, and loss of fire disturbance. The amount of habitat in the state has declined since presettlement times, listed above. State-wide estimates of jack pine and swamp conifer in 1992 were 578,000 acres or 3.7 percent and 2,846,000 acres or 18.1 percent, respectively (Jaakko Poyry 1992). Reduction of fire across the landscape, habitat changes, and fragmentation of habitat have all contributed to a reduction of suitable habitat.

The spruce grouse is a permanent resident of the north-eastern and north-central portions of the state. They are best represented in the northern halves of Cook, Lake, St. Louis, Koochiching, and Lake of the Woods counties (USDA FS 2002b, planning record). Very few, if any spruce grouse are located in the Chippewa National Forest boundaries, and distribution on the Forest is unknown (USDA FS 2002b, planning record). This indicates a range contraction has occurred in the Chippewa planning area.

Globally the spruce grouse is demonstrably secure (G5), declining only in segments on the southern fringe of its range (NatureServe 2002) including northern Minnesota. There is a large global population, extensive range of which a large portion is unlikely to ever be destroyed. It is critically imperiled (S1) in Wisconsin, imperiled (S2) in Michigan, and not ranked in Minnesota (NatureServe 2002). The spruce grouse is considered secure, widespread, and abundant in most of Canada, including Ontario and Manitoba (Canadian Endangered Species Conservation Council 2000).

Spruce grouse habitat is northern coniferous forests of various species compositions, but almost always including short-needled trees. Habitat includes boreal forest and wet spruce forests in the

Final

far north to jack pine-spruce, jack pine, or spruce-fir forest communities in the southern portions of the range from Minnesota to the east (NatureServe 2002). Short-needled upland conifers and adjacent lowland spruce are used in summer and winter.

Suitable types present on the Chippewa National Forest include spruce-fir, northern hardwood-conifer, conifer swamp, forested bog, jack pine, red pine, mixed pine-hardwood, and white pine-hardwoods (Barrett, personal communication, 2000b in USDA FS 2002c). Red pine plantations are avoided because they offer little food or cover. Though forest species composition varies across the range, the habitat has certain features in common throughout. One regular component of spruce grouse habitat everywhere is inclusion of areas with an understory of low berries, especially *Vaccinium* spp. (blueberries, bilberries, etc.), an important food source.

Another key feature is a forest structure that provides good cover for these ground-nesting birds. This means either live branches from 0-4 meters above ground level, or sufficient tree density to create suitable escape cover. Jack pine forests must be young enough that trees have not begun to self-prune. Generally, they must be less than about 12 m in height. Thus in areas where spruce grouse occupy jack pine forests, the grouse are essentially a successional species. Populations may be highest in earlier stages of post-fire succession. Older pine forests are used only when subdominant spruce are also present. Mature fir stands would also self-prune and become unsuitable. Mature spruce stands are more suitable.

Habitat patch size used ranges from 12 to 16 hectares in Michigan to 155 hectares in Alaska. In Maine spruce grouse have been found to use patches as small as 8 hectares as long as they are relatively near (<1.2 kilometers) another occupied patch. Large blocks of deciduous forest have been found not to be a barrier to dispersal (USDA FS 2002b, planning record). There is a need for research determine optimum patch size, patch distribution, and connectivity parameters needed for viable populations (NatureServe 2002). This information is critical for maintenance and management of the species at the southern edge of its range.

A dominant threat is loss, degradation, and fragmentation of habitat by incompatible forest management practices, including suppression of fire in conifer-dominated habitat. Past timber harvest has reduced the amount of habitat available to the spruce grouse in Minnesota and across the Chippewa National Forest. While spruce grouse are declining in some segments of the southern fringe of their range because of habitat fragmentation, there are still vast areas to the north with stable populations. Logging of conifer forests that are then replaced by deciduous forest reduces and fragments habitat. Spruce grouse would fare poorly in areas of increased timber harvest, short rotations, and natural regeneration of aspen forest types. Of greatest concern is the protection of extensive stands of lowland conifer, which are critical to spruce grouse in winter (Jaakko Poyry 1992).

Hunting pressure is significant because ruffed and spruce grouse hunting are popular activities and the species of grouse taken is often determined only after the bird has been shot. Spruce grouse are not wary of people and do not flush readily, which can make them easy to kill, but their lower population makes them seen less often than ruffed grouse. Spruce grouse are not as popular for eating as ruffed grouse but are consumed. Small populations on Chippewa may be vulnerable to hunting if entire fall flocks of spruce grouse are killed (Gallagher 2003). In Minnesota, local populations have been extirpated, especially in the southern portion of the Minnesota range (USDA FS 2002b, planning record). The number of ruffed and spruce grouse hunters declined between 1989-90 and 2001-02 hunting seasons (Dexter 2002). Hunter success

Final

rates for the period 1990-91 to 2001-02 for both ruffed and spruce grouse have varied (Dexter 2002) with no apparent trend.

The species can be expected to undergo a decline in the future as this area either becomes over-mature for spruce grouse habitat or is subjected to renewed timber harvests sometime in the next 20 years (NatureServe 2002).

Direct/Indirect Effects

Management Indicator Habitat 5, Upland Conifer in the sapling/pole age group and Management Indicator Habitat 9, Mature Lowland Black Spruce /Fir were chosen for analysis because they provide nesting and cover habitat in a large variety of conifer types and short-needled conifers used for food. Upland conifer of all mature age groups was used for RNV comparisons because there is no RNV data for the sapling pole age group of upland conifer.

The objectives are to decrease mature upland conifer-dominated forest (MIH5) and mature lowland black-spruce tamarack forest (MIH9) (Final EIS Chapter 3.3.2.b and Forest Plan) on the Chippewa.

MIH5 Upland conifer

Spruce Grouse Table 1 shows that upland conifer sapling/pole would remain very near or above existing conditions during all decades except for decade 10 of Alternative D when 65 percent of existing acreage is predicted. RNV has not been calculated for sapling/pole upland conifer.

Spruce Grouse Table 1: MIH 5 - Upland conifer acreage in the sapling/pole age group on the Chippewa National Forest.

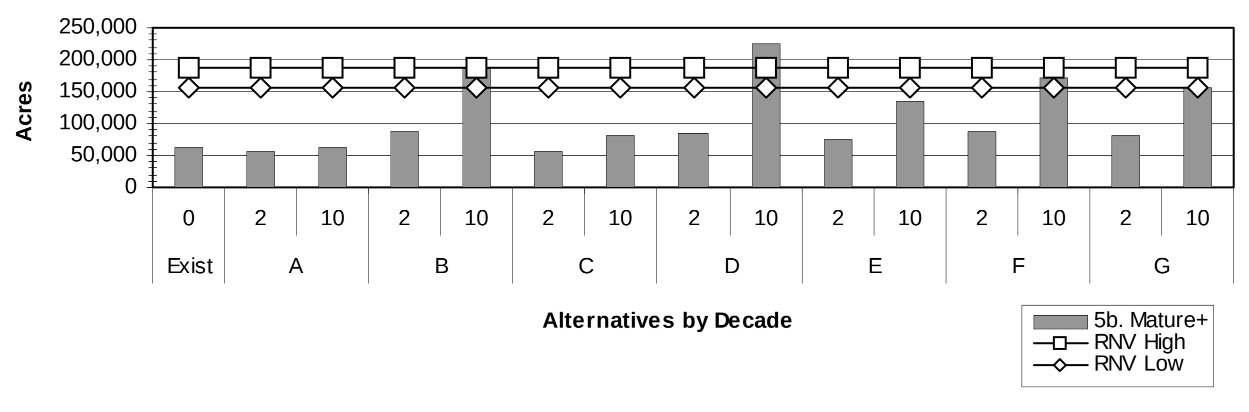
Decade	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Mod Alt. E	Alt. F	Alt. G
2	48,896	53,361	50,906	66,643	59,624	53,652	54,799	56,253
5		70,340	49,132	76,954	62,929	48,061	56,565	61,965
10		59,988	55,062	62,370	31,995	53,993	48,831	55,221

Figure WLD 5b. is the predicted acreage of mature and older upland conifer for all alternatives in decades 2 and 10. The range of RNV for mature/old upland conifer includes the sapling/pole age group. Alternatives B, F and G are within RNV in decades 10 and Alternative D is greater than RNV in decade 10. The other alternatives are well below the RNV in decades 2 and 10, and Modified Alternative E is the highest in this group (Figure WLD 5b and Final EIS Appendix D).

Final

MIH9 Lowland Black Spruce-Tamarack

Figure WLD 5b. Chippewa NF MIH 5b: All Upland Conifer Forest -Mature / Older



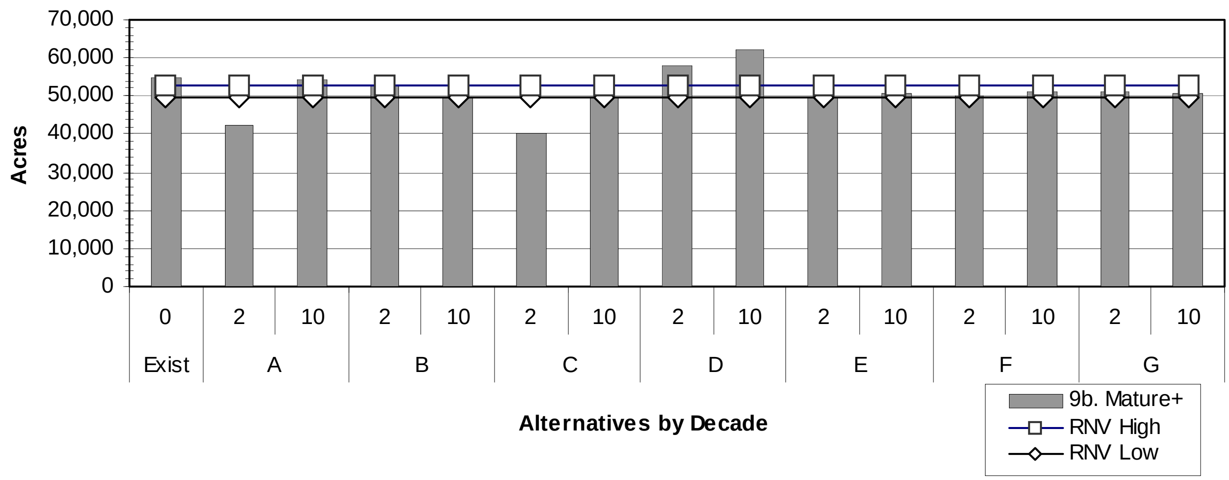
Spruce Grouse Table-2 And Figure WLD 9b show that mature/older lowland black spruce-tamarack forest acreage is predicted to remain at or above existing levels and very close to RNV in all decades and all alternatives with two exceptions. Alternatives A and C would fall below existing levels and below the low range of RNV in decade 2.

Spruce Grouse Table 2: MIH 9 - Mature Lowland Black Spruce/Fir Forest acreage on the Chippewa National Forest.

Decade	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Mod Alt. E	Alt. F	Alt. G
2	54,603	42,110	52,637	40,151	57,877	51,543	50,312	51,276
5		38,237	48,742	40,131	61,413	46,939	46,000	46,588
10		54,270	49,808	49,466	62,195	53,354	51,407	50,517

Final

Figure WLD 9b. Chippewa NF MIH 9b: Lowland B. Spruce / Fir Forest - Mature / Older



Management in lowland conifer is expected to increase by a factor of 2-9 times current levels in 6 of 7 of the alternatives. No lowland black spruce-tamarack forest is scheduled to be harvested in Alternative D. Alternatives A and C propose the largest amount of harvest and vary the amounts considerably among decades. For most of the other alternatives, there would be 3-4 times the amount of 0-9 age class as a result of harvest than currently exists (Table FAC-43). The ranking of these alternatives from most to least harvest it: E (Mod.), F, G, B.

Rates of reforestation are lower in lowlands and may require more time to become fully stocked (Rockis 1996). Model results may underestimate the duration of young lowland forest openings and this may result in edge effects (Chen et al. 1999, Matlack 1993). Nesting cover in lowland spruce-tamarack forest would not regenerate as quickly as in the upland conifer forests.

Opportunities for management ignited fire

Management ignited fires in upland conifers are likely to beneficially affect spruce grouse habitat. Surface fires for ecological objectives, fuel reduction fires, and site preparation fires would all be expected to increase berry producing shrubs that would provide summer food for spruce grouse. Stand replacement fires in jack pine and spruce-fir would provide regenerating stands that would provide habitat after reaching the sapling/pole growth stage.

All Alternatives would treat more acres using surface fires for ecological objectives and for hazardous fuel reduction than are currently treated (Table FIR-2). Alternatives A and C would provide the lowest opportunity for the use of management ignited surface and fuel reduction fires and are expected to cause a decline in ecosystem components dependent on fire. Alternatives B and D would provide the highest and Alternatives E (Mod.), F, and G would provide a moderate amount of opportunity. Alternatives B and D produce the most amounts of jack pine and lowland conifer available for fire treatment because of lower harvest levels of jack pine and lowland conifer.

The use of management ignited fire for site preparation would be lowest in Alternative C and moderate in Alternatives A, B, Mod. E, and G. Alternative F would provide the highest number of opportunities for site preparation fires and Alternative D has no acreage scheduled for this type of management activity.

Stand replacement fires, which are most likely of all types mentioned to benefit spruce grouse, are expected to decrease in all alternatives from current conditions. The following ranks alternatives from highest opportunity to lowest: F, B, G, D, Mod. E, A, C. Alternatives F and B would provide the highest opportunity for management ignited stand replacement fires, Alternatives G, D, and Mod. E, would provide a moderate amount. Only Alternatives A and C, which provide the lowest opportunity for stand replacement fire, would fall below the acreage currently burned by management ignited stand replacement fires.

Habitat Fragmentation
The size and amount of large mature and older forest patches is used here to evaluate habitat as it relates to fragmentation and spatial diversity (Final EIS Spatial Patterns). Short term spatial pattern effects are most pertinent to spruce grouse because of the low population and the lack of understanding of the species' distribution on the Chippewa National Forest. If the population continues to exist in the short term, then long term increases in beneficial patterns would be important to the species continued presence on the Chippewa National Forest.

Alternative B would provide the greatest short term gain and a long term gain in spatial diversity. Alternative D provides the greatest long term gain. Alternatives F and D provide similar increases in short term gain of large mature forest patches. Alternative F, along with B and D, would provide greater spatial diversity than exists today. Alternatives G, Mod. E, A, and C cause a loss of spatial components as compared to existing. Alternative A provides the least favorable conditions for species and ecosystems needing large upland forest patches.

Spruce Grouse Table 3: Historical, current, and future outcomes for Spruce Grouse in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	E	E	E	E	**D**	**D**	**D**	E	E	E	**D**	**D**	**D**	E	E	E	**D**	**D**	**D**	E	E	E

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Cumulative Effects

Historical Outcome - C
Habitat loss has diminished the population since European settlement. Habitat fragmentation has isolated populations. Range contraction has occurred on the south, which includes the cumulative effects area.

Current Outcome - D
Population estimates and trends are unknown for the cumulative effects area. The loss of habitat continues to cause a decline in the population on the southern portion of the spruce grouse range.

Final

Any climate change that would affect conifer distribution would affect spruce grouse distribution (USDA FS 2002b, planning record). Legal hunting of spruce grouse is expected to continue. Research defining the population numbers and distribution of spruce grouse on the edge of their range and implementation of beneficial habitat projects would decrease the likelihood of population decline.

The alternatives that improve spatial patterns and allow stand replacement fires, especially in jack pine, may provide enough beneficial effects to increase the population and provide for better habitat distribution. Proactive application of fine filter mitigations would be needed to protect spruce grouse and their habitat in Modified Alternative E because of the loss of large forest patches in decade 2 on both forests. Viability of the spruce grouse on the Chippewa is a high risk in Alternatives A and C because of lack of fire and beneficial large forest habitat patches.

Spruce Grouse Table 4: Cumulative Historical, current, and future outcomes for the spruce grouse in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	**E**	**E**	**E**	D	**C**	**C**	**E**	**E**	D	D	**C**	**C**	D	D	D	D	**C**	**C**	D	D	D

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Determination of Effects

Spruce Grouse Table 5: Determination of effects for Spruce

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	4a	2	4a	2	3	2	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a - Likely to result in a trend towards federal listing or a loss of viability. 4b Likely to result in a loss of viability in the planning area (but) not likely to cause a trend toward federal listing.

Final

Yellow rail (*Conturnicops novebo*racensis)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome – Chippewa C, Superior D

Yellow rails breed from south central Northwest Territories, Canada, east through New Brunswick and Maine and south through Michigan, Wisconsin, North Dakota and northeastern Montana (NatureServe 2003). The species was formerly found south to Illinois, Ohio, Massachusetts, and Connecticut (USDA FS 2002b, planning record). In Minnesota, they are widespread, but never common, throughout the northern regions of the state in wet meadows bordering large lakes and rivers, rich fens on extensive northern peatlands, wet prairies, and wet hayfields (Minnesota County Biological Survey 1988). Historical distribution within the planning areas is unknown. The species has been found within the Chippewa (Outcome C) and the Superior (Outcome D) Forest boundaries.

Current Outcome – Chippewa D, Superior D

Yellow rails are well distributed within suitable habitat in Cass County, Minnesota. The most important areas are wetlands bordering Leech Lake and the Boy River in the Chippewa National Forest. This is one of the largest known concentrations of yellow rail in Minnesota. Other occupied areas within the Forest include the wetland area adjoining the Mud-Goose Wildlife Management Area (Minnesota County Biological Survey 1988). On the Superior some sightings have been reported in Cook and St. Louis Counties (USDA FS 2002b, planning record), but it appears that the Superior offers comparatively little suitable habitat.

Yellow rail habitat includes sedge or grass-dominated wetlands, particularly rich fens with narrow-leaved sedge, wet meadows with wide-leaved sedges and grasses, and water depths between 1 to 10 inches, especially during the breeding season (Minnesota County Biological Survey 1988). Habitat is usually sparsely populated, even in large areas of suitable habitat because water depths vary within the wetland. This species has likely persisted as a small sub-populations or rare, local endemic since the historical period. The population trend for this species is believed to be decreasing range-wide.

The amount and distribution of habitat has probably not changed much from historical conditions on the Superior. On the Chippewa, however, dams on the Mississippi Headwaters Reservoirs have greatly altered the hydrology of the floodplain wetlands. For example, in 1884, Leech Lake dam was constructed, and raised the water level in the lake by about one foot, and altered the hydrologic regime of connected streams and wetlands. These hydrologic changes, in addition to alterations from ditching and channelization promote vegetation and water levels that are unsuitable to yellow rails. Recent collections in the Red Lake peatlands in northern Minnesota indicate that with continued destruction of habitats in other parts of its range, peatlands may constitute an important refuge.

Habitat loss is a major threat to this species (USDA FS 2002b, planning record). On Chippewa and Superior National Forest lands, habitat or potential habitat is expected to remain fairly constant for the foreseeable future; however 70% of the riparian area within the Chippewa boundary is managed by other entities (County, State, Federal, Tribal, or private), and 54% of the

Final

Superior's riparian areas are in other ownership. Minnesota has established a no-net-loss policy for wetlands and is implementing programs to restore and protect existing wetlands (USDA FS 2002b, planning record); however, impacted wetlands are not currently replaced type for type, and there are no guarantees that floodplain wetlands that are filled for shoreline development will be replaced as a floodplain wetland or in the same vicinity. As a result, it is unclear if this policy would benefit yellow rail because of the unique nature of its habitat compared to wetland types resulting from restoration. Yellow rail habitat can benefit from the use of prescribed fire to reduce shrub density and maintain sedge and grass habitats in sedge wetlands (Minnesota County Biological Survey 1988, Goldade *et al*. 2002). The yellow rail is a Species of Special Concern in Minnesota. For the Chippewa the current condition is Outcome D and for the Superior the current condition is Outcome D.

Direct/Indirect Effects

Effects Common to All Alternatives

Amounts of open sedge meadow and wetland habitat or potential habitat are expected to remain fairly constant on Chippewa and Superior lands in the next 20 years, although periodic adverse impacts may occur. Loss of wetland habitat due to the development and filling of wetland habitats on private lands, water level fluctuations due to reservoir management, alterations of the water table, and the encroachment of shrubs in sedge wetlands are perhaps the most serious threats to yellow rail (USDA FS 2002b, planning record , Goldade et al. 2002).

Effects by Alternative

All Alternatives for the Chippewa and Superior would result in Outcome D for this species. However, some Alternatives may be more beneficial to maintaining yellow rail habitat than others. Yellow rail is most affected by loss of suitable habitat, and prescribed fire is an important tool in maintaining sedge-dominated wetlands. Alternatives D, B, and F (in that order) have the highest level of prescribed fire for meeting ecological objectives in both decades 1 and 2 (see Final EIS Chapter 3.5.2b for the full analysis of this Indicator). A high level of prescribed fire for meeting ecological objectives may be beneficial in protecting or maintaining suitable habitat types for yellow rail on the Chippewa National Forest and, to a lesser extent, on the Superior. Conversely, Alternatives C and A have the lowest level of prescribed fire for meeting ecological objectives. In addition, Alternatives A, C, and Mod. E have the highest projected road and trail construction, mostly due to temporary roads built for forest management activities, and a high level of ATV trail construction. (Refer to Final EIS Appendix F Transportation System for information on roads and Table RMV-2 and RMV-4 of Chapter 3.8 of the Final EIS for information on ATV construction.) Road and trail construction within the Chippewa National Forest usually requires the filling of wetland habitats and could result in changes in hydrology, which may affect habitat suitability for yellow rails. The potential to negatively affect habitat is greatest in these Alternatives.

Yellow Rail Table 1: Historical, current, and future outcomes for the Yellow Rail in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Superior	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Cumulative Effects

Wetland succession affects habitat quality for the yellow rail, and is often influenced by human activities that purposely or inadvertently alter the water table. These activities include wetland draining and filling for development and road and trail construction, alterations in hydrology due to reservoir management, and a lack of natural disturbance, including suppression of wildfire and elimination of periodic flooding. Land ownership on the Chippewa National Forest is very fragmented, and continued high levels of private development and wetland alterations on all ownerships may result in further isolation of the species. Ownership on the Superior is more contiguous, though habitat for this species is sparse. Reservoir management and private development would continue. Wolter and White (2002) outline trends in upland forest spatial patterns and forest age. Continued downward trends of upland habitat likely coincide with increased impacts to lowlands and this species' habitat. Alternatives that continue these trends would adversely affect this species to a greater degree than those that reverse the trends and begin improving landscape conditions. Alternatives that maintain wetland habitats in suitable vegetative conditions through the use of prescribed fire would help improve conditions for this species within the planning area.

Yellow Rail Table 2: Cumulative Historical, current, and future outcomes for the Yellow Rail in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Superior	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

Yellow rail is likely to persist on the planning areas under all Alternatives for the Chippewa and Superior. Suitable habitat is present, however, external factors, such as reservoir management, high levels of private development, and associated wetland alterations (on public and private lands) are likely to impact the species. Although these activities may impact individuals or their habitat, they are not likely to cause a trend toward federal listing.

Yellow Rail Table 3: Determination of effects for the yellow rail.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Wilson's phalarope (*Phalaropus tricolor*)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome - Chippewa and Superior E

Wilson's phalarope in the United States is primarily associated with wetlands found in open grassland ecosystems (NatureServe 2003), and in Minnesota, it was historically most abundant in the prairie region of the state (USDA FS 2002b, planning record). The Chippewa is at the edge of the species' range in the state, and the Superior is even farther from where this species is usually observed in Minnesota. Although suitable open wet meadow habitat for this species appears to be of low abundance and patchily distributed (outcome D) on both Forests, the fact that the Forests are at or beyond the periphery of the species' range in the state mean that its habitat has probably historically been scarcer and even more highly isolated on the Chippewa and Superior.

Current Outcome - Chippewa and Superior E

Past wetland drainage and lowland roads construction may have caused a decrease in suitable habitat for Wilson's phalarope, but such impacts probably only affected a fraction of the total suitable habitat available. There have been a couple of breeding records reported from the Chippewa in the past ten years (MNNHP 2001), and there have been sightings reported from northeast Minnesota that probably represent migrants (Janssen 1987). However, the Forests are still at the edge or beyond the species' range in the state. Therefore, the amount and distribution of suitable ecological conditions is still roughly similar to historical conditions.

Direct/Indirect Effects

Effects Common to All Alternatives

With the exception of construction of lowland roads, there would be no direct impacts of management activities to suitable habitat. Lowland roads would only be used during winter, and hydrologic impacts would be minimized by riparian standards and guidelines. (Refer to Table F-7 in Appendix F: Transportation System of the Final EIS for information on temporary roads.) Indirect impacts from adjacent upland timber harvest would also be minimized by riparian standards and guidelines. For these reasons, the amount and distribution of suitable ecological conditions would not change appreciably from current outcomes in response to any of the alternatives.

Wilson's Phalarope Table 1: Historical, current, and future outcomes for Wilson's phalarope in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Superior	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E

Final

Cumulative Effects

There are several additional populations of Wilson's phalarope known from the cumulative effects analysis area. Suitable ecological conditions for this species in the cumulative effects analysis areas historically would parallel those in the direct/indirect effects analysis areas, so the cumulative historical outcomes would not differ from the direct/indirect effects outcomes. Suitable ecological conditions in the cumulative effects analysis areas would currently be highly isolated and of very low abundance (outcome E), due to the fact that most of the Drift and Lake Plains and the Northern Superior Uplands are beyond the main range of the species. Future actions similar to those that occurred in the past (for example, lowland road construction) would have minor cumulative effects on Wilson's phalarope, and these effects would not be expected to differ by alternative. For all alternatives, the cumulative impacts to habitat would result in outcome E.

Wilson's Phalarope Table 2: Cumulative Historical, current, and future outcomes for Wilson's Phalarope in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Superior	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E

Determination of Effects

For both Forests, it is expected that the distribution and abundance of suitable habitat under all alternatives would be sufficient for the continued persistence of Wilson's phalarope. All the alternatives may impact individuals but are not likely to cause a trend to federal listing or loss of viability. Existing habitat and occurrence of the species will likely not change.

Wilson's Phalarope Table 4: Determination of effects for Wilson's Phalarope.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Common tern (*Sterna hirundo*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - C

The common tern is holarctic with an extensive range throughout Europe and Asian. In North America, the common tern nests primarily on the Atlantic Coast, the Great Lakes region, and the northern Great Plains region (Coffin and Pfannmuller 1988, Kudell-Ekstrum 2001a). Common terns nest within the Chippewa National Forest in Leech Lake, in Cass County. The extent of historical nesting at this site is unknown, but prior to construction of the dams on the Mississippi River headwater lakes (ca 1880's), nesting habitat was probably more abundant.

Current Outcome - D

Common terns nest on isolated, sparsely vegetated islands or peninsulas of sand in large lakes (greater than 50,000 acres; NatureServe 2003, Wisconsin Department of Natural Resources; US Department of Agriculture, USDA Forest Service 2002b, planning record). In the Great Lakes region, the number of common terns has declined, leading to its status as Threatened in Minnesota (Coffin and Pfannmuller 1988). In Minnesota, the species nests regularly at only four locations: Duluth, Mille Lacs Lake, Lake of the Woods, and Leech Lake. The species is listed as "rare and declining" by the U.S. Fish and Wildlife Service. On Leech Lake, the nesting population has declined four percent annually; it now consists of about 200 pair (US Department of Agriculture, Forest Service 2002b, planning record, Kudell-Ekstrum 2001a). Habitat quality appears to be deteriorating. Erosion reduces beach nesting habitat, due to soil deposition which connects nesting islands to the shoreline and allows predators access to the nesting colony. Shoreline development and high recreational fishing and boating traffic disrupt common tern nesting and feeding activity.

Direct/Indirect Effects

Effects Common to All Alternatives
The greatest threat to this species is predators: Ring-billed Gull, Herring Gull, Ruddy Turnstone, Great Horned Owl, Black-crowned Night-Heron, mink, and possibly river otter. The second greatest threat is impoundments, which maintain high, stable water levels that result in a loss of habitat (USDA Forest Service 2002b, planning record). Increasing and expanding ring-billed gull populations tend to displace common terns, by preying on the nests and young and by competing with the common terns for nest sites. Other threats include human disturbances, pollutants, shoreline development, and erosion. Shoreline development and human disturbance are not regulated by the Forest Plan. These activities are expected to continue under all Alternatives.

Effects by Alternative
Common tern distribution on the Chippewa National Forest is very limited, due to habitat requirements of the species and low population numbers. The nesting colony on Leech Lake is found on lands managed by entities other than the Chippewa National Forest. Leech Lake is a reservoir managed by the U.S. Army Corps of Engineers, and shoreline erosion on Leech Lake is largely a result of maintaining the lake at a high, stable water level. Higher levels of water access development in Alternative A, C, and E may increase human disturbance levels compared to

Final

other alternatives; however, no alternative would actively remove water access in order to reduce human disturbance on species. (Refer to Table WTA-7 of Chapter 3.8 of the Final EIS for information on water access development by alternative.) Known nesting colonies on National Forest System land would be protected from disturbance under all Alternatives.

Alternatives B, D, Mod. E, and G have a pro-active riparian and fish habitat management approach, and would actively manage riparian lands to maintain or restore riparian functions, including shoreline stability on National Forest lands. However, other governmental agencies and private individuals manage the majority of the lands and water accesses on Leech Lake. Therefore, all alternatives would result in Outcome D for this species. (Outcome D)

Common Tern Table 1: Historical, current, and future outcomes for the common tern in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Cumulative Effects

Suitable habitat (lakes greater than 50,000 acres) is limited on the Chippewa National Forest. In addition, large impoundments have further reduced the available habitat for common tern. Increasing competition with gulls and other species for these limited nesting sites is the greatest threat to common tern viability. Control of competitors and predators may be crucial in maintaining common tern populations. Shoreline loss and water-based recreation pose greater threats to this species than Forest management. Land ownership on the Chippewa National Forest is very fragmented, and continued high levels of private development on all ownerships may result in further disturbance to the species.

Common Tern Table 2: Cumulative Historical, current, and future outcomes for the common tern in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Final

Determination of Effects

The presence of only two known breeding locations for common tern on the Forest makes this species highly vulnerable to human activity and habitat degradation. Nest and breeding territory protection would take place under all Alternatives. Collaboration with other landowners would be critical in maintaining high quality nesting habitat within the Forest. Forest management activities may impact individuals or their habitat, but they are not likely to cause a trend toward federal listing.

Common Tern Table 3: Determination of effects for the common tern.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Caspian tern (*Sterna caspia*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - D

The Caspian tern is found throughout the world. In North America, six disjunct populations breed on coastal and inland waters – on the Pacific coast, the Atlantic coast, Gulf coast, inland around the Great Lakes, and locally in the Great Salt Lake region (Michigan State University Extension 2003). Caspian terns have been observed on Leech Lake, in Cass County, and are considered a summer resident of the Chippewa National Forest. The extent of historical nesting at this site is unknown; the only breeding record is of two nests on Gull Island, Leech Lake, in 1969 (Green and Janssen 1975). Prior to construction of the dams on the Mississippi River headwater lakes (ca 1880's), nesting habitat was probably more abundant and higher quality.

Current Outcome - E

Caspian terns nest on isolated, sparsely vegetated islands or peninsulas of sand in lakes greater than 50,000 acres (NatureServe 2003, USDA FS 2002b, Kudell-Ekstrum 2001b). They nest in single or multi-species colonies, ranging in size from tens to hundreds of pairs (Shuford and Craig 2002). The Caspian tern is considered globally "Secure" (G5), and has no special status in Minnesota (Shuford and Craig 2002).

The Caspian tern has never been common or widespread in the Great Lakes region (Michigan State University Extension 2003). It is considered a casual summer resident in Minnesota (Green and Janssen 1975). There is no known breeding on the Chippewa National Forest. A flock of up to 40 birds has been observed on Leech Lake in recent years, but they are never observed courting or breeding, and are thought to be juveniles (Steve Mortensen, Leech Lake Band of Ojibwe, personal communication, 2003). Threats to Caspian terns include shoreline development and disturbance. Caspian terns are more sensitive than other tern species to disturbance. Habitat loss through development or disturbance are primary concerns for this species (USDA Forest Service 2002b, planning record). Declining nesting success and colony abandonment may be due to the effects of chemical contaminants (especially organochlorines), human disturbance at colony sites, competition for nesting sites with ring-billed gulls and herring gulls, and predation by Great Horned Owls and other predators. Conservation measures include controlling public access to the nesting colonies to minimize disturbance, eliminating predators from colony sites, and monitoring all potential nesting habitat, especially dredge spoil islands (Wisconsin Department of Natural Resources 2003). On Leech Lake, habitat quality appears to be deteriorating. Erosion has reduced beach nesting habitat, due to soil deposition which connects nesting islands to the shoreline and allows predators access to the nesting colony. Shoreline development and high recreational fishing and boating traffic may disrupt Caspian tern nesting and feeding activity.

Direct/Indirect Effects

Final

Effects Common to All Alternatives
There is currently no Caspian tern breeding activity on the Chippewa National Forest. The greatest threat to this species is habitat loss or deterioration of quality breeding habitat (sparsely vegetated islands; Shuford and Craig 2002). Impoundments, which maintain high, stable water levels, may affect the quality of island habitat within the planning area. Reservoir management, shoreline development and human disturbance on non-National Forest System lands are not regulated by the Forest Plan. These activities are expected to continue under all Alternatives.

Effects by Alternative
Caspian tern distribution on the Chippewa National Forest is very limited, due to habitat requirements of the species. There is no known courting or nesting activity on the Forest, although the species has been observed on Leech Lake. Leech Lake is a reservoir managed by the U.S. Army Corps of Engineers, and shoreline erosion on Leech Lake is largely a result of maintaining the lake at a high, stable water level. Higher levels of water access development in Alternative A, C, and Mod. E compared to other alternatives may increase human disturbance levels; however, no alternative would actively remove water access in order to reduce human disturbance on species. (Refer to Table WTA-7 of Chapter 3.8 of the Final EIS for information on water access development by alternative.) Known nesting colonies on National Forest System lands would be protected from disturbance under all Alternatives.

Alternatives B, D, Mod. E, and G have a pro-active riparian and fish habitat management approach, and would actively manage riparian lands to maintain or restore riparian functions, including shoreline stability on National Forest lands. However, other governmental agencies and private individuals manage the majority of the lands and water accesses on Leech Lake. Therefore, all alternatives would result in Outcome E for this species.

Caspian Tern Table 1: Historical, current, and future outcomes for the Caspian tern in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E

Cumulative Effects

Suitable habitat (lakes greater than 50,000 acres) is limited on the Chippewa National Forest. In addition, large impoundments have further reduced the available habitat for Caspian tern. Increasing competition with gulls and other species for these limited nesting sites would affect Caspian tern viability, if breeding adults inhabit the area in the future. Control of competitors and predators may be critical in maintaining Caspian tern populations within the Forest. Land ownership on the Chippewa National Forest is very fragmented, and continued high levels of private development on all ownerships may result in further disturbance to the species.

Caspian tern Table 2: Cumulative Historical, current, and future outcomes for the Caspian tern in 2, 5, and 10 decades from present on National Forest lands.																							
Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E

Determination of Effects

The lack of breeding individuals on the Forest affects the viability of this species within the planning area. Caspian terns have very specific habitat requirements, and habitat within the planning area may not be suitable. Nesting and breeding territory protection would take place under all Alternatives. Collaboration with other landowners to develop high quality nesting habitat would be critical in ensuring viability within the Forest. Forest management activities may impact individuals or their habitat, but they are not likely to cause a trend toward federal listing.

Caspian Tern Table 3: Determination of effects for the Caspian tern.							
Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3
Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.							

Final

Black tern (*Chlidonias niger*)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome - D

There is no information available on specific populations, but this species was probably never very abundant within the planning areas. The Chippewa and Superior National Forests are on the edge of this species breeding range. Suitable habitat distribution was likely similar to current conditions and is described as a patchy distribution. On the Chippewa dams placed on Cass Lake, Leech Lake, and Lake Winnibigoshish prior to 1900 raised water levels and likely reduced amounts of habitat compared to the period prior to damming. The dams also affected the hydrologic regime of connected streams and wetlands.

Current Outcome - E

There is a patchy distribution of breeding populations within the planning area. Habitat loss has likely contributed to population decline range-wide. Declines in muskrat populations (muskrat activity provides nesting habitat) have also been cited as a contributor. More recently, reduction in the wetland loss rate most likely has resulted in some localized increases in black tern populations, and a reduced range wide population decline.

General Effects

The greatest threat appears to be loss of habitat due to reduced muskrat numbers (note: loss of muskrat numbers may be coincident with tern decline). Conditions on wintering grounds (specifically food resource) may also be a significant factor. Other threats to this species include water quality and human disturbance of nesting areas.

Direct/Indirect Effects

Effects Common to All Alternatives
With the exception of construction of lowland roads, there would be no direct impacts of management activities to suitable habitat. Lowland roads would only be used during winter, and hydrologic impacts would be minimized by riparian standards and guidelines. Indirect impacts from adjacent upland timber harvest would also be minimized by riparian standards and guidelines.

Amounts of open sedge meadow and wetland habitat or potential habitat are expected to remain fairly constant on the Chippewa and Superior in the next 20 years. Periodic adverse impacts would occur. Loss of wetland habitat due to the development and filling of wetland habitats and water level fluctuations due to reservoir management are perhaps the most serious threat to black tern (USDA FS 2002b, planning record).

Effects by Alternative
Alternatives A, C, and Modified E have the highest projected road and trail construction, mostly due to temporary roads built for forest management activities, and a higher level of ATV trail construction. (Refer to Appendix F Transportation System of the Final EIS for information on

Final

roads and Table RMV-2 and RMV-4 of Chapter 3.8 of the Final EIS for information on ATV construction.) Road and trail construction within the planning areas usually requires the filling of wetland habitats and could result in changes in hydrology, which may affect habitat suitability for black terns. The potential to negatively affect habitat is greatest in these Alternatives. Alternatives A and C take a mitigative approach to managing riparian and aquatic habitats, by applying the minimum protection needed to minimize resource degradation.

Modified Alternative E has a higher level of new water access development than other alternatives, which could affect the quality of emergent vegetative habitat for the black tern. (Refer to Table WTA-7 of Chapter 3.8 of the Final EIS for information on water access development by alternative.) Larger boats stir up littoral zone sediments, and an increase in the number and development level of planned water access could impact black tern habitat.

Under Alternatives B and D there would be lower levels of planned water access, the least amount of new road construction, and a higher level of road decommissioning in Alternative D. These Alternatives would have the least direct and indirect effects to black tern habitat.

Black Tern Table 1: Historical, current, and future outcomes for Black Tern in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Superior	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E

Cumulative Effects

Suitable ecological conditions for this species in the cumulative effects analysis areas historically would parallel those in the direct/indirect effects analysis areas, so the cumulative historical outcomes would not differ from the direct/indirect effects outcomes. Suitable ecological conditions in the cumulative effects analysis areas would currently be isolated and of low abundance (outcome E), because most of the Drift and Lake Plains and the Northern Superior Uplands contain patchy distributed habitat. Future actions similar to those that occurred in the past (for example, lowland road construction) would have minor cumulative effects on the Black Tern, and these effects would not be expected to differ by alternative. For all alternatives for both forests, the cumulative impacts to habitat would result in outcome E.

Black Tern Table 2: Cumulative Historical, current, and future outcomes for Black Tern in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Superior	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E

Final

Determination of Effects

Black tern is likely to persist on the planning areas under all Alternatives for the Chippewa and Superior. Suitable habitat is present, however, external factors, such as additional boat accesses on other ownerships, reservoir management, high levels of private development, and associated wetland alterations (on public and private lands) are likely to impact the species. Although these activities may impact individuals or their habitat, they are not likely to cause a trend toward federal listing.

Black Tern Table 3: Determination of effects for the Black tern.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod.Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Great gray owl (*Strix nebulosa*)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome – Chippewa C, Superior C

The project area is located in the southern edge of the species historical range, where populations were unevenly distributed, and irregularly from year to year. No information is available on estimated historical population levels (USDA FS 2002b, planning record). This species has likely always been a relatively rare nesting bird in Minnesota and at least partially dependant on vagaries of meadow vole and lemming populations (Jaakko Poyry 1992). Based on the assumed amount of suitable ecological conditions historically, the Chippewa and the Superior likely had and outcome of C.

Current Outcome – Chippewa D, Superior C

Current range is probably still the same as the historical range (USDA FS 2002b, planning record). Within the State of Minnesota, the primary breeding habitat of the species is coniferous lowland black spruce and tamarack peatlands, black ash wetlands, and coniferous uplands (Jaakko Poyry 1992). Minimum habitat requirements are not well understood, but availability of suitable nesting sites, many hunting perches (30/ac or more), the availability of abundant prey, and coniferous vegetation appear to be important. In the project area, nesting habitat consist of a wide variety of dense coniferous and hardwood forest, especially pine, spruce, black ash, basswood, tamaracks, paper birch and aspen. This species forages in open areas with scattered trees, including bogs, selective and clear cut logged areas with residual perches, natural meadows and open forest within 1-3 km of the nest sites (USDA FS 2002b, planning record). Great gray owls tend to avoid dense jack pine and black spruce, open treeless areas, and habitats with a dense shrub layer for nesting and foraging. Limiting factors include availability of suitable nest sites, foraging habitat, and prey abundance. Historically, great gray owl distribution was likely limited by the same factors that presently limit the population, the availability of suitable nest sites and prey abundance (Duncan and Hayward 1994).

Final

Suitable habitat consist of 30-300 acres patches of dense, mature and old aged aspen and mixed conifer stands that are adjacent or within 1-3 km of open to park like areas suitable for foraging. Nest sites utilized are typically stick nest of other raptors, such as goshawk, or ravens, and broken toped snags of large diameter trees. Interior forest is preferred for its reduced potential for avian and mammalian predators on young. Current habitat conditions on both forests may be affecting the species ability to find suitable nest sites. Down wood is an important component of both foraging and nesting habitat. Great Gray owls are a species which require open areas for foraging, and forest fragmentation is seemingly a necessary landscape feature. However, in fragmented landscapes the amount of edge available may not be as important as the amount of forested area available for nesting (USDA FS 2002b, planning record). It is likely that they are much rarer today than in pre-settlement times due to the reduction in conifer vegetation of the state and an increase of illegal killing (Jaakko Poyry 1992). However, clear-cuts can create foraging habitat in dense forest in previously unoccupied areas (Duncan 1997). It should be noted that timber harvest is not at odds with the preservation of the great gray owl. Some logging may even enhance habitat by opening up dense stands.

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 (Jaakko Poyry 1992).

Direct/Indirect Effects

Effects Common to All Alternatives

Logging in nesting habitat could impact the great gray owl in all alternatives, by removing suitable nesting structure. Consequently, harvest can also create more temporary foraging habitat in some conifer forest types. Standards/guidelines specific to this species would protect and minimize disturbance to all known nest sites. Also standards and guidelines for maintaining large mature patches of upland forest would help to ensure suitable interior nesting habitat would be available across the landscape. And implementation of Minnesota Forest Resources Council’s Voluntary Site-Level Forest Management Guidelines (MFRC 1999) would help to ensure that snags, reserve trees, and down wood are provided in all harvested stands. There would be little to no difference between alternatives from ATV use. Each alternative could have an impact on nesting great gray owl by disturbance or displacement, with A, C and E having a slightly higher potential for these impacts than the other alternatives. Increasing fire on the landscape is an important component of maintaining natural foraging habitat in all alternatives.

Effects by Alternative

Foraging Habitat

Suitable foraging habitat is discussed in terms of permanent openings, unproductive forest, and recently harvested upland (0-9 years) and lowland (0-19 years) conifer (MIH 4 and MIH 9). While MIH 5 in the 0-9 age class may provide short term foraging habitat immediately after harvest, this forest type would likely become unsuitable for foraging, much more quickly than MIH 4 or MIH9.

Chippewa

On the Chippewa, approximately 14,000 acres of unproductive upland and lowland habitat currently exists that is suitable of providing foraging habitat. This acreage is likely to remain in this condition in all alternatives and decades. Additionally, each decade and each alternative would add varying levels of temporary foraging habitat in the form of harvest units and other natural disturbance. These acreages are displayed below in Great Gray Owl Table 1: MIH 5a total young conifer upland forest on the Chippewa and Table 2: MIH 9a total young lowland conifer forest on the Chippewa.

Great Gray Owl Table 1: MIH 5aTotal young (0-9 years) upland conifer forest on the Chippewa National Forest.

MIH 5a CNF	**Exist**	**Alt. A**			**Alt. B**			**Alt. C**			**Alt. D**		
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Acres	9,753	19,763	14,342	21,434	8,811	14,212	7,491	18,598	13,641	17,305	8,253	7,010	4,298
Percent	2.1%	4.3%	3.1%	4.7%	1.9%	3.1%	1.6%	4.1%	3.0%	3.8%	1.8%	1.5%	0.9%
	Exist	**Mod. Alt. E**			**Alt. F**			**Alt. G**					
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**			
Acres	9,753	10,561	11,815	13,559	13,287	14,615	13,643	15,311	12,049	15,879			
Percent	2.1%	2.3%	2.6%	3.0%	2.9%	3.2%	3.0%	3.4%	2.6%	3.5%			
Estimated RNV		Low			Mid			High					
Acres		7,500			13,600			19,800					
Percent		1.6%			3.0%			4.4%					

Young upland conifer forest remains within RNV levels in all alternatives and decades except alternative D in decades 5 and 10. This decade the acreage percentage falls below but remains relatively close to RNV levels.

Great Gray Owl Table 2: MIH 9a Total young (0-19 years) lowland conifer forest on the Chippewa National Forest.

MIH 9a CNF	**Exist**	**Alt. A**			**Alt. B**			**Alt. C**			**Alt. D**		
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Acres	2,574	15,766	3,024	1,923	5,239	4,782	4,513	17,725	1,888	8,871	0	0	0
Percent	4.1%	25.4%	4.9%	3.1%	8.4%	7.7%	7.3%	28.5%	3.0%	14.3%	0.0%	0.0%	0.0%
	Exist	**Mod. Alt. E**			**Alt. F**			**Alt. G**					
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**			
Acres	2,574	6,434	4,989	3,502	7,565	4,150	5,351	6,600	5,126	3,694			
Percent	4.1%	10.3%	8.0%	5.6%	12.2%	6.7%	8.6%	10.6%	8.2%	5.9%			
Estimated RNV		Low			Mid			High					
Acres		4,500			5,400			6,200					
Percent		7.3%			8.6%			9.9%					

There would be an increase in decade 2, alternatives A and C, of potential lowland black spruce foraging areas. And Alternative D, all decades, would not contribute any acreage of lowland black spruce foraging habitat. Alternatives B, Mod. E, F and G all fall within RNV or above for all decades except for Modified Alt. E and G in decade 10.

In summary, young upland and lowland conifer would fluctuate around RNV levels in most alternatives and decades. This taken in combination with the approximately 14,000 acres of unproductive upland and lowland habitat that currently exists and would remain suitable, on the Chippewa, suitable foraging habitat for the great gray owl does not appear to be limiting in any alternative or decade.

Final

Superior

On the Superior approximately 131,671 acres of unproductive upland and lowland habitat currently exists that is suitable of providing foraging habitat. This acreage is likely to remain in this condition in all alternatives and decades. Additionally, each decade and each alternative would add varying levels of temporary foraging habitat in the form of harvest units and other natural disturbance. These acreages are displayed below in Table 3: MIH 5a total young conifer upland forest on the Superior and Table 4: MIH 9a total young lowland conifer forest on the Superior.

On the Superior young upland conifer forest acreage (MIH 5a) falls below RNV levels in alternatives B and D. All other alternatives remain in RNV levels for all decades except for alternative A in decade 2.

Final

Great Gray Owl Table 3: MIH 5a Total young (0-9 years) upland conifer forest on the Superior National Forest.

MIH 5a SNF	Exist	Alt. A			Alt. B			Alt. C			Alt. D		
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Acres Outside BWCAW	64,332	19,683	42,108	48,905	9,974	16,224	20,154	37,934	40,056	51,469	24,766	12,609	18,509
Percent	6.7%	2.0%	4.4%	5.1%	1.0%	1.7%	2.1%	3.9%	4.2%	5.3%	2.6%	1.3%	1.9%
Acres Inside BWCAW	99,384	5,810	6,456	5,810	5,810	6,456	5,810	5,810	6,456	5,810	5,810	6,456	5,810
Percent	14.5%	0.8%	0.9%	0.8%	0.8%	0.9%	0.8%	0.8%	0.9%	0.8%	0.8%	0.9%	0.8%
Combination Acres	163,716	25,494	48,565	54,715	15,784	22,680	25,964	43,744	46,512	57,279	30,576	19,065	24,319
Percent	9.9%	1.5%	2.9%	3.3%	1.0%	1.4%	1.6%	2.7%	2.8%	3.5%	1.9%	1.2%	1.5%
	Exist	**Modified Alt. E**			**Alt. F**			**Alt. G**					
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**			
Acres Outside BWCAW	64,332	36,610	27,984	34,038	23,348	25,091	32,500	21,518	31,331	36,339			
Percent	6.7%	3.8%	2.9%	3.5%	2.4%	2.6%	3.4%	2.2%	3.3%	3.8%			
Acres Inside BWCAW	99,384	5,810	6,456	5,810	5,810	6,456	5,810	5,810	6,456	5,810			
Percent	14.5%	0.8%	0.9%	0.8%	0.8%	0.9%	0.8%	0.8%	0.9%	0.8%			
Combination Acres	163,716	42,420	34,440	39,848	29,159	31,547	38,311	27,329	37,788	42,149			
Percent	9.9%	2.5%	2.1%	2.3%	1.8%	1.9%	2.3%	1.7%	2.3%	2.6%			
Estimated RNV		Low			Mid			High					
Acres		26,000			38,300			50,700					
Percent		1.6%			2.3%			3.1%					

Great Gray Owl Table 4: MIH 9a Total young (0-19 years) lowland conifer forest on the Superior National Forest.

MIH 9a SNF	Exist	Alt. A			Alt. B			Alt. C			Alt. D		
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Acres Outside BWCAW	7,247	24,426	14,454	3,310	13,253	13,413	10,142	61,227	10,958	13,626	0	0	0
Percent	3.5%	11.9%	7.0%	1.6%	6.4%	6.5%	4.9%	29.8%	5.3%	6.6%	0.0%	0.0%	0.0%
Acres Inside BWCAW	6,676	1,433	2,014	1,433	1,433	2,014	1,433	1,433	2,014	1,433	1,433	2,014	1,433
Percent	8.6%	1.8%	2.6%	1.8%	1.8%	2.6%	1.8%	1.8%	2.6%	1.8%	1.8%	2.6%	1.8%
Combination Acres	13,922	25,859	16,468	4,743	14,685	15,428	11,575	62,660	12,972	15,059	1,433	2,014	1,433
Percent	4.9%	9.1%	5.8%	1.7%	5.2%	5.5%	4.1%	22.1%	4.6%	5.3%	0.5%	0.7%	0.5%
	Exist	**Modified Alt. E**			**Alt. F**			**Alt. G**					
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**			
Acres Outside BWCAW	7,247	14,987	14,988	12,997	15,604	15,709	14,632	10,195	10,568	10,997			
Percent	3.5%	7.3%	7.2%	6.3%	7.6%	7.6%	7.1%	5.0%	5.1%	5.4%			
Acres Inside BWCAW	6,676	1,433	2,014	1,433	1,433	2,014	1,433	1,433	2,014	1,433			
Percent	8.6%	1.8%	2.6%	1.8%	1.8%	2.6%	1.8%	1.8%	2.6%	1.8%			
Combination Acres	13,922	16,420	17,002	14,430	17,036	17,723	16,065	11,628	12,582	12,430			
Percent	4.9%	5.8%	6.0%	5.1%	6.0%	6.3%	5.7%	4.1%	4.4%	4.4%			
Estimated RNV		Low			Mid			High					
Acres		11,600			16,100			20,600					
Percent		4.1%			5.7%			7.3%					

In the young lowland conifer forest types (MIH 9a), Alternative D appears to provide the least amount of suitable foraging habitat in this type, remaining well below RNV levels in all decades. All other alternatives remain within RNV levels in all decades, except for Alternative A which falls below in decade 10

In summary, young upland and lowland conifer remain at or near RNV levels in most alternatives in most decades. Alternative D would contribute the least to providing suitable foraging habitat in these forest types. However, this taken in combination with the approximately131,671 acres of unproductive upland and lowland habitat that currently exists and would remain suitable, on the Superior, suitable foraging habitat for the great gray owl does not appear to be limiting in any alternative or decade.

Nesting Habitat

Management Indicator Habitats (MIH) 4b, mature aspen-birch and mixed aspen-conifer forest and MIH 5b, mature upland conifer forest were chosen for analysis because they best represent nesting habitat requirements of the great gray owl.

Final

Chippewa

Great Gray Owl Table 5: MIH 4b Total mature aspen-birch and mixed aspen-conifer forest on the Chippewa National Forest.

MIH 4b CNF	Exist	Alt. A			Alt. B			Alt. C			Alt. D		
Decade	0	2	5	10	2	5	10	2	5	10	2	5	10
Acres	100,018	19,937	17,239	2,131	65,895	118,038	19,916	19,013	21,250	4,420	69,535	122,177	17,965
Percent	21.9%	4.4%	3.8%	0.5%	14.5%	25.9%	4.4%	4.2%	4.7%	1.0%	15.3%	26.8%	3.9%
	Exist	Mod. Alt. E			Alt. F			Alt. G					
Decade	0	2	5	10	2	5	10	2	5	10			
Acres	100,018	46,500	53,918	41,094	59,951	106,781	7,073	58,705	95,696	29,164			
Percent	21.9%	10.1%	11.8%	9.0%	13.2%	23.4%	1.6%	12.9%	21.0%	6.4%			
Estimated RNV		Low			Mid			High					
Acres		unk			7,100			19,900					
Percent		unk			1.6%			4.4%					

The table above shows that mature aspen-birch and mixed aspen-conifer forest (MIH 4b) on the Chippewa National Forest is currently well above the estimated high range of RNV. This habitat type would remain within the RNV range in all alternatives for the next 50 years, and in some alternatives for the next 100 years. Alternatives A and C fall below the mid RNV levels in decade 10. However, all alternatives would fall below the existing level.

Great Gray Owl Table 6: MIH 5b Total mature upland conifer forest on the Chippewa National Forest.

MIH 5b CNF	Exist	Alt. A			Alt. B			Alt. C			Alt. D		
Decade	0	2	5	10	2	5	10	2	5	10	2	5	10
Acres	63,194	54,839	53,489	62,258	88,779	127,095	187,932	54,952	62,674	82,231	83,764	133,778	224,529
Percent	13.9%	12.0%	11.7%	13.7%	19.5%	27.9%	41.2%	12.1%	13.7%	18.0%	18.4%	29.3%	49.3%
	Exist	Mod. Alt. E			Alt. F			Alt. G					
Decade	0	2	5	10	2	5	10	2	5	10			
Acres	63,194	81,204	109,659	124,567	87,538	122,712	172,590	81,045	118,373	156,809			
Percent	13.9%	17.8%	24.1%	27.3%	19.2%	26.9%	37.9%	17.8%	26.0%	34.4%			
Estimated RNV		Low			Mid			High					
Acres		157,200			172,600			187,900					
Percent		34.6%			37.9%			41.2%					

The table above shows that mature upland conifer forest on the Chippewa is predicted to remain below RNV in all decades and all alternatives with four exceptions. Alternatives B, D, and F reach RNV levels in decade 10. Alternatives A, in all decades, and Alternative C, in decade 2 and 5, fall below the existing level of this forest type. This indicates that on the Chippewa, mature upland conifer forest would provide very limited amount of suitable nesting habitat for the great gray owl.

In summary, suitable nesting aspen-birch and upland conifer habitat on the Chippewa would

Final

decrease in alternatives A and C from existing levels, and these alternatives appear to have the most negative effect to suitable great gray owl nesting habitat. All other alternatives appear to provide adequate suitable nesting habitat acreage.

<u>Superior</u>

Great Gray Owl Table 7: MIH 4b Total mature aspen-birch and mixed aspen-conifer forest on the Superior National Forest.

MIH 4b SNF	**Exist**	**Alt. A**			**Alt. B**			**Alt. C**			**Alt. D**		
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Acres Outside BWCAW	334,751	153,316	113,238	10,224	295,502	354,979	50,567	124,519	107,369	14,017	237,732	202,147	104,977
Percent	34.7%	15.9%	11.7%	1.1%	30.7%	36.8%	5.2%	12.9%	11.1%	1.5%	24.7%	21.0%	10.9%
Acres Inside BWCAW	198,807	181,938	139,802	113,050	181,938	139,802	113,050	181,938	139,802	113,050	181,938	139,802	113,050
Percent	29.0%	26.6%	20.4%	16.5%	26.6%	20.4%	16.5%	26.6%	20.4%	16.5%	26.6%	20.4%	16.5%
Combination Acres	533,558	335,253	253,040	123,274	477,439	494,781	163,617	306,457	247,171	127,067	419,670	341,949	218,027
Percent	32.4%	20.3%	15.4%	7.5%	29.0%	30.0%	9.9%	18.6%	15.0%	7.7%	25.5%	20.7%	13.2%
	Exist	**Modified Alt. E**			**Alt. F**			**Alt. G**					
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**			
Acres Outside BWCAW	334,751	192,874	88,545	80,416	263,086	291,774	44,787	238,331	234,067	60,585			
Percent	34.7%	20.0%	9.2%	8.3%	27.3%	30.3%	4.6%	24.7%	24.3%	6.3%			
Acres Inside BWCAW	198,807	181,938	139,802	113,050	181,938	139,802	113,050	181,938	139,802	113,050			
Percent	29.0%	26.6%	20.4%	16.5%	26.6%	20.4%	16.5%	26.6%	20.4%	16.5%			
Combination Acres	533,558	374,812	228,347	193,466	445,024	431,576	157,836	420,269	373,869	173,634			
Percent	32.4%	22.8%	13.9%	11.7%	27.0%	26.2%	9.6%	25.5%	22.7%	10.5%			
Estimated RNV		Low			Mid			High					
Acres		152,100			157,800			163,600					
Percent		9.2%			9.6%			9.9%					

The table above shows that mature aspen-birch and mixed aspen-conifer forest (MIH 4b) on the Superior National Forest is currently well above the estimated high range of RNV. This habitat type would remain above the RNV range in all alternatives for the next 10 decades, except for alternative A and C in decade 10. This indicates that mature aspen-birch and mixed aspen forest would be abundant with all alternatives and in all decades.

Great Gray Owl Table 8: MIH 5b Total mature upland conifer forest on the Superior National Forest.

MIH 5b SNF	**Exist**	**Alt. A**			**Alt. B**			**Alt. C**			**Alt. D**		
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Acres Outside	170,408	178,414	214,025	305,819	196,023	302,156	616,990	150,558	184,811	312,883	237,290	484,885	665,750

Final

Great Gray Owl Table 8: MIH 5b Total mature upland conifer forest on the Superior National Forest.

MIH 5b SNF	Exist	Alt. A			Alt. B			Alt. C			Alt. D		
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
BWCAW													
Percent	17.7%	18.5%	22.2%	31.7%	20.3%	31.4%	64.0%	15.6%	19.2%	32.5%	24.6%	50.3%	69.1%
Acres Inside BWCAW	319,608	352,171	460,881	519,131	352,171	460,881	519,131	352,171	460,881	519,131	352,171	460,881	519,131
Percent	46.7%	51.4%	67.3%	75.8%	51.4%	67.3%	75.8%	51.4%	67.3%	75.8%	51.4%	67.3%	75.8%
Combination Acres	490,016	530,585	674,906	824,950	548,195	763,037	1,136,121	502,729	645,692	832,014	589,461	945,766	1,184,881
Percent	29.7%	32.2%	40.9%	50.0%	33.3%	46.3%	68.9%	30.5%	39.2%	50.5%	35.8%	57.4%	71.9%

	Exist	Modified Alt. E			Alt. F			Alt. G		
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Acres Outside BWCAW	170,408	217,447	359,970	436,884	176,396	252,900	511,497	197,829	259,344	452,449
Percent	17.7%	22.6%	37.4%	45.4%	18.3%	26.2%	53.1%	20.5%	26.9%	46.9%
Acres Inside BWCAW	319,608	352,171	460,881	519,131	352,171	460,881	519,131	352,171	460,881	519,131
Percent	46.7%	51.4%	67.3%	75.8%	51.4%	67.3%	75.8%	51.4%	67.3%	75.8%
Combination Acres	490,016	569,618	820,851	956,015	528,567	713,781	1,030,628	550,000	720,225	971,580
Percent	29.7%	34.5%	49.8%	57.9%	32.1%	43.3%	62.5%	33.4%	43.7%	58.9%
Estimated RNV		Low			Mid			High		
Acres		925,100			1,030,600			1,136,100		
Percent		56.1%			62.5%			68.9%		

The table above shows that all alternatives are effective in increasing the amount of mature upland conifer forest (MIH 5b) on the Superior National Forest, from current conditions. RNV levels of this habitat type are achieved in decade 10 in alternatives B, D, Mod. E, F and G. Alternative D reaches RNV the quickest (decade 5) and provides the most mature conifer forest. This indicates that mature upland conifer would continue to provide suitable nesting habitat acreage at increasing levels with all alternatives and decades.

In summary, the potential great gray owl nesting habitat on the Superior would continue to occur and increase in amount over time with all alternatives.

Final

Outcome Determination

Great Gray Owl Table 9 reflects the likely outcomes of each alternative based on the analysis conducted above.

Great Gray Owl Table 9: Historical, current, and future outcomes for great gray owl in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Superior	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Chippewa and Superior
On both forests, adequate amounts of suitable nesting and foraging habitats appear to be available with all alternatives and decades. None of the alternatives is likely to change the habitat enough to cause an outcome change different from current. The limiting factor for the great gray owl on both forests is probably more closely tied to stand structure than to forest type and age. Availability of suitable nesting sites in the form of large broken toped snags and large abandoned stick nests probably plays a key role affecting great gray owl abundance. At the forest level, all alternatives appear to provide for adequate levels of suitable habitat types. Project level habitat management should focus on increasing the amount of suitable natural and/or artificial nest structure.

Final

Cumulative Effects

Historical Outcome - Drift and Lake Plains D, Northern Superior Uplands C
The great gray owl has likely been a permanent resident, albeit rare nesting bird, throughout the areas of the Drift and Lake Plains, and Northern Superior Upland Subsections that had extensive coniferous vegetation and interspersed open habitat.

Current Outcome - Drift and Lake Plains E, Northern Superior Uplands C
The first documented nest record for this species came in 1935 in Roseau county. Since then breeding records have been documented in Lake of the Woods, Koochiching, Itasca, Cass, Aitkin, St. Louis counties and summer sight observations Cook, Lake and Carlton counties (Janssen, 1987). Suitable habitat has likely decreased from historical levels due to permanent land conversion to other use and unsuitable forest types. Current population and trends are unknown, however it is estimated that approximately 200 great gray owl pairs are found in Minnesota year around (Jaakko Poyry, 1992).

Great Grey Owl Table 9: Cumulative Historical, current, and future outcomes for the great grey owl in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Superior	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E

Determination of Effects

All alternatives may impact but not likely to cause a trend to federal listing or loss of viability. 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 nest sites from adverse affects of forest management.

Great Gray Owl Table 10: Determination of effects for great gray owl.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Boreal owl (*Aegiolus funereus*)

Regional Forester Sensitive Species: Superior

Historical Outcome - C

The range of the boreal owl follows the extent of the boreal forest including much of Canada, the northern states and portions of the Rocky Mountains. Although we have very little information on the historical distribution of boreal owls in the Great Lakes Region, it is likely that their range included the boreal forest throughout MN and WI and covered a larger area than it does today.

Current Outcome - D

It is likely that the range and the population of boreal owls has decreased since historical times due to a reduction and fragmentation of boreal forest habitats as well as a loss of long-lived cavity tree species such as white pine.

The population in Minnesota is part of a larger Canadian population and may not be viable by itself at present. 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.

Average home range size for four radio-tagged boreal owls on the Superior National Forest was 1202 ha (Lane 2000). Home range size is probably variable depending on prey density and other factors.

Direct/Indirect Effects

Effects Common to All Alternatives
Extensive harvest of mature lowland conifer and upland forest has led to habitat loss for this species. Limiting factors may include 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.

Recent research efforts in northern MN point to the importance of upland nesting habitat adjacent to large blocks of lowland conifers used for foraging (Lane 2001). Cavity trees are generally older aspen however other tree species may be used.

Standards/guidelines and objectives/conditions of the Forest Plan would help protect this species from timber harvest impacts, and help to create required habitat components.

Effects by Alternative
Boreal owls nest in cavity trees typically found in aspen-birch or mixed upland conifer forests and adjacent to large blocks of lowland conifer. Effects on these habitats were analyzed by looking at Management Indicator Habitats 4, 5, 6, 7, 8 and 9 (Boreal Owl Table 1, -2 and -3).

In the past the Northern Superior Uplands was dominated by pine and spruce-fir whereas the current landscape has a high percentage of aspen (see Final EIS Chapter 3.3, 3.2 Forest).

Final

Although nests are generally found in decadent aspen with cavities, boreal owls use other tree species when available. Therefore, a reduction in the aspen types as a result of the alternatives may be compensated for by an increase in the pine and spruce-fir types for nesting boreal owls.

In the short-term (decade 2), overall upland nesting habitat is reduced in all alternatives (Tables 1 and -2) The increase in upland conifer (Table -2) is less than the reduction in aspen types (Table -1). A conservative analysis of upland nesting habitats considered only aspen, aspen-mix and spruce-fir types (MIH 4 and 6). Alternative A and C would result in a 20-32% forest-wide reduction in these upland nesting habitats within the second decade as compared to the existing condition. Alternative E would lead to a 15% reduction in the short-term. Alternative B, D, F and G would also lead to reductions in nesting habitat in the short-term but the reduction is generally less than 10% from existing conditions. Nesting habitat appears to be fairly secure in the long-term under any alternative. The exception to this is in Alternatives A and C where mature aspen, spruce-fir, red and white pine types are below historical conditions (RNV). All alternatives result in less of the mature aspen types but more of the spruce-fir and pine types that also provide nesting conditions. The desired objectives/conditions and standards and guidelines of the Forest Plan promote conserving boreal owl nesting habitat and nest sites in all alternatives.

There is no research that indicates whether fragmentation of nesting habitat is detrimental to boreal owls. Forest fragmentation can lead to an increase in predators and competitor species that could negatively affect boreal owls. In the short-term all the alternatives lead to a reduction in acres of large mature upland forest (see Final EIS 3.2 Table FSP-2). Alternatives B, D and F lead to the lowest short-term forest-wide reductions (3-6%) and lead to an extensive large patch matrix by decade 10. Alternatives G and E lead to more fragmentation of uplands (7-9% forest-wide reduction from existing) than B, D and F but less so than Alternatives A and C. Alternatives A and C would lead to a 12-16% forest-wide decrease in large upland forest patches in the short-term from the existing condition. This becomes a 51-55% decrease in decade 5 if the Boundary Waters is not included in the calculation.

Boreal Owl Table 1: Acres and percent of mature aspen-birch dominated forest (MIH 4) on the Superior National Forest (including BWCAW) by decade. Percentages represent % of total upland forest on National Forest Lands. Mid-point RNV is 9.6%

Decade	Existing Condition (%)	ALT A (%)	ALT B (%)	ALT C (%)	ALT D (%)	ALT E (%)	ALT F (%)	ALT G (%)
2	533,558 (32.4%)	335,253 (20.3%)	477,439 (29%)	306,457 (18.6%)	419,670 (25.5%)	383,758 (23.3%)	445,024 (27%)	420,269 (25.5%)
5		253,040 (15%)	494,781 (30%)	247,171 (15%)	341,949 (20.7%)	322,040 (19.5%)	431,576 (26.2%)	373,869 (22.7%)
10		123,274 (7.5%)	163,617 (9.9%)	127,067 (7.7%)	218,027 (13.2%)	158,887 (9.6%)	157,836 (9.6%)	173,634 (10.5%)

Boreal Owl Table 2: Acres and percent of mature upland conifer (MIH5) on the Superior National Forest (including BWCAW) by decade. Percentages represent percent of total upland forest on National Forest lands. Mid-point RNV is 62.5%

Decade	Existing Condition (%)	ALT A (%)	ALT B (%)	ALT C (%)	ALT D (%)	ALT E (%)	ALT F (%)	ALT G (%)
2	490,016 (29.7%)	530,585 (32.2%)	548,195 (33.3%)	522,865 (31.7%)	569,326 (34.5%)	528,109 (32%)	528,567 (32.1%)	550,000 (33.4%)
5		674,906 (40.9%)	763,036 (46.3%)	645,691(39.2%)	945,766 (57.4%)	693,095 (42%)	713,780 (43.3%)	720,225 (43.7%)
10		824,950 (50%)	1,136,121(68.9%)	832,014 (50.5%)	1,184,881(71.9%)	920,355 (55.8%)	1,030,628 (62.5%)	971,580 (58.9%)

Final

Recent research indicates that boreal owls require large lowland conifer areas for foraging and nests are usually located in upland stands adjacent to large lowland areas. The effects of the

Boreal Owl Table 3: Acres and percent of mature lowland black spruce/fir (MIH9) on the Superior National Forest (including BWC decade. Percentages represent percent of total lowlands on National Forest lands. Mid-point RNV is 76.8%

Decade	Existing Condition (%)	ALT A (%)	ALT B (%)	ALT C (%)	ALT D (%)	ALT E (%)	ALT F(%)	ALT G(%)
2	224864 (79.4%)	218494(77.2%)	229668 (81.1%)	181693 (64.2%	242920 (85.8%)	223674 (79%)	227317 (80.3%)	232725 (82.2%
5		177866(62.8%)	225598 (79.7%)	176803 (62.5%	259079 (91.5%)	211518 (74.7%	219973 (77.7%)	233125 (82.4%
10		246336(87%)	227171 (80.3%)	236604 (83.6%	262647 (92.8%)	212349 (75%)	217491 (76.8%)	231248 (81.7%

alternatives on mature lowland conifer habitats can be seen in Boreal Owl Tables -3 and -4. Timber harvesting would take place in lowland conifer stands in all alternatives except Alternative D. Alternatives A and C harvest more than the other alternatives and lead to larger reductions in acres of mature forest than the other alternatives (20% and 21% less than existing condition in decade 5). The percentage of mature lowland conifer on the landscape falls below historical conditions (RNV midpoint 76.8%) in Alternative C in the second and fifth decade. Alternatives E, F and G result in relatively small (<10%) changes in acres of mature lowland conifer and large lowland conifer patches. Alternatives B and D increase the mature lowland conifer acreage on the forest as well as patch size. In the long-term (tenth decade) most of the of alternatives show more mature forest than what exists today with the exception of Alternatives E and F.

Additional information on impacts to lowland conifer habitats can be found in the Forest Vegetation Chapter 3.2 of the Final EIS.

Boreal Owl Table 3: Acres and percent of mature lowland black spruce/fir (MIH9) on the Superior National Forest (including BWCAW) by decade. Percentages represent percent of total lowlands on National Forest lands. Mid-point RNV is 76.8%

Decade	Existing Condition (%)	ALT A (%)	ALT B (%)	ALT C (%)	ALT D (%)	ALT E (%)	ALT F (%)	ALT G (%)
2	224,864 (79.4%)	218,494 (77.2%)	229,668 (81.1%)	181,693 (64.2%)	242,920 (85.8%)	223,674 (79%)	227,317 (80.3%)	232,725 (82.2%)
5		177,866 (62.8%)	225,598 (79.7%)	176,803 (62.5%)	259,079 (91.5%)	211,518 (74.7%)	219,973 (77.7%)	233,125 (82.4%)
10		246,336 (87%)	227,171 (80.3%)	236,604 (83.6%)	262,647 (92.8%)	212,349 (75%)	217,491 (76.8%)	231,248 (81.7%)

Fragmentation effects to lowland conifer habitats can be seen in Table BOR-4. In the short-term (decades 1 and 2), Alternatives B, D, E, F and G all lead to an increase in large patch acreage for patches over 100 acres in size. Alternatives A and C lead to a decrease in these size patches in the short-term but show the biggest decrease in the long-term during decades 5 (up to a 35% reduction from existing condition outside the BWCAW). In the long-term, Alternatives B, D and G generally provide more acres of habitat in large patches than what exists currently. In the long term Alternatives E and F lead to a decrease in large patch acres as compared to the existing condition (2-12% reduction) but less so than Alternatives A and C.

Final

Boreal Owl Table 4 Acres of mature lowland conifer in patches of 100 acres or greater on the Superior National F for existing conditions and decades 1, 2, 5 and 10 for all alternatives.								
Decade	**Existing**	**ALT A**	**ALT B**	**ALT C**	**ALT D**	**ALT E**	**ALT F**	**ALT G**
1	72515	79992	77162	73623	80959	74893	77085	77741
2	72515	71858	78058	50802	85558	74375	77203	80143
5	72515	47148	73644	46862	94600	65905	71736	77290
10	72515	84308	72095	78767	96039	64409	68411	73838

With an emphasis on early successional/ young forest, alternatives A and C would likely result in maintenance of outcome D. Both of these alternatives result in a reduction in upland nesting habitat of 20-32% in the second decade; a 51-55% decrease in large upland forest patches outside the BWCAW; up to a 21% decrease in mature lowland conifer forest-wide and a 35% reduction in large lowland conifer patches outside of the BWCAW. Outcome E was not selected for these alternatives largely due to the buffering effect provided by the wilderness area. Alternatives E, F and G differ slightly from current conditions but not enough to improve the existing outcome (Outcome D). Alternatives E, F and G would result in a 17-27% reduction in large upland forest patches as compared to existing conditions outside the BWCAW but these changes are less if the BWCAW is considered and fragmentation of nesting habitats may be less important than loss of lowland conifer habitats for boreal owls. Alternatives E, F and G result in relatively small (<10%) changes in acres of mature lowland conifer and large lowland conifer patches. Alternatives B and D are the only alternatives that would lead to outcome C due to the increase in mature upland forest patches and the increase in lowland conifer acres as well as large patch size.

Boreal Owl Table 5: Historical, current, and future outcomes for Boreal Owl in 2, 5, and 10 decades from present on National Forest lands.																							
Forest	**Historical**	**Current**	**Alt. A**			**Alt. B**			**Alt. C**			**Alt. D**			**Alt. E**			**Alt. F**			**Alt. G**		
			2	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Superior	C	D	D	D	D	C	C	C	D	D	D	C	C	C	D	D	D	D	D	D	D	D	D
Definitions: See biological evaluation for outcome definitions.																							
Notes: Outcomes in underlined bold text are those that differ from the current outcome.																							

Cumulative Effects

Historical Outcome is C. **Current outcome is D**. Effects common to all alts is D. (Cumulative effects analysis addressed below in Determination of Effects).

Boreal Owl Table 6: Cumulative Historical, current, and future outcomes for the boreal owl in 2, 5, and 10 decades from present.																							
Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

Alternatives A and C are likely to result in a loss of viability within the planning unit. Both of these alternatives result in a forest-wide reduction in upland nesting habitat of 20-32% in the

Final

second decade; a 51-55% decrease in large upland forest patches outside the BWCAW; up to a 21% forest-wide decrease in mature lowland conifer forest- and a 35% reduction in large lowland conifer patches outside of the BWCAW. This level of fragmentation is expected to increase predation levels as well as competitors. Cumulatively, the loss of habitat and edge effects are expected to be as great as or greater than our forest-wide predictions. Alternatives B, D, E, F and G may impact individuals, but are not likely to cause a trend to federal listing or a loss of viability. Alternatives B and D also have beneficial impacts but many of these benefits are not realized in the first decade.

Boreal Owl Table 7: Determination of effects for boreal owl.

	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Superior	4a	3	4a	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Black-backed woodpecker (*Picoides arcticus*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - C

The Black-backed woodpecker is considered a permanent resident in coniferous forests across much of the northern tier of North America but it is not distributed as far north as the Three-toed woodpecker (Corace *et al.* 2001). There is not information on the previous range of this species but it probably was found as far south as the boreal forest was distributed.

This species prefers old-growth coniferous forests and recently disturbed areas associated with forest fire, wind, disease and insect outbreaks (Corace *et al.* 2001). The historical natural fire regime, insect outbreaks, disease, and abundant beaver would have provided a continuous mosaic of dying and dead trees for foraging of their chief prey, bark beetles. White cedar for winter thermal cover was also present on a small portion of the landscape. Habitat would have fluctuated greatly depending on weather influences on fire, insect cycles and human influences. For this reason it was given an outcome of C.

Current Outcome - D

Black-backed woodpecker habitat is coniferous forest (primarily spruce and fir), especially windfalls and burned areas with standing dead trees; less frequently in mixed forest, rarely in winter in deciduous woodland (NatureServe 2003). This is a species of the northern conifer forests. Habitats include tamarack/spruce bogs, mature white cedar, recently burned conifer stands, and upland spruce, balsam, and pine (Corace *et al.* 2001). This species is very rare on the Chippewa National Forest, as the Forest is on the southern fringe of boreal characteristics. The species has a wandering habit. The total amount of available dead and dying conifer is likely more important than the configuration upon the landscape. This species exhibits irregular populations irruptions related to disturbances such as fire, disease, and insect infestations (such as spruce budworm). Optimal habitat includes decadent conifer and insect-killed conifer stands. Wind events likely provide habitat opportunities for the short-term.

Black-backed woodpecker is a species of boreal and montane coniferous forests. It usually inhabits mature or old-growth coniferous stands (decadent jack pine, balsam fir, tamarack, cedar, and black spruce stands) with abundant insect-infected dead and dying trees (Corace *et al.* 2001). Even in predominately living forests, Black-backed woodpeckers forage mainly on dead and dying timber. This 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. Information regarding the effects of fragmentation or patch size for Black-backed woodpeckers was not available or does not exist.

Management practices, which could decrease habitat, include fire suppression and control of insect and disease outbreaks. Proportion of mature conifers on the landscape may be a concern. Sanitation/salvage harvest of decadent stands directly removes prime habitat, particularly if tree mortality relates to bug infestation. Salvage harvest of wind-damaged stands also likely reduces potential habitat. Quality habitat on the Chippewa has been greatly reduced due to the above factors. For this reason it was given an Outcome Ranking of D.

Final

Direct/Indirect Effects

Effects Common to All Alternatives
Salvage harvesting and suppression of stand replacement fires in mature conifer in all alternatives would keep habitat at the present low levels. Snag retention guidelines would provide a small amount of habitat.

Timber harvest during the breeding season also 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 or flood.

Effects by Alternative
Analysis of effects by alternative would focus on MIH-9 Mature spruce/tamarack habitat, MIH-5 Upland conifer-dominated forest and fire disturbance.

MIH9 Lowland Black Spruce-Tamarack and MIH5 Upland Conifer-dominated Forest

Black-backed Woodpecker Table 1: MIH 9. Mature Lowland Black Spruce/Fir Forest acreage on the Chippewa National Forest.

Decade	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
2	54,603	42,110	52,637	40,151	57,876	51,543	50,312	51,276
5		38,236	48,742	40,131	61,412	46,939	46,000	46,587
10		54,270	49,808	49,466	62,194	53,354	51,406	50,517
MIH 5. Mature Upland Conifer-dominated Forest acreage on the Chippewa National Forest.								
2	63,200	54,800	88,800	55,000	83,800	81,204	87,500	81,000
5		53,500	127,100	62,700	133,800	109,659	122,700	118,400
10		62,300	187,900	82,200	224,500	124,567	172,600	156,800

Black-backed Woodpecker Table 1 and Figure WLD 9b show that mature/older lowland black spruce-tamarack forest acreage is predicted to remain near existing levels and within or above RNV (estimated at a range from 49,800 to 53,000 acres) in all decades and all alternatives.

Management in lowland conifer on the Chippewa is expected to increase by a factor of 2-9 times current levels in 6 of 7 of the alternatives. No lowland black spruce-tamarack forest is scheduled to be harvested in Alternative D. Alternatives A and C propose the largest amount of harvest and vary the amounts considerably among decades. For most of the other alternatives, there would be 3-4 times the amount of 0-9 age class as a result of harvest than currently exists. The ranking of these alternatives from most to least harvest is: C, A, Modified E, F, B, G with D having no harvest.

Upland conifer-dominated forest is predicted to remain near or exceed existing levels and approach RNV (estimated range from 157,200 to 187,900 acres) by Decade 10 in all but three

Final

alternatives. Alternative A, C and Modified E would remain below RNV during all three decades. Alternative A is the only Alternative that would remain below existing acres even after Decade 10. These numbers should be considered maximum harvest because there are Standards that would maintain most mature jack pine and red and white pine that was not included in the model.

Fire Disturbance

The difference in the role of fire by alternatives would be used to analyze the effects on Black-backed woodpeckers. This species closely associates with conditions resulting from fire, specifically stand replacing fires. Maximum acres available to management ignited stand-replacing fires for both Ecological and Hazardous Fuels objectives would be used as an indicator of the role of fire by alternative.

Black-backed Woodpecker Table 2: Proposed Maximum Acres of Management Ignited Stand Replacing Fire on the Chippewa National Forest.

Decade	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
1	6,912	7,751	7,156	8,923	7,888	7,469	6,815
2	6,006	8,389	6,396	10,142	8,223	7,870	6,895

Alternatives A and C produce the lowest number of opportunity acres available for stand replacing fires (ephemeral Black-backed woodpecker habitat). Alternatives B and D produce the highest number of opportunity acres for stand replacing fires. Mimicking natural disturbance by utilizing fire on a moderate scale (Alternative B) and on a slightly larger scale (Alternative D) would enhance woodpecker habitat. Alternatives Modified E, F, and G produce a moderate amount of opportunity acres for stand replacement fires.

Outcome Determination

Black-backed Woodpecker Table 3: Historical, current, and future outcomes for Black-backed Woodpecker in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	C	C	C	D	D	C	C	C	C	C	C	C	C	C	C	C	C	C

Future outcomes range from C to D on the Chippewa for the seven alternatives in Decades 2, 5 and 10. Maximum acres of management-ignited stand replacing fires did not differ by more than 5,000 acres in any alternative. Fire was not as important a factor as mature black spruce/tamarack habitat and upland conifer-dominated habitat.

Alternative A was given an outcome ranking of D in Decade 2, 5 and 10. Alternative A had the second least acres of potential stand replacement fires, a decrease of lowland and upland conifer-dominated habitat below existing levels in all decades. By Decade 10, both habitats would be near existing levels and within RNV for black spruce habitat.

Alternative B was given a ranking of C for Decades 2, 5 and 10. It had the second most acres of

Final

potential stand replacement fires; it remained in RNV and near existing acres of lowland habitat during all decades (except slightly below RNV in Decade 5) and had the second greatest increase in upland conifer-dominated habitat.

Alternative C was given an outcome ranking of D in Decade 2 and a ranking of C in Decade 10. Alternative C had the least acres of potential stand replacement fires, a 25% decrease of lowland habitat below existing and below RNV in Decade 2 and 13% decrease in upland conifer-dominated habitat in Decade 2. Overall total potential habitat would be 22,000 acres less than existing in Decade 2 and 15,000 acres less in Decade 5. In Decade 10, it was given an Outcome Ranking of C because total habitat would be increased (14,000 acres) over existing and the new snag and leave tree policy should retain more potential foraging and nesting habitat.

Alternative D was given a ranking of C for Decades 2, 5 and 10. It had the most acres of potential stand replacement fires, it increased acres of lowland habitat during all decades and increased upland conifer-dominated habitat from existing during all decades.

Modified Alternative E was given a ranking of C for Decades 2, 5 and 10. Mature lowland black spruce was within RNV for Decades 2 and 10 and upland conifer-dominated habitat increased greatly over existing conditions (70,900 acres by Decade 10).

Alternative F was given a ranking of C for Decades 2, 5 and 10. Mature lowland black spruce was within RNV for Decades 2 and 10 and upland conifer-dominated habitat increased greatly over existing conditions (109,400 acres by Decade 10).

Alternative G was given a ranking of C for Decades 2, 5 and 10. Mature lowland black spruce was within RNV for Decades 2 and 10 and upland conifer-dominated habitat increased greatly over existing conditions (93,600 acres by Decade 10).

Cumulative Effects

Historical Outcome - C
Natural fire regimes in mature conifer and large amounts of old growth forest would have created abundant foraging habitat (Outcome C) for Black-backed woodpeckers in the Drift and Lake Plains prior to European settlement. Clearing of the forests and fire suppression efforts after settlement would have started to reduce habitat for this species.

Current Outcome - D
The amount and quality of lowland conifer habitat likely would remain stable within the cumulative effects area. In large part this habitat is inaccessible, of low economic value, and unsuitable for development. The amount and quality of older jack pine and balsam fir is likely to remain stable or decline within the cumulative effects area because of shorter rotations and more salvage logging on many state, county, and private lands outside the National Forest.

Black-backed Woodpecker Table 4: Cumulative Historical, current, and future outcomes for the Black-backed Woodpecker in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G

Final

			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

Black-backed Woodpecker Table 5: Determination of effects for Black-backed Woodpecker.

	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	2	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

May impact but not likely to cause a trend to federal listing or loss of viability for all Alternatives except Alternative D which would have beneficial impacts. The general maintenance or increase of lowland spruce/tamarack and upland conifer-dominated habitat, increased use of snag and leave trees and the species ability to travel long distances to locate quality habitat would offset the reduction in habitat by fire suppression and salvage logging.

Final

Three-toed woodpecker (*Picoides tridactylus*)

Regional Forester Sensitive Species: Superior

Historical Outcome - C

The Three-toed woodpecker is listed as a Regional Forester Sensitive Species on the Superior National Forest. It is a rare, permanent resident of extreme northern parts of Minnesota (Janssen 1987), and is slightly more common as a winter visitor to the northeastern and north-central regions of the state. Winter records from as far south as Washington County can be found (Janssen 1987). This species is a rare breeding species in the state. Very few nests have been found in the state, mainly in Cook County. However, the species is likely a regular nesting species, but presumably in very low numbers and in very remote parts of the state.

This species prefers old-growth coniferous forests and recently disturbed areas associated with forest fire, wind, disease and insect outbreaks. The historical natural fire regime, insect outbreaks, disease, and abundant beaver would have provided a continuous mosaic of dying and dead trees for foraging of their chief prey, bark beetles. White cedar for winter thermal cover was also present on a small portion of the landscape. Habitat would have fluctuated greatly depending on weather influences on fire, insect cycles and human influences. For this reason it was given an outcome of C.

Current Outcome - D

Three-toed woodpecker breed throughout coniferous forests in Canada and the western U.S., and in northern Minnesota and Wisconsin. On the Superior, three-toed woodpeckers have been reported in St. Louis, Cook and Lake Counties.

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). Even in predominately living forests, Three-toed woodpeckers forage mainly on dead and dying timber. In Region 9 they seem to nest mainly in spruce and balsam snags and mature trees. This 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 (Burdette and Niemi 2002a). According to Green and Niemi (1980), 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 (Burdette and Niemi 2002a) 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 (Burdette and Niemi 2002a).

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. For this reason it was given an Outcome Ranking of D.

Direct/Indirect Effects

Effects Common to All Alternatives
Salvage harvesting and suppression of stand replacement fires in mature conifer in all alternatives would keep habitat at the present low levels. Snag retention guidelines would provide a small amount of habitat. Beaver control measures would probably be similar between all alternatives and would be mainly driven by fur prices, with higher trapping when fur prices are higher. During low fur prices, beaver populations may increase and thereby increase ephemeral Three-toed woodpecker habitat (flood-killed trees).

Timber harvest during the breeding season also 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 or flood.

Effects by Alternative
Analysis of effects by alternative would focus on MIH-9 Mature spruce/tamarack habitat, fire disturbance and fragmentation.

MIH9 Lowland Black Spruce-Tamarack

Three-toed woodpecker Table 1: MIH 9b. Mature Lowland Black Spruce/Fir Forest acreage on the Superior National Forest (including BWCA).

Decade	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
2	206,894	218,494	229,668	181,693	242,920	228,318	227,317	232,725
5		177,866	225,599	176,804	259,079	220,568	219,973	233,125
10		246,336	227,171	236,604	262,647	223,563	217,491	231,248

Three-toed woodpecker Table 1 And Figure WLD 9b show that mature/older lowland black spruce-tamarack forest acreage is predicted to remain at or above existing levels and very close to RNV (estimated at a range from 208,000 to 227,000) in all decades and all alternatives with two exceptions. Alternative C would fall below existing levels and below the low range of RNV in Decade 2 and 5 but would increase above RNV in Decade 10. Alternative A would fall below existing levels and below the low range of RNV in Decade 5 but would increase above RNV in Decade 10.

Management in lowland conifer on the Superior is expected to increase by a factor of 2-9 times current levels in 6 of 7 of the alternatives. No lowland black spruce-tamarack forest is scheduled to be harvested in Alternative D. Alternatives A and C propose the largest amount of harvest and vary the amounts considerably among decades. For most of the other alternatives, there would be 3-4 times the amount of 0-9 age class as a result of harvest than currently exists. The ranking of these alternatives from most to least harvest is: C, A, Mod. E, F, B, G with D having no harvest.

Fire Disturbance

The difference in the role of fire by alternatives would be used to analyze the effects on Three-toed woodpeckers. This species closely associates with conditions resulting from fire, specifically stand replacing fires. Maximum acres available to management ignited stand-

Final

replacing fires for both Ecological and Hazardous Fuels objectives would be used as an indicator of the role of fire by alternative.

Three-toed woodpecker Table 2: Proposed Maximum Acres of Management Ignited Stand Replacing Fire on the Superior National Forest.

Decade	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
1	7,268	8,036	7,154	9,198	6,230	6,833	7,109
2	7,767	9,008	7,635	10,572	7,190	7,870	7,760

Alternatives A, C and G produce the lowest number of opportunity acres available for stand replacing fires (ephemeral Three-toed woodpecker habitat). Alternatives B and D produce the highest number of opportunity acres for stand replacing fires. Mimicking natural disturbance by utilizing fire on a moderate scale (Alternative B) and on a large scale (Alternative D) would enhance woodpecker habitat. Alternatives E (Mod.), and F produce a moderate amount of opportunity acres for stand replacement fires.

Forest Fragmentation

Forest interior habitat would be used as an indicator for forest spatial patterns (fragmentation) by Alternatives. 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 from the edge of all forest patches. The resulting area, interior forest habitat, was summed forest-wide for that time period and alternative.

Three-toed woodpecker Table 3: Total Area of Interior Forest within all Mature or older Upland Forest within the Superior National Forest (excludes BWCA).

Decade	Existing 2002	Existing 2004*	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
2	147,715	141,358	93,073	149,624	74,454	144,148	128,429	128,688	120,339
5	147,715	141,358	87,158	245,901	79,888	260,798	140,872	177,343	158,960
10	147,715	141,358	94,355	263,555	97,889	321,012	179,238	193,979	160,311

* Applies to Modified Alternative E only. The model was run for Modified Alt. E only with new data after the DEIS came out.

Alternative A is among the lowest at maintaining interior forest over the short-term and the long-term. There is as much as a 41% decrease from existing conditions. This loss of patch quality indicates a shift towards a more highly fragmented landscape with fewer patches that contain interior mature forest habitat.

Alternative B is among the highest at maintaining interior forest over the short-term and the long-term. In the short-term there is a slight net increase from existing conditions and a 78% increase over the long-term. This alternative would compensate for losses of interior forest habitat on other ownerships and, where large forest patches join with the BWCAW, would form an extensive coarse filter.

Alternative C is the lowest at maintaining interior forest over the short-term and the long-term. There is a 50% reduction from existing in this indicator and a 34% reduction in the long-term. This loss of patch quality indicates a shift towards a more highly fragmented landscape with fewer patches that contain interior mature forest habitat.

Final

Alternative D results in a slight short-term decrease in interior forest than exists currently. This may be due partially to the effect of succession modeling rules that may over-predict a change to a younger forest condition. In the long-term this alternative causes the greatest increase (117%) in interior forest among all alternatives.

Alternative E causes a decline of 9% decline in the second decade in interior forest from existing condition. A 27% increase in interior forest habitat is created in the long-term.

Alternative F causes a decline of 13% in the short-term and a 31% increase in the long-term of interior forest habitat. In the long-term this alternative significantly improves interior forest habitat.

Alternative G causes a decline of 19% in the short-term and a 9% increase in the long-term of interior forest habitat. In the long-term this alternative marginally improves interior forest habitat.

Outcome Determination

Three-toed woodpecker Table 4: Historical, current, and future outcomes for three-toed woodpecker in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	D	**C**	D	**C**	**C**	**C**	**C**	D	D	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**

Notes: Outcomes in underlined bold text are those that differ from the current outcome.

Future outcomes range from C to D on the Superior for the seven alternatives in Decades 2, 5 and 10. Maximum acres of management-ignited stand replacing fires did not differ by more than 5,000 acres in any alternative. Fire was not as important a factor as mature black spruce/tamarack habitat and fragmentation.

Alternative A was given an outcome ranking of D in Decade 5 and a ranking of C in Decade 2 and 10. Alternative A had the second least acres of potential stand replacement fires, a decrease of lowland habitat below existing in Decade 5 and a minimum of 35% decrease in interior habitat during all decades.

Alternative B was given a ranking of C for Decades 2, 5 and 10. It had the second most acres of potential stand replacement fires, it increased acres of lowland habitat during all decades and increased interior habitat during all decades.

Alternative C was given an outcome ranking of D in Decade 2, 5 and a ranking of C in Decade 10. Alternative C had the least acres of potential stand replacement fires, a decrease of lowland habitat below existing in Decade 2 and 5 (14% increase in Decade 10) and a minimum of 30% decrease in interior habitat during all decades. The increase in lowland habitat by Decade 10 should provide enough habitat to offset the decrease in interior habitat.

Alternative D was given a ranking of C for Decades 2, 5 and 10. It had the most acres of

Final

potential stand replacement fires, it increased acres of lowland habitat during all decades and increased interior habitat from existing during all decades.

Alternative E was given a ranking of C for Decades 2, 5 and 10. It increased acres of lowland habitat during all decades but slightly decreased the amount of forest interior (10,000 acres less in Decade 10). This decrease of forest interior should be mitigated by Spatial objectives, Standards and Guidelines (S&Gs) relating to patch management and by snag and leave tree S&Gs.

Alternative F was given a ranking of C for Decades 2, 5 and 10. It had the fourth most acres of potential stand replacement fires, it increased acres of lowland habitat during all decades and increased interior habitat during all decades except Decade 2.

Alternative G was given a ranking of C for Decades 2, 5 and 10. It had the third most acres of potential stand replacement fires, it increased acres of lowland habitat during all decades and increased interior habitat during all decades except Decade 2.

Cumulative Effects

Historical Outcome - C
Natural fire regimes in mature conifer and large amounts of old growth forest would have created abundant foraging habitat (Outcome C) for Three-toed woodpeckers in the Northern Superior Uplands prior to European settlement. Clearing of the forests and fire suppression after settlement would have started to reduce habitat for this species.

Current Outcome - D
Habitat is decreasing range wide (USDA FS 2002b, planning record). Fire suppression, salvage logging, clearcutting without abundant conifer reserve trees, maintenance of aspen, beaver and spruce budworm control, and habitat fragmentation threaten 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 (Niemi *et al.* 2003). For this reason, it was given an Outcome Ranking of D.

Spatial Patterns

The Superior National Forest manages approximately 42% of the forested lands in this ecological Section. Wolter and White (2002) showed that management as affected by ownership (for example, private industrial or federal) strongly influences landscape patterns in the Northern Superior Uplands in northeastern MN. This work shows an overall trend toward less interior forest area and decreased connectivity (increased fragmentation) across the managed forest landscape in northeastern MN. By contrast the Boundary Waters Canoe Area Wilderness, considered unmanaged forest in this study, remained relatively constant with regard to these same measures of spatial patterns.

Final

Three-toed woodpecker Table 5: Cumulative Historical, current, and future outcomes for the three-toed woodpecker in 2, 5, and 10 decades from present.																						
Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G	
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

Three-toed woodpecker Table 6: Determination of effects for Three-toed Woodpecker.							
	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Superior	3	3	3	2	3	3	3
Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.							

May impact but not likely to cause a trend to federal listing or loss of viability for all Alternatives except Alternative D which would have beneficial impacts. The general maintenance or increase of lowland spruce/tamarack acreage, increased use of snag and leave trees and the species ability to travel long distances to locate quality habitat would offset the reduction in habitat by fire suppression and fragmentation. Also, the BWCA currently supports the species and there would always be dead trees and fire and disease in this area.

Final

Olive-sided flycatcher (*Contopus borealis*)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome – Chippewa C, Superior B

Broad historical range with gaps between suitable habitat. Historical fire regimes in upland conifers created and maintained foraging habitat (outcome B on the Superior and C on the Chippewa because of less conifer acreage). Nesting habitat and wintering were not limiting.

Current Outcome - Chippewa D, Superior D

Breeding habitat is subject to alteration through harvesting and reduction of fire (MIH 5). Fire is thought to be more important than harvesting for creating habitat. Live and dead snags are used for hunting perches.

General Effects

Foraging habitat structure of live and dead snags is the most important component in the breeding range. Reduction in fire frequency may have a greater impact on foraging habitat and may not be outweighed by habitat created through harvesting. Nesting habitat and wintering are not limiting. Range wide population decline includes the planning area (outcome D). The causes of the decline are not well known and may include wintering habitat changes.

Direct/Indirect Effects

Effects Common to All Alternatives
All Alternatives would increase snags and leave island retention via standards and guidelines but this is of lesser importance than fire regime (outcome D).

Effects by Alternative
Alternatives D, B, and F (in that order) have the highest level of prescribed fire for meeting ecological objectives in both decades 1 and 2 (see Final EIS Chapter 3.5.2b for full analysis of this Indicator). A high level of prescribed fire for meeting ecological objectives may be beneficial in maintaining amounts of suitable habitat for the Olive-sided flycatcher on the Chippewa and Superior. Conversely, Alternatives C and A have the lowest level of prescribed fire for meeting ecological objectives.

Mature or older upland conifer forest (MIH 5b) increases in Alternatives B, D, Mod. E, F, and G in the first 20 years (Appendix D in Final EIS). Amounts decrease during this time period for Alternatives A and C. Amounts of mature or older lowland conifer forest (MIH 9b) decrease in the next 20 years in all alternatives except alternative D (Appendix D in Final EIS). Rates of harvest in lowland conifer forest greatly increase in these alternatives over existing condition. This would result in greater amounts of open lowland habitat with perches for foraging.

Indicators of Watershed Health (Final EIS Chapter 3.6.1b) show the potential to change habitat for this species in or near riparian habitats. Alternative C, A, Mod. E, and G, in this order, would have the greatest stream crossing density among alternatives and may have the greatest potential

Final

for beaver impoundments, thus creating standing dead timber habitat conditions for the Olive-sided flycatcher.

Olive-sided flycatcher Table 1: Historical, current, and future outcomes for the Olive-sided Flycatcher in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	**C**	**C**	**C**	D	D	D	**C**	**C**	**C**	D	D	D	**C**	**C**	**C**	D	**C**	**C**
Superior	B	D	D	D	D	**C**	**C**	**C**	D	D	D	**C**	**C**	**C**	D	D	D	**C**	**C**	**C**	D	**C**	**C**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Cumulative Effects

Historical fire disturbances in upland conifer would have created abundant foraging habitat (outcome B). Alternative habitats such as water killed timber due to beaver impoundments are available throughout the cumulative effects area. Fire frequency is similar on the planning area versus the cumulative effects area, and is generally highly suppressed. Alternatives B, D, F, and G would lead to outcome C because of habitat creation by an increase in fire frequency.

Olive-sided flycatcher Table 2: Cumulative Historical, current, and future outcomes for the Olive-sided Flycatcher in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	D	D	D	D	**C**	**C**	**C**	D	D	D	**C**	**C**	**C**	D	D	D	**C**	**C**	**C**	**C**	**C**	**C**
Superior	B	D	D	D	D	**C**	**C**	**C**	D	D	D	**C**	**C**	**C**	D	D	D	**C**	**C**	**C**	**C**	**C**	**C**

Determination of Effects

All alternatives may impact individuals, but are not likely to cause a trend to federal listing or a loss of viability.

Olive-sided flycatcher Table 3: Determination of effects for the Olive-sided Flycatcher.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Black-throated blue warbler (*Dendroica caerulescens*)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome - Chippewa B, Superior B
Current Outcome - Chippewa D, Superior C

The black-throated blue warbler ranges throughout the northeastern mixed hardwood forest from the Great Lakes east to the maritime provinces, Nova Scotia, New England, and in the Appalachians south to Georgia. As much of the eastern mixed hardwood forest matured over the past few decades, black-throated blue warbler populations increased, and through the 1990's, were either stable or increasing. Province 212 is at the western edge of this species' range. In this region, black-throated blue warblers appear to be vulnerable to habitat fragmentation due to logging, urbanization, and creation of edge.

Black-throated blue warblers are known to nest in the northern hardwood forests in the Superior Highlands in Lake and Cook Counties. Territorial males are also known to be widely scattered across the Chippewa National Forest, particularly in areas of more contiguous mature forest.

Suitable breeding habitat for the black-throated blue warbler appears to be mature deciduous or mixed deciduous/coniferous forest with dense understory development. In addition, black-throated blue warblers are found only in relatively large blocks of contiguous mature forest (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. 1996, Steele 1992, NatureServe 2003). Minnesota is on the western edge of the species' range, and Minnesota nesting has only been confirmed near the shore of Lake Superior. However, singing males have been observed on the Chippewa NF by the Natural Resources Research Institute (Lind et al., 2000).

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.

The black-throated blue warbler is area sensitive, requiring large, relatively intact areas of continuous canopy forest. Research from the eastern parts if its range (Robbins et. al, 1989) suggest that areas at least 2500 acres in size and greater than 70% closed canopy are needed to support populations. Fragmented habitats create conditions for American redstarts (*Setophaga ruticilla*) and chestnut-sided warblers (*Dendroica pensylvanica*) that compete with and 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 the fragmented landscape. In these situations, the likelihood of these

Final

species invading interior patches after even a slight amount of disturbance is much greater (Hamady 2002). Secure populations of black-throated blue warblers require large areas of interior forest with little or no fragmentation in the form of canopy openings.

Direct/Indirect Effects

Effects by Alternative

Indicator 1

For the purpose of this analysis, an interior forest block is considered suitable for black-throated blue warblers if it is mature or older forest and closed canopy cover is at least 70%. To be considered closed canopy, a forest stand must have a crown closure of at least 70%. Robbins et al. (1989) developed a predictability table for area sensitive forest birds that predicted a 50% chance of finding black-throated blue warblers in a forest patch of 2500 acres in size. As patch size decreases from 2500 acres, the chances of finding this species declines rapidly. As patch size increases from 2500 acres, black-throated blue warbler presence is more reliable. Robbins et al. (1989) suggested that this 2500-acre patch size be used to assure breeding, and therefore sustainability. This analysis uses forest patch size of 2500 acres as the indicator for maintenance of sustainable populations of black-throated blue warblers. Since suitable nesting and foraging habitat appears to be provided by a variety of forest types, particularly mixed deciduous, and any type of closed canopy forest excludes chestnut sided warblers and American redstarts, all upland forest types are considered in the analysis of patch size. The most important factor in providing habitat for this species is the presence of large patches (at least 2500 acres) of closed canopy forest. This analysis is relative to changes to patches predicted by the Dualplan harvest modeling. The effect of probable management direction for maintaining large patches is addressed in the context of each alternative.

Indicator 2

Effects of alternatives on this species are also assessed more generally by examining the trends of mature or older upland forest predicted by alternative and decade. An assumption in this approach is that management objectives to maintain or increase large patches and interior forest would be successful in spatially allocating habitat in large enough blocks to maintain this species at viable levels.

BWCAW

There are about 706,299 upland acres in Federal ownership in the Boundary Waters Canoe Area Wilderness. About 79% (559,000 acres) is currently within 2500 acre or larger mature forest patches. This very large pool of habitat, compared to that outside of the wilderness, for the black-throated blue warbler is projected to increase in future decades as blown-down forest from the 1999 event grows into mature forest. The analysis of large patches for this species is for outside the wilderness only, but the analysis, outcomes, and effects determinations are made for the entire Superior NF. The influence of the BWCAW on spatial diversity for forestland outside the wilderness was accounted for by the use of spatial zones to provide a context for large patch numbers and acres to ensure well-distributed habitats away from the BWCAW.

Final

Black-throated blue warbler Table 1: Indicator 1 - Mature and older upland forest patches greater than 2500 acres per alternative by decade, Chippewa National Forest.

Dec.		Existing Condition	ALT A	ALT B	ALT C	ALT D	MOD. ALT E	ALT F	ALT G
2	No. Patches	7	4	11	4	9	6	11	6
	Ac. in Patches	37,724	17,829	52,307	23,341	46,170	35,537	52,452	35,180
	% Upland Forest	8	4	11	5	10	8	12	8
5	No. Patches		5	19	9	19	8	17	10
	Ac. in Patches		25,488	114,243	42,363	102,803	46,181	102,385	62,076
	% Upland Forest		6	25	9	23	10	22	14
10	No. Patches		6	21	9	28	11	16	14
	Ac. in Patches		32,459	109,552	45,859	154,613	63,472	93,906	74,243
	% Upland Forest		7	24	10	34	14	21	16

Black-throated blue warbler Table 2: Indicator 1 - Mature and older upland forest patches greater than 2500 acres per alternative by decade, Superior National Forest not including BWCAW.

Dec.		Existing Condition	ALT A	ALT B	ALT C	ALT D	MOD. ALT E	ALT F	ALT G
2	No. Patches	23	9	23	6	22	12	19	15
	Ac. in Patches	120,197	50,424	122,479	33,167	111,201	65,111	88,196	70,956
	% Upland Forest	13	5	13	3	12	7	9	7
5	No. Patches		9	35	5	32	19	24	22
	Ac. in Patches		41,737	269,068	30,767	285,971	95,451	154,044	146,965
	% Upland Forest		4	28	3	30	10	16	15
10	No. Patches		11	37	11	31	20	24	24
	Ac. in Patches		63,049	334,611	62,098	398,517	149,942	190,338	172,160
	% Upland Forest		7	35	6	42	16	20	18

Final

Black-throated blue warbler Table 3: Indicator 2 - Percentage of All Upland Forest in Mature/Older Upland Forest within the Chippewa and Superior National Forests for existing condition and decades 2, 5, and 10 for each alternative.

National Forest		Alt. A No Action	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	Existing	49%	49%	49%	49%	49%	49%	49%
	2	31%	52%	28%	51%	44%	51%	47%
	5	27%	78%	31%	79%	57%	75%	65%
	10	28%	77%	36%	88%	54%	72%	64%
Superior	Existing	56%	56%	56%	56%	56%	56%	56%
	2	38%	55%	32%	53%	46%	49%	47%
	5	38%	72%	32%	76%	51%	60%	55%
	10	37%	74%	38%	85%	58%	62%	58%
Superior	Existing	51%	51%	51%	51%	51%	51%	51%
w/BWCAW	2	43%	53%	39%	52%	48%	49%	48%
	5	49%	69%	47%	71%	58%	62%	60%
	10	52%	74%	53%	80%	65%	67%	64%

Source: Based on existing data and harvest model output for decades 2,5,10 for Federal ownership only. Superior in BWCAW, acres of mature/older upland from MIH report 1.
Definitions: A patch is defined as a contiguous grouping of similar vegetative conditions.
‡Notes: Chippewa NF: Total upland acres: 455,880 ac, Total federal ownership: 666,471 ac, Superior NF: Total upland acres: 1,666,569 (outside the wilderness 960,270 ac. 706,299 ac. within the wilderness) Total federal ownership: 2,171,660 acres.

Chippewa Discussion

Little is known about black-throated blue warblers on the Chippewa National Forest. Occurrence data suggests that breeding is almost assured. It is unknown whether the existing condition supports a viable, sustainable population or whether the Chippewa is a fringe area serving as a population sink. Because of this lack of knowledge, it is not possible to determine what conditions would be necessary to support a viable population. However, it appears that numbers are very sparse and that any loss of suitable and presumably occupied habitat would likely jeopardize viability, regardless of viability of the existing population. Therefore, any reductions in the amount of suitable habitat must be considered a threat to the viability of the species on the Chippewa.

Harvest intensity predicted for Alternatives A and C causes the greatest decreases to Indicator 1 in the second decade and is the greatest among all alternatives. Alternative A does not recover and continues to decline throughout, but approaches recovery to the existing condition by decade 10. Alternative C recovers the habitat loss and shows a slight increase by decade 5 with stable amounts of habitat thereafter. Harvest intensity in these alternatives would likely make an objective to increase very large patches very difficult. Indicator 2, percentage of all upland forest in mature or older age, shows short-term and long-term decreases in potential habitat without regard to spatial distribution. Amounts in future decades never meet or exceed current amounts. As with indicator 1, these alternatives show the greatest decreases among all alternatives.

Alternatives E (Modified) and G both predict drops in the second decade in Indicator 1 from existing condition with a recovery to about existing condition by decade 5. Management direction to maintain or increase large patches would likely be successful at spatially arranging harvests to maintain very large (2500 ac) patches and could, therefore, eliminate the projected

Final

drop in this indicator. Habitat increases in decade 5 and continues increasing through decade 10. After a century, Modified Alternative E shows about 68% more suitable habitat than presently exists and Alternative G about a 100% increase. Indicator 2 shows a similar trend for both alternatives with projected drops in potential habitat in the second decade but long-term increases from existing condition.

Alternatives B, D, and F all show substantial increases in Indicator 1 in decade 2 with further increases in decades 5 and 10, approximately tripling the amount of suitable habitat by the next century. Management direction to maintain or increase large patches would likely be successful at spatially arranging harvests to maintain very large (2500 ac) patches and could, therefore, eliminate the projected drop in this indicator. Indicator 2 shows a similar trend as Indicator 1, with increases by the second decade to beyond existing condition. These are the only alternatives that would have more potential habitat (Indicator 2) than currently exists at the end of the second decade.

Superior Discussion

The Superior National Forest is known to have a consistently breeding population of black-throated blue warblers in the sugar maple dominated hardwood forests along the north shore of Lake Superior. However, black-throated blue warblers are also scattered throughout the Forest. The north shore population is considered to be a viable population. The status of the species elsewhere on the Superior is similar to that of the Chippewa, low numbers and status mostly unknown.

In Indicator 1 all of the alternatives predict reductions through the second decade. One alternative (B) maintains existing conditions by the end of the second decade. Alternatives A, C, Mod. E, F, and G all could result in substantial habitat loss in the second decade. Management direction would maintain existing patch numbers for patches greater than 1000 acres and 90% of patch acres in patches greater than 1000 acres in spatial zones not proximate to the BWCAW. This would likely maintain a majority of the habitat found in the northern hardwood belt along the north shore of Lake Superior (in Spatial Zone 2, see Proposed Forest Plan 2003, p.2-79). Additional habitat on the forest would be maintained in spatial zone 1, where, similarly, patch numbers are maintained and 90% of patch acres are maintained in patches greater than 1000 acres. For the remainder of the forest, the BWCAW would dominate spatial patterns and habitat conditions for this species. This would not prevent reductions in this indicator in the future. Gaps in habitat could exist between the large body of habitat in the BWCAW and in spatial zones where habitat is at least maintained near existing condition. Management direction would likely be needed and apply to Alternatives B, D, Mod. E, F, and G. Achieving vegetation objectives along with all other management direction may be difficult in Modified Alternative E. Projected harvest levels in this Alternative may be difficult to spatially arrange while still maintaining near existing spatial conditions. Alternatives A and C would likely have different management direction to address the themes of these alternatives.

Trends in Indicator 2 show short-term and long-term decreases in potential mature forest habitat in Alternatives A and C from existing conditions outside of the BWCAW. Forest-wide, existing amounts of this indicator are not reached until the tenth decade for Alternatives A and C. Alternatives B and D decrease in the first decade but meet or exceed existing amounts forest-wide by the end of the second decade. Alternatives E (Mod.), F, and G decrease in the second decade but meet or exceed existing amounts by the fifth decade.

Management objectives in Alternatives A and C pose a high risk to the continued existence of this species on the Superior by severely limiting the distribution and spatial arrangement of this species' habitat. All of the remaining alternatives would likely maintain the core of habitat for this species on the forest in the short-term and show habitat recovery and improvement in decades 5 and 10, with substantial increases in habitat availability in Alternatives B and D.

Black-throated blue warbler Table 4: Historical, current, and future outcomes for Black-throated Blue Warbler in 2,5,10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	D	**E**	D	D	**C**	**B**	**B**	E	**D**	**D**	**C**	**B**	**B**	D	D	**C**	**C**	**B**	**B**	D	**C**	**C**
Superior	B	C	**E**	**D**	**D**	C	**B**	**B**	**E**	**E**	**D**	C	**B**	**B**	**D**	**D**	**D**	C	C	C	C	C	C
Definitions: See biological evaluation for outcome definitions.																							
Notes: Outcomes in underlined bold text are those that differ from the current outcome.																							

Cumulative Effects

The black-throated blue warbler has extraordinary habitat requirements that are difficult to maintain given today's human population and land uses. This is particularly true for the Northern Minnesota Drift and Lake Plains Section, which is geologically very fragmented. It would be difficult for and unlikely that other ownerships, or combinations of ownerships would provide very much suitable habitat for this species. Providing habitat for the black-throated blue warbler in Minnesota is going to rely heavily on national forest management in cooperation with state and county land managers with intermingled land parcels. Habitat availability outside of the national forest boundaries would probably be scarce. The cumulative effects for this species habitat are very similar to the cumulative effects addressed in Chapter 3.2.2d. Forest Spatial Patterns. Wolter and White (2002) showed that management as affected by ownership (*e.g.* private industrial vs. federal, etc.) strongly influences landscape patterns in the NSU in northeastern MN. With even greater interspersion of ownerships within the DLP, these effects are greater in this Section. The cumulative effects for this species are likely to be more severe than those projected for the National Forests.

Black-throated blue warbler Table 5: Cumulative Historical, current, and future outcomes for Black-throated Blue Warbler in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	D	**E**	**E**	**D**	**C**	**C**	**C**	**E**	**E**	D	**C**	**C**	**C**	**E**	D	D	D	**C**	**C**	D	**C**	**C**
Superior	B	C	**E**	**E**	**E**	C	C	C	**E**	**E**	**E**	C	C	C	**E**	**D**	**D**	**D**	C	C	**D**	C	C

Final

Chippewa NF and the DLP

Alternatives B, D, F, and G

Reductions in disturbance rates (Wolter and White 2002, p.149) combined with MA allocations, more diverse options for forest management would, in the long term, reverse recent past effects on forest spatial patterns on the forest. These alternatives would, to varying degrees, compensate for continued trends on other ownerships in the DLP.

Modified Alternative E

This alternative has fewer management area allocations that would result in larger forest patches of mature or older forest. As a result, it has a lower ability to compensate for interspersed ownership patterns. Maintenance of disturbance rates similar to recent levels combined with a predominance of even-aged early successional species management on the forest and throughout the DLP Section would perpetuate recent downward trends to forest spatial patterns in the region (Host and White 2002).

Alternative A and C

High rates of disturbance perpetuate trends in forest fragmentation (Host and White 2002, Wolter and White 2002) of small patches, decreasing interior forest, and high amounts of edge. There is a corresponding decrease in mature or older upland forest and large patches of forest in these age classes. More larger patches could be managed for the future in these alternatives, but at the expense of maintaining adequate habitat in the next 10 to 20 years.

Superior NF and the NSU

Alternatives B, D, F, and G

Reductions in disturbance rates (Wolter and White 2002, p.149) combined with MA allocations, more diverse options for forest management would begin to change recent past effects on forest spatial patterns on the forest. These alternatives would, to varying degrees, compensate for higher amounts of fragmentation and smaller patch sizes due to interspersed ownership patterns in the NSU. With the BWCAW, these alternatives implement an effective matrix of habitat for this species across the forest and NSU.

Modified Alternative E

This alternative has fewer management area allocations that would result in larger forest patches of mature or older forest. As a result, it has a lower ability to compensate for interspersed ownership patterns. Maintenance of disturbance rates similar to recent levels combined with a predominance of even-aged early successional species management on the forest and throughout the NSU Section would perpetuate recent downward trends to forest spatial patterns in the region (Host and White, 2002). Rates of disturbance predicted combined with landscape trends may limit the distribution of habitat for this species, especially with regard to large forest patches, across the NSU in the next 10 to 20 years and beyond. The BWCAW would continue to contribute significantly to habitat for this species in that portion of the forest.

Alternative A and C

High rates of disturbance perpetuate trends in forest fragmentation (Host and White 2002, Wolter and White 2002) of small patches, decreasing interior forest, and high amounts of edge. There is a corresponding decrease in mature or older upland forest and large patches of forest in these age classes. The BWCAW would continue to contribute significantly to habitat for this species in that portion of the forest. More larger patches could be managed for the future in these

Final

alternatives by larger harvests, but at the expense of maintaining adequate habitat in the next 10 to 20 years. Areas outside of the wilderness would continue in the downward trend in large patches of habitat for this species.

Determination of Effects

On the Chippewa, Alternatives B, D, and F are expected to have beneficial impacts on the black-throated blue warbler. Alternatives E (Mod.) and G impact individuals but are not likely to cause a trend to federal listing or loss of viability on the planning area. On the Superior, all alternatives except A and C may impact individuals but are not likely to cause a trend to federal listing or a loss of viability on the planning area.

On both forests Alternatives A and C have a high risk of loss of viability in the planning area, but are not likely to cause a trend toward federal listing. Risk of loss of viability is related to a loss of amounts and distribution of habitat in the planning area (Chippewa) and a loss of well-distributed habitat on the Superior. On the Chippewa these alternatives result in at least a 40% reduction in very large patches of habitat and over a 40% forest-wide reduction in mature or older forest that could potentially serve as habitat if aggregated spatially. On the Superior these alternatives would cause as much as a 65 to 75% reduction in very large patches of habitat. Management intensity outside the BWCAW would greatly reduce the distribution of this species' habitat.

Black-throated blue warbler Table 6: Determination of effects for Black-throated Blue Warbler

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	4a	2	4a	2	3	2	3
Superior	4a	3	4a	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Bay-breasted warbler (*Dendroica castanea*)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome - Chippewa D, Superior B

Bay-breasted warbler distribution probably coincided historically with the sub-boreal forest zone that occurred in the project area. That is, those areas, which were dominated by mid-aged and mature fir (*Abies*), and upland and lowland spruce (*Picea*), where spruce budworm outbreaks were common. The bay-breasted warbler is a species that is highly associated with the outbreaks of spruce budworm and generally at its highest densities in areas where spruce budworm is found (Jaakko Poyry 1992). Spruce budworm prefer balsam fir and white spruce, but can also be found in lowland and upland black spruce to a lesser extent. They persist in stands for several years before eventually causing 30-100% mortality of all fir and spruce trees. Fire would generally occur following budworm outbreaks, promoting new growth of spruce-fir and perpetuating the habitat (USDA FS 2002b, planning record). Due to these ecological processes, availability and distribution of suitable habitat occurred cyclically both over time and space. The southern extent of the boreal ecosystem is ultimately determined by climate and historically occurred at higher levels on the Superior than were found on the Chippewa. Historical population levels are unknown, but based on availability and distribution of suitable habitat, the Chippewa likely had a historical population outcome of D and the Superior an outcome of B.

Current Outcome - Chippewa E, Superior C

This species occurs at (or very near) the southern limit of its range on the Chippewa and Superior National Forests. The only recorded Minnesota nests are from Lake and Cook Counties. The Chippewa bird list classifies them as a rare breeding species. And on the Superior National Forest, much of the breeding habitat occurs along the Minnesota/Canadian border in the Boundary Waters Canoe Area Wilderness (BWCAW) (USDA FS 2002b, planning record). Little is known about the overall population trend of the bay-breasted warbler because of the remote areas where they are primarily found (Jaakko Poyry, 1992). However, the population does fluctuate in apparent response to spruce budworm outbreaks.

The Bay-breasted warbler is a conifer dependent species. Current habitat distribution is presumably similar to the historical distribution. However conifer dominated stands have decreased and been replaced by aspen over the past 100 years, indicating that less habitat is available than historically. The limiting distance between habitat patches is unknown, however species distribution is probably based more on availability of prey than on distance between patches. Productivity of Bay-breasted warblers is cyclic and is strongly influenced by spruce budworm outbreaks and also in respond to other lepidopteran caterpillar irruptions such as the forest tent caterpillar. Forested conifer riparian habitat strips, up to 60 m wide, may be of importance, also (USDA FS 2002b, planning record). Current habitat trend appears to be decreasing due to conifer harvest resulting in conversion to aspen. Current outcomes have been reduced from historical levels to C on the Superior and E on the Chippewa because the increase in aspen in spruce-fir dominated forests has reduced canopy closure and conifer density. A viable population, with and outcome of C, would probably require 10,000's of acres of suitable habitat (USDA FS 2002b, planning record). Threats to the Bay-breasted warbler include logging that

Final

causes a decrease in habitat quality and changes in vegetation composition, and active budworm control programs that cause a loss of the Bay-breasted's obligate prey.

Bay-breasted warblers are most likely to be found in the Canadian boreal coniferous forest, and an estimated 90% of the population nest in Canada (USDA FS 2002b, planning record). Across its range spruce-fir forest tend to be continuous over vast regions; any patchiness is a result of disturbance such as blowdown, fire, insect damage, timber harvest or a variation in underlying topography. Canada has tried to control budworm outbreaks by applying insecticide, but it has questionable environmental effects. Important habitats include relatively mature and old aged spruce-fir forests, sometimes pine or hemlock, spruce bogs, and coniferous riparian areas requiring greater than a 70% conifer cover. Spruce-fir forests are still extensive across the main breeding range in Canada, although logging pressure is increasing. Aerial spraying to control budworm in Canada in the past 50 years may have dampened the budworm peaks sufficiently to affect Bay-breasted numbers. Long Point Observatory in Ontario recorded little change in spring numbers from 1961 to 1999, but witnessed fall peaks in the late 1970s and early 1980s that coincided with budworm outbreaks. The Canadian BBS survey shows a downtrend marked by significant peaks that may coincide with budworm outbreaks. Bay-breasted respond to prey abundance rather than to habitat availability, and can reach densities as high as 250 pair/km during a budworm outbreak. Studies in Maine show 72 to 83 pairs/ha in both coniferous and mixed conifer-deciduous forest, twice as man as any other warbler species in the study site have been documented.

Direct/Indirect Effects

Management Indicator Habitats (MIH) 6b, mature spruce/fir forest, MIH 9b, mature lowland black spruce/fir, and MIH 13, mature large upland and lowland conifer patches, were chosen for analysis because they represent most habitat requirements of the Bay-breasted warbler. RNV comparisons are made for MIH 6b and MIH 9b. No RNV data was available for MIH 13. This MIH is included to discuss the potential for continued Spruce budworm outbreaks.

Effects Common to All Alternatives

Logging in nesting habitat could impact breeding bay-breasted warblers in all alternatives. Logging lowland conifer stands in the winter to utilize frozen ground conditions may minimize these impacts. Impacts may still occur from logging in upland spruce-fir during the nesting season. Any active spruce budworm control program in any alternative could also negatively impact this species. Impacts from ATV use of bay-breasted warbler habitat are expected to be minimal however they would be slightly higher with Alternative A than with other alternatives. Standards and Guidelines provide for retaining varying levels of mature spruce-fir and lowland black spruce, as well as large patches of conifer forest.

Effects by Alternative

MIH 6b Mature Spruce/fir

Bay-breasted warble Table 1 and 2 display the change in spruce/fir MIH from existing to that available in 20, 50 and 100 years, on each forest.

Final

Chippewa

Bay-breasted warbler Table 1: MIH 6b Total mature spruce/fir forest on the Chippewa National Forest.

	Exist	Alt. A			Alt. B			Alt. C			Alt. D		
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Acres	13,422	8,542	9,516	17,122	24,028	46,997	78,168	8,835	12,930	20,854	20,070	37,128	67,606
Percent	2.9%	1.9%	2.1%	3.8%	5.3%	10.3%	17.1%	1.9%	2.8%	4.6%	4.4%	8.1%	14.8%

	Mod. Alt. E			Alt. F			Alt. G		
Decade	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Acres	17,090	32,496	45,008	24,321	47,913	72,944	20,619	41,608	54,058
Percent	3.8%	7.1%	9.9%	5.3%	10.5%	16.0%	4.5%	9.1%	11.9%

Estimated RNV	Low	Mid	High
Acres	67,700	72,900	78,200
Percent	14.9%	16.0%	17.1%

The table above shows that mature spruce/fir (MIH 6b) on the Chippewa National Forest is currently well below the estimated low range of RNV. This habitat type would remain below the low RNV range in all alternatives for the next 50 years, and in some alternatives for the next 100 years. Alternative B would reach the high RNV level, Alternative F the mid point, and Alternative D the low level, by decade 10. Of all the alternatives, B and F are most effective in increasing the amount of MIH 6b and would have the greatest benefit to the bay-breasted warbler.

Final

Superior

Bay-breasted warbler Table 2: MIH 6b Total mature spruce/fir forest on the Superior National Forest.

MIH 6b SNF	Exist	Alt. A			Alt. B			Alt. C			Alt. D		
Decade	0	2	5	10	2	5	10	2	5	10	2	5	10
Acres Outside BWCAW	71,545	80,609	91,345	213,163	82,291	143,804	449,864	56,644	67,561	185,180	119,661	274,831	406,537
Percent	7.4%	8.4%	9.5%	22.1%	8.5%	14.9%	46.7%	5.9%	7.0%	19.2%	12.4%	28.5%	42.2%
Acres Inside BWCAW	159,670	196,003	332,547	423,352	196,003	332,547	423,352	196,003	332,547	423,352	196,003	332,547	423,352
Percent	23.3%	28.6%	48.6%	61.8%	28.6%	48.6%	61.8%	28.6%	48.6%	61.8%	28.6%	48.6%	61.8%
Combination Acres	231,215	276,612	423,891	636,514	278,294	476,350	873,215	252,647	400,107	608,532	315,664	607,378	829,889
Percent	14.0%	16.8%	25.7%	38.6%	16.9%	28.9%	53.0%	15.3%	24.3%	36.9%	19.1%	36.8%	50.3%

Bay-breasted warbler Table 2: MIH 6b Total mature spruce/fir forest on the Superior National Forest.

	Exist	Alt. E			Alt. F			Alt. G		
Decade	0	2	5	10	2	5	10	2	5	10
Acres Outside BWCAW	71,545	102,655	212,875	274,436	75,134	119,447	360,374	73,947	115,461	278,623
Percent	7.4%	10.6%	10.2%	28.5%	7.8%	12.4%	37.4%	7.7%	12.0%	28.9%
Acres Inside BWCAW	159,670	196,003	332,547	423,352	196,003	332,547	423,352	196,003	332,547	423,352
Percent	23.3%	28.6%	48.6%	61.8%	28.6%	48.6%	61.8%	28.6%	48.6%	61.8%
Combination Acres	231,215	298,658	545,422	697,788	271,137	451,994	783,725	269,949	448,007	701,974
Percent	14.0%	18.0%	26.1%	42.3%	16.4%	27.4%	47.5%	16.4%	27.2%	42.6%

Estimated RNV	Low	Mid	High
Acres	694,235	783,700	873,200
Percent	42.1%	47.5%	53.0%

As displayed by the table above, the Boundary Waters Canoe Area Wilderness (BWCAW), plays a significant role in providing MIH 6b, on the Superior National Forest. Current condition for the BWCAW is provides 70% of all mature spruce-fir forest on the Superior but is still far below RNV. However, habitat distribution across the landscape and the project area needs to be considered. Spatial arrangement of habitat may have the greatest impact on bay-breasted warblers. The combined acres and percentages show that alternatives would meet or approach RNV levels in 1000 years. Over all alternatives B and D would be the most effective in increasing MIH 6b forest, and have the greatest benefit to the bay-breasted warbler.

MIH 9b Mature Lowland Black Spruce/Fir

Bay-breasted Warbler Table 3 and 4 display the change in mature lowland black spruce/fir MIH from existing to that available in 20, 50 and 100 years, on each forest. Bay-breasted warblers may not be found in MIH 9b as abundantly as in MIH 6b because black spruce is not the preferred food source for the spruce budworm, however budworm is known to infest it. Because of this uncertainty, MIH 9b is included in this analysis.

Chippewa

Final

Bay-breasted warbler Table 3: MIH 9b - Total mature lowland spruce/fir forest on the Chippewa National Forest.

MIH 9b CNF	Exist	Alt. A			Alt. B			Alt. C			Alt. D		
Decade	0	2	5	10	2	5	10	2	5	10	2	5	10
Acres	54,603	42,110	38,237	54,271	52,638	48,742	49,808	40,151	40,131	49,466	57,877	61,413	62,195
Percent	87.8%	67.7%	61.5%	87.3%	84.6%	78.4%	80.1%	64.6%	64.5%	79.5%	93.1%	98.7%	100.0%

Bay-breasted warbler Table 3: MIH 9b - Total mature lowland spruce/fir forest on the Chippewa National Forest.

Acres	Exist	Mod. Alt. E			Alt. F			Alt. G		
Decade	0	2	5	10	2	5	10	2	5	10
Acres	54,603	51,543	46,939	53,354	50,312	46,000	51,407	51,276	46,588	50,517
Percent	87.8%	82.9%	75.5%	85.8%	80.9%	74.0%	82.7%	82.4%	74.9%	81.2%
Estimated RNV		Low			Mid			High		
Acres		49,800			51,400			53,000		
Percent		80.1%			82.7%			85.3%		

The table above shows that mature/older lowland black spruce forest on the Chippewa is predicted to remain at or above existing levels and very close to RNV in all decades and all alternatives with two exceptions. Alternatives A and C would fall below existing levels and below the low range of RNV in decade 2 and 5. Management in lowland conifer is expected to increase by a factor of 2-9 times current levels in 6 of 7 of the alternatives. No lowland black spruce forest is scheduled to be harvested in Alternative D. Alternatives A and C propose the largest amount of harvest and vary the amounts considerably among decades. Monitoring on the Chippewa has found that rates of reforestation are lower in these forest types. Nesting and foraging habitat would not regenerate in MIH 9 as quickly is in MIH 6.

Final

Superior

Bay-breasted warbler Table 4: MIH 9b Total lowland black spruce-tamarack forest on the Superior National Forest.

MIH 6b SNF	Exist	Alt. A			Alt. B			Alt. C			Alt. D		
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Acres Outside BWCAW	172,731	165,711	121,960	189,164	176,885	169,692	169,999	128,910	120,898	179,432	190,137	203,173	205,475
Percent	84.1%	80.6%	59.4%	92.1%	86.1%	82.6%	82.7%	62.7%	58.8%	87.3%	92.5%	98.9%	100.0%
Acres Inside BWCAW	52,133	52,783	55,906	57,172	52,783	55,906	57,172	52,783	55,906	57,172	52,783	55,906	57,172
Percent	67.2%	68.1%	72.1%	73.7%	68.1%	72.1%	73.7%	68.1%	72.1%	73.7%	68.1%	72.1%	73.7%
Combination Acres	224,864	218,494	177,866	246,336	229,668	225,599	227,171	181,693	176,804	236,604	242,920	259,079	262,647
Percent	79.4%	77.2%	62.8%	87.0%	81.1%	79.7%	80.3%	64.2%	62.5%	83.6%	85.8%	91.5%	92.8%
	Exist	**Modified Alt. E**			**Alt. F**			**Alt. G**					
Decade	**0**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**			
Acres Outside BWCAW	172,731	175,535	166,568	166,391	174,534	164,067	160,319	179,942	177,219	174,076			
Percent	84.1%	85.4%	81.1%	81.0%	84.9%	79.8%	78.0%	87.6%	86.2%	84.7%			
Acres Inside BWCAW	52,133	52,783	55,906	57,172	52,783	55,906	57,172	52,783	55,906	57,172			
Percent	67.2%	68.1%	72.1%	73.7%	68.1%	72.1%	73.7%	68.1%	72.1%	73.7%			
Combination Acres	224,864	228,318	222,474	223,563	227,317	219,973	217,491	232,725	233,125	231,248			
Estimated RNV		Low			Mid			High					
Acres		207,800			217,500			227,200					
Percent		73.7%			77.1%			80.5%					

The Boundary Waters Canoe Area Wilderness (BWCAW) does not play as dramatic of a role the availability of MIH 9b habitat as it did in 6b. However, all alternatives reach or exceed predicted RNV levels by decade 10. As mentioned in the MIH 6b discussion, habitat needs to be well distributed across the project area and consideration given to those impacts to MIH 9b, which occur outside as well as inside the BWCAW. The combined acres and percentages show that existing condition as well as all alternatives and decades are within RNV levels, with two exceptions. Alternatives A, at decade 5, and Alternative C, at decades 2 and 5 are below. In summary, all alternatives are capable of providing RNV levels of MIH 9b sometime in the next 100 years, with alternatives B, D, Mod. E, F and G providing RNV levels or above throughout the next 100 years.

<u>MIH 13 Large Mature Upland and Lowland Conifer Patches</u>

Bay-breasted Warbler Table 5 and 6 display the change in large (41-10,001 acre) mature upland and lowland conifer patches MIH from existing to that available in 20, 50 and 100 years, on each forest. This MIH is included to consider the potential for and scale of continued Spruce budworm outbreaks, which ultimately could effects Bay-breasted warbler distribution on the forests.

Final

Chippewa

Bay-breasted warbler Table 5: Total mature conifer upland and lowland conifer acreage in large (41 to 10,001 acres) patches on the Chippewa National Forest.

Existing CNF		Decade	Alt. A		Alt. B		Alt. C		Alt. D	
Acres	# patches		acres	# patches	acres	# patches	acres	# patches	acres	# patches
70,465	582	2	58,293	517	89,855	701	61,052	476	89,653	720
		5	52,870	450	114,904	877	63,634	467	132,385	951
		10	70,345	569	168,367	1,225	83,301	616	217,610	1,313

Decade	Mod. Alt. E		Alt. F		Alt. G	
	acres	# patches	acres	# patches	acres	# patches
2	87,168	691	87,991	688	82,945	667
5	102,516	828	109,363	838	104,458	827
10	117,231	948	158,381	1,127	140,871	1,045

On the Chippewa, alternatives A, and C would result in decrease in the number and acreage of large conifer patches in the second and fifth decade. By decade 10, alternative all alternatives will provide more acres and numbers of patches than existing except for alternative A which will provide similar to existing. Alternative D produces the highest number and acreage of large patches capable of sustaining a budworm epidemic over 10 decades, of all the alternatives. Alternatives B and F fall near the middle and alternatives G and E (modified) between the middle and low range. All alternatives appear to be capable of sustaining budworm; however alternatives D, B, F, G, and Mod. E probably have the greatest potential to sustain the largest epidemics.

Superior

Bay-breasted warbler Table 6: Total mature upland and lowland conifer acreage in large (41 to 10,001 acres) patches on the Superior National Forest.

Existing SNF		Decade	Alt. A		Alt. B		Alt. C		Alt. D	
Acres	# patches		acres	# patches	acres	# patches	acres	# patches	acres	# patches
234,095	1,993	2	259,222	2,012	301,341	2,216	208,338	1,712	313,489	2,311
		5	288,893	2,111	294,377	2,157	265,335	1,993	560,838	2,958
		10	373,506	2,380	671,570	2,580	370,582	2,451	749,995	2,951

Decade	Alt. E		Alt. F		Alt. G	
	acres	# patches	acres	# patches	acres	# patches
2	288,664	2,131	280,441	2,148	283,070	2,130
5	409,329	2,632	437,368	2,705	426,899	2,646
10	479,162	2,640	553,563	2,676	495,637	2,698

On the Superior, all alternatives would result in a great number and acreage of large patches in decades five and ten. Alternative D followed by B then F probably has the greatest potential for sustaining large budworm epidemics.

Outcome Determination

Final

Bay-breasted Warbler Table 7 reflects the likely outcomes of each alternative based on the analysis conducted above.

Bay-breasted warbler Table 7: Historical, current, and future outcomes for Bay-breasted warbler in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	E	E	E	E	E	E	**D**	E	E	E	E	E	**D**	E	E	E	E	E	**D**	E	E	**D**
Superior	B	C	C	C	**B**	C	**B**	**B**	C	C	**B**	C	**B**	**B**	C	C	**B**	C	C	**B**	C	C	**B**

Notes: Outcomes in underlined bold text are those that differ from the current outcome.

Chippewa

On the Chippewa National Forest alternatives B, D, F and G would rise from the current outcome of E to an outcome of D in decade 10. This is due to a combination of factors. These alternatives reach or are near RNV levels in MIH 9 and 6 in this decade. Also it is this decade that these alternatives have the highest number and acreage of large mature conifer patches (MIH 13) that have the highest potential to lead to spruce budworm epidemics. Due to the low predicted historical and current levels of suitable ecological conditions, Alternative A and C especially decades 2 and 5 would have the greatest negative impacts to bay-breasted warbler, by reducing suitable habitat below current levels.

Superior

With the help of the BWCAW, the Superior would rise from a current outcome of C to an outcome of B in all alternatives, by decade 10. This is because all alternatives would reach RNV levels in MIH 9 and 6 and show in increase in the number and size of large mature conifer patches (MIH 13) in this decade, leading to conditions that may more closely resemble historical outcome conditions. Alternatives B and D would exhibit these condition starting in decade 5.

Cumulative Effects

Historical Outcome - Drift and Lake Plains D, Northern Superior Uplands B

This species is considered a regular summer resident of MN in the northern coniferous zone near the Canadian border and a rare summer resident the Chippewa and has been seen in all MN counties during migration. Prior to 1936 breeding individuals were documented from Sherburne, Cass, and Cook counties as well as Itasca State Park. Historical range and distribution in the cumulative effects areas was dictated by the southern extent of the sub- boreal forest ecosystem, which was historically more abundant on the Superior than on the Chippewa.

Current Outcome - Drift and Lake Plains E, Northern Superior Uplands C

The bay-breasted warbler is a regular resident only in the northern portion of Cook, Lake, and St. Louis, Koochiching, Beltrami, Roseau and Lake of the Woods counties (Janssen, 1987). In the cumulative effects area population trends are unknown due to limited census data, but habitat appears to be decreasing due to conifer harvest resulting in conversion to aspen. Within the range of the species habitat appears to be stable and spruce-fir forests are still extensive across the main breeding range in Canada although logging pressure is increasing. Range-wide the population trends are unclear. Breeding Bird Surveys (BBS) indicate downward trend since 1966, but Bay-breasted respond to cyclical increases in spruce budworm. Aerial spraying to control budworm in Canada in the past 50 years may have dampened the budworm cycle sufficiently to affect bay-breasted numbers. Partners In Flight has interpreted the BBS data to indicate the bay-breasted warbler is uncommon to fairly common breeder over 5.0 to 9.9% of North America, but there is insufficient data to project population trends.

Habitat loss in wintering habitat is the most obvious impact to the bay-breasted warbler. Global warming models predict northward retreat of the boreal forest. However, warm dry spring and summers favor caterpillar irruption. Canadian conifer harvesting would exacerbate the summer habitat loss as the conifers are replaced by deciduous species and less suitable conifer species. Other potential threats such as tower kills, hurricanes, effects of budworm pesticides, subsistence collecting have uncertain long-term effects. Planting of black spruce and jack pine, which are more resistant to budworm, may be a threat. Longer rotation of spruce-fir would benefit the species.

Cumulative outcomes for this species would likely remain at or near current levels in the next 20 years, with the Drift and Lake Plains exhibiting an outcome of E and the Northern Superior Uplands exhibiting an outcome of C.

Bay-breasted warbler Table 8: Cumulative Historical, current, and future outcomes for Bay-breasted warbler in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	E	E	E	E	E	E	**E**	E	E	E	E	E	**E**	E	E	E	E	E	**E**	E	E	**E**
Superior	B	C	C	C	**C**	C	**C**	**C**	C	C	**C**	C	**C**	**C**	C	C	**C**	C	C	**C**	C	C	**C**

Definitions: See biological evaluation for outcome definitions.

Notes: Outcomes in underlined bold text are those that differ from the current outcome.

Determination of Effects

All alternatives may impact but not likely to cause a trend to federal listing or loss of viability. Ninety percent of the bay-breasted warbler’s breeding habitat is in Canada. On the Chippewa, Alternative A may result in a decrease of well distributed habitat for the bay-breasted warbler, this may result in a loss of viability. However with ninety percent of the bay-breasted warbler’s breeding habitat is in Canada a healthy source population may help to keep the population on the Chippewa from trending toward listing. The Superior would continue to provide habitat at more than current levels. More research and monitoring of this species in needed in the project area.

Final

Bay-breasted warbler Table 9: Determination of effects for Bay-breasted warbler.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	4a	3	3	3	3	3	3
Superior	3	3	3	3	3	3	3
Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.							

Connecticut warbler (*Opornis agilis*)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome – Chippewa B, Superior B

This species was first described by Alexander Wilson in 1812, was poorly known at the turn of the twentieth century and still is the least known member of the genus *Oporornis* partly due to its secretive nature and habit of nesting in dense vegetation. Also, this species has a naturally spotty distribution, even in suitable habitat (Callog 1994 In McPeek and Adams).

In the early twentieth century, Connecticut warblers ranged as far south as the tamarack bogs of Isanti County, but there has not been a record reported there for 65 years, reported by Janssen in 1987. In north-central Minnesota, the Connecticut warbler is best represented as a resident from Koochiching, Aitkin, Hubbard and Beltrami Counties westward into eastern Marshall and Roseau Counties and in the northeast region in St. Louis, Lake and Cook Counties and as far south as northern Pine Counties. There were large amounts of swamp conifer in presettlement Minnesota (6,668,000 acres or 24.6% of forest in Minnesota)(Jaako Poyry 1992).

The roadside count data for Minnesota has indicated no change in the population of Connecticut warblers between 1966 and 1990 (Niemi *et al.* 2003a). However, few individuals are detected along these routes and the sample size is relatively small for detecting a significant trend. The trend for the 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).

The Species Viability Evaluation information was that this species has always been fairly rare in contrast to other species that were fairly abundant (Kudell-Ekstrum 2002, USDA FS 2002b, planning record). Also, the Chippewa and Superior are at the southern edge of the Connecticut warblers range (outcome B). The large amount of Connecticut warbler's primary breeding habitat of lowland black spruce-tamarack, the relative uncommonness of this species and being at the southern edge of this species range provided an outcome of B on both the Chippewa and Superior.

Current Outcome – Chippewa C, Superior C

The Connecticut Warbler has a restricted breeding distribution in the northern Great Lakes states; 85% of the North American breeding range is in central and eastern Canada. There have been approximately 84 locations of the Connecticut Warbler on the Chippewa land base recorded by the NRRI Breeding Bird Survey conducted yearly since 1991. On the Superior land base of the Forest, there have been 37 individuals recorded by the NRRI Breeding Bird Survey conducted yearly since 1991. Populations seem to be larger on the Chippewa than on Superior. Surveys on the Chippewa and Superior by NRRI have shown a significant population decline on the Chippewa and an apparent decline on the Superior (non-significant) (Niemi *et al.* 2003b).

Habitat occurrences of Connecticut warbler on the Chippewa include open, mature lowland conifer including tamarack, sphagnum and jack pine (Kudell-Ekstrum 2002, USDA FS 2002b, planning record). Habitat occurrences of Connecticut warbler on the Superior include primarily boreal bogs and jack pine (Kudell-Ekstrum 2002, USDA FS 2002b, planning record). This

Final

species nests on the ground in a small hollow, on moss mound in a bog, or in grasses or weeds, or at the base of a shrub (Nature Serve 2001). Habitat for Connecticut warblers was described as mature, short-needle conifers, usually single aged, either lowland conifer or jack pine with the key feature appearing to be an ericaceous shrub layer up to about three feet high. It does not appear to be an edge sensitive species in that it doesn't avoid edge habitat (Kudell-Ekstrum 2002, USDA FS 2002b, planning record).

Current outcome is C on the Chippewa because recent surveys have shown Connecticut warbler populations are significantly declining on the Chippewa (no significant trend evident on the Superior). Current outcome on the Superior is also C due to smaller population size and an apparent population decline. Threats to Connecticut warbler populations are not fully understood but include loss of breeding habitat, loss of wintering habitat, nest predation and parasitism, collision with towers, and possibly habitat fragmentation. Little is known of the specific habitat needs and breeding biology of the Connecticut warbler.

Direct/Indirect Effects

Management Indicator Habitat 9, Mature Lowland Black Spruce/Tamarack was chosen for analysis because it provides the most common nesting and cover habitat for Connecticut warblers on both the Chippewa and Superior National Forests. Management Indicator Habitat 8, Jack Pine Forest was also analyzed since it used by Connecticut warblers on both forests. However, not all mature jack pine forest should be considered Connecticut warbler habitat. A well-developed ericaceous understory would be needed to meet the nesting requirements of this species.

Effects Common to All Alternatives

Standards and guidelines would protect this species from timber harvest impacts, and forest management activities are not expected to have major impact on water level fluctuations, which are an important ecological process for this species. Direct impacts to suitable habitat from ATV use would probably be less in alternatives B-G than in Alternative A, since cross-country use would be permitted in Alternative A. Another effect common to all alternatives would be from logging in nesting habitat during the breeding season. Such potential impacts would be minimal because of the overall limited harvest in Connecticut warbler habitat (Mature lowland conifer) in most alternatives and lowland conifer logging would be conducted in the winter to utilize frozen ground conditions.

Effects by Alternatives

Chippewa

Connecticut warbler Table 1: MIH 9b. Mature Lowland Black Spruce/Fir Forest acreage on the Chippewa National Forest.								
Decade	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
2	54,603	42,110	52,637	40,151	57,876	51,543	50,312	51,276
5		38,236	48,742	40,131	61,412	46,939	46,000	46,587
10		54,270	49,808	49,466	62,194	53,354	51,406	50,517
MIH 8b. Jack Pine Forest Mature / Older acreage on the Chippewa National Forest.								

Final

2	9,133	1,735	6,075	1,768	3,437	2,751	6,183	5,161
5		8,212	10,771	10,168	19,063	14,234	13,146	13,538
10		7,437	10,783	9,503	26,072	9,856	10,477	21,496

MIH9 Lowland Black Spruce-Tamarack

Connecticut Warbler Table 1 And Figure WLD 9b (Final EIS p. 3.3.1-25) show that mature/older lowland black spruce-tamarack forest acreage is predicted to remain at or above existing levels and very close to RNV in all decades and all alternatives with two exceptions. Alternatives A and C would fall below existing levels and below the low range of RNV in decade 2 but would increase back to within RNV in Decade 10.

MIH8 Jack Pine Forest Mature / Older

Spatial standards and guidelines would also reduce the acreage harvested since some of these jack pine stands would be maintained in patches ranging from 300 acres to over 5,000 acres. These standards and guidelines would reduce harvest levels mainly during Decades 1 and 2 before other forest stands age and increase the number of patches. Another Standard in the Plan, which applies only to the Chippewa that would reduce harvest levels from the model results states that the Chippewa would maintain at least 5,300 acres in mature or older jack pine forest types during the implementation period of the forest plan. This would reduce harvest levels, thereby, increasing the remaining acres of mature jack pine than what would be shown in the following tables.

Connecticut Warbler Table 1 And Figure WLD 8b (Final EIS p. 3.3.1-25) show that mature/older Jack Pine forest acreage is predicted to remain at or above existing levels by Decade 10 and very close to RNV estimate in all alternatives with two exceptions. Alternatives A would fall below existing levels and below the low range of RNV in decade 2 and 10. Modified Alternative E would fall below existing and RNV in decades 2 and 10.

RNV for Jack pine Forest Mature / Older is estimated from a low of 10,171 acres to a high of 10,783 acres.

Superior

Connecticut warbler Table 2: **MIH 9b. Mature Lowland Black Spruce/Fir Forest acreage on the Superior National Forest (includes BWCA).**								
Decade	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
2	206,894	218,494	229,668	181,693	242,920	228,318	227,317	232,725
5		177,866	225,599	176,804	259,079	222,474	219,973	233,125
10		246,336	227,171	236,604	262,647	223,562	217,491	231,248
MIH 8b. Jack Pine Forest Mature / Older acreage on the Superior National Forest.								
2	180,58172	156,862	171,678	153,815	175,574	164,800	160,472	165,889
5		122,515	138,836	123,694	184,143	138,502	119,098	129,321
10		76,290	96,261	92,158	171,678	106,219	89,424	54,277

Final

MIH9 Lowland Black Spruce-Tamarack

Connecticut Warbler Table 2 And Figure WLD 9b (Final EIS p. 3.3.1-26) show that mature/older lowland black spruce-tamarack forest acreage is predicted to remain at or above existing levels and very close to RNV in all decades and all alternatives with one exception. Alternative C would fall below existing levels and below the low range of RNV in decade 2 but would increase to within RNV in decade 10.

Management in lowland conifer on both the Chippewa and Superior is expected to increase by a factor of 2-9 times current levels in 6 of 7 of the alternatives. No lowland black spruce-tamarack forest is scheduled to be harvested in Alternative D. Alternatives A and C propose the largest amount of harvest and vary the amounts considerably among decades. For most of the other alternatives, there would be 3-4 times the amount of 0-9 age class as a result of harvest than currently exists. The ranking of these alternatives from most to least harvest it: E (Mod.), F, G, B.

Rates of reforestation are lower in lowlands. Nesting cover in lowland spruce-tamarack forest would not regenerate as quickly as in the upland conifer forests.

MIH8 Jack Pine Forest Mature / Older

Connecticut Warbler Table 2 and Figure WLD 8b (Final EIS p. 3.3.1-25) show that mature/older Jack Pine forest acreage is predicted to decrease below existing levels by Decade 10, but they would be very close to RNV in all alternatives with two exceptions. Alternatives A and G would fall below existing levels and below the low range of RNV (82,600 acres) in decade 10.

Jack Pine forest on the Superior would be close to RNV by Decade 10 for most Alternatives. Most Alternatives would have lower acreage in Decade 2, above RNV on the Superior. A large portion of Jack Pine Forest in Decade 2 on the Superior would be provided in the BWCA. In Decade 10, this would have changed to provide a better spatial representation throughout the forest. Mature jack pine habitat outside the BWCA increases under all Alternatives except for Alternative G.

Outcome Determination

Connecticut warbler Table 3: Historical, current, and future outcomes for Connecticut Warbler in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	C	**D**	**D**	C	C	C	C	**D**	**D**	C	**B**	**B**	**B**	C	**D**	C	C	**D**	C	C	C	C
Superior	B	C	C	C	**B**	C	C	C	C	C	C	**B**	**B**	**B**	C	C	C	C	C	C	C	C	C

Definitions: See biological evaluation for outcome definitions.

Notes: Outcomes in underlined bold text are those that differ from the current outcome.

Future outcomes range from B to D on both the Chippewa and Superior for the seven alternatives in Decades 2, 5 and 10. Since jack pine habitat was maintained under most alternatives (model results and Standards and Guidelines) it was not as important a factor as mature black spruce / tamarack habitat.

Final

Alternative A on the Chippewa was given an outcome of D for Decades 2 and 5 because it reduced mature lowland forest acreage by over 20% during that time period. It was given a C in Decade 10 because it provided similar amounts of habitat to the current acreage. Alternative A on the Superior was given an outcome ranking of C in Decade 2 and 5 and B in Decade 10. Decade 2 and 5 maintained similar acreage to current conditions and Decade 10 provided a 10% increase in type.

Alternative B on the Chippewa was given an outcome rank of C for Decades 2, 5 and 10. There was not a change over 10% from current conditions in overall mature lowland acreage. Alternative B on the Superior was given a ranking of C for Decades 2, 5 and 10 since acreage was only slightly higher in Decades 2, 5 and 10 than current conditions.

Alternative C on the Chippewa was given an outcome ranking of D in Decades 2 and 5 because it reduced mature lowland forest acreage by over 20% during that time period. It was given a C in Decade 10 because it provided similar amounts of habitat to the current acreage. Alternative C on the Superior was given a ranking of C for Decades 2, 5 and 10 since there was only a slight drop (5%) in habitat in Decade 2 and 5 and a slight increase in acreage in Decade 10 than current conditions.

Alternative D was the only alternative to provide more mature lowland forest on both forests and all Decades. It increased habitat more than any other alternative compared to the current conditions and was given an outcome ranking of B.

Modified Alternative E on the Chippewa was given an outcome rank of C for Decades 2 and 10. There was not a change over 10% from current conditions in overall mature lowland acreage. Decade 5 was given an outcome ranking of D since it produced a 19% decrease in habitat compared to current conditions. Modified Alternative E on the Superior was given a ranking of C for Decades 2, 5 and 10 since acreage was only slightly lower in Decades 2, 5 and 10 than current conditions.

Alternative F on the Chippewa was given an outcome rank of C for Decades 2 and 10. There was not a change over 10% from current conditions in overall mature lowland acreage. Decade 5 was given an outcome ranking of D since it produced a 16% decrease in habitat compared to current conditions. Alternative F on the Superior was given a ranking of C for Decades 2, 5 and 10 since acreage was only slightly higher in Decade 2 and 5 and slightly lower in Decade 10 than current conditions.

Alternative G on the Chippewa was given an outcome rank of C for Decades 2 and 10. There was not a change over 10% from current conditions in overall mature lowland acreage. Decade 5 was given an outcome ranking of D since it produced a 15% decrease in habitat compared to current conditions. Alternative G on the Superior was given a ranking of C for Decades 2, 5 and 10 since acreage was only slightly higher in Decade 2, 5 and 10 than current conditions. Alternative G did have a large decrease (70% less than current conditions) in mature jack pine by Decade 10 but since the preferred habitat (mature black spruce/tamarack) increased during both Decades I still gave an outcome rank of C.

Cumulative Effects

Final

Historical Outcome - C
Jack pine and tamarack acreage has declined since European settlement. Range contraction in Minnesota is due to loss of suitable nesting habitat in southern portions of Connecticut warbler range. The causes of range-wide decline are not fully understood.

Current Outcome - C
The amount and quality of Connecticut warbler habitat likely would remain somewhat stable within the cumulative effects area. The black spruce-tamarack bogs where Connecticut warblers are found are inaccessible, of low economic value, and unsuitable for development. They are likely to remain mostly unchanged over time. Within the cumulative effects area, the likelihood of ecological conditions contributing to the long-term species abundance and distribution for Connecticut warbler is predicted to remain at its present level (Outcome C). This agrees with the predicted trends in habitat indicators for Connecticut warbler within the cumulative effects area. Peat mining may pose a threat to nesting habitat. Towers and structures are reported as specific threats during migration. Over-wintering habitat is another threat to Connecticut warblers about which not much is known.

Connecticut Warbler Table 4: Cumulative Historical, current, and future outcomes for the Connecticut Warbler in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Superior	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Determination of Effects

May impact but not likely to cause a trend to federal listing or loss of viability for all Alternatives except Alternative D which would have beneficial impacts. Information is lacking on breeding biology, habitat use, population status, and viability. This contributes to uncertainty in evaluating this species and increases risk for the species.

Connecticut warbler Table 5: Determination of effects for Connecticut Warbler.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	2	3	3	3
Superior	3	3	3	2	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

LeConte's sparrow (*Ammodramus leconteii*)

Regional Forester Sensitive Species: Chippewa and Superior

Historical Outcome - Chippewa C, Superior D

The project area is at the edge of the species range, where suitable habitat likely had patchy distribution (outcome C-D). It is known from a wide variety of non-forest and wetland vegetation condition. Its habitat was likely perpetuated by disturbance such as flood and fire. Historically there were likely fewer acres of habitat for the species than there is today.

Current Outcome - Chippewa C, Superior D

The amount of habitat has changed slightly from historical conditions (outcome C-D). Timber harvest likely has increased the amount of habitat. Often found in the same habitat as the yellow rail, Le Conte's sparrow also occurs in a wider array of habitats, as it does not require standing water. The population trend for this species is unknown but it would appear to be stable within Minnesota. Local populations fluctuate dramatically depending on rainfall.

General Effects

Major issues are actions that alter the hydrologic condition of wetlands such as ditching which dries the site, or excessive water release from dams, which increase the moisture content of wetland. Short term or annual habitat loss can occur as a result of mowing or burning. Long-term habitat loss can occur as a result of fragmentation of habitat patches through actions such as plowing, farming development, and road construction.

Direct/Indirect Effects

Effects Common to All Alternatives
Amounts of upland open and lowland meadow habitat or potential habitat are expected to remain fairly constant on the Chippewa and Superior in the next 20 years. Because of the finite amount ecological conditions suitable for this species, it would continue to face a viability risk. Standards and guidelines would avoid and minimize impacts to this species and its habitat, and forest and road management activities are not expected to have major impact on water level fluctuations, which are an important ecological process for this species. Over the long-term, only slight change in existing habitat is expected. It is not known how the species responds to repeated burning of sedge meadows. The species avoids areas immediately following burning, but returns after litter and vegetation increased. Outcome C-D is expected to continue for all alternatives.

Effects of Alternatives
Prescribed fire is an important tool in maintaining sedge-dominated wetlands relatively free of thick brush encroachment. Alternatives D, B, and F (in that order) have the highest level of prescribed fire for meeting ecological objectives in both decades 1 and 2 (see Final EIS Chapter 3.5.2b for full analysis of this Indicator). A high level of prescribed fire for meeting ecological objectives may be beneficial in protecting or maintaining suitable habitat types for LeConte's sparrow on the Chippewa and Superior. Conversely, Alternatives C and A have the lowest level of prescribed fire for meeting ecological objectives. In addition, Alternatives A, C, and Mod. E

Final

have the highest projected road and trail construction, mostly due to temporary roads built for forest management activities, and a high level of ATV trail construction. Road and trail construction within the Chippewa National Forest usually requires the filling of wetland habitats and could result in changes in hydrology, which may affect habitat suitability for LeConte's sparrow. The potential to negatively affect habitat is greatest in these Alternatives.

Amounts of ephemeral habitat for this species, that lasting 10 years or less, would be greatest in alternatives with higher levels of clear-cut harvests. MIH 1a: upland young forest, MIH 9a: lowland young forest, and MIH 11: management induced edge for upland and lowland forest (see Final EIS Chapters 3.3.1.c and 3.3.2 for the full analysis of these Indicators) help to characterize alternatives with regard to potential amounts of ephemeral habitat. Alternatives, in this order, would provide the most ephemeral habitat in the next 20 years: C, A, Mod. E, G, F, B, D.

LeConte's sparrow Table 1: Historical, current, and future outcomes for the LeConte's Sparrow in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Superior	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Cumulative Effects

Cumulative effects are likely to be similar to direct and indirect effects for this species.

LeConte's sparrow Table 2: Cumulative Historical, current, and future outcomes for the LeConte's Sparrow in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Superior	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Final

Determination of Effects

All alternatives may impact individuals, but are not likely to cause a trend to federal listing or a loss of viability. The appropriate ecological conditions for this species have remained relative constant since historical times in the project area and cumulative effects area. Amount and distribution of suitable habitat does not change much as a result of any of the alternatives.

LeConte's sparrow Table 3: Determination of effects for the LeConte's Sparrow.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Nelson's sharp-tailed sparrow (*Ammondramus nelsoni*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - C

The Chippewa is at the edge of the species range, where suitable habitat likely had patchy distribution, and was naturally fragmented (Outcome C). Its habitat was probably perpetuated by disturbance such as fire and flooding. On the Chippewa dams placed on Cass Lake, Leech Lake, and Lake Winnibigoshish prior to 1900 raised water levels and likely reduced amounts of habitat compared to the period prior to damming. The dams also affected the hydrologic regime of connected streams and wetlands, also causing reductions in amounts of habitat.

Current Outcome - C

The amount and distribution of habitat has probably not changed much from historical conditions (Outcome C). This species has likely persisted as a small sub-populations or rare, local endemic since the historical period. Population trends for this species range-wide, regionally, and within the planning area are declining, primarily due to habitat loss. (USDA FS 2002b, planning record).

General Effects

Major issues are actions that alter the hydrologic condition of wetlands such as ditching which dries the site, or excessive water release from dams, which increase the moisture content of wetland. Short term or annual habitat loss can occur as a result of mowing or burning. Long-term habitat loss can occur as a result of fragmentation of habitat patches through actions such as plowing, farming development, and road construction. Human destruction and alteration of grassland and marsh habitat for agriculture has occurred through most of this species' breeding range. Meadows have been altered by unsuccessful drainage ditching for agriculture. Logging occurred from the early 1800s until the early 1900s, which likely altered sedge meadow and marsh hydrology. Water impoundment through dams, roads, and right-of-way development has changed wetland hydrology. The intense, frequent fires following logging also likely had an effect on these habitats. And, from the early 1900s until the late 1900s, fire suppression has impacted drier suitable habitats, leading to succession.

Direct/Indirect Effects

Effects Common to All Alternatives

Amounts of habitat or potential habitat within the Chippewa are expected to remain fairly constant for the foreseeable future. Minnesota has established a no-net-loss policy for wetlands and is implementing programs to restore and protect existing wetlands (USDA FS 2002b, planning record). It is unclear if this policy would benefit this species habitat compared to wetland types resulting from restoration. Because of the finite amount ecological conditions suitable for this species, it would continue to face a viability risk. Standards and guidelines would avoid and minimize impacts to this species and its habitat. Over the long-term, only slight change in existing habitat is expected (outcome C).

Final

Effects of Alternatives
Alternatives D, B, and F (in that order) have the highest level of prescribed fire for meeting ecological objectives in both decades 1 and 2 (see Final EIS Chapter 3.5.2b for full analysis of this Indicator). A high level of prescribed fire for meeting ecological objectives may be beneficial in protecting or maintaining suitable habitat types for Nelson's sharp-tailed sparrow on the Chippewa National Forest. Indirect impacts from prescribed burning would be short-term. Fire likely influences Nelson's sharp-tailed sparrow in a manner similar to the effects on yellow rail.

Conversely, Alternatives C and A have the lowest level of prescribed fire for meeting ecological objectives. In addition, Alternatives A, C, and Mod. E have the highest projected road and trail construction, mostly due to temporary roads built for forest management activities, and a high level of ATV trail construction. Road and trail construction within the Chippewa National Forest usually requires the filling of wetland habitats and could result in changes in hydrology, which may affect habitat suitability for this species. With the exception of some habitat created by clearcuts in wet habitat, the potential to negatively affect habitat is greatest in these Alternatives.

Nelson's sharp-tailed sparrow Table 1: Historical, current, and future outcomes for the Nelson's sharp-tailed sparrow in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Cumulative Effects

Effects Common to All Alternatives
The threat of breeding habitat loss through human land use and poor management practices are primary concerns for MN northern forest populations by reducing reproduction opportunities, and could potentially greatly impact their future (USDA FS 2002b, planning record). Protecting habitat from development and its consequences and properly managing habitat through the use of fire, water manipulation, and the removal of invasive plants is crucial to Nelson's survival. Wetland succession affects habitat quality for the yellow rail, and is often influenced by human activities that purposely or inadvertently alter the water table. These activities include wetland draining and filling for development and road and trail construction, alterations in hydrology due to reservoir management, and a lack of natural disturbance, including suppression of wildfire and elimination of periodic flooding. Land ownership on the Chippewa National Forest is very fragmented, and continued high levels of private development and wetland alterations on all ownerships may result in further isolation of the species. Public lands may eventually serve as a primary population source for this species in MN. Reservoir management and private development would continue. Wolter and White (2002) outline trends in upland forest spatial patterns and forest age. Continued downward trends of upland habitat likely coincide with increased impacts to lowlands and this species' habitat (USDA FS 2002b, planning record). Alternatives that continue these trends would adversely affect this species to a greater degree than those that reverse the trends and begin improving landscape conditions. Alternatives that

Final

maintain wetland habitats in suitable vegetative conditions through the use of prescribed fire would help improve conditions for this species within the planning area.

Nelson's sharp-tailed sparrow Table 2: Cumulative Historical, current, and future outcomes for Nelson's sharp-tailed sparrow in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

All alternatives may impact individuals, but are not likely to cause a trend to federal listing or a loss of viability. The appropriate ecological conditions for this species have remained relative constant since historical times in the project area and with greater losses in the cumulative effects area due largely to development of private lands and reservoir management. Amount and distribution of suitable habitat does not predictably change as a result of any of the alternatives, however small incremental losses likely to occur in some alternatives are difficult to measure or predict.

Nelson's sharp-tailed sparrow Table 3: Determination of effects for the Nelson's Sharp-tailed sparrow.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Amphibians and Reptiles

Wood turtle (*Clemmys insculpta*)

Regional Forester Sensitive Species: Superior

Historical Outcome - D

Historical population information about the wood turtle is very limited or unavailable. The population was probably larger than it is currently because of less habitat degradation due to recreational activities, road and trail building and illegal collection by humans (USDA FS 2002b, planning record).

Current Outcome - D

The wood turtle utilizes well-drained moist sand or soil along streams where the substrate is not subject to flooding, and is free of rocks and thick vegetation. They prefer clear streams with a moderate current. They are also usually found where openings in the streamside canopy allow growth of herbaceous plants.

The wood turtle is currently present just south and west of the Superior National Forest along the St. Louis River and in the south end of the Superior National Forest along the Cloquet River (USDA FS 2002b, planning record). Populations are isolated and may travel 3 miles to find nesting sites. The likelihood of the wood turtle on the National Forests is minimal because of the lack of sandy soils and larger streams.

Direct/Indirect Effects

Effects Common to All Alternatives
Some riparian disturbance would occur in all alternatives due to vegetation treatments and road and trail building. These activities may impact sandy substrate and herbaceous cover. Refer to Final EIS Appendix F Transportation System for information on roads; Final EIS Chapter 3.8 Tables RMV-2 and RMV-4 for information on ATV construction; and Final EIS Chapter 3.631-47 for information on vegetation treatments in riparian areas. Standard and guidelines would reduce the impacts in riparian areas. Outcome is D.

Effects by Alternative

All Alternatives would result in Outcome D for this species. However, some Alternatives may impact wood turtle habitat more than others. Impacts may occur due to road and trail construction or loss of basking sites due to riparian timber harvest. Standard and guidelines would help to reduce the impacts. Expert panels concluded some riparian disturbance would be acceptable if the disturbance maintained the sandy substrate and herbaceous cover necessary (USDA FS 2002b, planning record).

Alternatives A, C, and Modified E have the highest projected road construction, mostly due to temporary roads built for forest management activities, and a high level of ATV trail construction. In addition, Alternatives A and C take a mitigative approach to managing riparian and aquatic habitats, by applying Best Management Practices to minimize resource degradation rather than proactively managing for aquatic and riparian resource health (Minnesota Forest Resources Council 1999). The potential to negatively affect habitat is greatest in these alternatives.

Although Modified Alternative E has a pro-active riparian and fish habitat management approach, it has the third greatest increase in road construction, as well as the highest projected construction of new ATV trails, which could affect the quality and availability of habitat for wood turtle.

Forest management activities in Alternatives B, D, and G would also increase road and trail densities, but these activities occur at lower levels. In addition, Alternatives B, D, and G also include pro-active riparian management measures to actively improve or restore habitats. These Alternatives also plan a medium - low level of ATV trail construction.

Wood turtle Table 1: Historical, current, and future outcomes for wood turtle in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Cumulative Effects

Historical Outcome - Outcome D

Populations of the wood turtle were less isolated historically due to less disturbance of habitat, roads and people. Historically the only habitat that existed on the National Forests is currently covered with water as it is underneath the Whiteface reservoir.

Current Outcome - Outcome D

The wood turtle is on the edge of its range on the Superior National Forest and any populations on the Forest would not exist without the populations outside the Forest. They are more isolated today.

Effects of Alternative

All alternatives are likely to associate with outcome D given the standard and guidelines for riparian management and transportation that have been proposed. Since these standards and guidelines do not apply to non-NFS lands the outcome could change. Therefore Alternatives A and C may have a higher risk of Outcome D due to the increased levels of riparian disturbance and road and trail building combined with that on non-NFS lands.

Final

Wood turtle Table 2: Cumulative Historical, current, and future outcomes for the Wood turtle in 2, 5, and 10 decades from present.																							
Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

All alternatives may impact individuals but are not likely to cause a trend to federal listing or a loss of viability. The population is expected to remain viable in its range but there are concerns with range contraction that can be a risk to any species.

Wood turtle Table 3: Determination of effects for wood turtle.							
Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3
Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.							

Final

Blanding's turtle (*Emydoidea blandingii*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - C

Blanding's turtles are found throughout the Great Lakes states, from southern Ontario through the Great Lakes states to northeastern Nebraska (Oldfield and Moriarty 1994). Disjunct populations exist in New England and Nova Scotia (Coffin and Pfannmuller 1988), indicating a broad former range. Minnesota lies on the northwest periphery of the species' range. The species is locally abundant in southeastern Minnesota, in an extensive area of sand dunes and marshes along the Mississippi River, although it has been collected along the Mississippi and St. Croix rivers northward into east-central Minnesota (Coffin and Pfannmuller 1988).

Historical distribution within the planning area is unknown. Two collections have been made within the Chippewa National Forest boundary.

Current Outcome - C

The primary habitat for the Blanding's turtle includes calm, shallow water with abundant aquatic vegetation and sandy, well-drained, uplands with sparse vegetation. Nesting females may travel considerable distances (up to 1 mile) to a sandy nesting area (Coffin and Pfannmuller 1988). The species is long-lived (reaching 40 or more years in age), has low reproductive potential, and a late maturation (typically reproducing at 14 to 20 years of age) (NatureServe 2003). Although the Blanding's turtle is widely distributed, habitat loss due to draining, ditching, and channelization and impounding of rivers and wetland floodplains has greatly decreased the amount of available habitat across the state (Coffin and Pfannmuller 1988). In addition, its life history characteristics make it especially vulnerable to habitat loss and human disturbance. Southeastern Minnesota holds perhaps the largest breeding populations throughout the species range (Coffin and Pfannmuller 1988). Blanding's turtle is listed as a Species of Special Concern in Minnesota and Wisconsin.

The species is known from two wetland locations on the Chippewa National Forest. Wetland habitats on National Forest System lands are generally stable, although small areas of wetland are often filled in association with road and trail construction. The Chippewa National Forest is on the edge of the species historical range, and that is likely the reason for the low numbers and limited distribution on the Forest.

Direct/Indirect Effects

Effects Common to All Alternatives

Shoreline development, the elimination of rooted aquatic vegetation, eutrophication, and impounding of wetland habitats, along with wetland draining and filling are perhaps the most serious threats to Blanding's turtle (Coffin and Pfannmuller 1988). Roads and trails present additional threats to the species, including mortality due to increased vehicular traffic, fragmentation and compaction of habitats due to road construction, and increased human disturbance in nesting areas.

Final

Effects by Alternative
All Alternatives would result in Outcome C for this species. However, some Alternatives may contribute more to habitat degradation than others. Blanding's turtle is most affected by loss of suitable habitat. On the Chippewa National Forest, this habitat loss could be due to wetland filling for road and trail construction, fragmentation of habitats due to road and trail construction, compaction of nesting sites due to forest management activities, or loss of basking sites due to riparian timber harvest. Refer to Final EIS Appendix F Transportation System for information on roads; Final EIS Chapter 3.8 Tables RMV-2 and RMV-4 for information on ATV construction; and Final EIS Chapter 3.631-47 for information on vegetation treatments in riparian areas. Standard and guidelines would reduce the impacts in riparian areas. Alternatives A and C have the highest projected road construction, mostly due to temporary roads built for forest management activities, and a high level of ATV trail construction. In addition, Alternatives A and C take a mitigative approach to managing riparian and aquatic habitats, by applying Best Management Practices to minimize resource degradation (Minnesota Forest Resources Council 1999). The potential to negatively affect habitat is greatest in these alternatives.

Although Modified Alternative E has a pro-active riparian and fish habitat management approach, it has the third greatest increase in road construction and timber harvest within 100' of all lakes, streams, and palustrine wetlands, as well as the highest projected construction of new ATV trails, which could affect the quality and availability of habitat for Blanding's turtle, as well as disrupt migrations of turtles to and from breeding areas..

Forest management activities in Alternatives B, D, and G would also increase road and trail densities, but these activities occur at lower levels. In addition, Alternatives B, D, and G also include pro-active riparian management measures to actively improve or restore habitats. These Alternatives also plan a medium - low level of ATV trail construction.

Blanding's turtle Table 1: Historical, current, and future outcomes for the Blanding's Turtle in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	C	C	**D**	**D**	C	C	C	C	**D**	**D**	C	C	C	C	**D**	**D**	C	C	C	C	C	C

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Cumulative Effects

The low number of Blanding's turtle collections on the Forest and the fact that the Forest is on the edge of its range may be affecting population distribution and abundance within the planning area. Predation and human disturbance likely have more affect on these populations than habitat, as wetland habitats are abundant on the Forest. Land ownership on the Chippewa National Forest is very fragmented. Continued high levels of private development and road building on all ownerships in may result in further isolation of the species. Sustained road and trail construction (5 and 10 decades out) at a high level (as in Alternative A, C, and Mod. E) are likely to result in Outcome D for this species.

Final

Blanding's turtle Table 2: Cumulative historical, current, and future outcomes for the Blanding's turtle in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

Blanding's turtle is likely to persist on the planning area under all Alternatives. Suitable habitat is present, however, external factors, such as high levels of private development and associated road building (on public and private lands) are likely to impact the species. Although these activities may impact individuals or their habitat, they are not likely to cause a trend toward federal listing.

Blanding's turtle Table 3: Determination of effects for the Blanding's turtle.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Four-toed salamander (*Hemidactylium scutatum*)

Regional Forester Sensitive Species: Chippewa
Historical Outcome: C
Current Outcome: D

Population trends and habitat requirements for this species in Northern Minnesota are poorly understood. The Minnesota population appears to be disjunct but additional survey work may determine that it is connected with populations in Wisconsin. Four-toed salamanders were first discovered in Minnesota in 1994. There is nothing known about population trends. Locations where 4-toed salamanders were found on the Marcell Ranger District are somewhat different than where they've been found more centrally in their range. While most literature identifies hardwood forest as the primary upland habitat for this species, locations on the Chippewa National Forest also include mature and older aspen and aspen/balsam fir forest. Habitat for this species is typically a landscape pattern of mature and old growth upland hardwood, aspen or aspen/fir forest with well interspersed fishless wetlands with relatively permanent water. Occurrence of Sphagnum or other moss in the wetland systems is important as this substrate is used for egg incubation and cover during the egg laying and incubation period.

Local habitat concerns for the species are for protection of wetlands, preserving understory microclimates, and offering steady supplies of large woody debris on the forest floor. Even aged cutting practices are most likely to directly diminish habitat suitability for the species. Shelterwood and thinning cutting practices leaving at least 50% canopy cover are expected to assure supplies of large woody debris. Impacts on understory microclimates are unknown. Prescribed burning may reduce understory vegetation, lead to more open canopies, and may consume existing large woody debris. However, tree mortality from burning may ultimately lead to increased quantity and dispersion of large woody debris. Direct impacts from fire can be mitigated by protecting inclusional wetlands and bogs in stands from hot, intense fires. In particular, wetlands having sphagnum should be protected. Retention of mature canopies of at least 50% is assumed to protect habitat suitability for the species.

Four-toed salamanders live under rocks and logs in old and old growth hardwood forest, and in Minnesota, in old aspen and aspen/fir forest. Reproduction occurs among mosses in swamps, boggy streams, and wet, wooded or open areas near ponds or quiet, mossy or grassy/sedgy pools (USDA FS 2002b, planning record). Eggs are laid in moss hummocks immediately above or next to a pool, into which the larvae drop or wriggle after hatching. Locally, suitable pools occur as small pot-holes in rolling landscapes, in mixed hardwood, balsam fir and aspen forest. Suitable pools would be fishless, with Sphagnum hummocks and 10 to 12 inches of water (Carol Hall, personal communication, 2000). Four-toed salamanders were discovered in Minnesota on the Marcell Ranger District in 1994. NatureServe (2003) identifies loss or degradation of habitat as the primary potential threat to the species.

Environmental Consequences

Direct and Indirect Effects
Existing forest plan modeling and data sets are not suitable for identifying quantity or quality of four-toed salamander habitat over the planning time frame. Habitat can only be identified as a combination of forest condition imbedded in a landscape of suitable wetland habitat. Association

Final

of occupied four-toed salamander habitat with ecological landscapes has not been done. It is assumed that specific wetland conditions are critical to providing suitable habitat for this species. Upland habitat must provide cover and foraging areas in the form of large amounts of large woody debris where moisture regimes can be maintained during dry periods. Because of these habitat requirements, not all old and old growth northern hardwood forests support four-toed salamanders or have potential. Species or forest type may not be as important as the forest floor structural components discussed.

Recognizing that even-aged harvest methods may diminish habitat suitability for this species, Alternatives A, C, and Mod. E propose the highest levels of even-aged clear-cut harvest. These alternatives also propose maintaining the highest number of acres in aspen into the future and would likely perpetuate amounts of clear-cut harvest into the future. Effects related to this management would be greatest in decades 1 and 2 for Modified Alternative E, and decade 1-5 for Alternatives A and C. Refer to Final EIS Chapter 3.2-36-41 and Chapter 3.4 for more information on harvest levels.

Established plan standards that require surveying of potential habitat and avoidance or minimization of impacts to sensitive species should assure that occupied habitat is protected in all of the alternatives. Since it is presumed that four-toed salamanders probably do not range more than 1,000 feet from their breeding habitat (USDA FS 2002b, planning record) a population complex is estimated to be probably no more than 3000-5000 acres in size. In other words, habitat protection for four-toed salamanders would not constitute wide-spread application of habitat considerations, but considerations may be substantial in localized areas. Because impacts can not be projected through the planning cycle, the four-toed salamander should be prioritized for completion of a conservation strategy that would more specifically provide conservation direction on the Chippewa National Forest.

Four-toed salamander Table 1: Historical, current, and future outcomes for Four-toed Salamander in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	**E**	**E**	D	D	**C**	**C**	**E**	**E**	D	D	**C**	**C**	**E**	D	**C**	D	**C**	**C**	D	D	**C**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Cumulative Effects

Just as the status of this species would be determined by how occupied habitat is managed, likewise, the future of four-toed salamanders on other ownerships will depend on the level of effort and commitment to search for occupied habitat, and to manage that habitat to conserve the species. It appears that under present policy and regulation, management of the four-toed salamander is rather voluntary on other ownerships. The level of degradation or conservation of habitat is impossible to determine without adequate knowledge of this species' occurrence in the cumulative effects area.

Final

Four-toed salamander Table 2: Cumulative historical, current, and future outcomes for Four-toed Salamander in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	**E**	**E**	D	D	D	D	**E**	**E**	D	D	D	D	**E**	D	**C**	D	**C**	**C**	D	D	**C**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Determination of Effects

Four-toed salamander Table 3: Determination of effects for Four-toed Salamander.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Fish

Lake sturgeon (*Acipenser fulvescens*)

Regional Forester Sensitive Species: Superior

Historical Outcome - B

Historical populations of Lake Sturgeon have been documented in watersheds that are intersected by the Superior National Forest. Specifically in 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 2002b, planning record, NatureServe 2003).

Current Outcome - C

Key habitats and populations have decreased from historical levels due to overexploitation, channel manipulations, dams, road crossings, point source pollution from manufacturing and other sources and non-point sources of sediment. Lake Sturgeon spawn at water depths from 0.3m to 4.6m in the shallows of lakes or, more typically, in rivers (Becker 1983, Phillips *et al*. 1982). 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). Lake sturgeon require large areas of water less than 10m with abundant food (Becker 1983). Young feed on microcrustacea until a length of 178mm to 203mm; adults feed on midges, leeches, sphaeriidae (fingernail clams), and gastropods (snails), using their tubular mouth to filter food from the substrate Becker 1983, NatureServe 2003).

Populations in the Shannon and Sturgeon River drainage are at low levels and occurrences are relatively rare (USDA FS 2002b, planning record). Populations in the Rainy River system (potential source populations for the Sturgeon and Shannon River systems) have been increasing in recent years and have been attributed to decreased pollution inputs from manufacturing in International Falls.

Direct/Indirect Effects

Effects Common to All Alternatives
Substrate quality, channel stability, migration opportunity and stream temperatures are key habitat components that affect viability of lake sturgeon on NFS lands of the SNF. All alternatives have some level of active vegetation management and recreation, which rely on a road/trail-based transportation system. The transportation system is likely to have the primary role in impacting lake sturgeon habitats. Roads and trails can cause habitat degradation and fragmentation of key habitats where stream crossings are not adequately designed. Standard and guidelines included in the proposed Forest Plan are designed to minimize and remove these impacts (Forest Plan, Chapter 2: Transportation system). Road and trail effects on aquatic habitat quality are described in detail in the proposed Forest Plan (Final EIS 3.6.1b AND Chapter 3.6.2).

Final

The Outcome is C.

Effects by Alternative
Outcome C is the most likely to occur in all alternatives given the proposed standards and guides regarding sedimentation and road and trail crossing design. Because standards and guidelines do not eliminate all potential for habitat degradation caused by transportation systems, alternatives A, C, and Mod. E have a slightly higher risk of Outcome D due to the increased level of road and trail building and associated stream crossings. For the same reason, alternatives B, D, F, and G have a slightly greater chance of leading to outcome B.

Lake sturgeon Table 1: Historical, current, and future outcomes for lake sturgeon in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Cumulative Effects

Historical Outcome
Turn of the century and later pollution from manufacturing, channel manipulation, trail and road stream crossings and overexploitation seriously constricted the natural range and abundance of Lake Sturgeon in the 12-digit HUC watersheds associated with the SNF. Prior to these human caused effects, large populations were widespread in the Rainy River Basin. The historical Outcome is A or B (USDA FS 2002b, planning record).

Current Outcome
Range contraction is most noted in the Sturgeon and Shannon River Drainages (Outcome D or E) but are recovering in the Rainy River system (Outcome B). Therefore, cumulatively for the 12-Digit HUC watersheds associated with the SNF, the outcome is C.

Effects of Alternatives
All alternatives are likely to achieve Outcome C given the standards and guides associated with riparian area management and transportation that have been proposed. These standards and guidelines do not apply to non-NFS administered lands. This leads to a fair range of uncertainty about the outcome. Given uncertainties of management on non-NFS lands alternatives A, C, and Mod. E have a higher risk of Outcome D. This is due to the increased level of road and trail building and existing inadequate stream crossings on NFS administered and non-NFS lands. Alternatives B, D, F, and G have a slightly higher chance of leading to Outcome B.

Lake sturgeon Table 2: Cumulative Historical, current, and future outcomes for the lake sturgeon in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	A/B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Determination of Effects

All alternatives may impact individuals but are not likely to cause a trend to federal listing or a loss of viability. The population is expected to remain viable because of adequate habitat in the Rainy River population area and the stable to growing population there. Habitat conditions through the rest of the range are largely undocumented and may be poor throughout the Shannon and Sturgeon River drainages. Range fragmentation is a major risk for any species.

Lake sturgeon Table 3: Determination of effects for Lake Sturgeon.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Shortjaw cisco (*Coregonus zenithicus*)

Regional Forester Sensitive Species: Superior

Historical Outcome - B

Historical population data is largely unavailable except for Lake Superior and the other Great Lakes. At one time in Lake Superior shortjaw cisco was reported in harvest data to be the most common coregonid captured, comprising up to 90% of the coregonid catch. It now represents less than 5% (USDA FS 2002b, planning record). .

Current Outcome - B

Shortjaw cisco is currently present at low historical levels in Lake Superior. The species has been captured in Gunflint, Basswood, Saganaga and Magnetic Lakes of the Superior National Forest and is considered common in these lakes (USDA FS 2002b, planning record). Populations in lakes outside of Lake Superior are considered stable.

Direct/Indirect Effects

Effects Common to All Alternatives

Habitat degradation is not generally believed to be a major threat to this species because they inhabit only deep water lakes and are generally captured at depths greater than 200 feet (outcome B, NatureServe 2003). The species spawns in 18-45 m over sand or clay bottoms. The disposal of dredge materials and sedimentation may result in smothered eggs. All lakes in the affected area are adjacent to wilderness areas and have relatively low road densities, the primary source of sediment generated from forest management. Little additional roading is planned for this area in any alternative. Therefore the sedimentation threat is likely to be nominal for impacting populations of this species. The Outcome is B.

Effects by Alternative
All alternatives are likely to lead to the same outcome (Outcome B). The most important threats to the species include interspecies competition and predation from exotic species as well as hybridization with other coregonids. None of these threats are likely to be affected by any alternative.

Shortjaw cisco Table 1: Historical, current, and future outcomes for shortjaw cisco in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

Final

Cumulative Effects

Historical Outcome – Outcome A or B
Information is largely unavailable for the population distribution and habitat quality for this species in all of its range considered within the 10-digit HUC watersheds associated with the SNF, except for the Great Lakes. In the current range of the shortjaw cisco, beyond the Great Lakes, populations appear to be stable (USDA FS 2002b, planning record).

Current Outcome – Outcome B
Range contraction has been noted in the literature from the Great Lakes. Population declines have been severe in Lake Superior and the other Great Lakes but not noted in the other lakes within the range associated with the 10 digit HUCs of the SNF. Habitat loss or degradation is not believed to be a significant threat (NatureServe 2003, USDA FS 2002b, planning record) resulting in Outcome B.

Effects of Alternatives
Forest management activities planned under any of the alternatives are unlikely to affect the primary threats to this species. Therefore, all alternatives are likely to produce Outcome B. Risk of habitat degradation from sedimentation, although a minor threat for the species, may vary slightly with alternative but is unlikely to meaningfully impact the species outcome.

Shortjaw cisco Table 2: Cumulative Historical, current, and future outcomes for the shortjaw cisco in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	A/B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

Determination of Effects

All alternatives may impact individuals but are not likely to cause a trend toward federal listing or loss of viability. Forest management under any of the alternatives is not likely to influence the primary threats to species viability.

Shortjaw cisco Table 3: Determination of effects for shortjaw cisco.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3
Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.							

Final

Least darter (*Etheostoma microperca*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - A

Least darter are distributed throughout the Midwest, from southern Ontario west through the Great Lakes states to the Red River of the North system in Minnesota, and south, with disjunct populations in Oklahoma and the Ozark Upland Region (NatureServe 2003). The Chippewa National Forest is near the edge of its range. Least darter was described by Eddy and Underhill (1976) as having a "rather peculiar distribution" in Minnesota, because of its discontinuous distribution. It is present in Hudson Bay drainages in western Minnesota, Upper Mississippi River drainages, and one tributary of the Cedar River in south-central Minnesota (Phillips *et al.* 1982).

Historical distribution within the planning area is unknown, but it is likely that there was more habitat available prior to road-building and stream crossing construction, ditching, and forest management activities along streams and rivers.

Current Outcome - C

Least darter is a Minnesota Species of Special Concern. It is known from at least 34 sites across Minnesota, but mostly in the west-central portion of Minnesota (Minnesota Department of Natural Resources 1995). Distribution on the Forest is largely unknown. Recent surveys by the Minnesota Pollution Control Agency and others have resulted in 6 collections from Forest lakes and streams (Konrad Schmidt, personal communication 2002).

Least darters are strongly associated with dense aquatic vegetation, soft bottoms of sand, silt, or organic sediment, and quiet water (Johnson and Hatch 1991). After spawning in shallow water on vegetation, least darters move back into deeper water (Becker 1983). Habitat threats include increased sediment loading from ditching, draining, roading, construction of beaches, storm water release, use of fertilizers and fish toxicants (Becker 1983, Johnson and Hatch 1991, Dalton 1990). The species migrates a very short distance between deeper, over-wintering habitats to spawning habitats. In addition, the species is short-lived, with most individuals living only through two growing seasons. Most adults die shortly after their first spawn (Becker 1983), making a population especially vulnerable to catastrophic events or erratic environments (Johnson and Hatch 1991). Barriers between habitats could pose a serious threat to a population.

Direct/Indirect Effects

Effects Common to All Alternatives
All alternatives plan management activities that require additional road-building across the Forest. However, additional Standards and Guidelines that require stream crossing structures to maintain passage for fish and other aquatic life and properly distribute flood and bankfull flows, and which maintain sediment transport capacity would minimize the effects of road building on least darter.

Final

Effects by Alternative
Alternatives A, C, and F would likely result in Outcome C for this species because of increased forest management activities in riparian zones (see Final EIS Chapter 3.6.2b for more information and analysis of these riparian indicators) and a mitigative approach to managing riparian and aquatic habitats, by applying Best Management Practices to minimize resource degradation (Minnesota Forest Resources Council 1999). These Alternatives also have increased road-building and timber harvest activities in the uplands, which may increase the amount of open area and young forest (< age 16) in 12-digit watersheds across the Forest. Activities which cause the amount of open or young forest to exceed 60% of the area within a watershed would increase peak streamflow, increase in-channel erosion and sedimentation, and decrease physical and biological diversity within streams (Verry 2000; see Final EIS Chapter 3.6.1d of for the full analysis of this indicator).

Alternatives E (Modified), G, and B would result in Outcome C, although the potential for degradation of least darter habitat is greater in Alternative E (Modified), than in G, or B. Although all of these Alternatives also tend to increase the amount of open or young forest in 12-digit watersheds (albeit to a lesser degree than Alternative A or C), there are pro-active riparian management measures in place to actively improve or restore habitats under Alternatives B, Mod. E, and G. Modified Alternative E has a higher level of new water access development, which could affect the quality of near shore habitat for the least darter. Larger boats stir up littoral zone sediments, and an increase in the number and development level of planned water access could impact least darter habitat.

Alternatives B and D would result in Outcome B. Under these Alternatives, there would be lower levels of planned water access, no cross-country travel on ATVs, no new snowmobile or ATV trails in Alternative D and low levels in Alternative B, the least amount of new road construction, and a higher level of road decommissioning in Alternative D.

Least darter Table 1: Historical, current, and future outcomes for the least darter in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	A	C	C	C	C	**B**	**B**	**B**	C	C	C	**B**	**B**	**B**	C	C	C	C	**B**	**B**	C	**B**	**B**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Cumulative Effects

There is limited information regarding the species distribution on the Forest. This species' habitat requirements and the need for a free-flowing connection between habitats make it vulnerable to management activities. Shoreline development and water-based recreation also pose threats to this species. Land ownership on the Chippewa National Forest is very fragmented, with multiple road jurisdictions. Continued high levels of private development on all ownerships and sustained high levels (5 and 10 decades out) of road and trail construction and water access development (as in Alternative A, C, and Mod. E) are likely to result in Outcome C for this species.

Final

Least darter Table 3: Cumulative Historical, current, and future outcomes for the least darter in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	A	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Determination of Effects

Least darter is likely to persist on the planning area under all Alternatives. Suitable habitat is present, however, external factors, such as high levels of private development and activities which cause fragmentation or barriers to habitats, shoreline erosion or sedimentation of habitats are likely to impact the species. Although these activities may impact individuals or their habitat, they are not likely to cause a trend toward federal listing.

Least darter Table 3: Determination of effects for the least darter.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	2	3	2	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Northern brook lamprey *(Ichthyomyzon fosser)*

Regional Forester Sensitive Species: Superior

Historical Outcome - C

Little information is available on the historical range of the non-parasitic northern brook lamprey but its distribution may be similar to the parasitic silver lamprey *(I. unicuspis)* because it is derived from this lamprey. The silver lamprey probably inhabited the Upper Mississippi and Ohio River systems during the late Wisconsin glaciation period and moved north into regions freed from ice (Hubbs and Tratuman 1937 in Hubbs and Potter 1971).

Current Outcome - C

It is found in Canada in the Great Lakes basin from Lake Superior to Lake Erie and captured in the Ottawa River, the St. Lawrence river and as far west as the Nelson River drainage in Manitoba. It also occurs in the Western Great Lakes basin of Wisconsin and Michigan, the Eastern Great Lakes basin of Michigan, Ohio and Pennsylvania and the Ohio basin of Illinois, Indiana, Ohio and Kentucky and considered rare or extirpated in the Lake Ontario Watershed. It's non-migratory nature hinders genetic exchange between population so populations are not considered continuous.

The northern brook lamprey has been collected from the Big Fork River downstream of the Chippewa National Forest, but no collections have been made within the Forest boundary (C.Cook, pers. comm.). It has been recorded in the Dark River twice and this river drains part of the Superior National Forest in St. Louis County, but it has not been confirmed on the Superior National Forest (E.Lindquist, pers. comm.). It has been recorded as a native resident in the Rainy River, Superior, and Lower Mississippi drainage basins of Minnesota, and the St. Croix drainage basin of Wisconsin (Bell Museum of Natural History).

This lamprey requires warm, medium-sized streams with low-gradient areas (used by developing ammocoetes) in proximity to clear, higher-gradient areas with sand and gravel riffles or runs (used by adults for spawning). They require silt-free sand or gravel for spawning, a current flowing over the nest and suitable water temperatures. Spawning occurs in May to June in gravel areas near riffles about 0.3m deep (Becker 1983). Ammocoetes (larval form) require soft substrate (approx. 80% sand and silt) for burrowing, often among vegetation at depths of 0.2m to 0.6m. Their diet consists of diatoms and unicellular algae and growth is rapid; larvae require organically enriched, sandy substrate until metamorphosis. After a 3-6 year growth period, metamorphosis occurs and adults spawn about 3-4 months afterwards. As adults they do not feed and are believed to die a few days after spawning.

Direct/Indirect Effects

Effects Common to All Alternatives
Roads, trails and associated crossings would impact spawning habitat through contributions of fine-sediment into streams, diverting or rerouting stream flow and changes in water temperatures. All alternatives would build roads, trails and crossings. The least to most potential for negative impacts from those mentioned above is Alternative D, B, F, G, Mod. E, A and C. However,

Final

standards and guidelines in the Forest Plan would minimize the impacts to spawning habitat. Road and trail effects are described in detail in the proposed Forest Plan (Final EIS 3.61b). The outcome is probably C.

Effects by Alternative

Outcome C is more than likely to occur in all alternatives. The direct and indirect effects from roads, trails and crossings and would likely be less in alternatives D and B since their percentages are lower than in alternatives F, G, Mod. E, A and C. (Refer to Final EIS Chapter 3.6. for more detailed analysis of impacts of roads, trails and crossings.)

Northern brook lamprey Table 1: Historical, current, and future outcomes for northern brook lamprey in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Cumulative Effects

Historical Outcome - C

Very little information is available concerning the historical events affecting the lamprey. However, floods and fires from the past might have altered water temperatures, stream flow and stream composition which could affect ammocoete survival rate. Other factors impacting habitat is the incidental poisoning due to efforts, in the Great Lakes region to exterminate less desirable parasitic species of lamprey and pollution. Roads, trails and crossings from timber harvesting and recreational activities may disrupt substrate intensity, stream flow and increase sediment. The outcome is C.

Current Outcome - C

The effects from the historical outcome are similar to the current outcome that is C. Very little information is available concerning its distribution or ecology within the boundaries of Superior National Forest and outside the boundaries of the forest. The outcome is C.

Effects of Alternatives

Habitat degradation from sedimentation, water temperature changes, changes in stream flow due roads, trails and crossings vary in intensity from alternative to alternative. However, it is unlikely to make a measurable difference in impacts on the species outcome. The outcome is still C.

Northern brook lamprey Table 2: Cumulative Historical, current, and future outcomes for the northern brook lamprey in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Determination of Effects

All alternatives may impact individuals but are not likely to cause a trend to federal listing or a loss of viability. Road and trails building under any of the alternatives is not likely to influence the primary threats to species viability.

Northern brook lamprey Table 3: Determination of effects for northern brook lamprey.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3
Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.							

Final

Greater redhorse (*Moxostoma valenciennes*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - B

Typical greater redhorse habitat is moderate to fast-flowing, medium- to large-sized rivers. Greater redhorse sometimes occur in river reservoirs and large lakes (Scott and Crossman 1973). The species prefers clear water with substrates of clean sand, gravel, or boulders (Becker 1983). Spawning habitat is largely the same as non-spawning habitat, and includes shallow runs with sand and gravel substrates. The species needs an extensive connected stream system that is barrier free to maintain flows and facilitate migration to and from spawning habitats.

In Minnesota, the greater redhorse has been found in the upper Mississippi River drainage above St. Anthony Falls, in the Otter Tail River in the Red River drainage, and in the Lake of the Woods drainage (Phillips et. al 1982, Jenkins 2003, personal communication).

Historical distribution within the planning area is unknown, but it is likely that there was more habitat available prior to construction of the large reservoir dams.

Current Outcome - C

Greater redhorse is not tracked by the Minnesota Department of Natural Resources Natural Heritage program and has no special status in Minnesota. Therefore, information regarding current status is limited. On the Chippewa National Forest, verified collections have been made from eight lakes and rivers. Dams, shoreline development, and road-stream crossings have the potential to degrade habitat and limit the species ability to migrate to and from suitable spawning habitat.

There are 350 miles of medium to large-sized rivers on the Chippewa National Forest. Roads cross these rivers many times. A better understanding of greater redhorse habitat requirements and its range on the Chippewa National Forest is needed to identify lakes and streams which are likely to support viable populations. In addition, a closer look at road construction and maintenance programs across all government agencies is needed to ensure the protection of the species' habitats.

Direct/Indirect Effects

Effects Common to All Alternatives
All alternatives plan management activities that require additional road-building across the Forest. Refer to Final EIS Appendix F and Chapter 3.6.2 for more information on roads and their impacts.) However, additional Standards and Guidelines that require stream crossing structures to maintain passage for fish and other aquatic life and properly distribute flood and bankfull flows, and which maintain sediment transport capacity would minimize the effects of road building on greater redhorse.

Effects by Alternative
Alternatives A, B, C, Mod. E, F, and G would result in Outcome C for this species. However,

Final

some Alternatives may contribute more to habitat degradation than others. A, C, and Mod. E have increased road-building and a higher amount and intensity of timber harvest activities in the uplands. These Alternatives plan higher levels of forest management activities in riparian areas. Standard WS-1 would limit the combined acreage of upland young forest and upland openings to no more than 60% of any 6th level watershed to limit peak streamflow, in-channel erosion and sedimentation, and to limit the decrease of physical and biological diversity within streams (Verry 2000; see Final EIS Chapter 3.6.1d for full analysis of this Indicator). In addition, these Alternatives plan forest management activities in riparian zones (see Final EIS Chapter 3.6.2b for analysis of these Riparian Indicators). Alternatives A and C and take a mitigative approach to managing riparian and aquatic habitats, by applying Best Management Practices to minimize resource degradation (Minnesota Forest Resources Council 1999).

Although Modified Alternative E has a pro-active riparian and fish habitat management approach, it has a high level of riparian timber harvest and new water access development (which includes river access), which could affect the quality of habitat for greater redhorse. More developed accesses may lead to more and larger boats on the waterways, which would stir up sediments and degrade spawning and rearing habitats. In addition, Modified Alternative E has the highest level of new trail construction, which may require additional stream crossings and increase the potential for erosion and sedimentation of aquatic habitats.

Alternative D has no new trail or water access construction and has the lowest level of new road construction. In addition, Alternative D also includes pro-active riparian management measures to actively improve or restore aquatic and riparian habitats. Alternative D also has the highest level of road removal (decommissioning). The amount of habitat lost due to dams would not change under any alternative, but pro-active restoration measures to remove other barriers and improve aquatic and riparian habitat quality would benefit the species overall. (Outcome B)

Greater redhorse Table 1: Historical, current, and future outcomes for the greater redhorse in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	C	C	**D**	**D**	C	**B**	**B**	C	**D**	**D**	**B**	**B**	**B**	C	**D**	**D**	C	C	C	C	**B**	**B**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Cumulative Effects

There is limited information regarding the species distribution on the Forest and elsewhere in the State. This species' habitat requirements and the need for a free-flowing connection between habitats make it vulnerable to management activities. Shoreline development and water-based recreation also pose threats to this species. Land ownership on the Chippewa National Forest is very fragmented, with multiple road jurisdictions. Continued high levels of private development on all ownerships and sustained high levels (5 and 10 decades out) of road and trail construction and water access development (as in Alternative A, C, and Mod. E) are likely to result in Outcome D for this species.

Final

Greater redhorse Table 2: Cumulative Historical, current, and future outcomes for the greater redhorse in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	C	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**	D

Determination of Effects

Greater redhorse is likely to persist on the planning area under all Alternatives. Suitable habitat is present, however, external factors, such as high levels of private development and activities which cause fragmentation or barriers to habitats, shoreline erosion or sedimentation of habitats are likely to impact the species. Although these activities may impact individuals or their habitat, they are not likely to cause a trend toward federal listing.

Greater redhorse Table 3: Determination of effects for the greater redhorse.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Pugnose shiner (*Notropis anogenus*)

Regional Forester Sensitive Species: Chippewa

Historical Outcome - B

Pugnose shiner is one of the rarest cyprinids in northern North America and southern Canada (Bailey 1959), and one of Minnesota's rarest shiners (Phillips *et al*. 1982). It inhabits clear, well-vegetated, glacial lakes and streams of low gradient, usually connected to lakes, with bottoms of sand, mud, gravel, or marl (Becker 1983). They are commonly found in association with aquatic plants (Becker 1983; Parker et al. 1987). The pugnose shiner is found only in parts of Michigan, Wisconsin, and Minnesota, although it once ranged from North Dakota eastward through Wisconsin, Michigan, Illinois, Indiana, Iowa, and Ohio, including Lakes Ontario and Erie.

Historical distribution within the planning area is unknown. Scott and Crossman (1973) suggest that the species once had a broader range in Canada. Bailey (1959) reported four collections on or near the Chippewa National Forest.

Current Outcome - C

Although the pugnose shiner is widely distributed, it is never abundant where found (Bailey 1959; Eddy and Underhill 1974; Phillips *et al.* 1982; Becker 1983; Parker *et al*. 1987). Becker (1983) reported that attempts to capture pugnose shiners in Wisconsin waters where it was previously found where unsuccessful. Bailey (1959) reported similar results from Illinois and Ohio. In Minnesota, the pugnose shiner is still present in many undisturbed lakes in all drainages, except Lake Superior (Phillips *et al*. 1982). Minnesota is perhaps the center of abundance for the pugnose shiner, as it is extirpated in Iowa and other states in the eastern portion of its range (Dr. J.C. Underhill, Bell Museum of Natural History, personal communication 1994; Eddy and Underhill 1974; Minnesota Department of Natural Resources 1995). Pugnose shiner is listed as a Species of Special Concern in Minnesota (Minnesota Department of Natural Resources 1995).

One of the largest collections in Minnesota is from Cass Lake, on the Chippewa National Forest (Dr. J.C. Underhill, Bell Museum of Natural History, personal communication 1994). This is the only recent collection on the Forest, although it has been reported from nine water bodies. No attempt has been made to verify the species continued existence in those lakes.

Dams, shoreline development, and road-stream crossings have the potential to degrade habitat and limit the species ability to migrate to and from suitable spawning habitat. A better understanding of the pugnose shiner habitat requirements and its range on the Chippewa National Forest is needed to identify lakes and streams which are likely to support viable populations. In addition, a closer look at road construction and maintenance programs across all government agencies is needed to ensure the protection of the species' habitats.

Direct/Indirect Effects

Effects Common to All Alternatives
Shoreline development, the elimination of rooted aquatic vegetation, eutrophication, sedimentation, and turbidity are perhaps the most serious threats to pugnose shiner (Eddy and

Final

Underhill 1974; Phillips et al. 1982; Becker 1983). All alternatives plan management activities that require additional road-building across the Forest. However, additional Standards and Guidelines that require stream crossing structures to maintain passage for fish and other aquatic life and properly distribute flood and bankfull flows, and which maintain sediment transport capacity would minimize sedimentation from roads and trails and its affects on pugnose shiner.

Effects by Alternative

All Alternatives would result in Outcome C for this species. Pugnose shiner is perhaps most affected by shoreline development activities, which are not regulated by the Forest Plan. In addition, the majority of the shoreline on Cass Lake and its connected lakes is in other ownership. Shoreline development and water-based recreation on these lakes is expected to continue, and may well increase in the future. However, some Alternatives may contribute more to habitat degradation than others. Alternatives A, C, and Mod. E have increased road-building and a higher amount and intensity of timber harvest activities in the uplands. These Alternatives plan higher levels of forest management activities in riparian areas. Standard WS-1 would limit the combined acreage of upland young forest and upland openings to no more than 60% of any 6^{th} level watershed to limit peak streamflow, in-channel erosion and sedimentation, and to limit the decrease of physical and biological diversity within streams (Verry 2000; see Final EIS Chapter 3.6.1d for full analysis of this Indicator). Alternatives A and C plan forest management activities in riparian zones and take a mitigative approach to managing riparian and aquatic habitats, by applying Best Management Practices to minimize resource degradation (Minnesota Forest Resources Council 1999).

Although Modified Alternative E has a pro-active riparian and fish habitat management approach, it has a high level of riparian timber harvest and new water access development, which could affect the quality of habitat for the pugnose shiner. More developed accesses may lead to more and larger boats on the waterways, which would stir up sediments and aquatic vegetation, and impair feeding and breeding habitats.

Forest management activities in Alternatives B, D, and G would also increase the amount of open or young forest in 12-digit watersheds and construct additional roads and trails, but these activities occur at lower levels. These Alternatives also have lower levels of water access development. In addition, Alternatives B, D, and G also include pro-active riparian management measures to actively improve or restore habitats. The amount of habitat lost due to dams and shoreline development would not change under any alternative, but pro-active restoration measures to remove other barriers and improve aquatic and riparian habitat quality would be implemented in these alternatives.

Pugnose shiner Table 1: Historical, current, and future outcomes for the pugnose shiner in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	C	C	**D**	**D**	C	C	C	C	**D**	**D**	C	C	C	C	**D**	**D**	C	**D**	**D**	C	C	C

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Final

Cumulative Effects

The low number of pugnose shiner collections on the Forest and the fact that the majority of riparian zones on the Forest are in other ownership, make this species vulnerable to human disturbance. Shoreline development and water-based recreation pose greater threats to this species than Forest management. Clear, weedy lake habitats are abundant on the Forest. Land ownership on the Chippewa National Forest is very fragmented. Continued high levels of private development on all ownerships may result in further isolation of the species. Sustained road and trail construction, and water access development (5 and 10 decades out) at high levels (as in Alternative A, C, and Mod. E) are likely to result in Outcome D for this species.

Pugnose shiner Table 2: Cumulative historical, current, and future outcomes for the pugnose shiner in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	C	C	**D**	**D**	C	C	C	C	**D**	**D**	C	C	C	C	**D**	**D**	C	**D**	**D**	C	C	C

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Determination of Effects

Pugnose shiner is likely to persist on the planning area under all Alternatives. Suitable habitat is present, however, external factors, such as high levels of private development and activities which cause shoreline erosion and sedimentation of littoral zone habitats, or loss of aquatic vegetation (on public and private lands), are likely to impact the species. Although these activities may impact individuals or their habitat, they are not likely to cause a trend toward federal listing.

Pugnose shiner Table 3: Determination of effects for the pugnose shiner.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Mollusks

Creek heelsplitter (*Lasmigona compressa*)

Regional Forester Sensitive Species: Chippewa and Superior

Historic Outcome - B

The creek heelsplitter mussel is fairly widespread throughout the Midwest. In Minnesota, it was once widespread and abundant in streams and small rivers in the Mississippi drainage north of St. Anthony Falls (Dawley 1947). In 1912, Wilson and Danglade found creek heelsplitter in the Mississippi River near Lake Bemidji. Graf (1997) reports creek heelsplitter mussels as being present in all major drainages of Minnesota, including those within the Chippewa and Superior National Forests (Lake Superior, Lake of the Woods, and Mississippi River drainages.

Current Outcome – C

The creek heelsplitter is a headwaters species that is rarely found in large river systems (Cumming and Mayer 1992). It is found in fine gravel or sand and sandy mud areas (Watters 1995). Although it is widespread in distribution across Minnesota and other Midwestern states, it is usually found in low numbers (Minnesota Department of Natural Resources, 1995; Watters 1995. Creek heelsplitter mussel is a Species of Special Concern in Minnesota (S3), Critically Imperiled in South Dakota (S1), and Vulnerable (S3) or Imperiled (S2) in the remaining Midwestern States (NatureServe 2003; Watters 1995). In Minnesota, Bright et al. (1995) concluded that the species was once more widely distributed due to the distribution of live and dead shells in rivers of central Minnesota.

The Chippewa and Superior National Forests are near the edge of the species range. Creek heelsplitter mussels have been collected at 19 locations on the Chippewa National Forest in recent years. However, in many other locations, a high percentage of dead shells have been found, indicating a broad former range and greater abundance on the Chippewa National Forest (Chippewa National Forest unpublished data).

Direct/Indirect Effects

Effects Common to All Alternatives
All alternatives plan management activities that require additional road-building across the Forest. However, additional Standards and Guidelines that require stream crossing structures to maintain passage for fish and other aquatic life and properly distribute flood and bankfull flows, and which maintain sediment transport capacity would minimize the effects of road building on creek heelsplitter mussels.

Final

Effects by Alternative
Creek heelsplitter is primarily found in small to medium-sized rivers. These river systems have a higher likelihood of being impacted by new road construction. Alternatives A and C would likely result in Outcome D for this species because of increased road-building and the amount and intensity of timber harvest activities in the uplands. Standard WS-1 would limit the combined acreage of upland young forest and upland openings to no more than 60% of any 6th level watershed in order to limit peak streamflow, in-channel erosion and sedimentation, and to limit the decrease of physical and biological diversity within streams (Verry 2000; see Final EIS Chapter 3.6.1d for full analysis of this Indicator). In addition, these Alternatives take a mitigative approach to managing riparian and aquatic habitats, by applying the minimum protection needed to minimize resource degradation.

Alternatives E (Modified), F, G would result in Outcome C for the creek heelsplitter, due to the higher amount of timber harvest and associated road construction. Although all of these Alternatives also tend to increase the amount of open or young forest in 12-digit watersheds (albeit to a lesser degree than Alternative A or C), there are pro-active riparian management measures in place to actively improve or restore habitats under Alternatives B, Mod. E, and G. Alternative F does not employ pro-active riparian or fish habitat management, but forest management activities are generally less impacting than in Alternative A or C. Alternative E has the highest level of new water access development (which includes river access), which could affect the quality of habitat for the creek heelsplitter. More developed accesses may lead to more and larger boats on the waterways, which would stir up sediments and impair mussel feeding and breeding. However, a Forest Plan Guideline to minimize disturbance associated with management activities and maintain the physical habitat characteristics associated with freshwater mussel beds should help to protect the species from increased recreational use of larger rivers.

Alternative B and D would result in Outcome B. Under these Alternatives, there would be a lower level of planned water access (no new water access in Alternative D), no new snowmobile or ATV trails in Alternative D, and a low level of new trail construction in Alternative B. These Alternatives also have the least amount of new road construction, and a higher level of road decommissioning.

Creek heelsplitter mussel Table 1. Historical, current, and future outcomes for the creek heelsplitter mussel in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
			2	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**	**2**	**5**	**10**
Chippewa	B	C	D	E	E	B	B	B	D	E	E	B	B	B	C	C	C	C	D	E	C	C	C
Superior	B	C	C	D	E	B	B	B	D	E	E	B	B	B	C	C	C	C	D	E	C	C	C

Cumulative Effects

Substrate quality, channel stability, and migration opportunity are key habitat components that affect viability of creek heelsplitter mussel on NFS lands of the SNF and CNF. All alternatives have some level of active vegetation management and recreation, which rely on a road/trail-based transportation system. The transportation system is likely to have the primary role in impacting

Final

the species. Roads and trails can cause habitat degradation and fragmentation of key habitats where stream crossings are not adequately designed. Standard and guidelines included in the proposed Forest Plan are designed to minimize these impacts (Forest Plan, Chapter 2: Transportion system). These standards and guidelines do not apply to non-NFS administered lands. This leads to a fair range of uncertainty about the outcome.

Alternative A is likely to lead to Outcome C for the SNF and D for the CNF due to the relative amount of road and trail construction, timber harvest in the riparian zone and the mitigative approach to the same. Alternative C would likely lead to Outcome D for both Forests for the same reasons.

Alternatives B and D are likely to lead to Outcome B for both Forests because of the relative reduced amount of roading, level of timber harvest in the riparian zones, and pro-active management of riparian zones to promote riparian health. Alternatives E (Modified), F and G are likely to lead to Outcome C for both Forests during the life of the plan. While alternatives E, and G rank among the higher alternatives for road/trail building, they have a proactive riparian management direction that should help improve overall riparian health and therefore may have a greater chance of maintaining Outcome C over the long run. Alternative F also is likely to lead to Outcome C during the live of the plan. Alternative F relies on mitigative riparian management which generally would maintain existing riparian health. Therefore, there is greater risk of Outcomes D and E in decades beyond the life of the proposed plan.

Creek heelsplitter Mussel Table 2: Cumulative Historical, current, and future outcomes for the creek heelsplitter mussel in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	C	D	D	D	B	B	B	D	D	D	B	B	B	C	C	C	C	C	C	C	C	C
Superior	B	C	C	C	C	B	B	B	D	D	D	B	B	B	C	C	C	C	C	C	C	C	C

Determination of Effects

All alternatives may impact individuals but are not likely to cause a trend to federal listing or a loss of viability except Alternative D. Alternative D is likely to have beneficial impacts on the species because there would likely be a net improvement in habitat conditions because of the low level of road and trail construction, road decommissioning and proactive management of riparian areas.

Creek heelsplitter Mussel Table 3. Determination of effects for the creek heelsplitter mussel.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	2	3	3	3
Superior	3	3	3	2	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Fluted-shell mussel (*Lasmigona costata)*

Regional Forester Sensitive Species: Chippewa and Superior

Historic Outcome - D

Fluted-shell mussels are fairly widespread throughout the Midwest. The species has been collected twice from the Rainy River basin, although in both collections, only dead (empty) shells were found. Both collections were made in the Big Fork River watershed, and one was within the Chippewa National Forest boundary; the other collection was downstream of the Forest boundary. (Hove 1997). In 1912, Wilson and Danglade collected the species in the Red River drainage, and in 1947, Dawley also collected it there, as well as in the Lower Mississippi and Minnesota River drainages. Dawley (1947) did not find fluted-shell mussels in her survey of the Upper Mississippi or the Lake Superior drainages. Graf (1997) reports the species only from the Red River of the North drainage basin. (Outcome D)

Current Outcome – E

The fluted-shell is a riverine species, requiring good quality, medium-sized streams and rivers. Habitat includes fine gravel, sand, and sandy mud in areas with slow to moderate flow (Cummings and Mayer 1992). It is intolerant of pollutants and becoming increasing scarce in some systems (Watters 1995). Its perilously low number in Minnesota river systems is the reason behind its designation as a Minnesota Species of Special Concern (Minnesota Department of Natural Resources 1995). Although it is widespread in distribution, the fluted-shell is relatively uncommon in most systems, and is listed as Endangered in Iowa (NatureServe 2003).

The Chippewa and Superior National Forests are near the edge of the species range. Distribution on the Forest is largely unknown; despite numerous mussel surveys, it has only been found (dead) in one location (Chippewa National Forest unpublished data). (Outcome E)

Direct/Indirect Effects

Effects Common to All Alternatives
All alternatives plan management activities that require additional road-building across the Forest. However, additional Standards and Guidelines that require stream crossing structures to maintain passage for fish and other aquatic life and properly distribute flood and bankfull flows, and which maintain sediment transport capacity would minimize the effects of road building on fluted-shell mussels.

Effects by Alternative
Alternatives A and C would likely result in Outcome E for this species because of increased road-building and the amount and intensity of timber harvest activities in the uplands. Standard WS-1 would limit the combined acreage of upland young forest and upland openings to no more than 60% of any 6th level watershed to limit peak streamflow, in-channel erosion and sedimentation, and to limit the decrease of physical and biological diversity within streams (Verry 2000; see Final EIS Chapter 3.6.1d for full analysis of this Indicator). In addition, these Alternatives take a mitigative approach to managing riparian and aquatic habitats, by applying the minimum protection needed to minimize resource degradation.

Final

Alternatives E (Modified), F, G would result in Outcome D, although the potential for degradation of fluted-shell habitat is greater in Modified Alternative E, than in F or G. Although all of these Alternatives also tend to increase the amount of open or young forest in 12-digit watersheds (albeit to a lesser degree than Alternative A or C), there are pro-active riparian management measures in place to actively improve or restore habitats under Alternatives B, Mod. E, and G. Alternative F does not employ pro-active riparian or fish habitat management, but forest management activities are generally less impacting than in Alternative A or C. Modified Alternative E has the highest level of new water access development (which includes river access), which could affect the quality of habitat for the fluted-shell. Larger, developed access may lead to larger boats on the waterways, which would stir up sediments and impair mussel feeding and breeding. However, a Forest Plan Guideline to minimize disturbance associated with management activities and maintain the physical habitat characteristics associated with freshwater mussel beds should help to protect the species from increased recreational use of larger rivers.

Alternative B and D would also result in Outcome D, due to the limited distribution of the species on the Forests. However, threats to the species under these Alternatives are less than under Alternatives E (Mod.), F, and G. Under Alternatives B and D, there would be a lower level of planned water access (no new water access in Alternative D), no new snowmobile or ATV trails in Alternative D, and a low level of new trail construction in Alternative B. These Alternatives also have the least amount of new road construction, and a higher level of road decommissioning.

Fluted-shell mussel Table 1: Historical, current, and future outcomes for the Fluted-shell mussel in 2, 5, and 10 decades from present on National Forest lands.

FOREST	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	E	E	E	E	**D**	**C**	**C**	E	E	E	**D**	**C**	**C**	**D**	E	E	**D**	**C**	**C**	**D**	**C**	**C**
Superior	C	E	E	E	E	**D**	**C**	**C**	E	E	E	**D**	**C**	**C**	**D**	E	E	**D**	**C**	**C**	**D**	**C**	**C**

Cumulative Effects

Substrate quality, channel stability, and migration opportunity are key habitat components that affect viability of fluted-shell mussel on NFS lands of the SNF and CNF. All alternatives have some level of active vegetation management and recreation, which rely on a road/trail-based transportation system. The transportation system is likely to have the primary role in impacting the species. Roads and trails can cause habitat degradation and fragmentation of key habitats where stream crossings are not adequately designed. Standard and guidelines included in the proposed Forest Plan are designed to minimize and remove these impacts (Forest Plan, Chapter 2: Transportion system). These standards and guidelines do not apply to non-NFS administered lands. This leads to a fair range of uncertainty about the outcome.

Alternative A and C are likely to lead to Outcome E for both Forests due to the relative amount of road and trail construction, timber harvest in the riparian zone and the mitigative approach to the same.

All other alternatives are likely to lead to Outcome D due to the relative reduced amount of

Final

roading, and levels of timber harvest in the riparian zones.

Fluted-shell mussel Table 2: Cumulative Historical, current, and future outcomes for the Fluted-shell mussel in 2, 5, and 10 decades from.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	E	E	E	E	D	D	D	E	E	E	D	D	D	D	D	D	D	D	D	D	D	D
Superior	C	E	E	E	E	D	D	D	E	E	E	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

All alternatives except Alternative D may impact individuals but are not likely to cause a trend to federal listing or a loss of viability. Alternative D is likely to have beneficial impacts on the species because there would likely be a net improvement in habitat conditions because of the low level of road and trail construction, road decommissioning and proactive management of riparian areas.

Fluted-shell Mussel Table 3: Determination of effects for the fluted-shell mussel.

Forest	**Alt. A**	**Alt. B**	**Alt. C**	**Alt. D**	**Mod. Alt. E**	**Alt. F**	**Alt. G**
Chippewa	3	3	3	2	3	3	3
Superior	3	3	3	2	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Black sandshell (*Ligumia recta*)

Regional Forester Sensitive Species: Chippewa and Superior

Historic Outcome - B

Black sandshell is fairly widespread throughout the Midwest. In Minnesota, it was once common in all but the smallest rivers. Dawley (1947) collected black sandshell mussels in the Lake Superior, Hudson Bay, and Mississippi River drainages. She collected shells from Minnesota Point in Lake Superior as well. Graf (1997) reports black sandshell mussels as being present in all major drainages of Minnesota, including those within the Chippewa and Superior National Forests (Lake Superior, Lake of the Woods, and Mississippi River drainages). In 1912, Wilson and Danglade found the black sandshell to be fairly abundant in all the rivers visited in central and northern Minnesota (Outcome B).

Current Outcome – D

The black sandshell is almost entirely a riverine species, requiring deep run or glide habitat in river systems that are fairly wide and have a moderate current. Although it is widespread in distribution, the black sandshell is an uncommon species in much of the Midwest. Black sandshell mussel is a Species of Special Concern in Minnesota (S3), Critically Imperiled in South Dakota and Iowa (S1), and Threatened in Ohio (NatureServe 2003; Watters 1995). In Minnesota, there is evidence of declining abundance on the Mississippi and Minnesota Rivers (Minnesota Department of Natural Resources 1995).

The Chippewa and Superior National Forests are near the edge of the species range. Black sandshell mussels have been collected at 44 locations on the Chippewa in recent years. However, at 50% of those sites (22), no live black sandshells were collected. This high percentage of "dead" locations may indicate a decline in habitat quality (Chippewa National Forest unpublished data). Even within river systems, relative abundance of live shells is low. For example, in a1992 survey of the Leech Lake River on the Chippewa National Forest, 99% of the black sandshells collected were dead (empty shells; Doolittle 1992). (Outcome D)

Direct/Indirect Effects

Effects Common to All Alternatives

All alternatives plan management activities that require additional road-building across the Forest. However, additional Standards and Guidelines that require stream crossing structures to maintain passage for fish and other aquatic life and properly distribute flood and bankfull flows, and which maintain sediment transport capacity would minimize the effects of road building on black sandshell mussels.

Effects by Alternative

Although black sandshell is primarily found in larger rivers, Alternatives A and C would likely result in Outcome D for this species because of increased road-building and the amount and intensity of timber harvest activities in the uplands. Standard WS-1 would limit the combined acreage of upland young forest and upland openings to no more than 60% of any 6th level

Final

watershed to limit peak streamflow, in-channel erosion and sedimentation, and to limit the decrease of physical and biological diversity within streams (Verry 2000; see Final EIS Chapter 3.6.1d for full analysis of this Indicator). In addition, these Alternatives plan forest management activities in riparian zones (Refer to Final EIS Chapter 3.6.2b for the analysis of these Riparian Indicators) and take a mitigative approach to managing riparian and aquatic habitats, by applying Best Management Practices to minimize resource degradation (Minnesota Forest Resources Council 1999).

Alternatives E (Mod.), F, and G would result in Outcome C, although the potential for degradation of black sandshell habitat is greater in Modified Alternative E, than in F, G, or B. Although all of these Alternatives also tend to increase the amount of open or young forest in 12-digit watersheds (albeit to a lesser degree than Alternative A or C), there are pro-active riparian management measures in place to actively improve or restore habitats under Alternatives E (Modified) and G. Alternative F does not employ pro-active riparian or fish habitat management, but forest management activities are generally less impacting than in Alternative A or C. Modified Alternative E has the highest level of new water access development (which includes river access), which could affect the quality of habitat for the black sandshell. Large, developed access may lead to larger boats on the waterways, which would stir up sediments and impair mussel feeding and breeding. However, a Forest Plan Guideline to minimize disturbance associated with management activities and maintain the physical habitat characteristics associated with freshwater mussel beds should help to protect the species from increased recreational use of larger rivers.

Alternative D and B would result in Outcome B. Under these Alternatives, there would be lower levels of planned water access, no new snowmobile or ATV trails, the least amount of new road construction, and a higher level of road decommissioning.

Black Sandshell Table-1. Historical, current, and future outcomes for the black sandshell mussel in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	CURRENT	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	D	D	D	**E**	**B**	**B**	**B**	D	D	**E**	**B**	**B**	**B**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**B**	**B**
Superior	B	D	D	D	**E**	**B**	**B**	**B**	D	D	**E**	**B**	**B**	**B**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**B**	**B**

Cumulative Effects

Substrate quality, channel stability, and migration opportunity are key habitat components that affect viability of black sandshell mussel on NFS lands of the SNF and CNF. All alternatives have some level of active vegetation management and recreation, which rely on a road/trail-based transportation system. The transportation system is likely to have the primary role in impacting the species. Roads and trails can cause habitat degradation and fragmentation of key habitats where stream crossings are not adequately designed. Standard and guidelines included in the proposed Forest Plan are designed to minimize and remove these impacts (Forest Plan, Chapter 2: Transportation system). These standards and guidelines do not apply to non-NFS administered lands. This leads to a fair range of uncertainty about the outcome. Alternatives A and C are likely to lead to Outcome D (no change from Current Condition) for both Forests due to the relative amount of road and trail construction, timber harvest in the riparian zone and the mitigative approach to the same. Alternatives B and D are likely to lead to Outcome B for both Forests because of the relative reduced amount of roading and stream crossings, low levels of timber harvest in the riparian zones, and pro-active management of riparian zones to promote riparian health. For both Forests, Alternatives E (Mod.), F and G are likely to result in Outcome C due to the relative reduced levels of the above noted threats during the life of the plan.

Black Sandshell Table-2. Cumulative historical, current, and future outcomes for the black sandshell mussel in 2, 5 and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	B	D	D	D	D	**B**	**B**	**B**	D	D	D	**B**	**B**	**B**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**
Superior	B	D	D	D	D	**B**	**B**	**B**	D	D	D	**B**	**B**	**B**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**

Determination of Effects

All alternatives may impact individuals but are not likely to cause a trend to federal listing or a loss of viability except Alternatives B and D. Alternatives B and D are likely to have beneficial impacts on the species because there would likely be a net improvement in habitat conditions due to the low level of road and trail construction, road decommissioning and proactive management of riparian areas.

Black sandshell Table-3. Determination of effects for the black sandshell mussel.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	2	3	2	3	3	3
Superior	3	2	3	2	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Insects

Taiga alpine (*Erebia mancinus*)

Regional Forester Sensitive Species: Superior

Synonym: Mancinus Alpine or Disa Alpine (*Erebia disa alpinus*): Until recently E. mancinus was classified as a subspecies of disa, although its appearance is quite distinct (Layberry et al. 1998).

Historical Outcome - C

The Superior National Forest is at the extreme southern edge of the species' holarctic range in

Final

North America. Within much of its range the taiga alpine is described as common, but local (Layberry *et al.* 1998). The species is associated with semi-open to well-forested black spruce-tamarack sphagnum bogs (Layberry *et al*. 1998, Glassberg 1999, USDA FS 2002b planning record). The combination of environmental conditions (including climatic conditions) and low or isolated populations (probable result of species being at extreme south edge of range) suggests that suitable habitat on the Superior has likely always been widespread but patchy.

No information is available on historical condition of taiga alpine populations.

Current Outcome – D

The amount of suitable habitat probably has decreased slightly from historical conditions on the Superior as a result of timber harvest in lowland black spruce forest habitat over the last century.

Currently on the Superior National Forest there are four documented locations of taiga alpine (MN NHP 2002; USDA FS 2002b, planning record). MacLean (2001) reports that it is likely to occur widely within the large peatlands northwest of the Sand Lake, but that the status of the species there and throughout much of the Superior is largely unknown due to lack of extensive searches.

Direct/Indirect Effects

Effects Common to All Alternatives

Management activities in all alternatives change, in varying amounts and distributions, habitat for the taiga alpine. Activities that decrease suitable habitat include 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 forests habitat (USDA FS 2002b, planning record). Changes due to timber harvest or fire are relatively long-term as forests take up to 60 years to become mature again. Road construction or hydrological changes can be either short-term (5-10 years) or long-term (greater than 10 years). Changes to potential suitable habitat within the BWCAW would be the same in all alternatives: decreases in habitat would result primarily from fire or blowdown.

Management direction (including desired conditions, objectives, standards, and guideline) for all alternatives promotes the maintenance or enhancement of habitat for sensitive species and prohibits any activities that could cause a trend toward federal listing of the species. Because of the rarity of this species, all alternatives are expected to proactively protect or enhance habitat conditions at all known locations. Additionally, although the alternatives vary in the degree to which roads through potential habitat would be developed, direction for road management activities for all alternatives is likely to result in adequate protection of hydrological processes in black spruce-tamarack, minimizing the potential for impact to the species and its habitat. Therefore, road management activities are not expected to have major impact on the species and are not analyzed further. (Final EIS - Appendix F provides data and other information on road management under the alternatives.)

Effects of Alternatives

This evaluation uses management indicator habitat (MIH) 9b: mature lowland black spruce-tamarack as an indicator of differences in potential impacts among the alternatives, acknowledging limitations of its use. Habitat preferences and relationships are not well

Final

understood in Minnesota. Mature black spruce-tamarack forest (MIH 9b) that is dense enough to be subject to logging or management-ignited fire is a key habitat for the taiga alpine, but the species may also occur in younger lowland conifer or more open lowland conifer that is not usually subject to logging because of low site productivity. It is likely that the taiga alpine occurs in habitats other than MIH 9b and until further surveying and study of population status and habitat relationships is conducted, this effects analysis retains uncertainty.

Taiga Alpine Table 1 and Figure WLD-9b (Final EIS, p. 3.3.1 – 6) show that mature/older lowland black spruce-tamarack forest acreage is predicted to remain at or above existing levels and very close to RNV (estimated at a range from 207,811 to 227,171) in all decades and all alternatives with two exceptions. Alternative C would fall below existing levels and below the low range of RNV in Decade 2 and 5 but would increase above RNV in Decade 10. Alternative A would fall below existing levels and below the low range of RNV in Decade 5 but would increase above RNV in Decade 10.

Taiga Alpine Table 1: MIH 9b - Mature Lowland Black Spruce/Fir Forest acreage on the Superior National Forest.

Decade	Existing	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
2	206,894	218,494	229,668	181,693	242,920	228,318	227,317	232,725
5		177,866	225,599	176,804	259,079	222,474	219,973	233,125
10		246,336	227,171	236,604	262,647	223,562	217,491	231,248

Management in lowland conifer on the Superior is expected to increase by a factor of 2-9 times current levels in 6 of 7 of the alternatives. No lowland black spruce-tamarack forest is scheduled to be harvested in Alternative D. Alternatives A and C propose the largest amount of harvest and vary the amounts considerably among decades. For most of the other alternatives, there would be 3-4 times the amount of 0-9 age class as a result of harvest than currently exists.

All alternatives were given an Outcome D for all decades, no significant change from existing conditions. Although there are differences among the alternatives and the different decades, it is likely that the amount of suitable habitat conditions would remain adequate and where there are decreases, this is unlikely a limiting factor for the species.

Taiga Alpine Table 2: Historical, current, and future outcomes for the taiga alpine in 2, 5 and 10 decades from present on National Forest land.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Cumulative	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Cumulative Effects

Historical Outcome – C

The historical outcome for the taiga alpine is Outcome C, the same as on National Forest lands. Suitable ecological conditions for the taiga alpine in the cumulative effects area historically

Final

would parallel those in the direct/indirect effects analysis area, so the historical outcome is not likely to differ between the two analysis areas.

Current Outcome – D

The current outcome for the taiga alpine is Outcome D, the same as on National Forest lands. . There is just one additional documented site in the cumulative effects area, about two miles south of the proclamation boundary (USDA FS 2002b planning record). The total of five sites (including the four on National Forest lands) represent all known sites in Minnesota. Additional potential habitat probably occurs in the cumulative effects area, but as with the National Forest lands, both habitat and population status remains very uncertain because of lack of survey (MacLean 2001). Since historical times, similar actions have occurred within the cumulative effects area as occurred within the direct/indirect effects analysis area. These impacts parallel the decrease in abundance and distribution of ecological conditions in the direct/indirect effects analysis area.

Effects of the Alternatives

Future timber harvest in MIH 9b in the cumulative effects analysis area would occur on all ownerships, but the cumulative effects of these actions would be minor. The outcome by alternative is likely to be the same as the outcome for the direct/indirect effects analysis area.

Taiga Alpine Table 3: Cumulative historical, current, and future outcomes for the taiga alpine in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

All alternatives may impact individuals, but are not likely to cause a trend to federal listing or a loss of viability. The greatest potential for impacts would be the result of vegetation management activities in lowland black spruce forest suitable habitat without known locations. Potential for impacts would be mitigated at the site level by surveying areas with a likelihood of occurrence of taiga alpine surveyed prior to disturbance and protecting any new sites. At the landscape level, each alternative would provide an adequate representation of mature lowland black spruce forest to provide for coarse filter habitat.

Taiga alpine Table 4: Determination of effects for the taiga alpine.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Red-disked alpine (*Erebia discoidalis*)

Regional Forester Sensitive Species: Superior

Historical Outcome - C

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. The species is associated with a fairly wide variety of habitats from large sphagnum bogs with abundant cotton-grass, grassy meadows, spruce bogs, and sedge marshes to a wide variety of open upland and wetland habitats (Glassberg 1999, Nielson 1999, USDA FS 2002b planning record). The combination of environmental conditions (including climatic conditions) and low or isolated populations (probable result of species being at south edge of range) suggests that suitable habitat on the Superior has likely always been widespread but patchy (Outcome C).

No information is available on historical condition of red-disked alpine populations.

Current Outcome – C

Currently on the Superior National Forest there are seven documented locations of red-disked alpine (MN NHP 2002, USDA FS 2002b, planning record, McLean 2001). It is likely that there are additional locations, but the status of the species and its habitat relationships at the edge of it range in Minnesota are still unknown (McLean 2001). The known locations are associated with small to fairly large, open ericaceous or sphagnum-dominated bogs with abundant cotton grass and scattered spruce or tamarack as well as semi-open young to mature black spruce forests (USDA FS 2002b, planning record, McLean 2001, Fauske *et al*. 1993). These habitats have probably not changed much from historical times, although direct and indirect positive and negative impacts due to a limited amount of timber harvest and road or trail building and indirect impacts from timber harvesting probably occurred. At one site, McLean (2001) reports that red-disked alpines were observed flying in a narrow open boggy right-of-way corridor bordered by dense black spruce forest. He suggests that the construction of the corridor appears to have created the favorable habitat. Given the potential for both positive and negative impacts from management and the apparent greater preference for more open habitats that are not as frequently disturbed as well-forested habitat might be, it is unlikely that effects have been great enough to cause the current outcome to differ from the historical outcome.

Direct/Indirect Effects

Effects Common to All Alternatives

Management activities in all alternatives change, in varying amounts and distributions, habitat for the red-disked alpine. Activities that both decrease and increase suitable habitat include 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 forests habitat (USDA FS 2002b). Changes to potential suitable habitat within the BWCAW would be the same in all alternatives.

Management direction (including desired conditions, objectives, standards, and guideline) for all

Final

alternatives promotes the maintenance or enhancement of habitat for sensitive species and prohibits any activities that could cause a trend toward federal listing of the species. Because of the rarity of this species, all alternatives are expected to proactively protect or enhance habitat conditions at all known locations. Additionally, although the alternatives vary in the degree to which roads and trails through potential habitat would be developed, direction for road management activities for all alternatives is 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 and are not analyzed further. (Appendix F of the Final EIS provides data and other information on road management under the alternatives.)

The amount and distribution of suitable ecological conditions or other important ecological processes would not change appreciably from the current condition in any of the alternatives. This is, in part, because of the uncertainty of impacts on habitat from vegetation management. Since logging or burning may have either beneficial or negative direct or indirect impacts and all alternatives provide a range of disturbances in habitat that may be subject to management disturbance, it is difficult to predict quantitative changes to the species' habitat. Because there appears to be fairly widespread unoccupied habitat and known sites would be protected, it is unlikely that management activities would limit habitat availability at the landscape scale. Also, since its apparent favored habitat is more open and less likely to be subject to vegetation management activities, it likely that much of its suitable habitat would not be managed.

Red-disked alpine Table 1: Historical, current, and future outcomes for red-disked alpine in 2, 5, and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Cumulative Effects

Historical Outcome – C

The historical outcome for the red-disked alpine is Outcome C, the same as on National Forest lands. Suitable ecological conditions for the species in the cumulative effects area historically would parallel those in the direct/indirect effects analysis area, so the historical outcome is not likely to differ between the two analysis areas.

Current Outcome - C

The current outcome for the red-disked alpine is Outcome C. The species is found in at least one other location in the cumulative effects area as well in six additional counties in northern Minnesota (Northern Prairie Wildlife Research Center 2000) and northern Michigan and Wisconsin outside the cumulative effects area. A total of seven sites have been found on the Superior national Forest. Additional potential habitat probably occurs in the cumulative effects area, but as with the National Forest lands, both habitat and population status remains very uncertain because of lack of survey (MacLean 2001).

Final

Effects of the Alternatives
Cumulative effects of the alternatives would likely be minor and similar to effects on National Forest land. Because there appears to be fairly widespread unoccupied habitat and most known sites are on National Forest land and would be protected, it is unlikely that management activities would limit habitat availability at the landscape scale. Also, since its apparent favored habitat is more open and less likely to be subject to vegetation management activities, it likely that much of its suitable habitat would not be managed.

Red-disked Alpine Table 2: Cumulative Historical, current, and future outcomes for the red-disked alpine in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Determination of Effects

All alternatives may impact individuals, but are not likely to cause a trend to federal listing or a loss of viability. The appropriate ecological conditions for this species have remained relatively constant since historical times in the planning area and cumulative effects area. Amount and distribution of suitable habitat does not change much as a result of any of the alternatives.

The greatest potential for impacts would be the result of vegetation management activities in potential forested, semi-forested, and open lowland habitat without known locations. Potential for impacts would be mitigated at the site level by surveying areas with a likelihood of occurrence of red-disked alpine surveyed prior to disturbance and protecting any new sites. At the landscape level, each alternative would provide an adequate representation of undisturbed suitable environmental conditions to provide for coarse filter habitat.

Red-disked alpine Table 3: Determination of effects for red-disked alpine.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Nabokov's northern blue (*Lycaeides idas nabokovi*)

Regional Forester Sensitive Species: Superior

Historical Outcome - D

On the Superior National Forest, Nabokov's northern blue butterfly is at the southern edge of its holarctic range in North America (USDA FS 2002b, planning record). In the planning area, the species is associated with its exclusive larval host plant dwarf bilberry (*Vaccinium cespitosum*) in cool, well-drained sandy areas under coniferous forests, especially jack pine of the Vermilion Moraine (narrow band that extends through western Cook and central St. Louis Counties) (MacLean and MacLean 2000). The combination of environmental conditions (including climatic and soil conditions) and low or isolated populations suggests that suitable habitat on the Superior has been most likely isolated and of very low abundance – Outcome D. Past wildfires in jack pine stands on shallow soils may have maintained habitat by keeping stands open enough to allow dwarf bilberry, to thrive at different times and in different patches across the landscape. Adults could have dispersed occasionally to colonize new patches of habitat (USDA FS 2002b, planning record).

There is no information on the historical population status of this species.

Current Outcome – E

Past vegetation management such as logging has decreased the overall amount of jack pine forest and landscape fire suppression has probably increased the amount of older jack pine in areas of suitable habitat in the BWCAW (Frelich 1998). This would represent a decrease in suitable habitat for this butterfly from historical times. However, outside the BWCAW, timber harvest in conifer stands also might have maintained or increased locally the amount of suitable habitat for northern blue. For example, timber harvest in the vicinity of the Lima Mountain populations north of Grand Marais could have helped to sustain the populations by maintaining patches of dwarf bilberry and preventing the encroachment of woody plants and dense vegetation (USDA FS 2002b, planning record). Although uncertain, the distribution of suitable habitat for this species probably has decreased slightly to outcome E.

Currently on the Superior National Forest there are eight documented locations of northern blue butterfly (MN NHP 2002; USDA FS 2002b, planning record). These sites may represent a significant proportion of the population of this species in Minnesota (MacLean and MacLean 2000).

Direct/Indirect Effects

This evaluation uses management indicator habitat (MIH) 8a: young jack pine forest as an indicator of differences in potential impacts among the alternatives, acknowledging limitations of its use. Not all young jack pine on the Superior National Forest would be suitable for this species because of patchy distribution of bilberry or lack of required soils and climate characteristics. The species also is known to occur in other upland conifer forests, and in some cases in inclusions in aspen forest. However, young jack pine can indicate likely general trends to northern blue's habitat over time. Until further surveying and study of population status and habitat relationships

Final

is conducted, this effects analysis retains uncertainty.

Effects Common to All Alternatives

Creation of young open patches of jack pine would sustain habitat for this species in all alternatives. Management direction (including desired conditions, objectives, standards, and guideline) for all alternatives promotes the maintenance or enhancement of habitat for sensitive species and prohibits any activities that could cause a trend toward federal listing of the species. The effects of establishing young forest are relatively short-term, since jack pine grows into pole class at ten years and becomes less suitable for the species (USDA FS 2002b, planning record). Because of the rarity of this species, all alternatives are expected to proactively protect or enhance habitat conditions at all known locations. For all alternatives, the amount of young jack pine in the BWCAW would continue to decrease.

Effects by Alternative

For Alternative A, the amount of young jack pine would remain about the same as the existing amount of young jack pine over the time frame of this analysis (Appendix D, Final EIS). By decade two, the amount of young jack pine in alternative B would decrease compared to the existing condition, while the amount of young jack pine in alternative D would increase sharply. The other alternatives would remain similar to the existing condition.

For decade 5, all the alternatives but A, B, and C would have experienced a slight to moderate increase in young jack pine over existing levels.

By decade 10, all the alternatives but A would have experienced a moderate increase in young jack pine over existing levels.

Nabokov's Northern Blue Table 1: Historical, current, and future outcomes for Nabokov's northern blue in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	D	E	E	E	E	E	E	**D**	E	E	**D**	**D**	**D**	**D**	E	**D**	**D**	E	**D**	**D**	E	**D**	**D**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Cumulative Effects

Although the northern blue has been collected from other sites in Minnesota outside the Superior in the past, only the McNair site, the Lima Mountain sites, and the Plough Creek sites are known to support populations today (USDA FS 2002b, planning record); hence, there is additional suitable habitat in the cumulative effects analysis area, but no additional populations are known from the cumulative effects analysis area. Suitable ecological conditions for this butterfly in the cumulative effects analysis area historically would parallel those in the direct/indirect effects analysis area, so the historical outcomes would not differ between the two analysis areas. Although there is uncertainty about the current outcome in the cumulative effects analysis area, the fact that some previously known populations are not known to support populations today suggest that suitable habitat has decreased (outcome E) in the cumulative effects analysis area. For all alternatives, cumulative effects would be similar to those occurring currently and would

Final

result in outcome E. Timber harvest in suitable habitat would be expected to continue, which would maintain the young conifer types necessary for this species.

Nabokov's Northern BlueTable 2: Cumulative historical, current, and future outcomes for the Nabokov's northern blue in 2, 5, and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	D	E	E	E	E	E	E	**D**	E	E	**D**	**D**	**D**	**D**	E	**D**	**D**	E	D	D	E	**D**	**D**

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Determination of Effects

All the alternatives may impact individuals but are not likely to cause a trend to federal listing or loss of viability. It is expected that the distribution and abundance of suitable habitat under all alternatives would be sufficient for the continued persistence of Nabokov's northern blue on the Superior.

Nabokov's Northern Blue Table 3: Determination of effects for Nabokov's northern blue.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Jutta arctic (*Oenis jutta aserta*)

Regional Forester Sensitive Species: Superior

Historical Outcome - C

The Superior National Forest is near the southern edge of the species' holarctic range in North America (it is also found further south to Pine and Aitken Counties). The species is associated with semi-open to well-forested black spruce-tamarack bogs as well as bog openings, edges and adjacent trails or roads (USDA FS 2002b planning record, MacLean 2000, Glassberg 1999, Layberry *et al*. 1998, Nielsen 1999). The combination of environmental conditions (including climatic conditions) and low or isolated populations suggests that suitable habitat on the Superior has likely always been widespread but patchy.

No information is available on historical condition of jutta arctic populations.

Current Outcome – D

The amount of suitable habitat probably has decreased slightly from historical conditions on the Superior as a result of timber harvest in lowland black spruce forest habitat over the last century.

Currently on the Superior National Forest there are at least seven documented locations of jutta arctic (MN NHP 2002; USDA FS 2002b planning record, Northern Prairie Wildlife Research Center 2000). However, the species is likely more common than records indicate (USDA FS 2002b planning record).

Direct/Indirect Effects

Effects Common to All Alternatives
All alternatives propose site-specific protection of the known location of jutta arctic. Only those activities that protect, maintain, or enhance known locations would be permitted. This species would be a high priority for proactive management to maintain or restore high quality habitat.

Effects of the Alternatives
Because of the similarity in habitat use between the jutta arctic and the taiga alpine, the indicator of effects (MIH 9b – lowland black spruce-tamarack mature and older forest) and analysis for the taiga alpine serves also for the jutta arctic. Refer to the analysis for that species for effects of the alternatives. In summary, all alternatives would likely remain at Outcome D for all decades, no significant change from existing conditions. Although there are differences among the alternatives and the different decades, it is likely that the amount of suitable habitat conditions would remain adequate and where there are decreases, this is unlikely a limiting factor for the species.

Final

Jutta arctic Table 1: Historical, current, and future outcomes for jutta arctic in 2, 5, and 10 decades from present on National Forest lands.																							
Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Cumulative Effects

Historical Outcome - C

The historical outcome for the jutta arctic is Outcome C, the same as on National Forest lands. Suitable ecological conditions for the taiga alpine in the cumulative effects area historically would parallel those in the direct/indirect effects analysis area, so the historical outcome is not likely to differ between the two analysis areas.

No information is available on historical condition of jutta arctic populations.

Current Outcome – D

The current outcome for the jutta arctic is Outcome D, the same as on National Forest lands. . There are probably additional sites in the cumulative effects area (USDA FS 2002b, planning record), but since the species is not tracked by Minnesota's Natural Heritage Program, some sites may not be documented. Additional potential habitat occurs in the cumulative effects area, but as with the National Forest lands, both habitat and population status remains very uncertain because of lack of survey (MacLean 2001). Since historical times, similar actions have occurred within the cumulative effects area as occurred within the direct/indirect effects analysis area. These impacts parallel the decrease in abundance and distribution of ecological conditions in the direct/indirect effects analysis area.

Effects of the Alternatives

Future timber harvest in MIH 9b in the cumulative effects analysis area would occur on all ownerships, but the cumulative effects of these actions would be minor. The outcome by alternative is likely to be the same as the outcome for the direct/indirect effects analysis area.

Jutta Arctic Table 2: Cumulative historical, current, and future outcomes for the Jutta Artic in 2, 5, and 10 decades from present on National Forest lands.																							
Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

All alternatives may impact individuals, but are not likely to cause a trend to federal listing or a

Final

loss of viability. The appropriate ecological conditions for this species have remained relative constant since historical times in the project area and cumulative effects area. Amount and distribution of suitable habitat does not change much as a result of any of the alternatives. Proactive management objectives to restore and maintain quality habitat will contribute to maintaining habitat need to maintain population.

Jutta arctic Table 3: Determination of effects for jutta arctic.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Freija's grizzled skipper (*Pyrgus centaureae freija*)

Regional Forester Sensitive Species: Superior

Historical Outcome - D

The Superior National Forest is at the extreme southern edge of the species' holarctic range in North America. Within much of its range the taiga alpine is described as common, but local (Layberry *et al.* 1998). The species is associated with open upland grassy habitats (Layberry *et al*. 1998, Glassberg 1999, USDA FS 2002b planning record). The combination of environmental conditions (including climatic conditions) and very low or isolated populations (probable result of species being at extreme south edge of range) suggests that suitable habitat on the Superior has likely always been very isolated and patchy.

No information is available on historical condition of Frieja's grizzled skipper populations.

Current Outcome – D

The one sighting of this butterfly on the Forest is also the only know location in the lower 48 States. The habitat needs for this insect in Minnesota, therefore, are not well understood. The occurrence at the McNair site is similar to habitats described for the species in other parts of its range: upland acidic meadow. This habitat has probably not changed significantly from historical conditions.

Freija's grizzled skipper Table 1: Historical, current, and future outcomes for grizzled skipper in 2, 5, and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Direct/Indirect Effects

Effects of the Alternatives
Based on the above, for this analysis, key habitat for the Freija's grizzled skipper consists of upland grassland, since upland acidic meadows are most likely to occur in these areas (Table 1). Approximately 6,495 acres of such habitat occur throughout the BWCAW; the amount of grassland habitat was not affected by the July 4th storm (Appendix Table A).

Direct/Indirect Effects

Effects Common to All Alternatives
All alternatives propose site-specific protection of the known location of Freija's grizzled skipper. Only those activities that protect, maintain, or enhance known locations would be permitted. This

Final

species would be a high priority for proactive management to maintain or restore high quality habitat.

Effects by Alternatives
Differences among alternatives are likely to be minor, since management will protect known site. Direct and indirect impacts to potentially suitable habitat could occur from ATV use (trampling), and vegetation management (timber and fire management activities may directly and indirectly negatively or positively impact potential habitat by either creating or removing suitable habitat). These potential impacts would vary by alternative, but because of low likelihood of activity in potentially suitable habitat, these differences would likely be minor.

Cumulative Effects

Historical Outcome - D

The historical outcome for grizzled skipper is Outcome D, the same as on National Forest lands, though because of its rarity it could tend toward an Outcome of E. Suitable ecological conditions for the species in the cumulative effects area historically would parallel those in the direct/indirect effects analysis area, so the historical outcome is not likely to differ between the two analysis areas.

Current Outcome - D
The current outcome for the grizzled skipper is Outcome D, the same as on National Forest lands. Suitable ecological conditions for the species in the cumulative effects area historically would parallel those in the direct/indirect effects analysis area, so the historical outcome is not likely to differ between the two analysis areas.

Effects Common to All Alternatives
Because of the extreme rarity of this species with its only known location on National Forest land, the cumulative effects analysis area would be the same as on the National Forest. All alternatives would have similar effects because protection would be based on site protection and proactive management. The cumulative effects of alternatives on this species would be minor because there are no additional sites in the analysis area.

Freija's grizzled skipper Table 2: Cumulative historical, current, and future outcomes for Freija's grizzled skipper in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

Because of protections found in all alternatives, the alternatives potentially could have been determined to have no impact on the Freija's grizzled skipper (Condition 1). However, because of the uncertainty of success of proactive measures and because of the possibility of additional suitable unknown habitat being found, the determination is that all the alternatives may impact

Final

individuals but are not likely to cause a trend to federal listing or loss of viability. Site level, rather than forest plan level, environmental analysis would be needed to assure no impact.

Freija's Grizzled Skipper Table 3: Determination of effects for grizzled skipper.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Vertree's caddisfly (*Ceraclea vertreesi)*

Regional Forester Sensitive Species: Chippewa

Historical Outcome - D

Vertree's caddisfly is an aquatic insect, whose larval form is entirely aquatic. Adults are terrestrial and live approximately 1 month. They lay their eggs in strings or masses on objects near the water or in the water on stones or other objects. Little is known about this caddisfly (Minnesota Department of Natural Resources 1995). It has a global ranking of G2, and is listed as a Species of Special Concern in Minnesota.

In Minnesota, Vertree's caddisfly has only been found in Kabekona Bay of Leech Lake, Kabekona River, Stumphages Rapids of the Mississippi River, and Nicollet Creek in Itasca State Park. The collection from Kabekona Bay of Leech Lake is within the Chippewa National Forest boundary. Outside of Minnesota, it is known only from Oregon and British Columbia (Minnesota Department of Natural Resources 1995). Historical distribution within the planning area is unknown.

Current Outcome - D

Little is known about the habitat requirements of Vertree's caddisfly (USDA FS 2002b, planning record). It has been found on bottom substrates in lentic and lotic waters. Vertree's caddisfly larvae are undescribed; however, species of the Ceraclea genus are typically associated with freshwater sponges, upon which the larvae feed. Cases of larval *Ceraclea spp*. are constructed of sand and silk (Pennak 1978).

The only collection on the Chippewa National Forest is from Kabekona Bay of Leech Lake, in Cass County. There is no information available to document threats to the species because they are so rare and the larvae are undescribed. However, caddisfly larvae, in general, are often used along with mayfly and stonefly larvae as an indicator of pollution, primarily because of the narrow range of ecological conditions tolerated by many species (Ross 1941). While point source pollution is generally not a concern within the Chippewa National Forest, nonpoint sources of pollution (*e.g.*, surface run-off and erosion) have been associated with several forest management activities, including road construction and maintenance, and timber harvest activities **(**Minnesota Forest Resources Council 1999).

Direct/Indirect Effects

Effects Common to All Alternatives

Shoreline development, the elimination of rooted aquatic vegetation, eutrophication, and sedimentation of habitats are the most serious threats to Vertree's caddisfly. All alternatives plan management activities that require additional road-building across the Forest. However, additional Standards and Guidelines that require stream crossing structures to maintain passage for fish and other aquatic life and properly distribute flood and bankfull flows, and which maintain sediment transport capacity would minimize sedimentation from roads and trails and its affects on Vertree's caddisfly.

Final

Effects by Alternative
Alternatives A, B, C, Mod. E, F, and G would result in Outcome D for this species. Vertree's caddisfly is perhaps most affected by shoreline development activities, which are not regulated by the Forest Plan. In addition, the majority of the shoreline on Leech Lake and its bays is in other ownership. Shoreline development and water-based recreation on these lakes is expected to continue, and may well increase in the future. However, some alternatives may impact aquatic habitats more than others. A, C, and F have increased road-building and a higher amount and intensity of timber harvest activities in the uplands. These alternatives plan higher levels of forest management activities in riparian areas. Standard WS-1 would limit the combined acreage of upland young forest and upland openings to no more than 60% of any 6th level watershed to limit peak streamflow, in-channel erosion and sedimentation, and to limit the decrease of physical and biological diversity within streams (Verry 2000; see Final EIS Chapter 3.6.1d for full analysis of this Indicator). Alternatives A, C, and F plan forest management activities in riparian zones (see Final EIS Chapter 3.6.2b for the analysis of these Riparian Indicators) and take a mitigative approach to managing riparian and aquatic habitats, by applying Best Management Practices to minimize resource degradation (Minnesota Forest Resources Council 1999).

Although Modified Alternative E has a pro-active riparian and fish habitat management approach, it also has a higher level of new water access development (which includes river access), which could affect the quality of habitat for Vertree's caddisfly. More developed accesses may lead to more and larger boats on the waterways, which would stir up sediments and aquatic vegetation, and impair habitats for larvae and breeding. In addition, Modified Alternative E has the highest level of new trail construction. New trail construction would require additional stream crossings, which increase the potential for erosion and sedimentation of aquatic habitats. Use of ATVs in or near waterways may lead to an increase in erosion and surface run-off, which would degrade shallow water habitat.

Alternative D has no new trail or water access construction and has the lowest level of new road construction. In addition, Alternative D also includes pro-active riparian management measures to actively improve or restore aquatic and riparian habitats. Alternative D also has the highest level of road removal (decommissioning). The amount of habitat lost due to shoreline development would not change under any alternative, but pro-active restoration measures to remove other barriers and improve aquatic and riparian habitat quality would benefit the species overall. (Outcome C)

Vertree's caddisfly Table 1: Historical, current, and future outcomes for Vertree's caddisfly in 2, 5 and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Mod. Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	D	D	D	D	D	D	**<u>C</u>**	**<u>C</u>**	**<u>C</u>**	D	D	D	D	D	D	D	D	D

Note: Outcomes in underlined bold text are those that differ from the current outcome.

Cumulative Effects

The limited distribution of Vertree's caddisfly on the Forest and the fact that the majority of riparian zones on the Forest are in other ownership, make this species vulnerable to human disturbance. Shoreline development and water-based recreation pose greater threats to this species than Forest management. Clear, weedy aquatic habitats are abundant on the Forest. Land ownership on the Chippewa National Forest is very fragmented. Continued high levels of private development on all ownerships may result in further isolation of the species. Sustained road and trail construction, and water access development (5 and 10 decades out) at high levels (as in Alternative A, C, and Mod. E) are likely to result in Outcome D for this species.

Vertree's Caddisfly Table 2: Cumulative historical, current, and future outcomes for the Vertree's Caddisfly in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Chippewa	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Determination of Effects

The presence of only one known location for Vertree's caddisfly on the Forest makes this species highly vulnerable to human activity and habitat degradation. The lack of information regarding the species habitat requirements makes protection difficult. However, under all Alternatives, Best Management Practices (Minnesota Forest Resources Council 1999) would be implemented and in some Alternatives, proactive riparian management approaches would be implemented, which should help the species persist in the planning area under all alternatives. Although forest management activities may impact individuals or their habitat, they are not likely to cause a trend toward federal listing. External factors, such as high levels of private development and activities which cause shoreline erosion and sedimentation of littoral zone habitats, or loss of aquatic vegetation (on public and private lands), are likely to impact the species.

Vertree's caddisfly Table 3: Determination of effects for Vertree's caddisfly.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Mod. Alt. E	Alt. F	Alt. G
Chippewa	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability. 4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Final

Tiger beetle species (*Cicindela denikei*)

Regional Forester Sensitive Species: Superior

Historical Outcome - B

Habitat for the tiger beetle was likely fairly widespread in its range on the Superior. Fires probably helped create and maintain natural openings (Steffens 2001).

Current Outcome - B

This species of tiger beetle is a regional endemic reported only from Northwest Ontario, extreme Southeast Manitoba, and extreme northern Minnesota (Steffens 2001). Its Minnesota habitat includes sandy, rocky openings, gravel pits, timber sale roads, or other areas with reduced ground cover, but adjacent vegetation to provide shade (shuttles in and out of sun to control body temperature) (Steffens 2001, USDA FS 2002b, planning record). Steffens (2001) states that the species prefers soils with a very specific variety of consolidated, but not compacted, coarse sand, mixed with gravel and sometimes silt and/or larger stones and rocks.

Prior to 2000, this tiger beetle was known to occur at three sites on the Superior National Forest. Recent surveys have confirmed at least 17 sites on the forest, and there are other highly probable sites, including several more unconfirmed sites in the BWCAW (Steffens 2001).

Current native habitat may have been reduced in the planning area from fire suppression and natural succession, but has also been created through management activities such as logging (may have both beneficial and negative impacts), road building, and gravel extraction under some circumstances.

Direct/Indirect Effects

Effects Common to All Alternatives
Larval habitat of open sandy, gravelly substrate is critical. This stage of habitat is most susceptible to environmental disturbance, as adults can probably disperse to new habitats if disturbance occurs (Steffens 2001). All alternatives would have activities that may negatively impact larval habitat. These 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 abandonment or dispersal from formerly suitable habitats. The activities in all alternatives that would most commonly cause these changes would include gravel excavation, logging, management-ignited fire, road or trail building and vegetation succession. These same activities, under some circumstances, may also provide new habitats in all alternatives. Entomologist Ron Huber (USDA FS 2002b, planning record) suggests that road building may be facilitating the spread the species.

Management direction for all alternatives would avoid or minimize impacts to the species and would be limited to those that do not result in a trend toward federal listing.

Effects by Alternative
Because common management activities in each alternative may both benefit and negatively

Final

impact habitat for tiger beetle, it is difficult to assess impacts to the species. The Final EIS displays differences among the alternatives for acres harvested (TMB-3 and TMB-4, pp 3.4-4, 5), potentially prescribed burned (Tables FIR-1, FIR-2), and for miles of road construction (Appendix F: Tables F-3 through F-13, pp F-18-22), and RMV trail construction (Table RMV-2, p. 3.8-42).

Tiger Beetle *sp*. Table 1: Historical, current, and future outcomes for tiger beetle *sp.* in 2, 5, and 10 decades from present on National Forest lands.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

Cumulative Effects

Current Outcome

Habitat is broadly distributed and available on multiple ownerships (outcome B).

Effects Common to All Alternatives

Available habitat would be the same in all alternatives. Twenty sites are known in southeastern Manitoba and southwestern Ontario and two sites were known in northeastern Minnesota (Coffin and Pfannmuller 1988). Surveys in 2000 and 2001 resulted in detections of over 50 additional sites in Minnesota (USDA FS 2002b, planning record).

Tiger Beetle *sp*. Table 2: Cumulative historical, current, and future outcomes for tiger beetle *sp.* in 2, 5, and 10 decades from present.

Forest	Historical	Current	Alt. A			Alt. B			Alt. C			Alt. D			Modified Alt. E			Alt. F			Alt. G		
Decade			2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10	2	5	10
Superior	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

Determination of Effects

May impact but not likely to cause a trend to federal listing or loss of viability.

Tiger beetle species Table 3: Determination of effects for tiger beetle *sp*.

Forest	Alt. A	Alt. B	Alt. C	Alt. D	Modified Alt. E	Alt. F	Alt. G
Superior	3	3	3	3	3	3	3

Definitions: 1- No impacts. 2 - Beneficial impacts. 3 - May impact individuals but not likely to cause a trend towards federal listing or a loss of viability.

Final

4a- Likely to result in a loss in viability within the planning unit. 4b- Likely to result in a trend towards federal listing and a loss of viability.

Recommendations for Removing, Avoiding, or Compensating for any Adverse Impacts

Recommendations for removing, avoiding, or compensating for adverse impacts were incorporated into the alternatives as part of Desired Conditions, Objectives, Standards and Guidelines to protect, maintain, or enhance habitat conditions for species. Where adverse impacts would not be avoided, proposed plans state that management must not result in a trend toward federal listing. To implement this Forest Plan direction, site level or project environmental analyses would identify measures to avoid adverse impacts. The planning record provides information from literature reviews and expert panels (USDA FS 2002b, planning record) that should be considered at the project level for removing, avoiding, or compensating for any adverse impacts.

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APPENDIX A: Management Indicator Habitats

This appendix provides additional information in support of Chapter 3.3 Wildlife. It includes:

1. Descriptions of indicators used to analyze effects of alternatives on wildlife.
2. Supplementary data on acres of management indicators 1-10.

Description of Management Indicators

Tables DEIS-1 and 2 provide descriptions of the forest types and ages of the management indicators. Species associated with and represented by the management indicators in Tables 1 and 2 are listed in Chapter 3.3 Tables WLD 1-14. A more comprehensive list cross-walking additional species of management concern to is available in the planning record.

Table DEIS-1. Management Indicator Habitats (MIH) 1-14

#	**MIH** (Final EIS Chapters 3.3.1 through 3.3.3)	**Description and Forest types** (Code in Forest Service Data Base)
1	Upland forest	All upland forest types: jack pine (01), red pine (02), white pine (03), balsam fir-aspen-birch (11), spruce-fir (16), black spruce-jack pine (17), northern hardwoods, including oak and maple (50s, 80s), aspen (91), paper birch (92), bigtooth aspen (93), balsam poplar (94), 95 (aspen-spruce-fir)
2	Upland deciduous forest	All upland deciduous and deciduous-dominated mixed forest types: (50s, 80s, 91, 92, 93, 94, 95)
3	Northern hardwood and oak forest	All northern hardwood and oak forest types: (50s, 80s)
4	Aspen-birch and mixed aspen-conifer forest	All aspen, birch, and aspen-dominated aspen-birch-conifer mixed forest types: (91, 92, 93, 94, 95)
5	Upland conifer forest	All upland conifer and conifer-dominated mixed forest types: (01, 02, 03, 11,16, 17)
6	Upland spruce-fir forest	All spruce-fir and spruce-fir-dominated mixed forest types: (11,16, 17)
7	Red and white pine forest	Both red and white pine forest types: (02, 03)
8	Jack pine forest	Jack pine forest type: (01)
9	Lowland black spruce-tamarack forest	All lowland conifer and lowland mixed conifer types dominated by black spruce or tamarack: (12, 15, 18)
10	Upland mature riparian forest	All upland mature or old forest types in Riparian areas; inner zone 0-100 feet and outer zone 100-200 feet: (01, 02, 03, 11,16, 17, 50s, 80s, 91, 92, 93, 94, 95)

Final

Table DEIS-1. Management Indicator Habitats (MIH) 1-14		
#	**MIH** (Final EIS Chapters 3.3.1 through 3.3.3)	**Description and Forest types** (Code in Forest Service Data Base)
11	Management-induced Edge Density Upland forest & Lowland forest	Edge density (miles/sq mile) of young upland (management indicator habitat 1) or lowland forest (management indicator habitat 9). See Table DEIS-2 below for definitions of young age classes. This indicator does not include or measure inherent edge such as edges between forested lands and lakes, streams, non-forested lands: this does not vary among alternatives.
12	Upland Interior forest habitat	Acres of forest interior in all mature and older upland forest patches of any size (see management indicator habitat 1 for forest types in upland forest). All forest patches were buffered inwardly with a 100 meter buffer.
13	Large patches of upland mature/old forest	**Large (>300 acres) upland mature/old forest patches acres. (See management indicator habitat 1 for forest types in upland forest.).**
14	Aquatic habitats	Effects to the wide variety of aquatic habitats are addressed by aquatic and watershed health indicators described in the Final EIS in Chapter 3.6

Management indicators based on groupings of forest types in different age groupings. The age groupings are surrogates for ecological successional or vegetative growth stages. Because the ecology of the different forest types, age grouping depends on forest type and was selected to best typify vegetative growth stages.

Table DEIS-2. Management Indicator Habitats: Age groupings for forest types.

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