

BIOLOGICAL EVALUATION
OF
SENSITIVE SPECIES

MOON
VEGETATION MANAGEMENT PROJECT

WALKER RANGER DISTRICT
CHIPPEWA NATIONAL FOREST

CASS COUNTY
MINNESOTA

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Moon Project Biological Evaluation Walker Ranger District, Chippewa National Forest

I. Project Area Overview and Summary

Location:

The project area encompasses an area on the far east side of the Chippewa National Forest, in the Walker and Deer River Ranger Districts. The southern project boundary follows the Forest boundary along T143N, R27, 26, 25 W. Beginning with the southwest project corner, the project boundary runs through T141N, R27W east to T141N, R25W, and then north to T143N, R. 26 W. County Roads 129 and 65 roughly follow a diagonal west boundary, from T143N R26W to T141N, R27W. The project area encompasses 69,256 acres and lies outside the boundary of the Leech Lake Band of Ojibwe Reservation. National Forest System managed lands total approximately 39,736 acres of the project area. See Appendix A for Vicinity and Project maps.

Table1-1. Moon project area and ownership acres.

Ownership	NFS	State	Cass Cty	Other
Acres	39,736	4,416	10,532	14,572
Source: Corporate database ownership coverage, acreage is further generalized from GIS layers and may result in some variation from actual acres. 2008-10-23 ownership GIS data. Project wide, large water bodies cover over 5,200 acres; all surface water covers 7,360 acres.				

Ecological Setting:

The project area includes four Landscape Ecosystems: Boreal Hardwood Conifer (BHC), Dry Mesic Pine (DMP), Mesic Northern Hardwood (MNH), and Tamarack Swamp (TS). Table 2 shows NFS landscape ecosystem acres, all landscape ecosystem project area (PA) acres and percents for each.

Table 2. NFS landscape ecosystem acres and all landscape ecosystem project area acres.

LE	Description	NFS acres ¹	All acres ¹
BHC - Boreal Hardwood Conifer	Historically - mixed stands composed of aspen, paper birch, balsam fir, and northern white cedar, with some white pine, red pine, ash, basswood, bur oak, white spruce, elm, etc.	1,436	3,055
DMP - Dry Mesic Pine	Historically, red pine and white pine supercanopy with red maple and paper birch subcanopy.	10,161	14,914
MNH - Mesic Northern Hdwd	Historically, canopy dominated by sugar maple, basswood, and paper birch.	17,692	32,324
TS* - Tamarack Swamp	Tamarack dominant with a abundance of black spruce; includes some uplands with aspen, spruce/fir, pine, etc.	10,063	18,974

LE	Description	NFS acres ¹	All acres ¹
TOTAL LE Acres		39,348	69,256

*TSF in Forest Plan

¹ acreage is generalized from GIS layers

The project area includes two Chippewa NF Forest Plan Management Areas. These are: the General Forest Management Areas and Riparian Emphasis.

Patch size, edge, and forest or habitat fragmentation are elements of the spatial distribution of forest vegetation which affect wildlife, plant communities, and ecological function. The Moon project area is comparatively more fragmented, has more edge habitat, and has less interior forest than other areas of the Chippewa National Forest. Forest Plan objectives for forest spatial patterns include maintaining or increasing the acres and number of large mature/older forest patches and increasing the amount of interior forest.

Forest Plan objectives include maintaining, protecting, or improving habitat for threatened, endangered, or sensitive (TES) species (Forest Plan, O-WL-17, p.2-28), specifically for the northern goshawk, goblin fern, Canada yew, and bald eagle. In addition, Forest Plan objectives contribute to the conservation and recovery of Canada lynx and gray wolf (Forest Plan, D-WL-3, item c; pages 2-24 – 2-25). Maps for the location of the project and proposed activities are found in Appendix B of the Moon EA.

Maps for the location of the project and proposed activities are found in Appendices A and B of the Moon EA.

Analysis Approach and Context for the Moon Biological Evaluation

The analysis within the Moon Biological Evaluation (BE) is conducted at two scales: 1) the coarse filter using changes to Management Indicator Habitats, and 2) the fine filter using impacts to known occurrences to Regional Forester’s Sensitive Species.

The LE vegetation and Management Indicator Habitat (MIH) objectives of the Forest Plan (USDA FS 2004a, pp 2-62 – 64, 2-68 - 70) set forest-wide objectives for forest vegetation composition, structure, age, and tree diversity. By moving toward these long-term desired vegetative conditions, the Forest will move towards desired conditions for amounts, quality, and distribution of important wildlife species and their habitats. Conservation objectives for threatened, endangered and sensitive (TES) species and their habitats are interwoven into the LE objectives.

The ability to achieve objectives for a variety of TES species is directly related to moving towards the vegetative objectives.

In addition to composition and age objectives, the Forest Plan (USDA FS 2004a, pp. 2-23 – 2-24) provides guidance regarding spatial distribution of forest vegetation. Particularly important to a variety of TES species are objectives and guidance related to development of large, mature forest patches, providing opportunities for interior forest habitat conditions. These objectives for large, mature forest patches are of particularly high value to some TES species. Within the Moon project area there is currently one large 1000+ acre patch and six 301 to 1,000 acre patches.

Providing these long-term habitat opportunities through vegetation objectives and goals is part of a coarse-filter, or landscape-level approach intended to provide for the well being of TES species on the Chippewa. These objectives seek to address species' needs through integrated resource management at large landscape scales. Fine filter, or site-level management needs are addressed by managing specifically for high quality potential habitat or known locations of sensitive species (USDA FS 2004a, p. 2-28). It is important to employ both of these two strategies. Providing only for species needs at the site level, through meeting forest Plan standards, but failing to enact important guidelines, goals and objectives, will result in a failure to fully redeem Forest Plan direction for conservation of TES species. Site level management cannot compensate for a failure to address landscape-level concerns.

Three alternatives are proposed for consideration. These include:

- Alternative A: No Action.
- Alternative B: Proposed Action.
- Alternative C

A programmatic Biological Evaluation for Regional Forester's Sensitive Species on the Chippewa National Forest was completed in 2004 (USDA FS 2004 c, d), as a part of the revision of the Chippewa's Forest Plan. Sensitive species are defined (FSM 2670.5) as 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.

The Moon project BE was developed in consideration of relevant Forest Plan standards, guidelines, and management objectives, including conservation objectives for Sensitive Species. This required a review and consideration of the programmatic BE, such that context could be fully understood with respect to potential concerns at the project level. It is assumed in this analysis that site level standards, guidelines, and best management practices would be fully implemented. As an example, it is assumed that standing dead

trees are retained to the fullest extent practicable and that 6-15 live snag/den trees per acre are retained in final harvest stands.

Forest Service Manual (FSM 2672.42) objectives for completing a BE 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.

Regional Forester’s Sensitive Species Considered in the Project Area

Table BE-1 outlines the evaluation of RFSS species occurrences, habitat, and risk for the Moon project. The table also outlines the species for which a detailed evaluation was completed for the project area.

Table BE-1. Regional Forester’s Sensitive Species occurrence in the Moon project area for the biological evaluation.							
Species	Common name	Detailed Evaluation?	Suitable habitat present?	Documented Occurrence in project area	Risk	Project survey?	Habitat
Birds							
Accipiter gentiles	Northern goshawk	yes	yes	yes	Moderate	Yes	Large tracts of mature, closed canopy, deciduous, coniferous and mixed forests with an open understory
Ammodramus leconteii	LeConte’s sparrow	no	yes	yes	Low	No	Large sedge-dominated wetlands and wet meadows
Ammodramus nelsoni	Nelson’s sharp-tailed sparrow	no	yes	yes	Low	No	Wet meadows, marshes, and open peatlands
Buteo lineatus	Red-shouldered hawk	yes	yes	yes	High	Yes	Large tracts of mature, deciduous and mixed riparian forest habitats with a preference for bottomlands and wooded margins near marshes
Chilodnis niger	Black tern	no	yes	yes	Low	No	Nests in marshes and wet meadows
Contopus cooperi	Olive-sided flycatcher	No	yes	yes	low	No	Variety of boreal forests including uplands, lowlands, edges and beaver meadows with a preponderance of standing live or dead large pine, spruce or tamarack trees used for foraging
Coturnicops noveboracensis	Yellow rail	no	yes	yes	Low	No	Sedge meadows and grassy marshes
Cygnus buccinator	Trumpeter swan	No	yes	yes	Low	No	Small ponds and lakes or bays with extensive beds of cattails,

*Moon Project Area Biological Evaluation
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July 7, 2010*

Table BE-1. Regional Forester's Sensitive Species occurrence in the Moon project area for the biological evaluation.							
Species	Common name	Detailed Evaluation?	Suitable habitat present?	Documented Occurrence in project area	Risk	Project survey?	Habitat
							bulrushes, sedges, and/or horsetail
<i>Dendroica caerulescens</i>	Black-throated blue warbler	yes	yes	yes	High	Yes	Mature large deciduous trees, especially sugar maple, with a well developed understory of deciduous shrubs in blocks of habitat
<i>Dendroica castenea</i>	Bay-breasted warbler	no	yes	no	low	No	Mid-age to mature spruce forests infested with spruce budworm
<i>Falcipectens canadensis</i>	Spruce grouse	No	yes	No	low	No	Coniferous forest of jack pine, black spruce and tamarack; habitat always includes short needled component and branches that extend to the ground
<i>Oporornis agilis</i>	Connecticut warbler	No	yes	Yes	Low	Yes	Mature lowland coniferous habitats especially mature black spruce, tamarack bogs and jack pine barrens with thick shrub understory
<i>Phalaropus tricolor</i>	Wilson's phalarope	No	yes	No	Low	No	Quiet, shallow pools bordered by wet meadow vegetation
<i>Picoides arcticus</i>	Black-backed woodpecker	Yes	Yes	Yes	Moderate	No	Mature coniferous forests which include dead and dying conifers infested with wood boring beetle larvae
<i>Sterna caspia</i>	Caspian tern	No	No	No	Low	No	Islands in very large lakes
<i>Sterna hirundo</i>	Common tern	No	No	No	Low	No	Isolated, sparsely vegetated islands in large lakes
<i>Strix nebulosa</i>	Great gray owl	No	yes	No	Moderate	No	Mature lowland black spruce, black ash wetlands, tamarack wetlands and conifer and hardwood uplands adjacent to meadow openings
<i>Tympanuchus phasianellus</i>	Sharp-tailed grouse	No	No	No	Low	No	Expansive areas of graminoid and brush habitat. Habitat niche is between grassland and forests, usually created and maintained by fire.
Amphibians							
<i>Hemidactylium scutatum</i>	Four-toed salamander	No	No	No	Low	No	Adults live under or among mosses in swamps, boggy streams, and wet, wooded or open areas near ponds or quiet, mossy or grassy/sedgy pools
Mammals							
<i>Synaptommys borealis</i>	Northern bog lemming	No	yes	No	Low	No	Sphagnum and Labrador tea lowland black spruce/tamarack bogs and peatlands with grasses and sedges in conjunction with an ericaceous shrub layer
Reptiles							
<i>Emydoidea blandingii</i>	Blanding's turtle	No	yes	yes	Low	No	Calm, shallow watered marsh areas with soft bottoms with rich aquatic vegetation and sandy uplands for nesting

Table BE-1. Regional Forester's Sensitive Species occurrence in the Moon project area for the biological evaluation.

Species	Common name	Detailed Evaluation?	Suitable habitat present?	Documented Occurrence in project area	Risk	Project survey?	Habitat
Fish							
Moxostoma valenciennesi	Greater redhorse	No	No	No	Low	No	Moderate to fast-flowing, medium-sized to large rivers with sand and gravel substrates
Notropis anogenus	Pugnose shiner	No	yes	No	Low	No	Clear lakes and streams with bottoms of sand and gravel or marl and abundant submerged aquatic vegetation
Etheostoma microperca	Least darter	No	yes	No	Low	No	Clear lakes and streams with abundant submerged aquatic vegetation
Mollusks							
Lasmigona compressa	Creek heelsplitter	No	yes	No	Low	No	Headwaters, creeks, and small to medium rivers, in fine gravel or sand
Lasmigona costata	Fluted-shell mussel	No	No	No	Low	No	Medium to large rivers in sand, mud or fine gravel in areas with slow to moderate flow
Ligumia recta	Black sandshell	No	No	No	Low	No	Medium to large rivers with a good current, in riffles or raceways in gravel or firm sand
Insects							
Caraclea vertreesi	Vertere's caddisfly	No	No	No	Low	No	Medium to large-sized rivers or lakes that are directly connected to a medium or large-sized river. Typically in spring fed streams.
Plants							
Botrychium lanceolatum var. angustisegmentum	Lanceleaf grapefern	Yes	yes	yes	High	Yes	Northern hardwoods, lowland hardwoods
Botrychium mormo	Goblin fern	Yes	yes	yes	High	Yes	Northern hardwoods, lowland hardwoods
Botrychium oneidense	Blunt-lobed grapefern	Yes	yes	yes	High	Yes	Northern hardwoods, especially near ephemeral pools
Botrychium pallidum	Pale moonwort	Yes	yes	yes	High	Yes	Northern hardwoods, odd spots in pine habitat, and openings
Botrychium rugulosum	Ternate grapefern	Yes	yes	yes	High	Yes	Odd spots, particularly in pine habitat
Botrychium simplex	Least moonwort	Yes	yes	yes	Mod	Yes	Northern hardwoods, openings
Calypso bulbosa	Fairy slipper	No	Yes	no	Low	Yes	Lowland conifer
Cypripedium arietnum	Ram's-head lady's slipper	No	yes	Yes	low	Yes	Lowland conifer, transition between upland hardwood and lowland conifer
Dryopteris goldiana	Goldie's wood-fern	No	yes	no	Mod	Yes	Northern hardwoods, lowland hardwoods
Eleocharis olivacea	Olivaceous spike-rush	No	yes	No	Low	Yes	Bogs, lakes, streams, and shoreline
Eleocharis quinqueflora	Few-flowered spike-rush	No	yes	No	Low	Yes	Bogs, lakes, streams, and shoreline
Erythronium albidum	White trout-lily	No	yes	No	Mod	yes	Northern hardwoods by large lakes

Table BE-1. Regional Forester's Sensitive Species occurrence in the Moon project area for the biological evaluation.							
Species	Common name	Detailed Evaluation?	Suitable habitat present?	Documented Occurrence in project area	Risk	Project survey?	Habitat
Gymnocarpium robertianum	Limestone oak fern	No	yes	Yes	Low	Yes	Lowland conifer
Malaxis brachypoda	White adder's mouth	No	yes	yes	Low	Yes	Lowland hardwoods, lowland conifer
Orobanche uniflora	One-flowered broomrape	Yes	yes	No	Mod	Yes	Northern hardwoods, lowland conifer, upland/lowland conifer transition
Platanthera clavellata	Club-spur orchid	No	yes	No	Low	Yes	Lowland conifer and bog
Sparganium glomeratum	Northern bur-reed	No	yes	yes	Low	Yes	Bogs, sedge meadows, wetlands, lakes, streams, and shoreline
Subularia aquatica	Awlwort	No	No	No	Low	Yes	Lakes, streams, and shoreline
Taxus canadensis	Canada yew	yes	yes	yes	High	Yes	Northern hardwoods, lowland hardwoods, lowland conifer, moist sites in upland conifers

Summary of Conclusions

In summary, the purpose of a BE is to ensure that Forest Service actions (1)do not contribute to loss of viability of any native or desired non-native plant or animal species, (2)do not cause any species to move toward federal listing, and (3)to incorporate concerns for sensitive species throughout the planning process, reducing negative impacts to species and enhancing opportunities for mitigation. None of the Moon project alternatives would result in a loss of viability of any sensitive species, or cause any sensitive species to move toward federal listing. From that perspective, the first two objectives for completing the BE have been met by all alternatives.

However, there are identifiable negative effects predicted for 12 of the 47 sensitive species due to project action alternatives, primarily due to indirect effects to species' habitats. These are the bald eagle, northern goshawk, red-shouldered hawk, black-throated blue warbler, black-backed woodpecker, lance-leaf grapefern, blunt-lobed grapefern, goblin fern, pale moonwort, ternate grapefern, least moonwort, and the Canada yew. Because Alternatives B and C are similar in the amounts of upland mature forest that are harvested, these alternatives have similar effects to most RFSS species. The exception is the black-backed woodpecker. Alternatives differ primarily in the amount of pine and spruce thinning. Alternative C proposes to conduct thinning harvests on more acres of pine and spruce forest which serves as habitat for the black-backed woodpecker. Therefore, Alternative C would have a greater impact on this species.

Alternative C was designed to increase the harvest volume over that provided by Alternative B through harvesting more acres of pine plantation. The alternatives differ in the amount of pine thinning that is proposed. Otherwise, the alternatives are same in the amounts and kinds of activities proposed within or adjacent to the habitats of sensitive species and the amount of even-aged timber harvest.

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Table BE-2. Summary of effects and determinations for Sensitive Species in the Moon Project Area, Chippewa NF.

Species	No Impact	May Impact but will not contribute to a trend to Federal listing or loss of viability to population or species	Action alternative that least impacts species, or most contributes to conservation of species	Action alternatives that most impacts species, or least contributes to conservation of species	Rationale
Bald Eagle	Alt A	Alt B, C	Alternatives are similar	Alternatives are similar	Both action alternatives would cause indirect effects. Direct impacts are reduced by application of mitigations.
Northern goshawk	Alt. A	Alt. B, C	Alternatives are similar	Alternatives are similar	Alternatives propose similar amounts of regeneration harvest and have a similar effect on goshawk habitat.
Red-shouldered hawk	Alt A	Alt. B, C	Alternatives are similar	Alternatives are similar	Alternatives propose similar amounts of management in suitable habitat.
Black-throated blue warbler	Alt A	Alt. B, C	Alternatives are similar	Alternatives are similar	Alternatives propose similar amounts of regeneration harvest of mature forest habitat. All alternatives would increase the number and amount of large mature/older upland forest patches.
Black-backed woodpecker	Alt. A	Alt. B, C	Alternative B	Alternative C	Alternative C has the greatest indirect effects to habitat.
Mesic northern hardwoods sensitive plants: lance-leaf grapefern, blunt-lobed grapefern, goblin fern, one-flowered broomrape, Goldie's wood fern	Alt. A	Alt. B, C	Alternatives are similar	Alternatives are similar	Alternatives have similar direct and indirect effects on known locations and habitat indicators for these species. Direct and indirect impacts are reduced by application of mitigation measures.
Upland	Alt. A	Alt. B,C	Alternatives are	Alternatives are	Alternatives are

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disturbed sensitive plants: pale moonwort, ternate grapefern, least moonwort			similar	similar	similar in their indirect effect on this suite of species.
Canada yew	Alt. A	Alt. B, C	Alternatives are similar	Alternatives are similar	Alternatives have similar direct and indirect effects on known locations and habitat indicators for this species. Direct impacts are reduced by application of mitigations.

Determinations

None of the alternatives would result in a trend to federal listing or loss of viability to a population or species, but there are negative effects predicted for 12 of the 47 sensitive species for project action alternatives. These are the bald eagle, northern goshawk, red-shouldered hawk, black-throated blue warbler, black-backed woodpecker, lance-leaf grapefern, blunt-lobed grapefern, goblin fern, pale moonwort, ternate grapefern, least moonwort, and the Canada yew. Alternatives B and C are the same in the negative effects they cause.

Other RFSS sensitive species received ‘no impact’ determinations for all alternatives.

Required mitigation measures associated with these findings are presented in the body of the BE, and in stand-specific tables in Appendix B of the EA.

II. Coarse Filter Analysis of Vegetation Management Indicator Habitats

Scope of the Analysis

The Moon project area is dominated by four Landscape Ecosystems (LEs). Proposed activities would occur primarily on the Boreal Hardwood Conifer (BHC), Dry Mesic Pine (DMP), Mesic Northern Hardwood (MNH), and the Tamarack Swamp (TS) Landscape Ecosystems. A complete description of these LE's is provided in Appendix G of the Final Environmental Impact Statement (FEIS) for the Forest Plan (USFS 2004). Additionally, the analysis of forest composition and age in Chapter 3 of the Moon EA examines activities and their effect on all LEs within the project area.

Refer to Chapters 1 and 2 and related maps of the Moon EA for the location of the project and proposed activities.

The following summaries are taken from descriptions in Appendix G of the Forest Plan FEIS:

The BHC LE was dominated by mixed stands composed of aspen, paper birch, balsam fir, and northern white cedar. White pine, red pine, ash, basswood, bur oak, white spruce, and elm were also present with minor amounts of red maple, sugar maple, red pine and jack pine. This system occurs on nutrient rich, moisture transition areas between sugar maple dominated uplands and lowlands with saturated soils.

The DMP LE had mature and older stands dominated by a supercanopy of red pine and white pine. The subcanopy is a mixed stand of red maple and paper birch. White spruce, balsam fir, aspen, northern red oak, bur oak and bigtooth aspen are also found in this mixed subcanopy in some of the stands at lower stocking levels. Jack pine, red pine and white pine can occasionally occur in pure stands. Almost one-half of the landscape was characterized as multi-aged, beyond 175 years old.

The TS LE historically was dominated by tamarack in the lowlands, with black spruce and white cedar present as secondary dominants. The interspersed uplands in the LE included upland tamarack, spruce and cedar, along with aspen, paper birch, red pine, jack pine, balsam fir, and white pine. More than one-half of the landscape was older than 75 years.

The MNH LE usually occurs on fine-textured, well-drained, gently rolling till plains or stagnation moraines. Historically, the canopy was dominated by sugar maple, basswood, and paper birch. Sugar maple, basswood and ironwood are the major understory trees and would comprise the species present in the main canopy of any stand undisturbed for long periods. These were all-age stands dependant on individual tree or small group mortality to release trees established in the understory. Patches ranged from ¼ acre to

10s of acres in the younger growth stages, and from 10s-1000s of acres of contiguous forest in the old growth stage. Over three-quarters of the landscape occurred in the older growth stages.

Species Associations with MIHs

Appendix D to the Forest Plan FEIS (USDA FS 2004) contains a comprehensive list of animal and plant species of concern to associated MIHs, including age groups within MIHs. In this way, MIHs serve as indicators of habitat conditions for many species within the Chippewa National Forest. Many animal species will meet their life needs by using multiple MIHs and age classes. A detailed analysis of species associations and MIHs can be found in the Final EIS for Forest Plan Revision (USDA FS 2004) in Chapter 3.3.1.

Species associated with young aged forest MIHs 1-9 are gray wolf, lynx, moose, deer, ruffed grouse, American woodcock, gray catbird, indigo bunting, golden-winged warbler, rose-breasted grosbeak, chestnut-sided warbler, mourning warbler, song sparrow, and dark-eyed junco. All of these species will also utilize other age classes or habitats. For example, the American woodcock utilizes mature riparian forest, upland edge habitats, and a range of nonforest habitats irrespective of age. The golden-winged warbler has been associated with young forest but it occurs in a broader range of age groups within MIHs where micro-site habitat occurs or in unforested upland and lowland communities. The ruffed grouse is shown as an upland deciduous forest dwelling species and is associated with multiple age groups within upland deciduous forest MIHs.

Species associated with mature/old growth/multi-aged forest MIHs 1-9 include the northern goshawk, red-shouldered hawk, black-throated blue warbler, four-toed salamander, goblin fern, black-backed woodpecker, bay-breasted warbler, spruce grouse, and lynx.

Management Direction

The LE vegetation and Management Indicator Habitat (MIH) objectives of the Forest Plan (USFS 2004, pp 2-62 – 64, 2-68 - 70) set forest-wide objectives for forest vegetation composition, structure, age, and tree diversity. By moving toward these long-term desired vegetative conditions, the Forest will move towards desired conditions for amounts, quality, and distribution of important wildlife species and their habitats. Conservation objectives for threatened, endangered and sensitive (TES) species, other wildlife species, and their habitats are interwoven into the LE objectives.

Project objectives are addressed in more detail in Chapter 1 of the Moon EA and analyzed in the Vegetation analysis in Chapter 3.

The ability to achieve objectives for a variety of TES species and to provide for other wildlife species are directly related to moving towards these vegetative objectives.

In addition to composition and age objectives, the Forest Plan (USDA FS 2004a, pp. 2-23 – 2-24) provides guidance regarding spatial distribution of forest vegetation. Particularly important to a variety of TES species are objectives and guidance related to maintenance and development of large mature forest patches and providing opportunities for interior forest habitat conditions. These objectives for large, mature forest patches are of particularly high value to some TES species. Within the Moon project area there is currently one large 1000+ acre patch and six 301 to 1,000 acre patches. Providing these long-term habitat opportunities through vegetation objectives and goals is part of a coarse-filter, or landscape-level approach intended to provide for the well being of TES species and other wildlife on the Chippewa. These objectives seek to address species' needs through integrated resource management at large landscape scales. Fine filter, or site-level management needs are addressed by managing specifically for high quality potential habitat or known locations of sensitive species (USDA FS 2004a, p. 2-28). It is important to employ both of these two strategies. Providing only for species needs at the site level, through meeting forest Plan standards, but failing to enact important guidelines, goals and objectives, will result in a failure to fully redeem Forest Plan direction for conservation of TES species and other wildlife. Site level management cannot compensate for a failure to address landscape-level concerns.

Direct and Indirect Effects

An analysis of direct and indirect effects to MIHs was conducted on the Moon project area comparing Decade 1 MIH objectives in Chapter 2 of the Forest Plan and examining the projected acreage in each MIH five years from now (2015). A negative trend analysis was used to quantitatively and objectively evaluate each alternative considered in the Moon RMP. A negative trend was determined if *proposed management actions* moved existing conditions opposite from the Forest Plan objective for that MIH. The total acre departure is shown by alternative within each age grouping (young/seedling/open, mature, old/old growth) (*in* Biological Evaluation, Tables BE-1 – BE-3).

The total acre departure helps to place each alternative in perspective with regard to how well an alternative contributes to objectives in the Forest Plan and each alternative's relative impact to coarse filter wildlife habitats. A negative trend at this point in time, in itself, does not reflect an inconsistency with the Forest Plan or forest-wide objectives. Proposed changes may be minor and may not cause a percentage change in condition. Unique conditions and opportunities at the project level are also considerations in deciding appropriateness of management actions. Annual Forest Plan monitoring will gauge how well the Forest is meeting objectives.

Other MIH groups that are not specifically listed here are either unaffected or show positive trends.

Table BE-1. Negative trends of young/seedling/open MIH objectives resulting from management activities proposed in the Moon project area.

LE	Management Indicator Habitat	Forest Plan	Acres of negative trend		
			Alt A	Alt B	Alt C

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		Objective			
BHC	MIH 4: Young Aspen - Birch	decrease		31	31
BHC	MIH 3: Young Northern hardwood and oak	decrease		30	30
DMP	MIH 3: Young Northern hardwood and oak	decrease		100	100
DMP	MIH 6: Young Upland Spruce-Fir	decrease		106	106
MNH	MIH 6: Young Upland Spruce-Fir	decrease		36	36
MNH	MIH 7: Young red and white pine	decrease		7	7
TS	MIH 6: Young Upland Spruce-Fir	decrease		59	59
	Total acre departure from objectives		0	369	369

Table BE-2. Negative trends of mature forest MIH objectives resulting from management activities proposed in the Moon project area.

LE	Management Indicator Habitat	Forest Plan Objective	Acres of negative trend		
			Alt A	Alt B	Alt C
	none have negative trends		0	0	0
	Total acre departure from objectives		0	0	0

Table BE-3. Negative trends of old/old growth forest MIH objectives resulting from management activities proposed in the Moon project area.

LE	Management Indicator Habitat	Forest Plan Objective	Acres of negative trend		
			Alt A	Alt B	Alt C
BHC	MIH 4: Aspen-Birch	maintain	0	27	27
	Total acre departure from objectives		0	27	27

Alternative A (No Action)

Alternative A shows no negative trends of MIHs as a result of active management activities. No harvest would occur to work towards age or forest type objectives. This alternative produces no young forest MIHs and contributes to forest-wide objectives to reduce amounts of young forest and increase mature or old forest.

Alternative B (Proposed Action) and Alternative C

These alternatives are the same in how they affect Management Indicator Habitats. They affect changes to forest age and forest types similarly. Their effects are addressed together in this analysis.

The small acre departures portrayed in tables 3-22 through 3-24 for Alternatives B and C indicate that these alternatives are putting the right treatments in the right place in the Moon landscape.

Timber harvest activities that would create young forest are proposed for 1,268 acres in Alternatives B and C. Except for amounts of pine thinning, these alternatives would harvest a similar number of acres using similar harvest methods.

Alternatives B and C show negative trends in the young/seedling age class resulting from the addition of aspen-birch in the BHC LE, of northern hardwood/oak in the BHC and DMP, of spruce-fir in the DMP, MNH, and TS LEs, and of red and white pine in the MNH LE over existing conditions (Table). These amounts are minor in the context of the Moon project and the Forest as a whole.

In the mature MIH groups, Alternatives B and C cause no negative trends (Table) on the four LEs within the project area. The alternatives would conduct harvest management in line with mature forest objectives.

In old/old growth MIH groups, Alternatives B and C cause 27 acres of negative trends by harvesting old aspen/birch in the BHC LE (Table BE-). This causes a decrease of this age group when the objective is to maintain this age group in this LE. As with the negative trends in the young forest MIHs, this negative trend is minor in the context of the Project area and Forest-wide condition.

Cumulative Effects

For cumulative effects, the forest-wide analysis of MIH changes in the 2006 Monitoring and Evaluation report for the CPF (http://www.fs.fed.us/r9/forests/chippewa/publications/monitoring_reports/final_fy06_MonitoringReport.pdf) were compared to proposed management activities in the Moon EA. The 2006 monitoring and evaluation report represents the most recent report where MIH changes were examined. Following are the forest-wide highlights of MIH changes and trends, with an assessment of the contribution of the Moon EA management activities to those changes.

Dry Mesic Pine LE

- The amount of young upland conifer has decreased (15%) rather than increased.
- The amount of old and older upland conifer, especially in the spruce-fir and jack pine types has decreased (17%) rather than increased.
- The amount of old and older jack pine has decreased (32%) rather than increased.
- The amount of young lowland conifer has decreased (64%) rather than increased.

Boreal Hardwood Conifer LE

- The amount of old and older red and white pine has decreased (17%) rather than increased.

- The amount of old and older jack pine has increased (25%) rather than decreased.
- The amount of young lowland conifer has decreased (19%) rather than increased.

Mesic Northern Hardwood LE

- The amount of old and older upland spruce-fir has decreased (27%) rather than increased.

Tamarack Swamp LE

- The amount of young upland conifer has decreased (17%) rather than increased.
- The amount of mature upland conifer has increased (17%) rather than being maintained.
- The amount of young red and white pine has decreased (92%) rather than being maintained.
- The amount of young lowland conifer has decreased (37%) rather than increased.

In review and conclusion, the management activities in the Moon EA when considered in a forest wide context would not contribute to the negative trends of MIHs 1-9 in any of the four LEs examined in detail.

Exceeding acreages in mature or old/old growth MIHs is comparatively easy to correct over the course of a decade of Forest Plan implementation through additional harvest management to create young forest. It takes at least four decades to grow mature forest and many more decades to create old growth. Creating more young forest than is called for in objectives would compound imbalances among forest types and age classes for four or more decades.

At the forest scale, alternatives in the Moon project are the same in their effect to MIHs. The cumulative impact of other projects implemented across the forest will determine over time if objectives are met.

Spatial MIH 13: Large Mature Upland Forest Patches

Patch size, edge, and forest or habitat fragmentation are elements of spatial distribution which affect a variety of sensitive species and other wildlife. The FEIS (chapter 3.3.2) for the Forest Plan conducted a detailed programmatic analysis of forest spatial patterns that would likely result from implementation of the Forest Plan. This analysis showed that Forestwide, the combination of vegetative treatments to meet LE objectives could also result in an increase of number and acreage in 300 acre and larger mature/older upland forest patches.

Scope of the Analysis

The scope of the analysis is the Project and the mature/older forest patches that fall partially or wholly within the Project. For cumulative effects, the Chippewa NF was used.

Management Direction

Management Indicator Habitat 13 from the Forest Plan provides forest-wide direction as a part of the coarse-filter approach to providing landscape-level conditions for rare species sensitive to patch size. Patch management also affects edge (MIH-11) and interior forest (MIH-12). Forest Plan objective O-VG-19 compels management of the CPF to result in maintaining or increasing large mature forest patches:

O-VG-19 - Maintain or increase the acres and number of patches of mature or older upland forest in patches 300 acres or greater. Large upland forest patches may cross Landscape Ecosystem or other ecological boundaries (such as watersheds, Landtypes). When determining which large upland mature patches will be retained, take into consideration the contribution of other unmanaged lands within the same ecological setting and proximity.

Direct and Indirect Effects

A forest wide assessment of large/mature forest patches was completed for the Chippewa Forest Plan in 2004. Since then, updates due to recent management actions, corrections of errors in forest stand data, and redelineation of forest stands have changed the base data used to calculate forest patches. Analysis methods have been adapted to better reflect patch parameters considered in the Forest Plan even though base forest stand data have changed.

Alternatives are analyzed for this indicator at 5 years, following implementation of the proposal.

No Action Alternative, Proposed Action Alternative, and Alternative C

All alternatives in the Moon Project increase the number and acreage in large mature/older upland forest patches over existing condition.

Alternatives B and C would result in a net increase of 743 acres in mature/older forest within large forest patches over existing condition (Table BE-6), while Alternative A would result in 1,258 acres.

The project area contains two mature/older forest patches greater than 1,000 acres. The alternatives are the same in how they affect these patches. Total acres in this patch size class would increase from 3,843 acres to 3,864 acres under all alternatives. Patches this large are considered a rare landscape condition and are to be maintained per Forest Plan guideline G-VG-1 (Maintain a minimum of 19 patches of mature or older upland forest in patches of 1,000 acres or greater). All alternatives accomplish this.

Overall, Alternative A does the best at working towards the forest wide objective to maintain or increase the number and acres of large mature/older forest patches. Alternatives B and C also work toward meeting the forest wide objective by increasing the acres in 300 acre or larger forest patches. All alternatives result in improved spatial patterns of forest cover over existing conditions. The action alternatives are the same in how they work towards the forest wide objective of increasing the acreage of large mature/older upland forest patches.

Cumulative Effects

The area for cumulative effects analysis is forest-wide on the Chippewa during the next 10 years of Forest Plan implementation.

No Action Alternative, Proposed Action Alternative, and Alternative C

The addition of 1,258 and 743 acres in large mature/older patches, respectively, among Alternatives A and B or C in the Moon project would cumulatively result in a benefit to forest spatial patterns in the project area and contribute to the forest-wide objective to maintain or increase large mature forest patch acres. Patch numbers are increased among all alternatives.

Additions such as these would help to counter expected decreases in amounts and distribution of mature forest on other ownerships (state and county lands), or loss of forest land due to development on private lands. These effects are outlined in the 2004 Final EIS for the Forest Plan in Chapter 3.3.2.

Other recent projects on the Chippewa show variable trends towards meeting Forest Plan spatial objectives to “maintain or increase” acres and number of large mature/older upland forest patches. As examples, a subset of these include: on the Walker RD the Boy River 2 project, the Cuba Hill project, the Steamboat project, the Portage Lake project and the South Leech Lake project; the Southeast and the Mississippi Projects on the Deer River RD; and the Northwoods and the Round Island projects on the Blackduck RD. The Boy River 2, Cuba Hill, Steamboat, Portage Lake, and the South Leech Lake projects maintained existing conditions of upland mature forest patches and will result in increases of patch acres and numbers in five years. The Southeast and Mississippi projects would result in no reductions in large mature patches. The Big Fork project will result in a decrease of large mature patch numbers and patch acres. The Northwoods and the Round Island projects result in no loss of patch numbers though the acres within large mature patches are decreased over existing condition. Forest-wide in consideration of these planned projects, patch numbers and acres are modeled to increase over the course of the next 10 years.

Table BE-6. Mature/Older Forest Patches within the Moon Project Area: existing condition (2010), and by Alternatives A, B, and C five years from present.

Patch Size Class	Existing Condition Number	Existing Condition (Acres)	Alternative A + 5 Years (Number)	Alternative A + 5 Years (Acres)	Alternative B + 5 Years (Number)	Alternative B + 5 Years (Acres)	Alternative C + 5 Years (Number)	Alternative C + 5 Years (Acres)
1-40	206	2572	209	2562	207	2521	207	2521
41-100	49	3190	42	2748	40	2633	40	2633
101-300	20	3239	21	3588	19	3364	19	3364
301-500	3	1186	6	2422	6	2577	6	2577
501-1000	3	2308	3	2308	2	1639	2	1639
1001-2500	2	3843	2	3864	2	3864	2	3864
2501-5000	0	0	0	0	0	0	0	0
5001-10000	0	0	0	0	0	0	0	0
Number / acreage of large mature forest patches	8	7337	11	8595	10	8080	10	8080
Mature or older forest total	-	16337	-	17492	-	16598	-	16598

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III. Species-Specific Fine Filter Analysis of Effects

Bald eagle (*Haliaeetus leucocephalus*)

The bald eagle is a seasonal resident in much of the Chippewa National Forest, overwintering further south along the Mississippi River and other locations. Bald eagles build nests in large trees, usually within site of a lake or large river. They feed primarily on fish, though waterfowl and carrion also are used as food sources. To be successful, bald eagles require a reliable food source and large trees for nesting. The Chippewa National Forest Land and Resource Management Plan has guidelines for projects that occur within the vicinity of bald eagle nests.

Species Status

In 1978 the bald eagle was listed as a threatened species in Minnesota, Wisconsin, Michigan, Oregon, and Washington, and as endangered in the remaining contiguous United States. Recovery efforts were assumed in five regions in the country. Minnesota was grouped with 23 other states into the Northern States Region. The success of the recovery effort allowed the US Fish and Wildlife Service to take the eagle off the Threatened and Endangered Species list (USDI FWS 1999) in 2007.

Forest Plan Management Direction

Since the bald eagle was delisted in 2007, it was adopted as a Regional Forester's Sensitive Species. As with other sensitive species, the following general Forest Plan objective applies:

O-WL-17: Maintain, protect, or improve habitat for all sensitive species.

Meeting this objective will involve two basic and complementary strategies that would be implemented based on species' habitat requirements and distribution, individual site conditions, expected management impacts, and other multiple use objectives. These strategies include:

a.

Landscape level (or coarse filter) management strategies: Addressing species' needs through integrated resource management at large landscape scales including, but not limited to: Landscape Ecosystem or Landtype scales for vegetation and management indicator habitat objectives; watersheds for aquatic and riparian condition objectives; and Management Areas for desired or acceptable levels of human uses.

b.

Site-level (or fine filter) management strategies: Addressing species' needs by managing specifically for high quality potential habitat or known locations of sensitive species.

More specifically, revised management guides the National Bald Eagle Management Guidelines (USDI Fish and Wildlife Service 2007) are the method for maintaining the viability of this species and protect it from management actions on the national forest.

These are excerpted below:

Category C. Timber Operations and Forestry Practices

- Avoid clear cutting or removal of overstory trees within 330 feet of the nest at any time.
- Avoid timber harvesting operations, including road construction and chain saw and yarding operations, during the breeding season within 660 feet of the nest. The distance may be decreased to 330 feet around alternate nests within a particular territory, including nests that were attended during the current breeding season but not used to raise young, after eggs laid in another nest within the territory have hatched.
- Selective thinning and other silviculture management practices designed to conserve or enhance habitat, including prescribed burning close to the nest tree, should be undertaken outside the breeding season. Precautions such as raking leaves and woody debris from around the nest tree should be taken to prevent crown fire or fire climbing the nest tree. If it is determined that a burn during the breeding season would be beneficial, then, to ensure that no take or disturbance will occur, these activities should be conducted only when neither adult eagles nor young are present at the nest tree (i.e., at the beginning of, or end of, the breeding season, either before the particular nest is active or after the young have fledged from that nest). Appropriate Federal and state biologists should be consulted before any prescribed burning is conducted during the breeding season.
- Avoid construction of log transfer facilities and in-water log storage areas within 330 feet of the nest.

Category G. Helicopters and fixed-wing aircraft.

Except for authorized biologists trained in survey techniques, avoid operating aircraft within 1,000 feet of the nest during the breeding season, except where eagles have demonstrated tolerance for such activity.

Affected Environment for Bald Eagle

There are 21 known bald eagle nests within the Moon project. The project area contains numerous productive fish bearing lakes that help to support this breeding population.

Meeting the management guidance from the Northern States Bald Eagle Recovery Plan has been a highly successful approach for maintaining the bald eagle on the Chippewa. Each management alternative and specific action are examined in the context of these guides.

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Conserving existing old growth superstory pine and creating new pine forest across the Chippewa are important to the long term conservation of the bald eagle. To compare among the management alternatives in the Moon EA, acres of 0-9 year white and red pine, total acres of red and white pine all ages, and acres of red and white pine greater than 100 yrs. old are examined. These indicators are useful in determining the degree to which each alternative is likely to affect this species.

Analysis of Effects

Direct Effects

For direct effects to the bald eagle, management activities that fall within ¼ mile of known eagle nests are examined. Eagle nest management guidelines as stated in the National Bald Eagle Management Guidelines (USDI Fish and Wildlife Service 2007) are applied as mitigation measures WL1 and WL-2 on a stand by stand basis (Table Eagle-1 and Table Eagle-2). Alternatives B and C are the same in terms of specific stands and types of activities that are proposed.

Mitigations

The following mitigations are proposed for specific stands within the Moon Resource Management Project. These mitigations follow those prescribed by the National Bald Eagle Management Guidelines.

WL1

Exclude all land use activities within 330 feet of known eagle nest trees.

WL2

Avoid timber harvesting operations, including road construction and chain saw and yarding operations, during the breeding season within 660 feet of the nest. Harvest operations will be permitted between October 1 and February 14.

Table Eagle-1. Forest Stands where Eagle mitigation WL 1 is applicable in the Moon Project Area.					
Compartment	Stand	Alt B treatment	Alt C treatment	Area affected	notes
195	9	Opening maintenance	Opening maintenance	2.2	

Table Eagle-2. Forest Stands where Eagle mitigation WL 2 is applicable in the Moon Project Area.					
Compartment	Stand	Alt B treatment	Alt C treatment	Area affected	notes

Compartment	Stand	Alt B treatment	Alt C treatment	Area affected	notes
195	9	Opening maintenance	Opening maintenance	2.2	
172	5	Coppice regeneration harvest	Coppice regeneration harvest	21.4	

Indirect Effects

Alternatives B and C are the same in how they affect the habitat indicators examined for the bald eagle. The amount of new pine forest created within the project area is the same between action alternatives. Each action alternative proposes to nominally increase pine in the youngest age class. Each action alternative would increase the total amount of pine forest over existing condition and the No Action Alternative. Amounts of old growth pine that can serve as nesting habitat would increase above existing condition under all alternatives.. Alternatives B and C would decrease the amount of old growth red/white pine compared to Alternative A by conducting a regeneration harvest on 9 acres. Alternatives B and C do a good job of balancing pine regeneration and maintenance of high quality existing nesting habitat.

Table Eagle-3. Eagle habitat indicators for the Moon project area for existing condition and five years from present following implementation of alternatives.				
	Existing	Alt A	Alt B	Alt C
Age 0-9 red and white pine	9	0	86	86
Total acres of red and white pine	1997	1997	2057	2057
Red and white pine >100 yrs old	126	141	132	132

Cumulative Effects

The Forest Plan Final EIS for the Chippewa projected a greater rate of increase of young red and white pine than is occurring forestwide according to the 2006 Monitoring and Evaluation report for the CPF. Amounts of young red/white pine forest has decreased in the DMP and TS LEs rather than increased. The amount of old and older red and white pine has decreased in the BHC LE rather than increased. The Moon project area nominally increases amounts of young red/white pine forest and maintains the large majority of old pine forest. Cumulative effects are expected to be similar to the indirect effects for the eagle.

Determination

Alternative A would have a beneficial effect on the bald eagle. Total amounts of pine forest would be maintained in the project area and amounts of old growth would be increased. There are no direct effects anticipated for Alternative A. Alternatives B and C are not likely to cause a loss of viability of the bald eagle or a trend towards Federal listing. The action alternatives are the same in the amount of possible direct effects to

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known eagle nests. While habitat conditions may be improved over existing condition under the action alternatives, some direct effects are possible even with application of mitigation measures.

Northern Goshawk (*Accipiter gentilis*)

The northern goshawk serves as a Management Indicator Species (MIS) to meet the requirements of federal law (36CFR 219.19) and is also listed as a Regional Forester Sensitive Species.

Northern goshawk is an MIS because: population changes may indicate effects of management; it is a high public interest species and Region 9 Forester's sensitive species; its habitat associations are well-documented in literature; it can function as an umbrella species – (its large area requirements and use of multiple habitats encompass habitat requirements of many other species); and its breeding productivity and population and habitat trends can be monitored at site and landscape level. The Chippewa plays a major role in the Eastern Region of the Forest Service to contributing to the viability and well-distributed habitats for the goshawk.

Affected Environment for Northern Goshawk

Two northern goshawk nest areas fall within the Moon Project Area. Additionally, one red-shouldered hawk nest had been recorded within the Moon Project Area. The red-shouldered hawk is also a forest dwelling raptor that prefers mature forest conditions similar to those preferred by the northern goshawk.

The Final EIS section 3.3.6 for the Forest Plan (USDA FS 2004b) provides a good overview of the forest-wide, regional, and national affected environment for the northern goshawk.

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 (USDA FS 2002). Goshawks eat mainly rabbits, hares, squirrels, ducks, gallinaceous and other birds; local diet partly depends on availability. Snags, downed logs, openings, large trees, shrubby under-story, and interspersed 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 (USDA FS 2002). 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.

The effects on forest spatial patterns, specifically mature/older upland forest, in the Moon project area are covered earlier in this document and in Ch. 3: Management Indicator

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Habitat - Forest Spatial Patterns. Evaluating the arrangement of goshawk habitat helps to determine the effects on habitat quality by a project.

Forest Plan Management Direction

General Direction

O-WL-1 Populations: Provide ecological conditions to sustain viable populations of native and desired non-native species and to achieve objectives for management indicator species and management indicator habitats.

O-WL-2 Habitats: Move terrestrial and aquatic habitats in the direction of desired conditions and objectives for all native and desired non-native wildlife.

O-WL-17 Maintain, protect, or improve habitat for all sensitive species.

Meeting this objective will involve two basic and complementary strategies that would be implemented based on species' habitat requirements and distribution, individual site conditions, expected management impacts, and other multiple use objectives. These strategies include:

- a. Landscape level (or coarse filter) management strategies: Addressing species' needs through integrated resource management at large landscape scales including, but not limited to: Landscape Ecosystem or Landtype scales for vegetation and management indicator habitat objectives; watersheds for aquatic and riparian condition objectives; and Management Areas for desired or acceptable levels of human uses.
- b. Site-level (or fine filter) management strategies: Addressing species' needs by managing specifically for high quality potential habitat or known locations of sensitive species.

Specific to the Northern goshawk

O-WL-32: Provide habitat to provide for population goal minimum: 20-30 breeding pairs.

S-WL-8: At northern goshawk nest sites with an existing nest structure, prohibit or minimize, to the extent practical, activities that may disturb nesting pairs during critical nesting season (March 1 – August 30) and, to the extent practical, provide the following conditions in an area of 50 acres minimum (860 ft. radius):

Maintain, protect, or enhance high quality habitat conditions: 100% mature forest (>50 yrs old) with continuous forest canopy (>90% canopy closure) and large trees with large branches capable of supporting nests

G-WL-24: Within northern goshawk post-fledging areas, minimize activities, to the extent practical, that may disturb nesting pairs during critical nesting season (March 1 – August 30) and, to the extent practical, within a 500 acre area encompassing all known nest areas within the territory:

Maintain suitable habitat conditions on a minimum of 60% of the upland forested acres in post-fledging areas. Suitable habitat: jack pine and spruce/fir forest types >25

years and all other forest types >50 years with semi-closed to closed canopy (>70%). Aspen and birch forest types 25-50 years may be considered suitable if field review verifies that foraging habitat trees average 50 feet tall and canopy closure is 50-70% or greater.

Environmental Consequences for Northern Goshawk Habitat

For management and analysis purposes, there are three components to goshawk habitat (USDA FS 2004b: p. 3.3.6-2):

- 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).

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.

Williamson et al. (2001) described suitable habitat conditions and recommended thresholds for the Chippewa National Forest for the three habitat components (nesting habitat, post-fledging habitat, and foraging habitat) based on literature including Boal et al. (2001) and peer review.

A regional monitoring effort was completed in 2008 to establish a baseline of goshawk occupancy for population trend analysis in future monitoring efforts. Bruggeman et al. (2009) surveyed eighty six 600 ha Primary Sampling Units (PSUs) throughout the

Western Great Lakes bioregion for goshawk presence between mid-May and late June 2008, and again between July and mid-August 2008, and recorded 30 goshawk detections in 21 different PSUs. The 600 ha PSU was derived from goshawk territory size in the western U.S.. By applying the assumptions in the protocol, Bruggeman et al. (2009) estimated that there were $5,184 \pm 199$ (standard error) PSUs with goshawk occupancy regionwide in 2008, which comprised approximately 27% of the PSUs in the survey area.. For the Chippewa, this estimate is 271 ± 146 occupied PSUs.

Pending simulation modeling by Bruggeman et al., a working estimate of breeding pairs, known and unknown, can be derived using the known combined territory size of 6454 ha (Boal et al. 2001) for breeding goshawks on the Chippewa to correct for the larger home range size observed on the Chippewa compared to the bioregional monitoring methodology. Applying a 10.7 density correction ($6454/600$) to the report's assessment of 271 occupied PSUs ($271/10.7$), places the Chippewa's estimated breeding population at around 25 pairs (range: 12 pairs to 39 pairs). The number of known active territories on the Chippewa in 2008, at 21, falls into the lower end of the range for this estimated breeding population.

Compliance with goshawk conservation goals interwoven into the Forest Plan, particularly in the early phases of Plan implementation, is extremely important in helping to ensure population viability. It is not clear whether the varying numbers represent natural variation in nesting activity, flaws in monitoring, or actual declines and increases. However, given what we know about goshawk habitat requirements, many of the known territories on the Forest do not appear to be in a healthy condition. Known sites on the Forest continue to need protection and management, using the best information and parameters available. Without this effort, the long-term sustainability of the species on the Chippewa would be uncertain at best.

In its role as a Management Indicator Species, habitat parameters for the northern goshawk, especially amounts of foraging habitat (mature/older upland forest), represent conditions for many other species with similar habitat conditions (USDA FS 2004b, Forest Plan FEIS Appendix D, Table DEIS-9: Crosswalk to Animal Species Association with Management Indicator Habitats).

Because the Moon Project contains two nest sites that have been inactive for 5 or more years, an in-depth analysis of goshawk habitat suitability among ownerships or among components was not completed for the project area. Rather, amounts of mature/older upland forest which serves as the key habitat component was examined project area-wide for existing condition and by alternative. This indicator is appropriate to make an effects determination given the level of risk to occupied habitat and without more current nest activity data within the project area.

Direct and Indirect Effects to Northern Goshawk Habitat

Analysis of direct and indirect effects for the northern goshawk habitat takes place on National Forest managed lands within the Moon project boundary.

Table Goshawk-1. Amount of mature or older upland forest by alternative with the percentage (%) of the total potentially suitable forest affected, Moon Project Area.				
	Existing Condition acres (%)²	Alternative A¹ (No Action) acres (%)²	Alternative B acres (%)²	Alternative C acres (%)²
Mature/older upland forest foraging habitat¹	16337 (60%)	17492 (64%)	16598 (61%)	16598 (61%)
¹ Federal ownership only in 2015. ² Based on 27,379 Federal upland forested acres.				

Alternative A

Under this alternative goshawk habitat is increased. More mature/older forest would exist project-wide under this alternative than existing condition or either action alternative.

Alternatives B and C

The action alternatives are identical in the amount of mature/older forest that they retain on the landscape. Slightly more mature/older forest would exist in the Moon project area than exists currently. Amounts of mature/older forest are at amounts thought to be optimal (60%) for prey species favored by the goshawk (Williamson et al. 2001).

Cumulative Effects

Cumulative effects for the northern goshawk are examined on all public ownerships within the Moon project Area (Table Goshawk-2).

Table Goshawk-2. Amount of mature or older upland forest by alternative with the percentage (%) of the total potentially suitable forest affected, all public ownerships in the Moon Project Area.				
	Existing Condition acres (%)²	Alternative A¹ (No Action) acres (%)²	Alternative B acres (%)²	Alternative C acres (%)²
Mature/older upland forest foraging habitat¹	19,040 (55%)	20,166 (58%)	19271 (56%)	19271 (56%)

Table Goshawk-2. Amount of mature or older upland forest by alternative with the percentage (%) of the total potentially suitable forest affected, all public ownerships in the Moon Project Area.

	Existing Condition acres (%) ²	Alternative A ¹ (No Action) acres (%) ²	Alternative B acres (%) ²	Alternative C acres (%) ²
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¹All public ownership in 2015.

²Based on 34,582 upland forested acres.

Project-wide there is a lower percentage of mature/older upland forest across all public ownerships than is provided by National Forest. This indicates that State and County ownerships are more heavily managed than Federal land and provide comparatively less goshawk habitat. Overall, under all alternatives adequate goshawk habitat would exist in the project area. More habitat would be available than currently exists.

Forestwide in 2008, 8 goshawk nests successfully fledged young. A total of 21 active nests were known on the Chippewa in 2008.

Determination of Effects

Alternative A would increase habitat in the project area above existing amounts for the northern goshawk. Alternative A would have a beneficial effect on the northern goshawk. Alternative B and C each reduce the amount of suitable foraging habitat in the project area. Amounts of foraging habitat would still be adequate to support breeding pairs. Habitat quality is unlikely to cause a loss of these breeding territories and affect the Chippewa's ability to meet Forest Plan objective O-WL-32, to provide habitat for a goshawk population goal of 20 to 30 breeding pairs.

Alternatives B and C may impact individual northern goshawks but would not cause a loss of viability or cause a trend towards federal listing.

Red-shouldered hawk (*Buteo lineatus*)

Species Status

This 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 (USFS 2002; TNC 1992). These conditions are typically found in bottomland hardwood forests, but are also found in more upland habitats, particularly in northern Minnesota (USFS 2004b, p. 45). Water is a critical element of the habitat, and a high percent of the diet includes frogs and other herps (USFS 2002).

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 under-story vegetation, large crotches with large diameter

supporting branches (older trees), high basal area of larger trees, and a higher canopy height (TNC 1992). These are all old growth characteristics (USFS 2004b, p. 46).

A conservation assessment has been prepared for red-shouldered hawks in the National Forests of the North Central States (USFS 2002). Red-shouldered hawks are believed to have been one of the most common hawks in its historic range prior to 1900. A general major decline in red-shouldered hawk populations for the north central and northeast states is believed to have been caused by the major logging conducted during the 1800's and the early 1900's. Additional declines also appear to have occurred during the mid 1900's. Loss of wetlands and the use of pesticides probably also contributed to the decline.

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. 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 are few data from which to draw conclusions (USFS 2004b, p. 46).

Breeding bird survey data indicate a population decline of between 65% and 95% in the Great Lakes States between 1950 and 1970 (TNC 1992). 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 (TNC 1992).

Environmental Baseline:

Red-shouldered hawks are at the northern periphery of their range in the National Forests of Minnesota, Wisconsin, and Michigan (USFS 2002). Much of this species' former habitat in southern and central Minnesota has been destroyed or highly fragmented with greatly reduced population levels as a result of human settlement, logging and agricultural development (USFS 2004b, p. 46). There are presently about 429 known or suspected nesting sites in Minnesota; a majority of these sites are located within just a few meta-populations (USFS 2004b, p. 46). One of these meta-populations occurs on the Chippewa National Forest on the Ottertail Peninsula of Leech Lake.

A two-year study located 20 red-shouldered hawk nests on the Chippewa. These nests occur in closed-canopy mature northern hardwoods (17 nests) or mature aspen (3 nests) with interspersed wetlands (McLeod and Anderson 1997).

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 49 recorded nesting territories on the Chippewa.

Stick nest surveys and call-back surveys for the red-shouldered hawk were conducted on suitable habitat within the project area (Cable 2009). This effort included possible activity stands and buffer stands adjacent to activity stands. In total, 2 red-shouldered hawk territories are known in the Moon project area. This survey effort was not

comprehensive for the project area, but focused on areas of proposed management. Suitable un-surveyed habitat exists within the project area and could contain active red-shouldered hawk territories.

Red-shouldered hawk habitat occurs within the Moon project area, within mature northern hardwoods, lowland hardwoods, and aspen forest types, of suitable ages. Within the Moon project area there is currently one large 1000+ acre patch and six 301 to 1,000 acre patches. These are unique habitat features on the Chippewa and for this species.

Proposed Moon project activities which would affect the environment of the red-shouldered hawk include timber harvest and associated activities. These activities can affect red-shouldered hawks as they are nesting through direct disturbance. They can also affect long-term habitat suitability for red-shouldered hawks across the landscape, through their effect on forest type and age, and structure. Management practices which result in habitat fragmentation, or which open up the forest canopy too much, can allow a competitive advantage to the red-tailed hawk, a species which is adapted to open habitats with scattered trees or smaller woodlots (USFS 2004b, p. 47).

Effects of Action:

Direct Effects:

Two forest stands are proposed for a single tree selection harvest in both Alternatives B and C. Direct effects would be mitigated by the following mitigation measure:

WL5 : To meet G-WL-14 for the Red-shouldered Hawk, maintain at least 70% canopy closure within the stand and restrict harvest activity to the period of August 16 to March 31.

No activities are proposed in Alternatives A within 600 acre breeding territories surrounding known nest sites.

Table RSH-1. Forest Stands where Red-shouldered hawk mitigation WL 5 is applicable in the Moon Project Area.

Compartment	Stand	Alt B treatment	Alt C treatment	Area affected	notes
179	4	Single tree selection	Single tree selection	91.2	
179	1	Single tree selection	Single tree selection	9.7	

In Alternatives B and C, no activities are proposed in the 50 acre nest stands for red-shouldered hawk territories in the project area.

Alternatives B and C would affect habitat within 600 acre breeding territories of known nest sites. Alternatives would affect about 101 acres by intermediate harvest in one breeding territory. Potential for direct effects exist in stands proposed for harvest

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because red-shouldered hawk nests and breeding activity are dynamic. The possibility exists that harvest activity could impact nests established since surveys were last conducted.

Indirect Effects: Timber harvest and associated activities within suitable forest types may affect long-term habitat opportunities for red-shouldered hawk within the project area. Amounts of habitat after implementation of activities are shown in the table below (most habitats are mature vegetation growth stage or older).

Table RSH-2: Acres of red-shouldered hawk habitat, Projected to year 2015, Moon Project Area.				
Habitat component	Existing	Alt. A	Alt. B	Alt.C
Lowland hardwoods (all acres)	1706	1706	1706	1706
Northern hardwoods (MIH 3, mature/old)	7043	7098	6823	6823
Aspen/birch (MIH 4, mature/old)	4346	4928	3712	3712
Total	13,095	13,732	12,241	12,241

In both action alternatives, amounts of red-shouldered hawk habitat are reduced over existing condition and over Alternative A (No Action) as a result of even-aged regeneration harvests in mature/older aspen and northern hardwoods.

In addition to forest type, spatial patterns of vegetation are an important aspect of red-shouldered hawk habitat suitability. Habitat which occurs in larger blocks, or patches, has higher quality than habitat in small blocks or in a fragmented forest matrix. The large, mature upland patches referenced in “Spatial Distribution of Forest Vegetation” elsewhere in this BE include 8 existing large mature/older upland forest patches.

All alternatives result in the increase of the number of large mature forest patches and an increase of acreage within large mature forest patches. These increases result in indirect beneficial effects to this species under all alternatives.

Cumulative effects: At the landscape scale, the Chippewa provides important northern hardwood habitat for red-shouldered hawks (USDA FS 2004b, p. 49). The time period for cumulative effects for this species is the next 15 years in the project area.

Hardwood-dominated, large mature patches are particularly important for this species. Proposed harvests would reduce the amount of suitable habitat or alter the structure of existing large mature forest patches, at least minimum canopy closure would be maintained proximate to known occupied habitat. Alternatives B and C do not adversely affect large mature forest patches and no adverse cumulative effects would result.

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In regard to generalized habitat in the Moon project area, all alternatives maintain adequate habitat conditions even when management of state and county lands are considered. State and county lands are generally managed more intensively than federal lands. None of the alternatives contribute to adverse cumulative impacts.

Determination of effects:

Alternative A would have a beneficial impact to the red-shouldered hawk and its habitat. Alternatives B and C may impact individual red-shouldered hawks or its habitat, but will not contribute to a trend towards federal listing or loss of viability to the population or species.

Black-throated blue warbler (*Dendroica caerulecens*)

Species Status:

A bird of the forest interior, this warbler generally inhabits large tracts of relatively undisturbed hardwood and mixed deciduous-coniferous forests (Holmes 1994). 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 by USDA FS 2004d, p. 105). It nests in small trees, saplings, or shrubs, in dense undergrowth, within about a meter of the ground.

Forests most suitable as breeding habitat contain a relatively thick undergrowth of dense shrubs (Holmes 1994). A study in northeastern Minnesota found that in northern hardwood areas with few shrubs, black-throated blue warblers are primarily associated with small gaps (0.05-0.10 ha) in the canopy that have resulted from blowdowns (Hanowski 1998). The natural disturbance regime for northern hardwoods in this region was windstorms which occur every few decades and create small forest gaps by blowing down senescent or weak and hollow trees. Hanowski speculates it is possible that black-throated blue warblers historically responded to habitat that was created by these gaps and moved across the landscape as new patches were created and old patches became unsuitable.

Holmes (1994) indicates the black-throated blue warbler is a bird of the forest interior, and probably declined in population over the last 300 years due to extensive deforestation during the settlement of North America by Europeans. In more recent decades, however, as fields and pastures in the heart of its range have returned to forest, populations have apparently increased. This warbler is a rare and local summer resident in Minnesota (NRRI 2002c). On the western edge of its range here, black-throated blue warblers appear to be vulnerable to habitat fragmentation due to logging, urbanization, and creation of edge (USDA FS 2004d, p. 105).

On the Chippewa National Forest, there have been 15 recorded sightings of the black-throated blue warbler. A majority of these occur in large blocks of contiguous mature forests with minimal edge.

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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. (USDA FS 2004d, p. 105).

The black-throated blue warbler is area sensitive, requiring large, relatively intact areas of continuous canopy forest. The following summary is from USDA FS 2004d, p. 105-106:

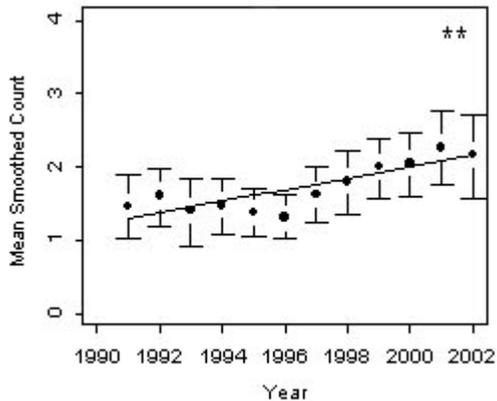
Research from the eastern parts of its range suggest that areas at least 2500 acres in size and greater than 70% closed canopy are needed to support populations. Fragmented habitats create conditions for American redstarts and chestnut-sided warblers that compete with and exclude black-throated blue 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 species invading interior patches after even a slight amount of disturbance is much greater. Secure populations of black-throated blue warblers require large areas of interior forest with little or no fragmentation in the form of canopy openings.

Environmental baseline:

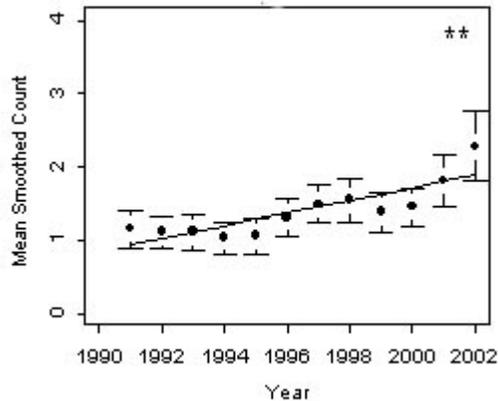
A rare and local summer resident in Minnesota, the black-throated blue warbler is apparently vulnerable to habitat fragmentation due to logging, urbanization, and creation of edge here in the western edge of its range (USDA FS 2004d, p. 105).

The primary competitors with black-throated blue warbler, the American redstart and Chestnut-sided warbler, show increasing population trends on the Chippewa National forest. These trends are shown below.

Population trend of American redstart on CNF



Population trend of Chestnut-sided warbler on CNF



(Data from Forest bird monitoring project 1990-2002, NRRI 2002, p. 9)

The increases in population of these competitors on the Chippewa could be due to increasing early successional habitats, more edge, or both. The 1986 Forest Plan emphasized management of early successional habitats through the use of small, scattered clearcuts, which tend to maximize edge.

Chestnut-sided warblers breed primarily in open vegetation recently disturbed by fire or logging. They reach their highest densities in clearcuts, and may also respond favorably to cottage developments which revert the surrounding vegetation to an earlier successional stage (NRRI 2002a). Populations of this species are high in comparison to pre-colonial populations, because it is a species which responds favorably to human-induced habitat changes, especially logging (NatureServe 2002).

The American redstart breeds in a wide variety of deciduous and mixed forest types, alder swamps, and various early successional habitats (NRRI 2002b). This is a species that frequents second growth forest with edge habitat and a high percentage of shrubs (Green 1995, p. 40). In New York, it has been observed to increase with increasing logging intensity, opening the forest canopy and encouraging rapid regeneration (NRRI 2002b). However, it is also a species susceptible to cowbird parasitism and predation associated with fragmentation (Nature Serve 2002a), and it is more common in large habitat tracts (NRRI 200b). For those reasons, it is considered as a forest interior species (NRRI 2002b; NatureServe 2002a).

Black-throated blue warbler habitat occurs within the Moon project area, within mature forest. Six (6) sightings of this species have been recorded within the project area, most recently in 2001.

Black-throated blue warbler surveys were not conducted within the Moon project area.

Proposed Moon project activities which would affect black-throated blue warbler habitat include timber harvest, especially harvest which would reduce mature forest patch size or contribute to habitat fragmentation (Casson 2002). Clearcuts and shelterwoods are more likely to favor competitors of the black-throated blue warbler than are thinnings or individual/group tree selection harvest methods, due to the size of opening created in the forest canopy.

Effects of Action:

Direct and Indirect Effects:

Timber harvest within suitable habitat may affect habitat opportunities for black-throated blue warblers within the Moon project area, particularly through a reduction in the amount of mature or older forest.

Alternative A would cause no direct or indirect adverse effects to this species.

The spatial analysis earlier in this BE indicates that all alternatives would improve the acreage of mature forest in large patches. This would improve the suitability of this habitat and benefit the black-throated blue warbler.

Analysis of Management Indicator Habitats (MIHs) (Table BE-3) shows that Alternative A would create no young forest habitat favored by competitor species and would not change amounts of mature or old growth habitat favored by this species.

Alternatives B and C would cause the same indirect effects by creating the same negative trends (369 acres) away from Forest-wide MIH objectives for the 0-9 forest age class.

The action alternative are the same in the negative trends of mature and old/old growth forest that they affect at 27 acres.

Cumulative Effects:

The area for cumulative effects analysis is project-wide during the next 15 years of Forest Plan implementation.

The programmatic BE for the 2004 Forest Plan states that the black-throated blue warbler has “extraordinary habitat requirements that are difficult to maintain given today’s human population and land uses” (USDA FS 2004d, p. 110). Providing habitat for black-throated blue warbler in Minnesota is going to rely heavily on National Forest lands.

Cass County and the State of Minnesota are planning harvests in scattered blocks in mature upland forest within the Moon project area. These ownerships have a smaller percentage of mature/older forest that serves as habitat for this species.

It is likely that there will be continued private lakeshore and small woodlot development within this project area.

Forest Service timber harvests that reduce the amount of mature/older upland forest habitat or that create young upland forest habitat for competing species are likely to be the primary cause of adverse cumulative effects in the project area.

Alternative A

Amounts of mature or older upland forest across the Moon project area would be additionally increased over that predicted in the analysis of direct effects to large mature/older upland forest patches in the next 15 years. As forest cover ages, some forest would contribute to large mature forest patches. Linkages would be developed between existing smaller mature patches to create increasingly larger patches than outlined in Table BE-6.

Additions such as this would help to counter expected decreases in amounts and distribution of mature forest on other ownerships, or the loss of forest land due to development on private land. These effects are outlined in the Final EIS for the Forest Plan in Chapter 3.3.2.

Alternatives B and C

In combination with other ongoing or expected management actions on other ownerships or areas of the Chippewa, over the course of Forest Plan implementation (the next 15 years) these alternatives causes the same decrease of mature/older forest habitat and the same increase of young forest habitat for this species' competitors. The cumulative adverse effects would be the same and similar to the indirect effects outlined earlier.

Determination of effects: Alternative A would have beneficial effects to black-throated blue warblers or their habitats. Alternatives B and C may impact individual black-throated blue warblers or their habitats, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.

The action alternatives are the same in how they affect this species and its habitat.

Black-backed Woodpecker (*Picoides arcticus*)

Species Status:

The black-backed woodpecker is a secretive and rare North American woodpecker. This is a species of the northern conifer forests. Though it appears to be widespread, it is confined primarily to mature, fire regulated, boreal and coniferous forest with decadent trees, snags and fallen logs. This woodpecker feeds on wood-boring insect larvae in dead/dying conifer trees. Even in preferred habitats, they are considered uncommon to

rare except when populations irrupt in response to out-breaks of wood-boring insects due to fires, flooding, and other disturbances which cause these kinds of insect infestations. This species has a wandering habit, so the total amount of available dead and dying conifer is likely more important than the configuration upon the landscape. According to the Nature Conservancy Species Status Sheet (1999), the black-backed woodpecker most frequently inhabits coniferous forest, especially blowdowns and burned areas with standing dead trees; less frequently in mixed forest; and rarely, in winter, in deciduous woodland.

Environmental baseline:

This woodpecker is a permanent resident in the conifer forests of northeastern and north-central Minnesota. It is very rare on the CNF. Ninety five (95) observations of this species have been recorded on the Chippewa. Six (6) have been recorded in the Moon Project Area.

Suitable habitat conditions for “normal” population levels are present in three situations. These are: 1) mature and older (decadent) jack pine (forest type 01), red pine (02), white pine (03), balsam fir (11), white spruce (16), lowland conifers (12, 15, 18), and white cedar (14, 19), where the amount of natural mortality occurring within the stand provides suitable foraging substrate and prey availability; 2) flooded conifer forests, where abundant amounts of dead and near-dead trees provide a temporary (up to five years) source of available foraging and nesting habitat; and 3) localized endemic wood-boring insect infestations occurring at the site level caused by disease, windthrow, flooding, other insect outbreaks, fire, etc.

Habitat conditions which provide for “irrupted” population levels are related to larger scale (10s - 1000s of acres) disturbances including fire, disease, wind events, flooding, and insect infestations such as spruce budworm outbreaks. During these events, populations of black-backed woodpeckers tend to increase because of the increase in wood-boring beetle larvae. (NRRI 2001; Murphy and Lenhausen 1998; USFS 2001b; Yunick 1985).

Suitable black-backed woodpecker habitat occurs in the project area.

Effects of Action:

Three indicators were examined to assess effects resulting from the alternatives in the Moon EA. Amounts of mature/older upland conifer forest were examined. This indicator does a good job of highlighting differences between existing condition and the alternatives in one of the primary forest communities affected by the Moon project and utilized by this species. The amounts of upland conifer forest regeneration and conifer forest thinning between alternatives are the second and third indicators examined. These indicators do a good job of showing the level of indirect effects to the species in the project area by the alternatives.

Direct and Indirect Effects:

Direct effects to this species are not known. Breeding territories and foraging use of forest habitat change annually. Table BBWP -1 display the indicators of indirect effects to this species.

Table BBWP-1: Acres of black-backed woodpecker habitat by indicator, projected to year 2015, National Forest ownership, Moon Project Area.				
Habitat component	Existing	Alt. A	Alt. B	Alt.C
Upland Conifer (MIH5, mature/older)	1487	1832	1796	1796
Acres of regeneration harvest in upland conifer	0	0	36	36
Acres of intermediate harvest harvest in upland conifer	0	0	548	1163

Alternative C has the greatest potential to adversely affect the black-backed woodpecker. This alternative would thin the greatest amount of upland conifer forest. Though thinning occurs primarily in red pine plantation, pine and other species in these stands serve as foraging and nesting habitat for this species. Harvest operations routinely remove trees with poor growth form or that are diseased. These trees often provide habitat where it may otherwise be sparse. Of the action alternatives, Alternative B would cause the least amount of indirect effects.

Alternative A would be beneficial to the black-backed woodpecker by providing more mature/old upland conifer forest and by not altering the within stand structure of conifer stands through thinning or regeneration harvest.

Cumulative Effects:

The cumulative effects are expected to be the same as the indirect effects for this species.

Determination of effects: Alternative A would have beneficial effects to black-backed woodpecker and its habitat. Alternatives B and C may impact individual black-throated blue warblers or their habitats, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.

Alternative C would have the greatest impacts to the black-backed woodpecker and its habitat. Alternative B would have the least impact among action alternatives.

Mesic Northern Hardwoods Sensitive Plants Guild

The following five species are evaluated as a guild, due to similarities in habitat requirements: blunt-lobed grapefern, goblin fern, one-flowered broomrape, Goldie's wood fern, and lanceleaf grapefern. All of these species are associated with mesic northern hardwood forests. Species information is based on USFS 2004a, USFS 1999b, USFS 1999c, USFS 1999d, and USFS 1999e.

Species Status: The table below provides a summary of habitat associations, life history, and risk factors associated with each species.

Table MNH-1. Summary of Mesic Northern Hardwoods Sensitive Plants Guild, Moon project area.						
Common name <i>Scientific name</i>	# sites known on Chip	# sites known in Moon project area	Habitat indicators	Life History/Habitat Summary	Risk factors	Specific Forest Plan Protections
Blunt-lobed grapefern <i>Botrychium oneidense</i>	5	1	Upland northern hardwoods and black ash: mature, old, older	Perennial fern; fluctuating woodland pools in maple basswood	Logging and associated activities, road building, other management activities	Forest Plan guideline G-TM-6 leaving a buffer around vernal ponds in northern hardwoods G-WL-11: avoid or minimize negative impacts to known occurrences of sensitive species
Goblin fern <i>Botrychium mormo</i>	152	8	Upland northern hardwoods, Quaking aspen, Paper birch: mature, old, older	Perennial fern; mesic deciduous forest with thick leaf layer, open understory. Very narrow global distribution, only northern MN, WI, MI. Half of range-wide occurrences are on the Chippewa; these are being invaded by earthworms.	Logging and associated activities, road building, other management activities	Forest Plan Standard S-WL-7 protects known sites and high quality habitats G-WL-11: avoid or minimize negative impacts to known occurrences of sensitive species
One-flowered broomrape <i>Orobanche uniflora</i>	1	0	Upland northern hardwoods and oaks: all	Perennial herb, a root parasite on forest trees and herbs; transition zone between northern hardwood forest and white cedar swamp. Single known site on Chip is disjunct from the statewide range in southern MN.	Logging and associated activities, road building, other management activities	G-WL-11: avoid or minimize negative impacts to known occurrences of sensitive species
Goldie's wood fern <i>Dryopteris goldiana</i>	8	0	Upland northern hardwoods: old, older	Maple-basswood forest. Currently known only within 0.4 miles of very large lakes, apparently due to climatic influence of large water bodies.	Logging and associated activities, road building,	G-WL-11: avoid or minimize negative impacts to known occurrences of sensitive species
Lanceleaf grapefern	43	9	Northern	Perennial fern; mesic	Logging and	G-WL-11: avoid

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<i>Botrychium lanceolatum</i> var. <i>angustisegmentum</i>			hardwoods, aspen, generally greater than 40 yrs old	deciduous forest with thick leaf layer, open understory. Rare at the western edge of its Great Lakes range, and is reported as extremely rare in Minnesota (USFS 2001a, p. 5); sporophytes fluctuate and individual plants may not appear every year	associated activities, road building, other management activities	or minimize negative impacts to known occurrences of sensitive species
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Environmental Baseline:

Suitable habitat within the Moon project area which is proposed for project activities was surveyed for the presence of these species. Any new additions found during this effort are included in occurrence numbers in the table above.

Sensitive plants are generally habitat specialists. The distribution and abundance of their suitable habitats has declined since historical times. The Mesic Northern Hardwoods Sensitive Species Plant Guild (MNH Guild) contains species that are currently and historically associated with northern hardwoods, and micro-sites within these forest communities. Timber harvest range-wide, and on the Chippewa, has resulted in younger, more even-aged, fragmented northern hardwoods forests that occupy a smaller portion of the landscape. Consequently, suitable ecological conditions for these plants are frequently isolated, and the plants generally occur at very low abundance. There are limited, if any, opportunities for sub-populations of these plants to interact. Although some sub-populations may be self-sustaining, there is a strong potential for extirpations to occur, with little likelihood of re-colonization of such patches. (USDA FS 2004c)

Proposed Moon project activities which would affect the environment of MNH Guild species include timber harvest, road/trail construction, and site preparation. Timber harvest can cause impacts to plant habitats from ground disturbance associated with logging, and with associated activities, such as construction of landings, skidding, site prep, and potential erosion/sedimentation and soil compaction. Timber harvest can alter forest over-story composition and structure, and result in changes to light conditions on the forest floor, which can result in a direct reduction in habitat suitability, or can allow competing species to flourish.

Construction of temporary roads can cause similar direct effects as timber harvest, and can also be an instrument in facilitating dispersal of non-native invasive species. These can include competing plant species (e.g. garlic mustard), or, of particular concern for the MNH Guild is the spread of non-native earthworms. There are documented negative impacts of earthworm invasions on species such as the goblin fern. Goblin fern occurrences on the Chippewa are being invaded by non-native earthworms, as are goblin fern occurrences in most other parts of the species range (USDA FS 2004c, p. 52).

Effects of Action:

The table below provides estimated amounts of habitat within the Moon project area which may be capable of supporting MNH guild species, by Alternative.

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Table MNH-2. Moon Project Area MNH Guild Habitat Indicators (projected to year 2015).				
Species	Habitat Indicator	Acres in Moon Project Area		
		Alt. A	Alt. B	Alt. C
Blunt-lobed grapefern	Upland northern hardwoods, black ash: mature, old, older	8601	8326	8326
Goblin fern	Upland northern hardwoods, quaking aspen, paper birch (MIH 3, 4): mature, old, older	12,026	10,535	10,535
One-flowered broomrape	Upland northern hardwoods and oaks (MIH 3): all	7763	8109	8109
Goldie's wood fern	Upland northern hardwoods (MIH 3): old, older	137	137	137
Lanceleaf grapefern	Upland northern hardwoods, quaking aspen, paper birch (MIH 3, 4): mature, old, older	12,026	10,535	10,535

Direct effects:

One known occurrence of the goblin fern is found in suitable habitat beyond the 250 feet zone of a proposed coppice cut in Alternatives B and C. The following mitigation is recommended to meet Standard S-WL-7 in the Forest Plan:

WL7: In the NW finger of stand 158/20, ensure that harvest or mechanical activity occurs on frozen ground conditions, and retains at least 70% canopy closure in order to meet Standard S-WL-7 (b and c).

Table MNH-4. Moon management stand where mitigation WL-7 applies.			
Compartment	Stand	Alternative B harvest	Alternative C harvest
158	20	coppice	coppice

Forest Plan standard S-WL-7 dictates the following management direction around known goblin fern colonies (occupied habitat) and unoccupied moderate to high quality habitat:

S-WL-7

- a. Activities that could disturb goblin ferns, their habitat, or microhabitat should not occur within 250 feet of known goblin fern populations.
- b. In suitable habitat that is immediately adjacent and contiguous to existing populations beyond the 250-foot no-activity zone, site disturbing activities should occur only during frozen ground conditions (as evidenced by an absence of rutting, compaction, or breaking through the frost layer), and a minimum canopy closure of 70% should be maintained.
- c. Minimize the likelihood of worm invasion in existing or potential habitat areas identified as having low potential for worm invasion.
- d. In unoccupied habitat, not contiguous to occupied habitat, of moderate or high quality (generally defined as mature or older northern hardwoods, mixed hardwoods on Mesic Northern Hardwood or Rich Hardwood Native Plant Communities; on sites currently free of exotic worm populations): In order to avoid light level changes that result in soil temperature increases, humidity and soil moisture decreases, management activities will maintain a minimum of 70% crown closure on average at the stand level.

Mitigation measures are listed in Appendix B of the Moon EA.

For the blunt-lobed grapefern, the lance-leafed grapefern, one-flowered broomrape, and Goldie's wood fern there are no direct effects as a result of any of the alternatives.

Indirect effects: Changes in forest cover type and age due to timber harvest may affect long-term opportunities for the MNH guild plants across the Moon project area landscape. Table MNH-2 shows changes in suitable species habitat by alternative as expressed by amounts of single MIHs or combinations of MIHs following project implementation.

Decreases in acres of habitat for the goblin fern, the lanceleaf grapefern, and blunt-lobed grapefern are a result of even-aged harvest in mature or older northern hardwood and aspen/paper birch forest. For these species, this decreases the amounts and suitability of habitat over the long term. Alternatives B and C are the same in how their indirect effects to this guild of species. Alternatives B and C would maintain about 1490 fewer acres of potential habitat for this guild of species. Alternative A would cause no indirect impacts and would do the best job of conserving MNH guild species.

Aspen stands on hardwood landtype phases develop into hardwood stands through aging and succession. Range-wide, emphasis on aspen regeneration on forest lands has caused conflicts with northern hardwood species' habitat, including goblin fern colonies, due to short rotations, conversion to aspen, and biases in timber typing which tend to favor aspen (Berlin et al. 1998, p. 61). Even-aged regeneration harvest of aspen sites which have the potential to support northern hardwoods perpetuates the current predominance

of aspen across the Chippewa's landscape, and reduces the potential for goblin ferns to occur. The action alternatives are the same in how they affect aspen stands.

Both action alternatives propose construction the same amount of temporary road. Temporary roads can be a concern for potential transport of earthworms between infested sites or introduction of non-native invasive plants (e.g. garlic mustard). This risk would be the same between action alternatives.

Cumulative effects: Recent past Forest Service projects in the Moon project area include the Walker Conifer Thin project (2004). Older projects were implemented under the 1986 Forest Plan and helped to create the forest vegetation patterns that affect the Moon project today. These projects emphasized aspen management, some on sites that would support MNH guild species or habitat. There are no additional Forest Service plans for timber harvest in MNH guild habitat within the Moon project area. The State of MN and Cass County have harvests planned in areas within the project proximate to known MNH plant guild sites.

Timber harvest range-wide, and on the Chippewa, has resulted in younger, more even-aged fragmented northern hardwood forests that occupy a smaller portion of the landscape. The 2004 Chippewa Forest Plan sets a new course for forest management on the Chippewa, moving towards older northern hardwoods managed through uneven-aged harvest techniques, with larger patch sizes as a goal. To the extent that the Moon project falls within this framework, by following LE vegetation objectives, large, mature upland patch objectives, and recognizing MNH guild species where they occur, Alternatives B and C would cumulatively contribute to meeting most of these objectives. Alternative A would cumulatively best meet these combined objectives in the context of losses of habitat on other public and private ownerships.

Determination of effects:

Alternative A would have a beneficial impact on MNH guild plant species or their habitats. Alternatives B and C may impact individual MNH guild plant species or their habitats, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.

The action alternatives are the same in their potential to negatively affect MNH guild plant species' habitats.

Upland Disturbed Sensitive Plants Guild

The following three species are evaluated as a guild, due to similarities in habitat requirements: pale moonwort, least moonwort, and ternate grapefern. All of these species are associated with upland disturbed, barrens, or early successional forest habitats. These species will be collectively referred to as "Upland Disturbed Sensitive Plants Guild (UD Guild)". Species information is based on USFS 2004a.

Species Status: The table below provides a summary of habitat associations, life history, and risk factors associated with each species.

Table UD-1. Summary of Upland Disturbed Sensitive Plants Guild for the Moon project area.				
Common name <i>Scientific name</i>	# known sites on Chip.	# known sites in the Moon area	Life History/Habitat Summary	Risk factors
Pale moonwort <i>Botrychium pallidum</i>	31	4	Perennial fern; open, disturbed habitats, log landings, roadsides, dunes, sandy gravel pits	Logging and associated activities, road building, succession, fire
Ternate grapefern <i>Botrychium rugulosum</i>	21	1	Perennial fern; dry areas with short grasses, bracken, sweet fern, jack and red pine, aspen/fir, open areas within these types. Margins of ephemeral pools in pines, spruce, birch/aspen. pH near neutral.	Logging and associated activities, road building, succession, fire
Least moonwort <i>Botrychium simplex</i>	34	1	Perennial fern; generally open habitats, such as old log landings, roadside ditch, trails, open fields, base of cliff, railroad ROW.	Logging and associated activities, road building, succession, fire

Environmental Baseline:

Table UD-1 outlines the number of known occurrences for the species in this guild. Suitable habitat within the Moon area which is proposed for project activities was surveyed for the presence of these species.

The UD Guild contains species that are currently found in habitats which experienced some heavy ground disturbance (e.g. pipe line, roadside ditch, old log landing, old building sites, old roads, old field, edges of trails, and gravel pits) in the past, but which are currently dominated by graminoids and forbs. Few are known from sites that originated from a natural disturbance (e.g. wildfire, windthrow). However, some are found in forested habitats. (USDA FS 2004c)

Historical natural disturbances such as wildfire and windthrow created early successional forest habitat in a variety of patch sizes. Early successional forest habitat on the current landscape is dominated by patches of human origin that are on average smaller than historical patches. Historically, disturbance and succession created a mosaic of suitable habitat for this suite of plants that shifted across the landscape. Today, early successional habitat still shifts across the landscape, but more early successional habitat is maintained in that state through repeated disturbance of, for example, roadside ditches or log landings. Current ecological conditions differ from historic in that disturbance regimes

and patch sizes have changed. In addition, suitable forested habitat is being impacted by exotic earthworms. (USDA FS 2004c). Because the current populations of UD Guild plants occur in limited abundance and disjunct locations, disturbances could impact populations of these plants.

Proposed Moon project activities that would affect the environment of UD Guild plants include timber harvest and associated activities (e.g. site preparation, reforestation) and maintenance of forest openings. Timber harvest can cause impacts to plant habitat from ground disturbance associated with logging, and with associated activities, such as construction of landings, skidding, site preparation, and potential erosion/sedimentation and soil compaction. Reforestation can cause changes to local conditions around plants through changes in light regimes. Maintenance activities in forest openings would have effects that range from being similar to those of harvest and site preparation to having virtually no effect. Road building can allow competing non-native invasive species to come into an area, or to have a competitive advantage within sites where they occur. (USDA FS 2004c)

Effects of Action:

Direct effects:

No occurrences of these species occur within activity stands of either action alternative. No direct effects are anticipated.

Indirect effects: Because UD Guild plants are associated with previous disturbance, it is not anticipated that activities within potential plant habitats will necessarily result in a negative impact due to disturbance per se, particularly over the long-term, provided that existing colonies are not directly affected. The exception may be activities such as road building, which provide opportunities for invasion, or competitive advantage, of non-native invasive species (such as exotic earthworms). Both action alternatives propose the same amounts of forest opening maintenance (93 acres) and of temporary roads (1.2 miles), and would have about equal impact on these species.

Cumulative effects: Cumulative effects to UD guild habitat would be similar as described for direct and indirect effects.

Determination of effects:

Alternative A would have no impact to UD guild plant species or their habitats. Alternatives B and C may impact individual UD guild plant species or their habitats, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.

Canada yew (*Taxus canadensis*)

Species Status: The range wide habitat for this species is described as understory shrub in rich forests (deciduous, mixed, or coniferous), bogs, swamps, gorges, ravine slopes, and rocky banks. This species is uncommon on the Chippewa, but found in several different upland and lowland habitats, including cedar swamp, northern hardwoods, mixed conifer swamps, and lowland hardwood communities (USFS 2001 p. 32). It has also been found in mesic sites within upland pine communities (J. Cable, pers. comm. 2005).

A species of the eastern U.S. and Canada, Canada yew currently occupies its apparent entire historic range, but in scattered patches that amount to less than 1% of the total land base. The patches are apparently random, small, long-lived, and rare. Adjacent or nearby habitats are usually undisturbed with minimum edge. Decreased forest edges, as found in the original forests of the Great Lakes states, favors the existence of Canada yew. (USFS 1999).

This species is found throughout Wisconsin, the upper and lower peninsulas of Michigan, and the eastern half of Minnesota. It does not occur in early or mid-seral communities. It is most common in the relatively stable conditions of old growth or climax forests. From this it can be deduced that Canada yew is commonly found in vegetation which exhibits some semblance of old growth vertical structure, with its mature trees, uneven aged species, infrequent canopy gaps, coarse woody debris, and snags. (USFS 1999).

The Regional Forester's Sensitive Species Risk Evaluation for Canada yew (USFS 2000) indicates Canada yew abundance and population viability on the Chippewa National Forest are at risk of over browsing by white-tailed deer, and many of the habitats of yew are vulnerable to logging, road building, and other forest management activities.

Canada yew will decline under browsing by white-tailed deer and moose, does not fare well after intense fire, will compete poorly under the shade of dense balsam fir, and is absent where Eastern hemlock cover is heavy (although Eastern hemlock is its most common plant associate). It will not thrive in exposed light conditions such as those created by more intense logging. Increased forest edge is linked with the species' decline. High white-tailed deer populations in northern areas, due to habitat conditions fostered by timber harvest, have resulted in more browsing of Canada yew (USFS 1999).

Environmental Baseline:

Timber harvest, wildfires that occurred after logging in the late 19th and early 20th Centuries, drainage, and road building have caused shifts in the acreage and age class structure of different forest types that constitute habitat for Canada yew on the Chippewa National Forest. These changes in forest cover have resulted in less lowland habitat and younger upland forest habitat than is optimal for this species. Historic high deer populations accompanying changes to forest vegetation have decreased the suitability of ecological conditions for this shrub. (USDA FS 2004c pp. 57-58).

Project surveys were conducted in the Moon project area in suitable habitat, in forest stands which were proposed for project activities. Additionally, other surveys and field

work identified Canada yew sites within the project area. Four (4) Canada yew sites are known to occur within the project area.

Proposed Moon project activities which would affect the environment of the Canada yew include timber harvest, site preparation, and reforestation. These activities can affect Canada yew if they create adverse exposed light conditions, burn up yew plants or the substrate supporting them, or increase deer browsing pressure. They can also affect long-term habitat potential for yew across the landscape, through their affect on forest type and age.

Effects of Action:

Direct Effects: Adverse direct effects are expected at one Canada yew site in Alternatives B and C due to timber harvest. The following measure would mitigate direct effects:

WL-4 Where intermediate timber harvest methods are used (i.e. thinning, group selection, single tree selection methods) or where at least 50% canopy closure would be maintained, protect an occurrence of an RFSS plant species with a 120 foot (2 chain) no activity buffer.

These mitigations apply to the following site and activity:

Table Taxus-1. Moon management stand where mitigation WL-4 applies.						
District	Compartment	Stand	Proximity to rare plant occurrence	Rare plant species	Proposed Activity – Alternative B	Proposed Activity – Alternative C
5	136	47	in stand	<i>Taxus canadensis</i>	Single Tree Selection	Single Tree Selection

Indirect Effects: Changes in forest cover type and age may affect long-term opportunities for Canada yew across the Moon project area landscape. Examining the MIH indicators (Tables Yew-1 and 2), Alternative B and C are the same in the adverse changes to this species most suitable habitat. This would occur on 27 acres of old/old growth aspen/birch forest on the BHC LE.

Perhaps the most significant indirect effect is the maintenance or increase of amounts of deer habitat within the project area resulting from even-aged harvest, specifically clearcutting and coppice harvests. The action alternatives are the same in this effect. Very high deer populations may adversely affect Canada yew occurrences.

The spatial analysis presented elsewhere in this BE and in Chapter 3 in the EA, indicates the action alternatives do not greatly affect large mature/older forest patches. The

alternatives are the same in how they affect forest interior habitat. Decreased forest edge, and greater amounts of forest interior, favors the existence of Canada yew.

Table Yew-1. Negative trends of mature forest MIH objectives resulting from the Alternatives proposed in the Moon EA.

LE	Objective			
		Alt. A	Alt. B	Alt. C
	none have negative trends	0	0	0
	Total acre departure from objectives	0	0	0

Table Yew-2. Negative trends of old/old growth forest MIH objectives resulting from the Alternatives proposed in the Moon EA.

LE	Objective			
		Alt. A	Alt. B	Alt. C
BHC	MIH 4: Aspen-Birch: maintain	0	27	27
	Total acre departure from objectives	0	27	27

Cumulative effects: High deer densities on the Chippewa are supported by prevalent vegetative conditions occurring across the landscape as seen on multiple land ownerships. It is anticipated that the Moon project area will continue to contribute to current deer populations, and continued high deer browsing pressure on Canada yew.

The BE for the Chippewa Forest Plan Environmental Impact Statement (EIS) (USDA FS 2004c, p. 58-59) assumes that with respect to cumulative effects, different forest owners across the landscape within each ecological section would cooperate to meet landscape-wide vegetation goals, thereby minimizing cumulative impacts to ecological conditions for species such as Canada yew. Further, it is predicated on the assumption that “standards for sensitive plants would protect this species from direct threats of management activities”. Both of these aspects can be analyzed through compliance with the following applicable Forest Plan guidance (USDA FS 2004a, p. 2-28), designed to ensure the conservation of Canada yew, as presented below:

Forest Plan Guidance	Compliance Met? By Alternative	Comments
O-WL-17 Maintain, protect or improve habitat for all sensitive species ... including at the (1)landscape level, and (2) site level	All alternatives minimally meet at landscape level. All alternatives meet at site level.	Action alternatives do a good job of maintaining appropriate amounts of mature/older forest in the project area.

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by managing specifically for high quality potential habitat or known locations of sensitive species		
G-WL-11 Avoid or minimize negative impacts to known occurrences of sensitive species	Yes, all Alternatives	Mitigation WL4 would be applied at one site.
S-WL-5 If negative impacts to sensitive species cannot be avoided, management activities must not result in loss of species viability forest-wide or create significant trend toward federal listing	Yes, all Alternatives	

Determination of effects:

Alternative A would be beneficial to Canada yew or its habitat. Alternatives B and C may impact individual Canada yew or its habitat, but will not contribute to a trend towards federal listing or loss of viability to the population or species.

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