United States Department of the Interior

FISH AND WILDLIFE SERVICE
Twin Cities Field Office
4101 American Blvd E.
Bloomington, Minnesota 55425-1665

September 16, 2011

Mr. Jim Sanders
Forest Supervisors
Minnesota National Forests
8901 Grand Ave. Place
Duluth, MN 55808-1122

Dear Mr. Sanders:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion and is based on our review of the biological assessment (BA) for the revised Land and Resource Management Plan (Forest Plan) for the Superior National Forest and its effects on the gray wolf (*Canis lupus*), gray wolf critical habitat, Canada lynx (*Lynx canadensis*) and Canada lynx critical habitat in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C., 1531 et seq.). The April 29, 2011, letter from the U.S. Forest Service (Forest Service) requesting formal consultation on the Revised Forest Plan was received in our office on May 5, 2011. This letter included a Biological Assessment dated April 21, 2011. On May 18, 2011, our office received a Biological Assessment with some revisions, dated May 17, 2011. A few typographical errors were corrected which did not affect the analyses or discussion; the corrected Biological Assessment was transmitted to the Service on June 9, 2011. A complete administrative record of this consultation is on file in this office.

Consultation History

In 2000, the Service completed a national biological opinion on the effects of the National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans on the Canada lynx (USFWS 2000). That consultation evaluated, in part, the effects of the current Chippewa and Superior National Forest Plans on Canada lynx. One or both of the Forest Plans were found to lack direction in each of the following categories: prohibitions to habitat conversion, integration of lynx habitat into thinning projects, suppression of fire to maintain or improve habitat, mitigation of effects of developed and winter recreation, protection against mineral exploration, prevention of barriers to connectivity, coordination of issues with neighboring units and agencies, and direction to monitor lynx and hare populations. The biological opinion concluded that the current Forest Plans were not likely to jeopardize the continued existence of the lynx and recommended the measures outlined in the Lynx Conservation Assessment and Strategy (LCAS; US Forest Service 1999) be incorporated in future Forest Plan revisions to minimize adverse effects on lynx.

On July 24, 2003, the U.S. Department of Interior responded to the Superior and Chippewa National Forests' request for comments on the draft Environmental Impact Statement (EIS) and

Draft Revised Forest Plans. Within that response was a short discussion of the threatened eagle, lynx, and wolf, and the Forest Service was encouraged to incorporate elements of the Recovery Plans for the eagle (USFWS 1983) and wolf (U.S. Fish and Wildlife Service 1992), as well as the LCAS, into the Forest Plans. As the Forest Service had determined that all alternatives may affect the three threatened species, further discussion of these species was to be accomplished via a biological assessment (BA).

The Twin Cities Field Office (TCFO) received a preliminary draft BA on all of the Revised Forest Plan alternatives from the Superior and Chippewa National Forests on July 29, 2003. Comments on the preliminary draft BA were provided to the Forest Service during meetings on August 12 and 13, 2003. Throughout the following months, the Forest Service and TCFO worked in coordination to develop Forest Plan language and monitoring guidance relevant to listed species. Subsequently, TCFO reviewed the draft BA on the selected alternative during April and May 2004 and provided comments to the Forest Service throughout that time. A request for concurrence with a not likely to adversely affect determination for the eagle and for gray wolf critical habitat, a request for formal consultation on the wolf and lynx, and a final BA were transmitted to the Service on June 7, 2004.

In a letter dated June 15, 2004, the Service concurred with your determination in the 2004 BA that the Revised Forest Plan is not likely to adversely affect the bald eagle or gray wolf critical habitat, and agreed to initiate consultation for the wolf and lynx. The concurrences for the bald eagle and gray wolf critical habitat were based on the consistency of the plans with the provisions set forth in the Northern States Bald Eagle Recovery Plan and the Eastern Timber Wolf Recovery Plan; direction to maintain and restore aquatic ecosystem composition; direction to maintain, protect, or improve habitat for endangered and threatened species and reduce or eliminate adverse effects on these species; and commitments to consult at the project level once site specific information is available to ensure adverse effects are addressed. Due to delisting, the bald eagle is no longer subject to Endangered Species Act, Section 7 consultation.

In addition to the concurrences for bald eagle and gray wolf critical habitat, the Service also issued a June 15, 2004 Biological Opinion for Canada lynx and Gray wolf. In that 2004 Biological Opinion, the Service concluded that the implementation of the revised Forest Plan would adversely affect, but would not jeopardize the continued existence of the Gray wolf or Canada lynx. The 2004 Biological Opinion included terms and conditions to reduce the anticipated take of these species.

The U.S. Fish and Wildlife Service announced a revised critical habitat designation for the Canada lynx, which was published in the Federal Register on February 25, 2009. The revised critical habitat rule became effective on March 27, 2009. This new designation triggered Section 7 consultation under the Endangered Species Act to assess the effects of Forest Plan implementation on lynx critical habitat. In addition, the Forest took this opportunity to update their Biological Assessment with current data and recent research relevant to lynx and wolves on the Superior National Forest, and to assess the effects of continued implementation of the Forest Plan on lynx, wolves and wolf critical habitat.

The Twin Cities Field Office (TCFO) received a BA dated April 21, 2011 from the Superior National Forest on May 5, 2011. A request for concurrence with a not likely to adversely affect determination for wolf critical habitat and lynx critical habitat, request for formal consultation on the wolf and lynx, and a draft BA were transmitted to the Service on April 29, 2011. A final BA dated May 17, 2011, was transmitted to the Service on May 18, 2011. A few typographical errors were corrected which did not affect the analyses or discussion; the corrected Biological Assessment was transmitted to the Service on June 9, 2011.

The following Biological Opinion builds upon, and for purposes of Superior National Forest operations revises and supplants, the 2004 Biological Opinion; the Chippewa National Forest contains no Canada lynx critical habitat, and thus was not subject to reinitiation of consultation. In drafting this new Biological Opinion, we have utilized information that the Forest Service provided in the 2004 and 2010 Biological Assessments, as well as supplemental information relevant to Canada lynx and Gray wolves. This supplemental information contains relevant research findings from reports and manuscripts published since the 2004 Biological Opinion was written, and includes information from the 2009 final rule designating lynx critical habitat.

Concurrence

The Service concurs that the continued implementation of the Forest Plan is not likely to adversely affect critical habitat for the gray wolf. We concur with this determination because although no primary constituent elements were identified when critical habitat was designated in 1978, the Eastern Timber Wolf Recovery Plan emphasizes the need for space (for growth and movement of packs), food, and cover sufficient to assure the survival of the species in these areas. The Recovery Plan encourages any activities that maintain or develop these factors in critical habitat, including maintenance of the forest products industry and activities that promote forest habitat management. Conversely, the Recovery Plan discourages any activities that permanently remove cover, including road construction and human developments. For the reasons outlined in the Biological Assessments of 2004 and 2011 and the Biological Opinion of 2004, and because the Revised Forest Plan continues forest management incorporating effective road closure methods and monitoring, and does not promote development, the continued implementation of the Forest Plan is not likely to adversely affect critical habitat for the gray wolf.

We also concur that the continued implementation of the Forest Plan is not likely to adversely affect critical habitat for the Canada lynx. In summary, our concurrence is based on the Forest Plan's compliance with provisions adapted from the Lynx Conservation Assessment and Strategy. Forest Plan direction was examined to determine if the direction, standards and guidelines adequately address each Primary Constituent Element (PCEs) of lynx critical habitat, which contains the physical and biological features that are essential to the conservation of the species. Detailed analyses of this concurrence are contained within the attached Biological Opinion.

The draft and final BAs, and discussions and email transmissions with Forest Service biologists form the basis for this biological opinion.

If you have any questions or comments on this biological opinion, please contact Ms. Tamara Smith, Fish and Wildlife Biologist, at 612-725-3548, ext 2219 or me at 612-725-3548, ext 2201.

Sincerely,

Tony Sullins
Field Supervisor

enclosure

BIOLOGICAL OPINION

Description of the Proposed Action

Proposed Action

The U.S. Forest Service (Forest Service) proposes to continue to manage Superior National Forest (Forest) as directed by the 2004 Forest Land and Resource Management Plan (Forest Plan) for the Superior National Forest (Forest). Under the National Forest Management Act, Forest Plans must be developed to guide all long-term natural resource management activities on National Forest System lands. They describe desired resource conditions, resource management practices, levels of resource production and management, the availability of suitable land for resource management, and monitoring and evaluation requirements for effective implementation. Forest Plans provide management direction for 10 – 15 years to ensure that ecosystems are capable of providing sustainable benefits to the public.

The goals of the Forest Plan for the Superior National Forest are protection and enhancement of resources, sustained vegetation management, and enhancement of social and economic benefits. The Forest Plan identifies desired conditions related to these goals that are broad statements specifying what the Forest Service will strive to achieve. Specific, measurable objectives are stepped down from these desired conditions. Finally, standards and guidelines provide the specific technical direction for managing resources. Standards are required limits to activities, while guidelines are preferred limits. Site-specific projects implement the Forest Plan and are developed to bring the Forest closer to the goals and desired conditions identified. However, the Forest Plan does not propose any site-specific projects; it is programmatic in scope and does not contain decisions to implement specific actions or projects. Therefore, this consultation is limited to the consideration of effects of the broader programmatic strategy. Since 2004, the U.S. Fish and Wildlife Service (Service) has actively consulted on actions and programs that were proposed, analyzed, and implemented under the Forest Plan; the Service expects future consultations to continue on such actions. Further, the biological opinion is generally narrowed in focus to those areas of the Forest outside the Boundary Waters Canoe Area Wilderness (BWCAW), though management direction developed by the Forest Service and analysis in the BA and in this biological opinion considered the contributions of the BWCAW.

This consultation is using a tiered consultation framework with the Forest Plan consultation resulting in a Tier I biological opinion and all subsequent projects implemented per the Forest Plan being Tier II consultations, with Tier II biological opinions issued as appropriate (i.e., whenever the proposed project will result in unavoidable adverse effects to listed species). This Tier I biological opinion evaluates the effects to threatened and endangered species at the Forest level based on the objectives and standards and guidelines that the Forest intends to follow in developing and implementing future projects. Tier II biological assessments (BAs) will be developed for future projects and, if necessary, Tier II biological opinions will be issued. The Tier II biological opinions will reference back to the Tier I biological opinion to ensure that the appropriate standards and guidelines are followed and the effects of the specific projects under consultation, taken together with all other Tier II projects, are commensurate with the effects

anticipated in the Tier I biological opinion. With each Tier II biological opinion, the cumulative total of incidental take exempted will be tracked.

In 2005, the Superior National Forest and the Service developed a streamlined consultation method for conducting project level consultations that are implemented under the Forest Plan, which tiers to the 2004 Forest Plan Biological Assessment and Biological Opinion. Standardized lynx analysis indicators were developed through this process. The indicators also serve as indicators for analysis of effects to lynx critical habitat because they address relevant Primary Constituent Elements (PCE) of lynx critical habitat, which are the physical and biological features that are essential to the conservation of the species.

The Forest Plan emphasizes providing sustainable amounts of timber, maintaining or enhancing biodiversity, contributing to economic and social needs of the community, and managing in an environmentally sound manner to produce goods and services that provide for long-term public benefits. Forest Plan activities assessed in this biological opinion are limited to those that are 1) directed or allowed and 2) proposed or probable. In many areas of the Forest, these activities include timber harvest, timber stand improvements, wildlife habitat management, road and trail construction and maintenance, construction and maintenance of dispersed recreation facilities and water accesses, hazardous fuels reduction, riparian and stream restoration, and habitat improvement. In other areas of the Forest, natural ecological processes will predominate.

The Forest Plan includes many objectives, standards, and guidelines for the protection of wolf and lynx and enhancement of their habitats, which are described in the BA (USDA 2011), as are the other objectives, standards, and guidelines that may affect listed species. Additionally, the Forest Plan includes information specific to analyses of project effects on lynx in Appendix E of the Forest Plan. While this appendix serves as guidance rather than management direction, it incorporates a number of the processes outlined in the Lynx Conservation Assessment and Strategy (LCAS) (U.S. Forest Service 1999). New information relative to lynx and wolf biology and management continues to be considered during project-level consultations, and is considered in this document.

Lynx Analysis Units (LAUs) were delineated on both Forests in 2000 as the smallest landscape scale on which to analyze effects to lynx. The boundaries have remained in place since that time to allow for long term analysis of project effects. However, the Superior National Forest Plan proposed several changes of current LAU boundaries, such as adding LAUs to the Virginia Management Unit of the Laurentian Ranger District; designating the BWCAW a lynx refugium (as defined in the LCAS) based on its large size (~1,000,000 acres), predominance of natural ecological processes, and security from human exploitation, habitat degradation, and substantial winter access; and refining boundaries of the LAUs that had overlapped into the BWCAW before its refugium designation. In doing so, two LAUs (44 and 46) were placed on highly developed land between areas of suitable lynx habitat. LAU 44 would be located in the narrow corridor of the Gunflint Trail between two portions of the BWCAW refugium, and LAU 46 would be delineated in the Virginia Management Unit in an area replete with campgrounds, subdivisions, mining lands, and other human developments. The primary purpose of these LAUs is to provide connectivity between areas of the BWCAW (LAU 44) and between two other LAUs (LAU 46). As such, and because lynx habitat within these LAUs is limited, in the Forest

Plan LAUs 44 and 46 were excepted from several of the standards and guidelines that apply to the rest of the LAUs on the Forest. Connectivity and travel habitat across these LAUs would be emphasized, and the amount of suitable foraging and denning habitat present would be deemphasized.

Although most of the designated lynx critical habitat is in an LAU, there are some areas outside of LAUs that have been designated as lynx critical habitat.

Included below, as presented in the Forest Plan, are the desired conditions, objectives, standards, and guidelines specific to threatened and endangered species and key relevant direction from recreational motor vehicles and the transportation system.

-Desired Conditions

Wildlife

D-WL-3. Aquatic and terrestrial wildlife habitats and species populations, while constantly changing due to both management activities and naturally occurring events, are present in amounts, quality, distributions, and patterns so that National Forest lands:

(a) provide representation of the full spectrum of habitats and conditions possible for ecosystem composition, structure, and function. Representation considers time frames, a variety of landscape scales, and current biological and physical communities and environments.
(b) maintain viable populations for all existing native and desired non-native species. (Viable populations are those with the estimated numbers and distributions of reproductive individuals to insure their continued existence is well distributed within their range in the planning area.)
(c) contribute to the conservation and recovery of federally-listed, proposed, or candidate threatened and endangered species and the habitats upon which these species depend.
(h) Provide structure, composition, connectivity, function, and spatial patterns of aquatic and terrestrial habitats that maintain or restore opportunities for species to interact, disperse, and migrate and to reduce negative impacts associated with forest habitat fragmentation.

D-WL-5. Roads and trails are managed to maintain native plants and animals, protect water quality, and to manage for compatible human uses and types of access.

D-WL-8. Fish populations are productive and support sustainable recreational, subsistence, and commercial fisheries while meeting the needs of fish-dependent threatened, endangered, or sensitive wildlife species.

-Objectives

Wildlife

O-WL-4. Maintain, protect, or improve habitat for all threatened and endangered species by emphasizing and working toward the goals and objectives of federal recovery plans and management direction in the Forest Plan.

O-WL-5. Seek opportunities to benefit threatened and endangered species by integrating habitat management objectives into plans for the full spectrum of management activities on National Forest System (NFS) land.

O-WL-6. Reduce or eliminate adverse effects on threatened and endangered species from the spectrum of management activities on NFS land.

O-WL-7. Minimize building or upgrading of roads in areas that are important for threatened and endangered species habitat and for habitat connectivity.

O-WL-8. Promote the conservation and recovery of Canada lynx and its habitat.

O-WL-9. In LAUs on NFS land, manage vegetation to retain, improve, or develop habitat characteristics suitable for snowshoe hare and other important alternate prey in sufficient amounts and distributions so that availability of prey is not limiting lynx recovery.

O-WL-10. In LAUs on NFS land, manage vegetation to provide for foraging habitat in proximity to denning habitat in amounts sufficient to provide for lynx.

O-WL-11. Maintain and, where necessary and feasible, restore sufficient habitat connectivity to reduce mortality related to roads and to allow lynx to disperse within and between LAUs and between LAUs and Boundary Waters Canoe Area Refugium on NFS land.

O-WL-12. Through partnerships with other agencies and landowners, participate in cooperative efforts to identify, map, and maintain or restore, where feasible, linkage areas that provide habitat connectivity sufficient to allow lynx to disperse between disjunct blocks of lynx habitat at larger landscape scales (for example, among National Forests in the Great Lakes region).

O-WL-13. Maintain or improve the natural competitive advantage of Canada lynx in deep snow conditions. Snow compacting activities (such as snowmobiling, snowshoeing, skiing, dogsledding) are planned and accommodated in areas best suited to the activity while maintaining large, interconnected areas of habitat with little or no snow-compacting, recreational activities.

O-WL-14. Through coordination with other agencies, participate in cooperative efforts to reduce, to the extent possible, the potential for lynx mortality related to highways and other roads within the proclamation boundary of the National Forest.

O-WL-15. In the Boundary Waters Canoe Area Wilderness Refugium lynx habitat conditions will predominantly result from natural ecological processes such as fire, wind, insects, disease, and vegetation community succession. However, some active management, with methods compatible with wilderness values, may be needed to restore or maintain desired vegetation characteristics. Lynx and its prey populations will fluctuate in response to changing environmental conditions.

O-WL-17. Promote the conservation and recovery of the gray wolf. Population goal minimum: contribution to statewide goal of 1251-1400.

Recreation

O-RMV-1 . A maximum of 90 additional all-terrain vehicle (ATV) trail miles and 130 Superior NF snowmobile trail miles with associated trail facilities (trailhead parking, signs, toilets, etc.) may be added to the designated National Forest Trail system.

Transportation System

O-TS-2. Few new OML 3, 4, 5 roads will be constructed.

O-TS-3. New roads built to access land for resource management will be primarily OML 1 or temporary and not intended for public motorized use. Temporary roads will be obliterated after their use is completed. All newly constructed OML 1 roads will be effectively closed to motorized road and recreational vehicles following their use unless they are needed for other management objectives.

O-TS-7. Unneeded roads will be decommissioned and closed to motorized vehicles. Roads that are not necessary for long-term resource management are considered "unneeded".

-Standards and Guidelines

Wildlife

S-WL-1. Management activities on NFS land shall not change more than 15% of lynx habitat on NFS land within an LAU to an unsuitable condition within a 10-year period.

S-WL-2. In LAUs on NFS land allow no net increase in groomed or designated over-the-snow trail routes unless the designation effectively consolidates use and improves lynx habitat through a net reduction of compacted snow areas.

S-WL-3. Management direction from the Wolf Recovery Plan (U.S. Fish and Wildlife Service 1992): *Road density standards:* The maximum road density standard for OML 3, 4, 5 in Zones 1 and 2 on the Superior would change from 0.9 to 1 mile per square mile.

S-WL-4. Management activities for the gray wolf will be governed by Recovery Plan for Eastern Timber Wolf (U.S. Fish and Wildlife Service 1992).

G-WL-1. Within LAUs on NFS land, moderate the timing, intensity, and extent of management activities, if necessary, to maintain required habitat components in lynx habitat, to reduce human influences on mortality risk and inter-specific competition, and to be responsive to current social and ecological constraints relevant to lynx habitat.

G-WL-2. Provide for the protection of known active den sites during denning season.

G-WL-3. Limit disturbance within each LAU on NFS land as follows: if more than 30% of the total lynx habitat (all ownerships) within an LAU is currently in unsuitable condition, no further reduction of suitable conditions should occur as a result of vegetation management activities by the National Forest. *LAUs 44 and 46 are excepted from this guideline.* (Refer to Lynx Appendix Section 5 in the Forest Plan for information on exceptions.)

G-WL-4. Within an LAU, maintain or promote well distributed denning habitat in patches generally larger than five acres, comprising at least 10% of lynx habitat. Where less than 10% of forested lynx habitat within an LAU provides denning habitat, defer those management actions on NFS land that would delay achievement of denning habitat structure. *LAUs 44 and 46 are excepted from this guideline.* (Refer to Lynx Appendix Section 5 in the Forest Plan for information on exceptions.)

G-WL-5. Following a disturbance on NFS land greater than 20 contiguous acres (such as a blowdown, fire, insect, or disease) that could contribute to lynx denning habitat, generally retain a minimum of 10% of the affected area on NFS land unless salvage or management-ignited fire is necessary to address human health and safety (such as in the Wildland Urban Interface) or scenic integrity.

G WL-6. Where a designated trail for snow-compacting activities is desired within LAUs, the proposed route should be planned to protect or improve the integrity of lynx habitat and minimize snow compaction in lynx habitat. The trail should be designed to:

- Move recreational use away from more sensitive or better quality lynx habitat,
- Concentrate use within existing developed areas rather than developing new recreational areas in lynx habitat, and/or
- Be located within the outer boundaries of a currently used road and trail system.

G-WL-7. For newly constructed snow-compacting trails, effectively close or restrict to public access those trails and OML 1, OML 2, temporary, and unclassified roads that intersect the new trails unless these trails or roads are being used for other management purposes.

G-WL-8. Within LAUs generally maintain road and snow-compacting trail densities below 2 miles per square mile to maintain the natural competitive advantage of lynx in deep snow. Where total road and regularly-used snow-compacting trail densities are greater than 2 miles per square mile and coincide with lynx habitat, prioritize roads for seasonal restrictions or reclamation in those areas, where practical or feasible. In this guideline "roads" include all ownerships of classified and unclassified roads and "regularly-used trails" are those that are used most years for most of the snow-season.

G-WL-9. Dirt and gravel roads that are under the jurisdiction of the National Forest and that traverse lynx habitat on NFS land (particularly those roads that could become highways) should generally not be paved or otherwise upgraded in a manner that is likely

to lead to significant increases to lynx mortality or substantially impedes movement and dispersal.

If the dirt and gravel roads described above are upgraded or paved in order to meet human health and safety or other environmental concerns and essential management needs, conduct a thorough analysis on effects to lynx and its habitat to determine minimum road design standards practical (including measures to minimize traffic speeds), to minimize or avoid foreseeably contributing to increases in human activity or adverse impacts to lynx and its habitat.

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

Recreation

S-RMV-1 . Motorized recreation use of designated trails is prohibited unless the trail is designated open for specific motorized uses such as for ATVs, OHMs, and snowmobiles.

S-RMV-3. Cross-country OHV travel is prohibited. Standards and guidelines for cross-country snowmobile use are described in Chapter 3 because direction for that use varies by Management Areas. *Summary from Chapter 3*: For most Management Areas: Cross-country snowmobile use is generally allowed unless prohibitions or restrictions are needed for resource protection to meet management objectives. *For Unique Biological, Research Natural, and Wilderness:* Cross-country snowmobile travel is prohibited.

G-RMV-4. RMV use will generally be allowed on existing unclassified, OML 1, and OML 2 roads. (Except ORVs will generally be prohibited on OML 1 roads.) Roads that are determined through site-specific analysis to have immitigable resource and social concerns and/or do not meet management objectives would be effectively closed (See exceptions for Management Areas: wild segments of Eligible Wild, Scenic, and Recreational Rivers, Semi-primitive Non-motorized Recreation, Research Natural Areas, Candidate Research Natural Areas, and Unique Biological Areas).

Transportation System

S-TS-3. As soon as access use is completed, stabilize temporary roads and effectively close them to motorized traffic. Vegetation will be established within 10 years after the termination of the contract, lease, or permit.

S-TS-4. Decommission unclassified roads that are not needed in the Forest road and trail system and special use permitted roads that are no longer needed. Decommissioning will make the road unusable by motorized vehicles and stabilize the roadbed.

G-TS-12. On existing OML 1 roads, an effective barrier will generally be installed as needed to prevent use by highway-licensed vehicles and ORVs. ATV and OHM use may continue to be allowed on some existing OML 1 roads.

G-TS-14. Temporary roads are generally not intended for public use, but public use may be temporarily allowed if needed to meet management objectives.

Monitoring and Evaluation

The Forest Plan also includes broad, strategic guidance for monitoring and evaluation in Chapter 4. Monitoring addresses the following questions for threatened and endangered species:

- To what extent is Forest management contributing to the conservation of threatened or endangered species and moving toward short-term (10-20 years) and long-term (100 years) objectives for their habitat conditions and population trends?

- To what extent is Forest management moving toward short term (10-20 years) and long term (100 years) objectives for habitat conditions for management indicator species and species associated with management indicator habitats?

- What are the population trends of management indicator species?

- To what extent are road and trail closures effective in prohibiting unauthorized motor vehicle use?

- To what extent is the Forest maintaining no net increase in groomed or designated over-the-snow trail routes unless the designation effectively consolidates use and improves lynx habitat through a net reduction of compacted snow areas?

This monitoring, along with any effectiveness or compliance monitoring associated with future consultations under the Forest Plan, should allow the Service and Forest to assess consistency with the Forest Plan and with this biological opinion. Unanticipated effects on wolf and lynx would likely be detected, and the success of conservation and recovery efforts could be evaluated and adjusted as needed.

Description of the Action Area

Regulations implementing section 7 of the Endangered Species Act (Act) define the action area as "all areas to be affected directly and indirectly by the proposed action." Species listed under the Act that are present in the Superior National Forest are: the gray wolf (*Canis lupus*) and the Canada lynx (*Lynx canadensis*). In addition, both the wolf and lynx have designated critical habitat within the Superior National Forest. The activities assessed in this biological opinion are limited to those that are 1) directed or allowed and 2) proposed or probable. These activities include timber sales, timber stand improvements, wildlife habitat management, road and trail construction and maintenance, construction and maintenance of dispersed recreation facilities and water accesses, hazardous fuels reduction, riparian and stream restoration, and habitat improvement. Physical effects of these projects include noise and habitat disruption. While direct and indirect effects will extend to private land inholdings within the Forest boundaries, all of these effects are expected to be contained within the proclamation boundaries of the Superior

National Forest, as shown in Figure 1. The Superior National Forest proclamation boundary encompasses approximately 3.9 million acres on all ownerships (U.S. Forest Service 2003). There is one other National Forest in Minnesota, the Chippewa National Forest (Figure 1), with no designated lynx critical habitat.

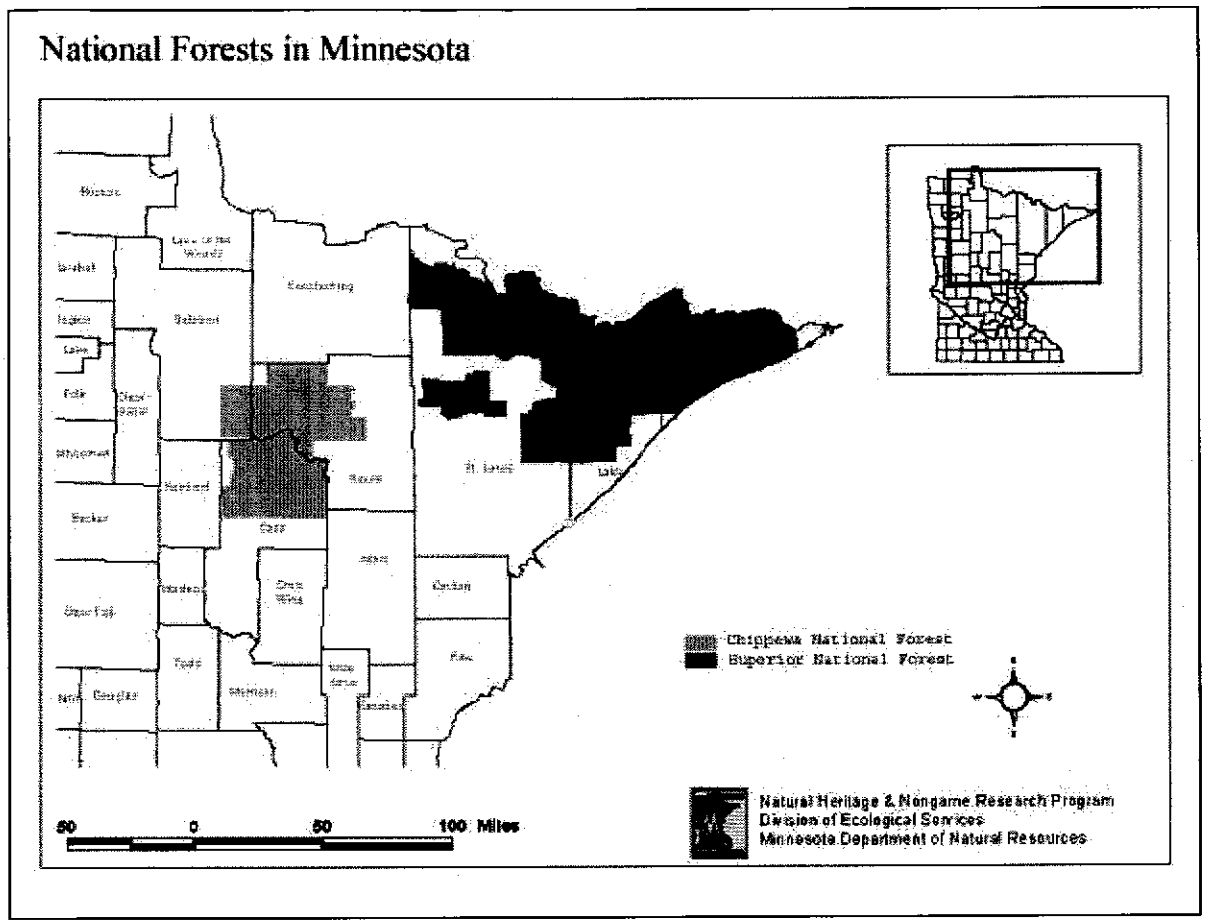

Figure 1. Location of the Chippewa and Superior National Forests in northern Minnesota.

PART I – GRAY WOLF (*Canis lupus*)

Status of the Species

Gray wolf populations in the United States are currently protected under the Act as a threatened species in Minnesota and endangered in the remaining 47 conterminous states and Mexico (50 CFR 17.11(h)). Within this broad area, there are separate regulations establishing non-essential experimental populations in the Northern Rocky Mountains and for the Mexican wolf (*C. lupus baileyi*) in Arizona and New Mexico (50 CFR 17.84(i), (k), and (n)). Since 2003, the status of the gray wolf under the Endangered Species Act has been subject to several regulatory changes and resulting litigation in numerous Federal Courts. The gray wolf remains a threatened species in Minnesota pursuant to the Endangered Species Act. On May 5, 2011, the Service published a

proposed rule to delist the Western Great Lakes DPS of the gray wolf (FRN 50 CFR Part 17 Vol 76 No 87 May 5, 2011).

The estimated population of wolves in Minnesota is 2,921, or 4.1 wolves per 100 km^2 (1.5 wolves per 100 mi^2) of occupied range, with a 90% confidence interval ranging from 2,192 wolves to 3,525 wolves (Erb 2008a). Wolves have an estimated occupied range of 27611 mi^2 (71,514 km^2) in Minnesota (Erb 2008a).

Species Description

Gray wolves are the largest wild members of the Canidae, or dog family, with adults ranging from 18 to 80 kilograms (kg) (40 to 175 pounds (lb)) depending upon sex and subspecies (Mech 1974). The average weight of male wolves in Wisconsin is 35 kg (77 lb) and ranges from 26 to 46 kg (57 to 102 lb), while females average 28 kg (62 lb) and range from 21 to 34 kg (46 to 75 lb) (Wisconsin Department of Natural Resources (WI DNR) 1999). Wolves' fur color is frequently a grizzled gray, but it can vary from pure white to coal black. Wolves may appear similar to coyotes (*Canis latrans*) and some domestic dog breeds (such as the German shepherd or Siberian husky) (*C. lupus familiaris*). Wolves' longer legs, larger feet, wider head and snout, and straight tail distinguish them from both coyotes and dogs.

The taxonomic status of the wolves in the western Great Lakes region has long been debated. Most recently, they have been considered as a mixed population of *Canus lupus, C. lycaon* (eastern wolf), and their intercrosses (e.g., Fain et al. 2010; Wheeldon et al. 2010). These varying interpretations of the taxonomic status of western Great Lakes wolves are summarized in the recently published proposed rule to delist the Western Great Lakes DPS of the gray wolf (FRN 50 CFR Part 17 Vol. 76 No. 87 May 5, 2011).

Life History

Wolves are primarily predators of medium and large mammals. Wild prey species in Minnesota include white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), beaver (*Castor canadensis*), and snowshoe hare (*Lepus americanus*), with small mammals, birds, and large invertebrates sometimes being taken (Mech 1974; Stebler 1944; Wisconsin Department of Natural Resources 1999). Wolves are habitat generalists that do not depend on the type, age, or structure of vegetation; instead, they are indirectly influenced by vegetative condition through the distribution of their primary prey species. In the Western Great Lakes, during the last 25 years, wolves have also killed domestic animals including horses (*Equus caballus*), cattle (*Bos taurus*), sheep (*Ovis aries*), goats (*Capra hircus*), llamas (*Lama glama*), pigs (*Sus scrofa*), geese (*Anser sp.*), ducks (*Anas sp.*), turkeys (*Meleagris gallopavo*), chickens (*Gallus sp.*), guinea fowl (*Numida meleagris*), pheasants (*Phasianus colchicus*), dogs, cats (*Felis catus*), and captive white-tailed deer (USDA - APHIS - Wildlife Services 2008, 2009; Wydeven 1998; Wydeven et al. 2001; Wydeven & Wiedenhoeft 1999, 2000, 2001, 2005).

Wolves are social animals, normally living in packs of 2 to 12 wolves. Pack size in Wisconsin averages 4.5 wolves per pack (Wydeven et al. 2006). In Minnesota, the average pack size ranges between 4.9 and 5.6, according to surveys conducted between 1988 and 2008 (Erb 2008b; Erb &

Benson 2004). Packs are primarily family groups consisting of a breeding pair, their pups from the current year, offspring from one or two previous years, and occasionally an unrelated wolf. Packs typically occupy, and defend from other packs and individual wolves, a territory of 20 to 214 square miles (mi^2) (50 to 550 square kilometers (km^2)). Midwest wolf packs tend to occupy territories on the lower end of this size range. Estimated sizes of individual wolf pack territories in the Michigan Upper Peninsula ranged from 22 mi^2 to 128 mi^2 (56–331 km^2) in 2003; and averaged 65 mi^2 (169 km^2) in 2004 (Huntzinger et al. 2005). Wisconsin territories averaged 37 mi^2 (96 km^2) in 2004– 05 (Wydeven & Wiedenhoeft 2005), and Minnesota territory size averaged 39 to 40 mi^2 (102 km^2) (Erb 2008a; Erb & Benson 2004). Normally, only the top ranking (''alpha'') male and female in each pack breed and produce pups. Litters are born from early April into May; they range from 1 to 11 pups, but generally include 4 to 6 pups (Michigan Department of Natural Resources 1997, 2008; U.S. Fish and Wildlife Service 1992). Normally a pack has a single litter annually, but the production of 2 or 3 litters in one year has been routinely documented in Yellowstone National Park (Smith et al. 2009; Smith et al. 2005). Yearling wolves frequently disperse from their natal packs, although some remain with their natal pack. Adult wolves and pups older than 5 months also may disperse but at much lower frequencies (Fuller 1989). Dispersers may range over large areas as lone animals after leaving their natal pack or they may locate suitable unoccupied habitat and a member of the opposite sex and begin their own pack. These dispersal movements allow a wolf population to quickly expand and colonize areas of suitable habitat that are nearby or even those that are isolated by a broad area of unsuitable habitat.

Wolf pack territory size in the Great Lakes region ranges from 42 to 100 square miles, but territories as large as 200 square miles have been reported (Fuller 1989). Recent surveys show that wolf territory size in Minnesota averages from 39 to 40 square miles (Erb 2008a; Erb & Benson 2004). Territories rarely overlap and are defended against other wolves (Peters and Mech 1975). Dispersal generally occurs between October and January when yearlings seek a mate and their own territory. Dispersal movements may be large in nature, covering upwards of 500 miles or more.

Wolves are sexually mature at 22 months but generally only the alpha pair breed (Mech 1970). The alpha pair normally inhibits sexual contact between other mature members. Breeding takes place from January through March, and gestation is 60-63 days. Pups (4-8) are born in early to mid-April (Fuller 1989). Pups remain at the den site for 6 to 8 weeks. Throughout the summer, wolves utilize 2-3 rendezvous sites (Fuller et al. 2003). In September, when the pups are large enough to travel with the pack, rendezvous sites are abandoned and the pack moves as a single unit.

Wolves are susceptible to disease, predation, human persecution, starvation, and accidents. Survival of pups in summer is difficult to estimate but has ranged from 0.48 to 0.89 (see summary in Fuller 1997)1. Survival of pups is likely related to prey biomass (Fuller 1989). Survival of yearlings and adults in the Great Lakes region has varied from 0.61 to 0.82 (Fuller 1989; Gogan et al. 2004; Wydeven et al. 1995).

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1 Fuller TK. 1997. *Guidelines for gray wolf management in the northern Great Lakes region.* Intl Wolf Center Pub No. IWC97-271. Available from the International Wolf Center, Ely, MN.

Disease such as canine parvovirus (CPV), mange, Lymes disease, canine distemper and blastomycosis have been observed in Minnesota wolves. Canine parvovirus (CPV) is a relatively new disease that infects wolves, domestic dogs, foxes, coyotes, skunks, and raccoons. CPV appeared in Minnesota wolves (based upon retrospective serologic evidence) live-trapped as early as 1977 (Mech et al. 1986), however, Minnesota wolves may have been exposed to the virus as early as 1973 (Mech & Goyal 1995). There is no evidence that CPV has caused a population decline or has had a significant impact on the recovery of the Minnesota wolf population. Mech and Goyal (1995), however, found that high CPV prevalence in the wolves of the Superior National Forest in Minnesota occurred during the same years in which wolf pup numbers were low. Because the wolf population did not decline during the study period, they concluded that CPV-caused pup mortality was compensatory, that is, it replaced deaths that would have occurred from other causes, especially starvation of pups. They theorized that CPV prevalence affects the amount of population increase and that a wolf population will decline when 76 percent of the adult wolves consistently test positive for CPV exposure. Their data indicate that CPV prevalence in adult wolves in their study area increased by an annual average of 4 percent during 1979–93 and was at least 80 percent during the last 5 years of their study (Mech & Goyal 1995). Additional data gathered since 1995 suggests that CPV reduced pup survival both in the Superior National Forest and statewide, between 1984 and 2004; however, statewide there is some evidence of a slight increase in pup survival since about 1995 (Mech et al. 2008).

In a more recent study, Mech and Goyal (2010) looked more specifically at CPV influence on the Superior National Forest population by evaluating five 7- year periods to determine when CPV had its greatest effects. They found the strongest effect on wolf pup survival was from 1981 to 1993, and that after that time, little effect was seen despite the continued seroprevalence of CPV antibodies (Mech and Goyal 2010). They conclude that after CPV became endemic in the population, the population developed immunity and was able to withstand severe effects from the disease (Mech and Goyal 2010). The observed population effects in the Superior National Forest population are consistent with results for studies in smaller, isolated populations in Wisconsin and on Isle Royale, Michigan (Peterson et al. 1998; Wydeven et al. 1995), but indicate that CPV also had only a temporary population effect in a larger population.

Sarcoptic mange is caused by a mite (*Sarcoptes scabiei*) infection of the skin. The irritation caused by the feeding and burrowing mites results in scratching and then severe fur loss, which in turn can lead to mortality from exposure during severe winter weather. Among Minnesota wolves, mange may always have been present at low levels and may currently infect less than 10 percent of the State's wolves. Of the 407 wolves trapped by Wildlife Services during 2006–08 in response to depredation complaints, 52 (13 percent) exhibited signs of mange (Hart 2009, pers. comm.); the proportion of wolves with signs of mange decreased from 17 percent in 2006 to 10 percent in 2008. During the previous 3-year period (2003–05), the proportion of trapped wolves with signs of mange was also about 13 percent, suggesting that mange has not increased in prevalence among wolves in Minnesota since 2003. The incidence of mange among wolves targeted by Wildlife Services is likely not representative of the prevalence of the disease in the statewide wolf population; wolves targeted for depredation control appear to be more likely to carry the disease (Hart 2009, pers. comm.). In a separate study, mortality data from 12 years

(1994–05) of monitoring radio-collared wolves in 7 to 9 packs in north-central Minnesota show that 11 percent died from mange (DelGiudice in litt. 2005). However, the sample size (17 total mortalities, 2 from mange in 1998 and 2004) is far too small to deduce trends in mange mortality over time. Furthermore, these data are from mange mortalities, while the Wildlife Services' data are based on mange symptoms, not mortalities.

Lyme disease, caused by the spirochete *Borrelia burgdorferi,* is another relatively recently recognized disease. It is possible that individual wolves may be debilitated by Lyme disease, perhaps contributing to their mortality; however, Lyme disease is not believed to be a significant factor affecting wolf populations (Kreeger 2003).

Canine distemper virus (CDV) is an acute disease of carnivores that is now infecting dogs worldwide (Kreeger 2003). CDV generally infects dog pups when they are only a few months old, so mortality in wild wolf populations might be difficult to detect (Brand et al. 1995). CDV mortality among wild wolves has not been documented in Minnesota. The continued strong recruitment in Wisconsin and elsewhere in North American wolf populations indicates that distemper is not likely a significant cause of mortality (Brand et al. 1995).

The dog louse (*Trichodectes canis*) has been detected in wolves in Ontario, Saskatchewan, Alaska, Minnesota, and Wisconsin (Kreeger 2003; Mech et al. 1985). Even though observed in nearly 4 percent in a sample of 391 Minnesota wolves in 2003–05 (Paul in litt. 2005), dog lice infestations have not been confirmed as a cause of wolf mortality, and are not expected to have a significant impact even at a local scale.

Other diseases and parasites, including rabies, canine heartworm, blastomycosis, bacterial myocarditis, granulomatous pneumonia, brucellosis, leptospirosis, bovine tuberculosis, hookworm, coccidiosis, and canine hepatitis have been documented in wild wolves, but their impacts on future wild wolf populations are not likely to be significant (see discussion in FRN 50 CFR Part 17 Vol. 76 No. 87 May 5, 2011) (e.g., Kreeger 2003; Mech & Kurtz 1999; Wisconsin Department of Natural Resources 1999). In addition, new and developing diseases such as chronic wasting disease (CWD), West Nile Virus (WNV) and canine influenza (Crawford et al. 2005), may move across species barriers or spread from domestic dogs to wolves. Currently there is no evidence that CWD can directly affect canids (Thomas in litt. 2006). Although experimental infection of dogs produced no ill effects, WNV is reported to have killed a captive wolf pup, so young wolves may be at some risk (Lichtensteiger et al. 2003).

Potential and favorable wolf habitat is defined by several elements such as low human population density, sufficient prey density, road density, vegetation cover and special landscape patterns (Mladenoff et al. 1997; Mladenoff et al. 1995). Gray wolves are generalists that can live in most any habitat that supports ungulate prey. Wolf densities are directly related to the densities of their primary ungulate prey (Fuller 1989) thus forested areas occupied by white-tailed deer and moose are critical. Additionally, the habitat should be suitable for smaller prey such as beaver and snowshoe hare which may be seasonally important (Mech 1970). Moose, deer, and snowshoe hare tend to forage in areas of regenerating upland forest, and conifer forest is an important component of thermal cover for all. Riparian aspen forest is important for

beavers. Patch structure is only important in that it may alter prey densities or include areas of high road and human densities thereby indirectly altering wolf distribution (Fuller 1997).

In Wisconsin, Mladenoff et al. (1995; Mladenoff et al. 1999) provided that re-colonizing wolf packs selected territories that contained no urban land, very little farmland, and that were 93% forested. Road density was the best predictor of suitable habitat for breeding packs (Mech et al. 1988a; Mladenoff et al. 1995; Thiel 1985). While wolves will use roads and readily cross them, generally, areas with road densities of <1 mile/mile^2 are best for wolf survival (Wydeven et al. 2001; Wydeven & Wiedenhoeft 2001)(see discussion in Fuller 1997).

Environmental Baseline

The environmental baseline is defined as the impacts from all federal, state or private actions and other human or natural activities in the action area, the anticipated impacts from all federal projects in the action area that have already undergone formal or early section 7 consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process.

Status of the Species within the Action Area

National Forests, and the prey species found in their various habitats, are important to wolf conservation and recovery in the western Great Lakes states. The Superior National Forest is operated and managed through the current Forest Plan in conformance with standards and guidelines that follow the 1992 Recovery Plan's recommendations for the wolf.

The wolf population is variable but generally stable on the Superior National Forest in Minnesota (Berg & Benson 1998; Mech & Karns 1977). The estimated wolf population on the Superior NF has averaged about 1 wolf per 10 – 15 mi^2 (Mech 2004, 2006, 2008). An aerial survey of radio-collared and non-radio-collared wolf packs in a large area (795 mi^2; 2,060 km^2) of the central Superior National Forest during the 2003-2004 winter estimated that about 62 wolves were present, or 7 wolves per 100 square miles (3.0/100km^2) (Mech 2004). Using the same methodology during the winter of 2007-08, the aerial survey estimated that approximately 82 wolves were present in a 795 mi^2 (2,060 km^2) area of the central Superior National Forest, or about 1 wolf for every 10 mi^2 (4.0/km^2) (Mech 2008). This density estimate is the same as estimates from similar winter 2005-2006 surveys (Mech 2006) and is the highest wolf population recorded in the study area since 1971 (Mech 1973, 1986, 2008). Assuming that wolf density is similar to the 2007-2008 density estimates throughout the forest, which covers approximately 4688 square miles (12,141 square kilometers), the Service estimates that there were approximately 484 wolves on the Superior National Forest in 2008.

Factors Affecting the Species within the Action Area

Various land management practices on the Superior National Forest may potentially affect wolves and wolf habitat. These practices include management of timber, vegetation, wildland or prescribed fire, wildlife habitat, recreation, roads and trails, minerals exploration, and other

human developments. Further, developments by other landowners or agencies within the boundaries of the Forests (on other ownerships or by authorization on National Forest System land) such as roads, railroads, utility corridors, land ownership patterns, and developments may affect wolf movements. Risks of direct wolf mortality may come from shooting, trapping, predator control, vehicle collisions, and competition or predation as influenced by human activities. Other large-scale risk factors on both Forests are disease and fragmentation and degradation of wolf habitat, climate change and illegal shooting. These risk factors are discussed in detail below in the primary categories of influence.

Prey habitat

Wolf density is heavily dependent on prey availability (Fuller et al. 2003), but prey availability is not likely to threaten wolves in Minnesota. Moose (*Alces alces*) and woodland caribou (*Rangifer tarandus caribou*) were the dominant ungulate species in northeast Minnesota, before European settlement around the turn of the 20th century. Today white-tailed deer (*Odocoileus virginianus*) have replaced caribou; beaver (*Castor canadensis*) are seasonally important prey in the Superior National Forest.

Conservation of primary wolf prey in Minnesota, white-tailed deer and moose, is a high priority for the Minnesota Department of Natural Resources (MDNR). As the MDNR points out in its wolf management plan (Minnesota Department of Natural Resources 2001), it manages ungulates to ensure a harvestable surplus for hunters, nonconsumptive users, and to minimize conflicts with humans. To ensure a harvestable surplus for hunters, MDNR must account for all sources of natural mortality, including loss to wolves, and adjust hunter harvest levels when necessary. For example, after severe winters in the 1990's, MDNR modified hunter harvest levels to allow for the recovery of the local deer population (Minnesota Department of Natural Resources 2001). In addition to regulation of human harvest of deer and moose, MDNR also plans to continue to monitor and improve habitat for these species. Land management carried out by other public agencies and by private land owners in Minnesota's wolf range, including timber harvest and prescribed fire, incidentally and significantly improves habitat for deer, the primary prey for wolves in the State. The success of these measures is apparent from the continuing high deer densities in the Forest Zone of Minnesota. About one-half of the Minnesota deer harvest is in the Forest Zone, which encompasses most of the occupied wolf range in the State (Cornicelli 2007). There is no indication that harvest of deer and moose or management of their habitat will significantly depress abundance of these species in Minnesota's core wolf range. Therefore, prey availability is not likely to limit the number of wolves in Minnesota.

Deer, moose, and beaver, the primary prey species for wolf, are closely associated with forage from young upland forest less than 10 years old. Deer and moose rely on upland conifer more than nine years old for thermal and hiding cover. Currently, the Forest provides ample habitat for prey species, and densities of these species (particularly deer) have been high; therefore, prey availability is not likely to threaten wolves in the Superior National Forest.

The potential implications of climate change to prey habitat in northern Minnesota are difficult to predict but continue to be studied regionally (e.g., Galatowitsch et al. 2009) and within the Superior National Forest (USDA 2011). The effects that climate change may have on prey habitat and availability is uncertain at this time and goes beyond the time frame of the current Forest Plan.

The next revision of the Forest Plan, anticipated to be written between 2015 and 2020, may incorporate direction specific to climate change.

Human access

Human settlement and roads are considered to be major determinants in wolf distribution. These activities have multiple effects, including increased human presence causing an increase in illegal poaching and legal predator control, increased chance of introduced diseases and parasites via pets (e.g., canine parvovirus), and potential deterrence to colonization of otherwise suitable habitat (Gogan et al. 1997; Mech & Goyal 1995). The Recovery Plan recommends that density of higher standard roads [equivalent to Forest Service Objective Maintenance Level (OML) 3, 4, and 5] remain below one mile/mile^2 in critical habitat to limit the extent of associated effects to wolves. The Superior National Forest high standard road density outside the BWCAW is 0.45 miles/mile^2.

Although the Recovery Plan addresses the impact of low standard roads (generally equivalent to Forest Service OML 1 and 2, temporary, and some unclassified roads), it does not recommend a density threshold for such roads. Low standard roads may have a greater potential for human impact on wolves than high standard roads due to the potential for human access for trapping and shooting. These roads typically are accessed by recreational motor vehicles (RMV) or on foot.

Illegal killing of wolves occurs for a number of reasons. Some of these killings are accidental (for example, wolves are hit by vehicles, mistaken for coyotes and shot, or caught in traps set for other animals); some of these accidental killings are reported to State, Tribal, and Federal authorities. Most illegal killings may be intentional and may never be reported to government authorities. Because they generally occur in remote locations and the evidence is easily concealed, we lack reliable estimates of annual rates of intentional illegal killings.

Road density correlates directly and indirectly with various forms of human-related wolf mortality factors. A rural area with more roads generally has a greater human density, more vehicular traffic, greater access by hunters and trappers, more farms and residences, and more domestic animals. As a result, there is a greater likelihood that wolves in such an area will encounter humans, domestic animals, and various human activities. These encounters may result in wolves being hit by motor vehicles, being controlled by government agents after becoming involved in depredations on domestic animals, being shot intentionally by unauthorized individuals, being trapped or shot accidentally, or contracting diseases from domestic dogs (Mech et al. 1988b; Mech & Goyal 1993; Mladenoff et al. 1995). Based on mortality data from radio-collared Wisconsin wolves from 1979 to 1999, natural causes of death predominate (57 percent of mortalities) in areas with road densities below 1.35 mi per sq mi (0.84 km per sq km), but human-related factors produced 71 percent of the wolf deaths in areas with higher road densities (Wydeven et al. 2001; Wydeven & Wiedenhoeft 2001).

Radiotelemetry studies are a good way to accurately estimate illegal mortality (Fuller 1989), however only a few radiotelemetry studies have taken place in Minnesota. Data from north-central Minnesota studying 16 diagnosed mortalities of radio-collared wolves over a 12-year period (1994-2005) show that human-causes resulted in 69 percent of the diagnosed mortalities.

These data include one wolf accidentally snared, two vehicle collisions, and eight (50 percent of all diagnosed mortalities) that were shot (DelGiudice in litt. 2005). A smaller mortality dataset of radio-collared wolves studied between 1987–1991 in and adjacent to Minnesota's Voyageurs National Park, found that all mortality inside the park was due to natural causes (for example, killing by other wolves or starvation), whereas the majority (60-80 percent) of mortality outside the park was human-induced (for example, shooting and trapping) (Gogan et al. 2004). Despite the difficulty in measuring the extent of illegal killing of wolves and accidental human caused mortality, these killings have not been of sufficient magnitude to stop the growth of the wolf numbers in Minnesota.

In addition to illegal mortality, the current Endangered Species sub-permit to USDA Wildlife Services (WS) allows WS and designated WS employees to capture and kill wolves in response to verified depredation of domestic livestock in accordance with regulations 50 CFR 17.40(d)(2)(i)(B)(4).Lethal wolf control is not allowed in federal wolf management Zone 1 in extreme northeastern Minnesota under this sub-permit. Zone 1, stretching from approximately Voyageurs National Park on the west to Taconite Harbor on Lake Superior on the east (Figure 2) comprises a generally remote area with minimal livestock production (USDA - APHIS - Wildlife Services 2008). From 1996 to 2009, an average of 146 wolves (with a 95 percent confidence interval of 132 to 159) have been taken as a result of depredation control in Minnesota (USDA - APHIS - Wildlife Services 2008, 2009). These numbers have not resulted in a significant decline in wolf numbers in Minnesota (Figure 3).

As wolf numbers in Minnesota increase and as humans encroach on wolf habitats, wolves more frequently prey on domestic livestock and pets (Bangs et al. 1998). Individual tolerance of wolves may be influenced by social, economic, political values as well as personal experience with depredation issues and compensation for depredation losses (Fritts et al. 2003). The Minnesota Department of Agriculture (MDA) compensates livestock owners for full market value of livestock that wolves have killed or severely injured. Although compensation for loss of domestic animals to wolves is generally supported by the public, it may not affect attitudes towards wolves by individuals who suffer depredation losses (Naughton-Treves et al. 2003).

It is important to note that despite the difficulty in measuring the extent of illegal killing of wolves, all sources of wolf mortality, including legal (e.g., depredation control) and illegal human-caused mortality, have not been of sufficient magnitude to stop the continuing growth of

the wolf population in Minnesota (Figure 3).

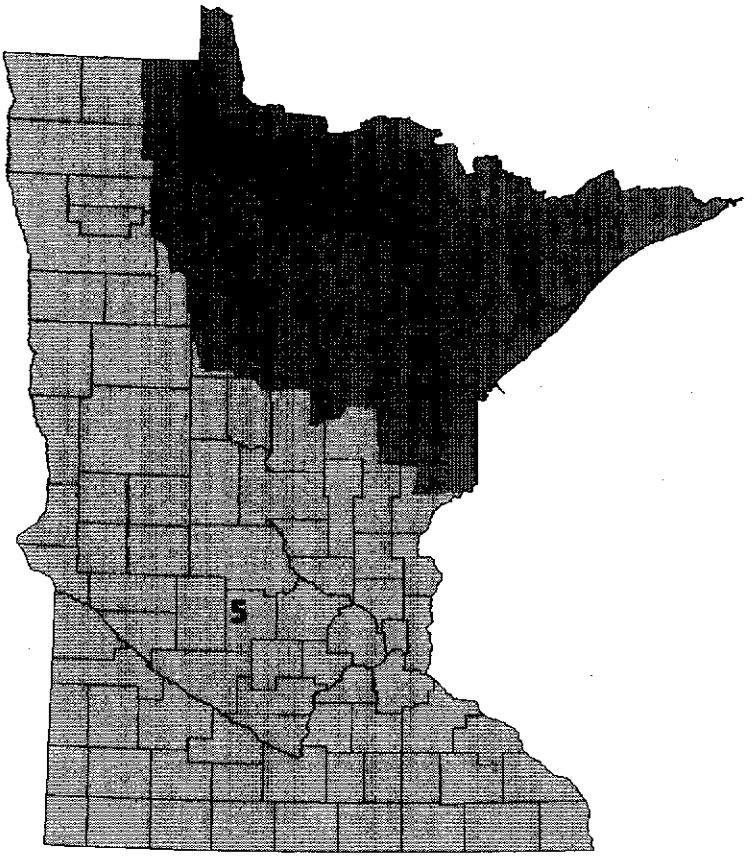

Figure 2: Wolf Critical habitat zones in Minnesota.

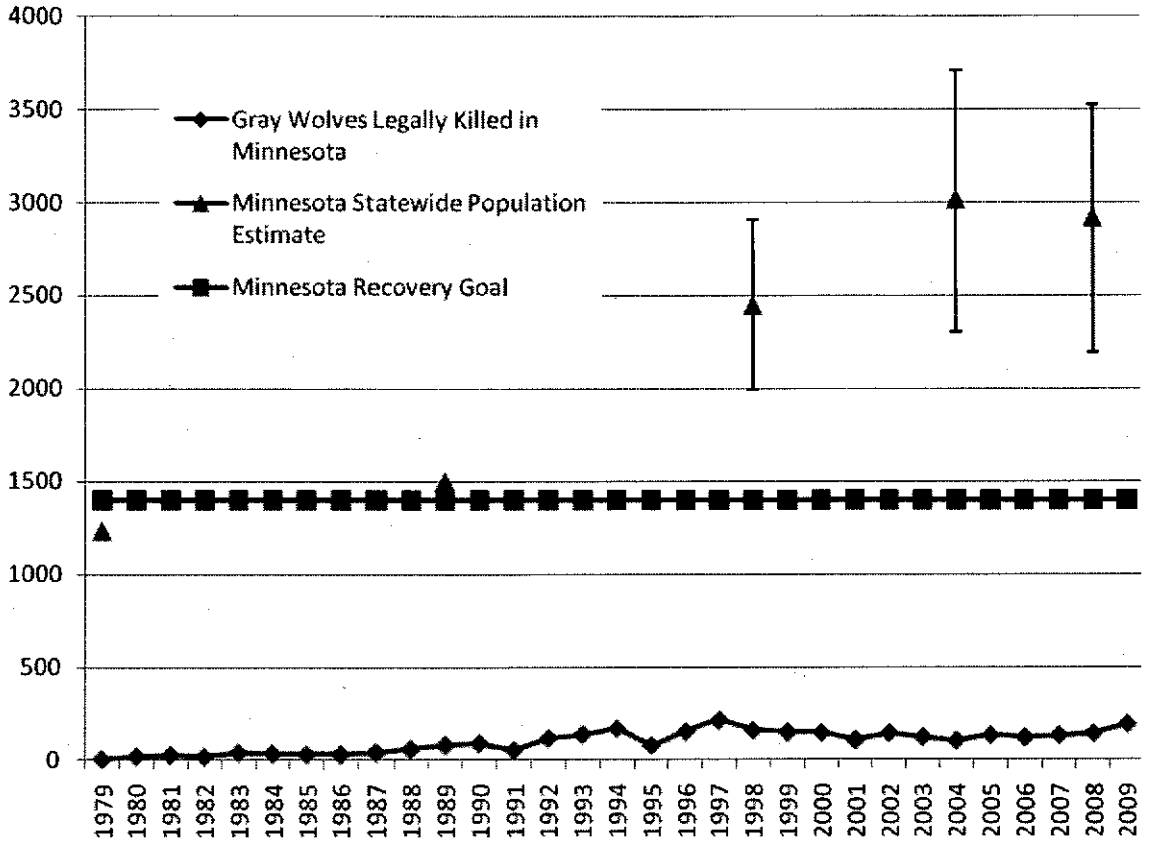

Figure 3. Estimated statewide population of wolves in Minnesota, the recovery goal and the number of gray wolves legally killed by USDA – Wildlife Services in Minnesota since 1979 in response to verified depredation complaints (Berg & Benson 1998; Erb 2008a; Erb & Benson 2004; USDA - APHIS - Wildlife Services 2009).

Other factors

Den site disturbance may occur during timber harvest, site preparation, prescribed burning, minerals exploration and other activities; however, wolves at dens and rendezvous sites have been known to tolerate nearby activities. The likelihood of a project site disturbing a significant number of wolves across the Forests is minimal, due to the large home range size of wolves in Minnesota.

The Superior National Forest is currently implementing the guidelines set forth in the Recovery Plan for all Forest activities, as directed by the current Forest Plan. Thus, the aforementioned risk factors are being minimized and managed appropriately to promote the conservation of gray wolf.

Effects of the Action

Direct and Indirect Effects

Direct effects are impacts on species and habitat that occur at the same time and place as the action and are caused by the action. Indirect effects are impacts caused by or resulting from actions of specific projects that are later in time and are reasonably certain to occur.

The Forest Plan incorporates integrated resource conservation measures, including applicable measures from the Recovery Plan, that address management of wolf by promoting the conservation of wolf and its habitat and identifying ways to reduce or eliminate adverse effects to the species. Specifically, the incorporation of Recovery Plan recommendations, including the maximum road density standard (S-WL-4), the protection of known active den sites (G-WL-10), and the effective closure of roads and trails (G-RMV-4; O-TS-3; O-TS-7; S-TS-3; S-TS-4; G-TS-12; and G-TS-14) should continue to benefit gray wolf on the Superior National Forest. However, all potential adverse effects of projects under the Forest Plan could not be eliminated. Following is an analysis of potential direct and indirect effects on gray wolf from specific management actions. Categories of management covered in the Forest Plan and not shown here either have no effect on the species, have risks that are completely eliminated by Forest-wide direction, or are irrelevant to this analysis.

Prey Habitat

Vegetation management activities, such as timber harvest and prescribed fire, that may be authorized or carried out under the Forest Plan are likely to have both positive and negative effects to moose and deer habitat and therefore would have both positive and negative effects on wolf. The Forest Service used the model Dualplan model to analyze vegetation changes as a result of Forest Plan implementation (USDA 2004a) and has incorporated those model parameters into their current GIS analyses (USDA 2011). A description of the Dualplan model may be found in the draft Environmental Impact Statement for the Forest Plan Revision, Volume II, Appendix B (USDA 2004b). The models use multiple factors to determine long term vegetation changes. As shown in Table 1, projected acreage of forage and cover habitats for moose and deer over 100 years shows decreasing forage habitat (upland forest younger than nine years) and greatly increasing cover habitat (upland conifer older than 10 years). Although the amount of available forage would decrease from current levels, the amount provided over the life of the Forest Plan should remain sufficient for healthy ungulate populations, based on the response of populations of these species on the Forest over the last two decades under current Forest management. Overall, although the Forest Plan would provide significantly more young upland forage habitat and less upland conifer than would be found in the range of natural variability (USDA 2011), moose and deer populations are not limiting factors for wolves under the Forest Plan.

Vegetation clearing for minerals exploration projects may have temporary impacts to prey habitat at drill pad sites. These impacts are expected to be minimal and temporary since the foot print of individual drill pads is typically less than 2 acres and the cleared land is expected to re-vegetate. Land exchanges in proposed mining sites could result in a loss of wolf prey habitat, but

may also result in consolidation or gain of habitat with newly acquired lands; the impacts of such exchanges must be considered through site-specific analysis, as lands are identified for exchange.

Table 1. Projected acres of suitable wolf prey habitat with continued implementation of the Forest Plan (USDA 2004a, b). Percentages refer to the percent of all forest types on National Forest lands that are in the specified category. For analysis purposes, Decade 1 begins January 1, 2005 with Decade 2 beginning on January 1, 2015.

Year/Decade of Forest Plan Implementation	Superior			
	Upland forest <9 years		Upland conifer >10 years	
	Acres	%	Acres	%
Current (2010)	65,000	6.8	343,700	36
Baseline (2004)	125,000	13	322,000	34
1	100,000	10.4	371,300	38.7
2	101,700	10.4	411,700	43
5	97,700	10.2	531,000	55
10	94,200	9.8	554,000	58

Human Access

Many of the projects and actions that have and may be implemented in the Forest Plan involve road construction for access to project sites. Further, road and trail maintenance and construction for recreational access continues under direction of the Forest Plan. The Forest Plan continues implementation of the recommended measures in the Recovery Plan, including maintaining or striving toward high standard road densities below one mile/mile^2 (S-WL-4). Although the scale is not prescribed in the Recovery Plan, the Forest has chosen to analyze the density at the scale of the Lynx Analysis Unit (see Description of the Proposed Action and Lynx Environmental Baseline sections), which average approximately 40,000 acres. However, as discussed above, this road density standard does not apply to temporary, OML 1, or OML 2 roads, which are generally the only new roads expected to be built on the Superior National Forest under the direction of the Forest Plan.

Human access occurs by foot and motorized vehicle, including RMVs and off-road vehicles, and generally occurs on trails, low standard roads, and temporary roads developed for management operations, particularly timber harvests, and more recently, minerals exploration. These roads provide access to wolf habitat when open for forest management purposes. As northern Minnesota has become more developed and the human population has increased, the Superior National Forest has sustained increased visitation in recent years (USDA 2011), which increases the opportunity for human-wolf encounters and the likelihood of poaching of wolves.

The Forest Plan provides for a maximum designation of 90 additional ATV miles and 130 additional snowmobile trail miles on the Superior National Forest (O-RMV-2). An additional 7.1

ATV miles that should have been included in the baseline calculation was discovered recently; there was an error in the calculations used in the 2004 BA. Therefore, as of 2010, there are 82.9 ATV miles and 130 snowmobile trail miles available for new designation on the Superior National Forest (USDA 2011). The Superior National Forest prohibits cross country travel of ATVs (S-RMV-3). The Superior National Forest generally allows cross country snowmobile travel except for the BWCAW, Research Natural Areas, and Unique Biological Areas (S-RMV-3).

The Superior National Forest Forest Plan projected a large number of temporary (754 - 764 miles) and OML 1 roads (1,132 – 2,022 miles) over the life of the Forest Plan; as of 2010, there are 158 miles of temporary roads and 948 miles of OML roads (USDA 2011). In 2004, the Forest estimated that it was likely to receive requests for special use roads to access state, county, and private in-holdings, for a total of approximately 326 miles on the Superior National Forest over the first 10 years of Forest Plan implementation (USDA 2004a). Temporary road construction for minerals exploration projects, may have significant contributions to temporary road densities and increase human-wolf conflicts due to increased human access during the time the roads are being used. In addition to the National Forest System land traversed by the special use roads, these roads also cross much state, county, and private lands, and the resource protection methods discussed above and implemented by the Forest Service would not apply on non-Forest Service lands (i.e., special use roads, especially temporary roads or roads used for forest management purposes, generally must be effectively closed or gated on Forest Service land, but the portion off Forest Service land would not necessarily be effectively closed or gated). All of these types of low standard roads provide the highest potential for den site disturbance, shooting, trapping, and vehicle collisions with wolves.

Due to the ATV and snowmobile trails that currently exist on the Superior National Forest, the additional miles of each trail type to be added per the Forest Plan, the temporary roads projected to be built for access to project sites, and the new system roads that will be built, human access is expected to continue to increase on the Forest. Any corridor open to RMVs provides the potential for Forest visitors to shoot, harass, incidentally trap, injure, or collide with wolves. These effects are minimized by the standards and guidelines directing all temporary roads and any unneeded system or unclassified roads to be closed effectively, but during the time the roads are open and available, human access (and therefore adverse effects to wolves) is likely. Cross country snowmobile travel is not allowed on the Superior National Forest (G-RMV-4). Generally, the tree and shrub density on the Superior National Forest relegates snowmobiles to existing roads, trails, or traditional travel routes; however, recently closed roads may be legally accessed by snowmobiles, even though this activity is not encouraged. The guidance for monitoring the effectiveness of road closures is critical to minimizing the adverse effects of roads and trails on wolves; road closures must be performed so as to effectively eliminate snowmobile use. All of the road and trail guidance calls for "effective" road closures or obliteration, and this, in combination with monitoring guidance, will ensure minimization of effects. Illegally created motorized trails have also been actively monitored on the Forest. Instances of illegal motorized use on closed or obliterated roads are being actively investigated, and regulations are being enforced when violators are found.

The effectiveness of road closures has been monitored by the Forest monitoring program. Since 2004, approximately 34 miles of road have been decommissioned, and an additional 109 miles of roads approved for decommissioning are planned. When these planned projects are fully implemented, a total of 143 miles of roads will have been decommissioned across the Forest. The Forest Plan objective is to decommission approximately 80 miles of road by 2014 (USDA 2011). A recent study of the effectiveness of road closures on the Nira Stewardship Project found that 81% of road closures were totally effective in restricting large and small motorized vehicle use (22 out of 27). Twenty-two of the 27 road closures (81%) on the Nira Stewardship project were found to be totally effective. Even though there was poor survival of planted wooded vegetation at four of the ineffective sites, the closures were still partially effective in keeping motorized use to a minimum (USDA 2009).

In 2009, the Forest made a decision to decommission 154 miles and designate 142 miles of unclassified roads to the Forest Service system (Travel Management Project, USDA 2009). The Travel Management Plan implementation would convert 14 miles of unclassified roads to system motorized trail.

Although data are inconclusive and scarce regarding wolf mortality, particularly illegal killing, it is unlikely that mortality would increase significantly from current rates, and as such, it is not anticipated to hinder wolf recovery and population stability on the Superior National Forest or in northern Minnesota. Despite undocumented current levels of suspected poaching, harassment, incidental trapping, injury, or vehicular collisions, there are no indications that wolf populations are declining in the action areas. Wolf populations in Minnesota are resilient with average litters of five to six pups per year, high summer survival, and significant capabilities of dispersal (Mech 2001). This resiliency, in conjunction with conservation measures that will tend to minimize illegal take, will allow wolves to sustain limited levels of illegal take under the current baseline conditions.

While the Forest Service has no jurisdiction or authority over illegal hunting of wolves, the agency would manage to the limit of its authority the factors that lead to poaching through effective road closures and environmental education efforts.

Other Factors

Vegetation and minerals management activities are be authorized or carried out under the Forest Plan have the potential to affect gray wolves through disturbance and disruption of den sites. However, a maximum of five percent of the Superior National Forest would be disturbed in one decade; the large size of wolf pack territories (approximately 100 miles^2 or 64,000 acres) makes it unlikely that management activities would coincide with den site locations. Additional protection is afforded in the Forest Plan to protect known active den sites during the denning season (G-WL-10).

Land exchanges in proposed mining sites could result in a loss of wolf prey habitat and connectivity, but may also result in consolidation or gain of habitat with newly acquired lands. Land ownership management direction D-LA-1 and O-LA-1 in the Forest Plan secures land ownership patterns that support and enhance total Forest Plan resource management objectives

and G-LA-2 ensures that land acquisitions are guided by certain criteria including land needed for habitat for federally listed endangered, threatened, proposed, or candidate species.

Effects of Interrelated and Interdependent Actions

Interrelated actions are those that are a part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the proposed action. The Service has not identified any actions interrelated or interdependent to the adoption of the Forest Plan that has the potential to affect gray wolves. It is possible that future specific programs and actions implemented under the Forest Plan may have relevant interrelated and interdependent actions and they will be considered in the context of consultations for those programs or actions.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Most occupied wolf habitat on the Superior National Forest is in areas of mixed land ownership, including other public (state, county), tribal, and private ownership. Actions on those lands have the potential to affect wolves in the action area. Future activities on non-federal lands that are reasonably certain to occur and could affect wolves and their habitat include timber harvest, road construction, recreation, prescribed burning, minerals exploration, mining, and fragmentation through human developments. Large-scale mining operations on non-Forest land could result in irreversible or irretrievable loss of wolf prey habitat. State, county, and private land timber harvest, related road construction activities, and fire management are not regulated and would not necessarily provide the same level of protection and conservation for threatened and endangered species and their habitats as the Forest Plans do for the Forest's administered lands. Human disturbance and loss of suitable habitat could result from timber harvest, fire management and mining activities. Conversely, forest management that increases numbers and distribution of moose and deer could have a beneficial effect on wolves. Recreational activities associated with state, county, and private lands will continue in the action area, and are reasonably certain to increase over the life of the Forest Plan as human population increases in northern Minnesota.

Vegetation and fire management and winter recreation will continue to occur on non-federal lands. These activities are occurring at approximately the same levels on non-federal land as on Forest Service land, and these levels are expected to remain steady in the future. More detailed analysis will occur at smaller geographic scales in context with actions or programs carried out under the Forest Plan.

Conclusions

After reviewing the current status of the gray wolf, the environmental baseline for the proposed action areas, the proposed management direction for the species, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Eastern DPS of the gray wolf. Critical habitat has been designated for the gray wolf in northern Minnesota; however, as stated above, the proposed action is not likely to adversely affect critical habitat.

The gray wolf population in the Forest and in the rest of northern Minnesota is evidently stable or increasing. The desired conditions, objectives, standards, and guidelines are intended to contribute to the recovery of the gray wolf and are expected to have long term beneficial effects. The risk of adverse effects of actions that could be implemented under the Forest Plan is expected to be minor and is moderated by direction to maintain or improve conditions for the species. Indeed, wolf densities in the Forest increased during the first four years of Forest Plan implementation (from 2004-2008), from approximately 7 wolves per 100 square miles (Mech 2004) to 10 wolves per 100 square miles (Mech 2008). More recent wolf data is not available. Therefore, the Superior National Forest Plan would contribute to the recovery of the Eastern DPS of the gray wolf and would provide long term management assurance for the wolf within the DPS.

Kohn et al. (2000) documented 37 wolf crossings of U.S. Highway 53 in Wisconsin (81 percent by dispersing (i.e., nonresident) wolves), which had a mean traffic volume of 4700 vehicles/day. In Spain, wolves "regularly crossed a fenced four-lane highway" with average traffic volume of over 12,000 vehicles/day (Blanco et al. 2005). In the Wisconsin study, wolves were most likely to cross the highway where visibility was relatively high – for example, where there was relatively little shrub cover at eye level – and where adjacent habitat was unfragmented by human-related disturbances, such as buildings, logging, and gravel pits (Frair 1999). Therefore, the extent of landscape fragmentation and other human disturbances along Forest roads, not traffic volume, is likely to be the predominant factor influencing wolf dispersal across the road.

Although roads on the Forest are unlikely to function as a significant barrier to dispersing wolves, some wolves may get hit while crossing roads. To estimate the number and frequency of wolf-vehicle collisions as a result of Forest implementation, we will use the results of the Wisconsin study referred to above (Kohn et al. 2000). In that study three wolves were confirmed dead from automobile collisions in a 44-mile length of U.S. Highway 53 during a seven-year study period (Kohn et al. 2000) – i.e., approximately 0.01 wolf/mile/year. Even intensive studies, such as this one, may not document all road-related mortality within the study area (Clarke et al. 1998). In the Wisconsin study (Kohn et al. 2000), the likelihood of detecting wolf-automobile collisions during the winter was probably high because a biologist drove the road every day looking for signs of wolves crossing the road, but the likelihood of detecting incidents during summer was probably low (E. Anderson, University of Wisconsin – Stevens Point, pers. comm. 11/29/06). We will extrapolate that Kohn et al. (2000) documented 50% of the wolf mortalities due to automobile collision on Highway 53 during their study – i.e., that actual mortality was 0.02 wolf/mile/year.

Traffic volume on Highway 53 was 4700 vehicles/day, (Kohn et al. 2000), however it is difficult to predict the traffic volume throughout the Forest. All the roads on the Forest are considered very low volume roads; all have an average daily traffic of less than 400 vehicles/day with the majority of them less than 100 vehicles/day (Taylor 2011, pers. comm.). For our analyses, we estimate that the average traffic volume on the Forest roads is 100 vehicles/day.

To estimate the frequency of wolf deaths due to automobile collisions on the Forest, we will utilize the following assumptions: 1. The probability of death due to automobile collision is likely to be proportional to traffic volume; 2. Traffic volume on the Forest roads is estimated 100 vehicles/day; 3. Posted speed limits will approximate (or be less than) those on Highway 53 during the study described above; and, 4. The likelihood of wolf mortality can be expected to be directly proportional to wolf density in the Forest, which will approximate those found by Mech (2008) in the central Superior National Forest (i.e., 0.04 wolves/square km, 0.10 wolves/sq mi.).

Anticipated take is based on Wisconsin study mortality rate of 0.02 wolves/mi/yr. This Wisconsin study's mortality rate was divided by the proportional difference in traffic volume [4700 vehicles from WI study/ 100 (estimated average Forest road traffic volume)] and then multiplied by 16.67 (0.10 wolves per sq. mi for action area/0.006 wolves per sq mi for WI study) to account for higher densities of wolves in the action area (NE Minnesota) than in the Wisconsin study. This gave us the mortality rate for this study (0.007 wolves/mi/year). Multiply mortality rate by number of miles of high standard roads on the Forest (634 miles – P. Taylor, U.S. Forest Service, pers. comm.) to get the estimated number of wolves taken per year (4.50wolves/year). This number was rounded up to give an estimate of 5 wolves taken per year. For the purposes of estimating incidental take of gray wolves and Canada lynx we will assume that Forest Plan implementation will continue for 10 years. With an estimate of 5 wolves hit by vehicles per year (see above), we would estimate that 50 wolves would be taken during that time period. The loss of 5 wolves every year to vehicle collision in the project area would have relatively minimal impacts on the population of wolves in the lower 48 states. Based on current population levels (Erb 2008a; Erb & Benson 2004; Huntzinger et al. 2005; Wydeven et al. 2007), this would represent the loss of about 0.15 percent of all wolves in Minnesota or 0.09 percent of all wolves the lower 48 states, respectively. In a worst-case scenario, five females with dependent pups could be killed, resulting in the potential loss of three litters of pups in addition to the adults. Mean litter size in northeastern Minnesota may be about four pups (Mech 1977a). Therefore, the proposed action would cause a 1.71 percent or 1.0 percent decrease in the number of wolves in Minnesota or the lower 48 states (excluding the nonessential experimental populations), respectively, every year. This is unlikely to result in any appreciable effects on the survival of wolves in Minnesota or in the lower 48 states. Additionally, the wolf population has remained stable or increased in Minnesota since Forest Plan implementation, further demonstrating that there are not likely to be any appreciable effects on the survival of wolves in Minnesota

As such, the Service does not anticipate any reduction in reproduction, numbers, or distribution of the species to result from implementing the Forest Plan. The action will not appreciably reduce the likelihood of survival and recovery of gray wolves.

Incidental Take Statement

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Amount or Extent of the Take

The risk of incidental take of gray wolf, though low, is not completely eliminated by provisions in the Forest Plan. Take could occur in the form of harassment during project implementation and death related to human disturbance and vehicle collisions. The Service does not anticipate that harassment would rise to the level of mortality to individuals. Mortality could only occur through vehicle collisions and illegal hunting or shooting. Any take that occurs due to illegal hunting or shooting is outside the jurisdiction and authority of the Forest Service and not exempted by this Incidental Take Statement.

The Service expects no more than five wolves would be taken annually on the Superior National Forest and no more than 50 wolves would be taken over the 10-years of remaining life of the Forest Plan due to vehicle collision on all roads on all ownerships within the Superior National Forest proclamation boundary. Because there is limited information from which to draw and we are unaware of the timing and location of roads that would be built or upgraded, this estimate is based on past reports of road kill. Across Minnesota, two to six road-killed wolves are reported to Minnesota DNR per year (U.S. Forest Service); it is reasonable to assume we are aware of roughly one-quarter of the mortality that occurs, as wolf deaths are not reported regularly. Therefore, approximately 24 wolves per year have been killed in northern Minnesota due to vehicle collisions. Because the Forest encompasses a subset of wolf habitat in northern Minnesota, the number of wolves killed by vehicle collisions is a subset of the number killed in northern Minnesota. In the 2004 BO, we assumed that roughly half of the wolves killed in northern Minnesota were within the proclamation boundaries of the Chippewa and Superior National Forests. Therefore, we may assume that roughly one quarter of the wolves killed in northern Minnesota are killed within the proclamation boundaries of the Superior National Forest. This rate is likely to continue under Forest Plan implementation. The Forest Plan provides descriptive management direction and are prescriptive in terms of "sideboards" that would guide or limit future project design. They do not, however, specify what management actions would be carried out nor when or where actions will occur. Therefore, site-specific

consultation will occur and section 7(o)(2) exemptions will be provided, as needed and appropriate, when these actions are expected to result in the incidental take described above.

Effect of the Take

In this biological opinion, the Service has determined that any incidental take that may result from the proposed action does not result in jeopardy to the species due to the adherence to the Recovery Plan recommendations for road density, continuation of forest management to benefit gray wolf prey species, and road closure methods included in the Forest Plan. These measures will minimize take and overall provide for increasing wolf populations in northern Minnesota. We do not expect any action implemented under the Forest Plan to result in levels of take that would affect the growth or stability of the Eastern DPS of gray wolves. Again, this conclusion is supported by the fact that wolf densities on the Superior National Forest increased during the years (2004-2008) for which there was data, and following adaption of the Forest Plan in 2004.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize effects of incidental take of the Eastern DPS of gray wolves:

> Document and report to the Service annually any known wolf mortality within the National Forest proclamation boundaries in Minnesota due to vehicle collisions or poaching.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are non-discretionary.

> 1. Mortality reports should be provided to the Service by December 31 of each calendar year the Revised Forest Plans are implemented. Reports should include, to the extent known, the cause of mortality, location, and sex of wolves killed.
>
> 2. Rather than establishing a discrete field monitoring effort to document wolf mortality, the Forest Service should coordinate with partners in state, tribal, county, municipal law enforcement, wildlife management agencies, wolf researchers, federal wolf trappers, and the public to collect information necessary for this reporting system. Information voluntarily provided by these agencies, researchers, and others would fulfill the requirements of the reasonable and prudent measure.

PART II – CANADA LYNX (*Lynx canadensis*)

Status of the Species

The Canada lynx in the contiguous U.S. were listed as threatened effective April 23, 2000 [65 Federal Register (FR) 16052, March 24, 2000]. The Service identified one distinct population segment (DPS) in the lower 48 states. On July 3, 2003, the Service published its Notice of Remanded Determination of Status for the Contiguous United States Distinct Population Segment of the Canada Lynx (68 Federal Register FR 40076, July 3, 2003) in which it clarified its findings in the 2000 final listing rule and reaffirmed the listing of the lynx DPS as threatened.

In 2006, the Service designated 1,841 square miles of critical habitat for the Canada lynx within the boundaries of Voyagers National Park in Minnesota, Glacier National Park in Montana, and North Cascades National Park in Washington. In February 2008, the Service proposed to revise the critical habitat designation after questions were raised about the integrity of the scientific information used and whether the decision made was consistent with appropriate legal standards. The U.S. Fish and Wildlife Service announced a revised critical habitat designation for the Canada lynx, which was published in the Federal Register on February 25, 2009. The revised critical habitat rule became effective on March 27, 2009.

An interagency Canada lynx coordination effort was initiated in March 1998 in response to the emerging awareness of the uncertain status of Canada lynx populations and habitat in the contiguous United States and the onset of the listing process. The Service, Forest Service, Bureau of Land Management, and National Park Service have participated in this effort. As a result of those efforts, three products important to the conservation of Canada lynx on federally managed lands were produced: The Scientific Basis for Lynx Conservation (Ruggiero et al. 1999); the Lynx Conservation Assessment and Strategy (LCAS; Ruggiero et al. 2000); and Lynx Conservation Agreements (CA) among the Service and various land management agencies (see U.S. Forest Service and USFWS 2000). The CA promotes the conservation of Canada lynx and its habitat on federal lands and identifies actions the federal agencies agree to take to reduce or eliminate potential adverse effects or risks to Canada lynx and their habitat. The LCAS was produced in 1999 to provide a consistent and effective approach to conservation of Canada lynx on federal lands and was used as a basis for assessing the effects of the Forest Plan on Canada lynx.

New information has become available since the LCAS was written. Kolbe et al. (2007) and Bunnell et al. (2006) published information on the effects of snowmobiling on lynx, and Squires and Ruggiero (2007) and Squires (2010) documented the importance of multilayered stands as snowshoe hare habitat. Ongoing research in Minnesota and Maine has resulted in information that contributes to our understanding of lynx and snowshoe hares (e.g., Fuller et al. 2007; Homyack et al. 2007; Hoving et al. 2005; Moen et al. 2008a; Moen et al. 2010).

Species Description

The lynx is a medium-sized cat with long legs; large, well-furred paws; long tufts on the ears; and a short tail whose tip is entirely surrounded by black (McCord & Cardoza. 1982)(the tips of bobcat tails are black only on the upper side). The lynx's long legs and large, well-furred paws

make it highly adapted for hunting in deep snow. Adult males average 10 kilograms (22 pounds) in weight and 85 centimeters (33.5 inches) in length (head to tail), and females average 8.5 kilograms (19 pounds) and 82 centimeters (32 inches) (Quinn & Parker 1987).The winter pelage of the lynx is dense and has a grizzled appearance with grayish-brown mixed with buff or pale brown fur on the back, and grayish-white or buff-white fur on the belly, legs and feet. Summer pelage of the lynx is more reddish to gray-brown (Koehler & Aubry 1994).

Classification of the Canada lynx (also called the North American lynx) has been subject to revision. In accordance with Wilson and Reeder (2005)2, the lynx in North America is *Lynx canadensis*. Previously the Latin name *L. lynx canadensis* was used for lynx (S. Williams, Texas Tech University, pers. comm. 1994). Other scientific names still in use include *Felis lynx* or *F. lynx canadensis* (Tumlison 1987, Jones et al. 1992)3.

Life History

Lynx evidently require large areas containing boreal forest[4] habitat. In the northeastern U.S., lynx were most likely to occur in areas containing suitable habitat that were greater than 40 miles^2 (Hoving 2001). The requirement for large areas also is demonstrated by home ranges that encompass many square miles. The size of lynx home ranges varies with sex, age, abundance of prey, season, and the density of lynx populations (Aubry et al. 2000; Hatler 1988; Koehler 1990; Mowat et al. 2000; Poole 1994; Slough & Mowat 1996). Generally, it is believed that larger home ranges, such as have been documented in some areas in the southern extent of the species' range in the west, are a response to lower-density snowshoe hare populations (Apps 2000; Koehler & Aubry 1994; Squires & Laurion 2000).

Long-distance movements (greater than 60 miles) are characteristic of lynx (Moen et al. 2010; Mowat et al. 2000). Lynx disperse primarily when snowshoe hare populations decline (Koehler & Aubry 1994; O'Donoghue 1997; Poole 1997; Ward & Krebs 1985). Subadult lynx also disperse even when prey is abundant (Poole 1997), presumably as an innate response to establish home ranges. Lynx also make exploratory movements outside their home ranges (Moen et al. 2010). Lynx are capable of moving extremely long distances (greater than 300 miles) (Brainerd 1985; Mech 1977b; Mowat et al. 2000; Poole 1997).

Recent studies of Minnesota lynx show that male home ranges varied between 11 and 201 mi^2, and female home ranges varied between 2 and 37 mi^2 (Burdett 2007). Home ranges varied during the breeding season; males tended to expand the size of their home ranges, presumably to search for females; females tended to contract their home ranges as the birthing period approached (Burdett 2007). A study of radio-collared lynx in Minnesota documented approximately 40% of male and female lynx making long distance movements outside of their home range between

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2 Wilson, D. E. and D. M. Reeder (editors). 2005. Mammal Species of the World. A Taxonomic and Geographic Reference (3rd ed), Johns Hopkins University Press, 2,142 pp. (Available from Johns Hopkins University Press, 1-800-537-5487 or (410) 516-6900, or at http://www.press.jhu.edu).

3 Jones, J. K., Jr., R. S. Hoffman, D. W. Rice, C. Jones, R. J. Baker, and M. D. Engstrom. 1992. Revised checklist of North American mammals north of Mexico, 1991. Occasional Papers, The Museum, Texas Tech University, 146:1-23.

[4] The term ''boreal forest'' broadly encompasses most of the vegetative descriptions of this transitional forest type that makes up lynx habitat in the contiguous U.S. (Agee 2000).

Ontario, Canada and Minnesota (Moen et al. 2010). Of those lynx that made long-distance movements, females tended to move 62-124 miles (100-200km) and did not return to their original home range, while males moved 31-49 miles (50-80km) back and forth between Ontario and Minnesota (Moen et al. 2010). While topographic features may influence in mountainous western states, lynx in Minnesota tended to move nearly straight paths (Moen et al. 2010).

Snow conditions also determine the distribution of lynx (Ruggiero et al. 1999). Lynx are morphologically and physiologically adapted for hunting snowshoe hares and surviving in areas that have cold winters with deep, fluffy snow for extended periods. These adaptations provide lynx a competitive advantage over potential competitors, such as bobcats (*Lynx rufus*) or coyotes (*Canis latrans*) (Buskirk et al. 2000; McCord & Cardoza. 1982; Ruediger et al. 2000; Ruggiero et al. 1999). Bobcats and coyotes have a higher foot load (more weight per surface area of foot), which causes them to sink into the snow more than lynx. Therefore, bobcats and coyotes cannot efficiently hunt in fluffy or deep snow and are at a competitive disadvantage to lynx. Long-term snow conditions presumably limit the winter distribution of potential lynx competitors such as bobcats (McCord & Cardoza. 1982) or coyotes.

Canada lynx prey primarily on snowshoe hares, especially in the winter when they comprise 35-97 percent of the diet (Koehler & Aubry 1994). Lynx may modify hunting behavior and switch to alternate prey when hare densities are low (O'Donoghue et al. 1998a; O'Donoghue et al. 1998b). Other prey species include red squirrel (*Tamiasciurus hudsonicus*), other small rodents, small carnivores, and birds, including ruffed grouse (Moen et al. 2004). Recent research indicates that the red squirrel is not an important prey species for lynx in northeastern Minnesota (Burdett 2007; Hanson & Moen 2008), similar to lynx in Montana (Squires & Ruggiero 2007). found that red squirrels comprised only two percent of the winter diet of lynx in Montana. In Minnesota, Hanson and Moen (2008) found that snowshoe hare remains were found in 76% of the lynx scat in their study, while no evidence of red squirrels remains were detected.

Snowshoe hares have evolved to survive in areas that receive deep snow (Koehler & Aubry 1994) and prefer conifer habitats with dense shrub understories that provide food, abundant cover to escape predators, and thermal protection during extreme weather (Fuller & Heisey 1986; Hodges & Sinclair 2005; Koehler & Aubry 1994; Monthey 1986; Pietz & Tester 1983; Wirsing et al. 2002; Wolfe et al. 1982). Early successional forest stages generally have greater understory structure than do mature forests and therefore support higher hare densities (Newbury & Simon 2005; Pietz & Tester 1983). It may take several years, however, for conditions to become suitable for hares after disturbances, such as clearcuts and fire; such areas may not be optimal until 15- 30 years after the initial disturbance, during what may be described as the sapling/large shrub stage – before the onset of self-thinning (Buskirk et al. 2000; Hoving et al. 2004; Koehler & Brittell 1990; Monthey 1986; Thompson et al. 1989). In central Labrador, for example, hare densities peaked thirty years after clearcuts – hare densities in 30-year-old clearcuts were 37 times higher than in recent clearcuts (Newbury & Simon 2005). Potvin et al. (2005) found that hare densities would likely peak no sooner than 15 years after clearcuts in southwestern Quebec and that optimal conditions took longer to develop in some boreal forest types (e.g., black spruce, *Picea mariana*). Peak densities may develop sooner in more southern forests (Newbury & Simon 2005; Potvin et al. 2005).

In the northeastern U.S., lynx were most likely to occur in areas containing suitable habitat that were greater than 100 square kilometers (km^2) (Hoving 2001). Studies in the southern portion of the species' range have found average home ranges of 151 km^2 and 72 km^2 for males and females, respectively (Aubry et al. 2000). Home range size is likely inversely related to density of snowshoe hare (Apps 2000; Koehler & Aubry 1994; Poole 1994; Squires & Laurion 2000).

Lynx use coarse woody debris, such as downed logs, root wads, and windfalls, to provide denning sites with security and thermal cover for kittens (Koehler 1990; Koehler & Brittell 1990; McCord & Cardoza. 1982; Moen et al. 2008a; Mowat et al. 2000; Squires et al. 2008; Squires & Laurion 2000). Mowat et al. (2000) summarized lynx selection of den sites in northern Canada and Alaska: "....female lynx appear to select den sites in a number of forest types in the North. Lynx do not appear constrained to select specific stand types; rather, the feature that was consistently chosen was the structure at the site itself. Wind-felled trees were the most common form of protection selected by female lynx, although other structures such as roots and dense live vegetation were also used." In Maine, 17 den sites have been located in a variety of stand types, including 10- to 20-year-old clear-cut and adjacent residual stands (J. Organ, U.S. Fish and Wildlife Service, in litt. 1999; G. Matula, Maine Department Inland Fisheries and Wildlife in litt. 2003). Maine den sites are characterized by regenerating hardwoods and softwoods, dense understory, and abundant coarse woody debris (J. Organ, in litt. 1999, 2003). In Washington, lynx denned in lodgepole pine (*Pinus contorta*), spruce (*Picea* spp.), and subalpine fir (*Abies lasiocarpa*) forests older than 200 years with an abundance of downed woody debris (Koehler 1990). A den site in Wyoming was located in a mature subalpine fir/lodgepole pine forest with abundant downed logs and dense understory (Squires & Laurion 2000). Downed logs and overhead cover must be available throughout the home range of females with kittens to provide alternative den and nursery sites and security when lynx kittens are old enough to travel (Bailey 1974). Den sites found recently in Minnesota were primarily found in low- lying areas with dense vertical and horizontal cover (Moen et al. 2008a). Moen et al. (2008a) found that all den sites studied in Minnesota were associated with a downed tree, with disturbance area varying from 20 m^2 (>50ft^2) to more than 1 hectare (2.5 acres). Lynx den sites consistently had lower stem density than the surrounding area, with greater than 80% of tree stems being coniferous species. Lowalnd conifer and upland conifer types made up greater than 70% of the area within 100m of den sites and the percentage of those cover types decreased with greater distance from the den sites. These findings are consistent with Forest Service definitions for suitable denning habitat.

Lynx breed in spring, and females give birth in late May to early June to litters of up to five kittens; hare densities are correlated positively with litter size, and age at first breeding is lower when hare populations are high. During the low phase of the hare cycle, few if any kittens are born (Brand & Keith 1979; Poole 1994; Slough & Mowat 1996). Litter sizes may be smaller in the southern lynx range due to lower peak hare densities (Koehler 1990; Squires & Laurion 2000). A lynx den found in Minnesota near Superior National Forest in 2004, however, contained five kittens. Therefore, although mean litter sizes may be smaller on the southern edge of the species' range, large litter sizes do occur. Kittens wean at about 12 weeks after birth and stay with females during their first winter when they may hunt cooperatively (Quinn & Parker 1987); family units break up at the onset of breeding, about mid-March (Quinn & Parker 1987).

The most commonly reported causes of lynx mortality include starvation of kittens (Koehler 1990; Quinn & Parker 1987) and human-caused mortality (Bailey et al. 1986; Ward & Krebs 1985). Significant lynx mortality due to starvation (up to two-thirds of deaths) has been demonstrated in cyclic populations of the northern taiga during the first 2 years of hare scarcity (Poole 1994; Slough & Mowat 1996). Where trapping of lynx occurs legally, mortality of adults may be almost entirely human-caused during hare population lows (Poole 1994). Lynx are also killed by automobiles, disease, and other mammal species, although the significance of these factors to lynx populations is uncertain (Bailey et al. 1986; Brand & Keith 1979; Carbyn & Patriquin 1983; Shenk 2009; Ward & Krebs 1985). During a lynx irruption in Minnesota in 1971-1974 when the state allowed take by trappers, 96 percent of 128 mortalities were caused by trapping or shooting, whereas 4 percent were killed by cars (Henderson 1977). Of the 118 lynx that have died of known or suspected causes in Colorado since the state began reintroducing the species in 1999, approximately 29.7% were human-induced through either collisions with vehicles or shot, 18.6% died of starvation or disease/illness and 37.3% of the deaths were from unknown causes (Shenk 2009).

Linear features such as roads may benefit lynx from an energetic perspective, but may also have negative effects if they increase human exposure and the chance of incidental mortality (Moen et al. 2010). Of the 39 lynx mortalities recorded in Minnesota since 2000, ten died after being trapped, seven died as a result of collisions with cars, twelve died of unknown causes, seven were shot, two died after collisions with trains, and one was likely predated (U.S. Fish and Wildlife Service, unpubl.data). Although there is no longer legal harvest in Minnesota, lynx that travel long-distances into Canada are susceptible to legal harvest there (Moen et al. 2010). Four of the ten trapped Minnesota lynx were taken as legal harvest in Canada.

Buskirk et al. (2000) suggested that when other hare predators, particularly coyotes (*Canis latrans*), can access lynx winter hunting areas via compacted snow they may compete for prey sufficiently to affect local lynx populations, and study results support that theory (Bunnell et al. 2006). Buskirk et al. (2000) also suggested that direct killing by coyotes, bobcats, and mountain lions (*Puma concolor*) could affect lynx numbers where these competitors' ranges overlap substantially with lynx; in addition, Quinn and Parker (1987) stated that "(G)ray wolves (*Canis lupus*) will kill lynx that they catch in the open." Bobcat home ranges often exhibit elevational or latitudinal separation from those of Canada lynx, which are better adapted to deep snow. The paws of lynx support twice as much weight on snow than bobcats (Quinn & Parker 1987). Bobcats are thought to displace Canada lynx where both felids are locally sympatric. Canada lynx occasionally may kill bobcats (Giddings et al. 1998)5, although the opposite also has been reported.

Hybridization of lynx with bobcats has been confirmed in Maine, Minnesota, and New Brunswick with DNA analysis (Homyack et al. 2008; Schwartz et al. 2004). The hybrid animals had external physical characteristics of both species (Homyack et al. 2008). The Superior National Forest maintains a database to document the genetically confirmed Canada lynx within

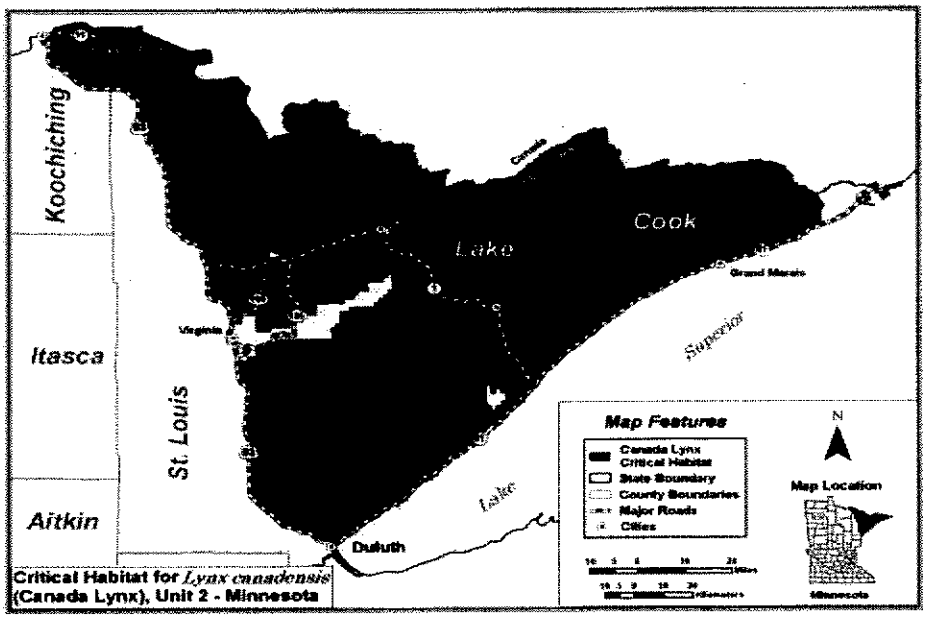
5 Giddings, B., W. Melquist, B. Oakleaf, and B. Bates. 1998. An assessment of lynx in the northern Rocky Mountains: a response to the U.S. Fish and Wildlife Service's request for information concerning the proposed rule to list the contiguous U.S. population of lynx as a threatened species. Montana Fish, Wildlife, and Parks, Helena.

Minnesota, which includes samples from the Forest's survey and monitoring program and other studies (Catton & Loch 2010). Of the 112 unique genotypes in the database, 104 are individual lynx (46 males, 57 females, and one undetermined) and eight are individual hybrids (3 females and 5 males) (Catton & Loch 2010). Lynx were detected in more than 10 counties, however the majority of the lynx were detected in St. Louis, Lake and Cook Counties where most of the data collection effort has been focused (Catton & Loch 2010).

Critical Habitat Description

In 2006, FWS designated 1,841 square miles as critical habitat for the lynx (71 CFR Nov. 9, 2006). In 2007, FWS began a new rulemaking for the critical habitat designation and, on February 25, 2009, FWS's revised critical habitat designation included approximately 39,000 square miles of critical habitat in five units in Maine (Unit 1), Minnesota (Unit 2), Montana and Idaho (Unit 3: Northern Rocky Mountains), Washington (Unit 4: North Cascades), and Wyoming (Unit 5: Greater Yellowstone Area, including part of southwestern Montana) (74 CFR Feb. 25, 2009). The majority of National Forest Lands within these units are within the designated lynx critical habitat area.

Unit 2, in northeastern Minnesota, is one of five units with designated critical habitat and is located in northeastern Minnesota in portions of Lake, Koochiching, Cook, and St. Louis Counties, which includes the majority of the Superior National Forest (Figure 4). An overall area of federal, state and private lands of 8,226.1 sq. miles was proposed for designation in Minnesota. The mining district in northeastern Minnesota known as the Iron Range, with an area of 78.2 sq. miles were excluded from the final designation, leaving 8,065.1 sq. miles as designated critical habitat (74 CFR Feb. 25, 2009). The majority of the designated critical habitat is



National Forest Land.

Figure 4. Lynx Critical Habitat in Minnesota

Status and Distribution

Canada lynx range is associated closely with the distribution of North American boreal forest inhabited by snowshoe hares (Agee 2000). It extends from Alaska, the Yukon Territories, and Northwest Territories south across the United States border in the Cascades Range and northern Rocky Mountains, through the central Canada provinces and down into the western Great Lakes region, and east to New Brunswick and Nova Scotia, Canada, and south into the northeastern United States from Maine to New York (McCord & Cardoza. 1982; Quinn & Thompson 1987).

Within the transitional boreal forest within the contiguous United States there are core areas for Canada lynx in Maine, Minnesota, Montana, Washington and likely Idaho (68 Federal Register 40076-40101, July 3, 2003). More generally, these core areas are contained within the Northeast, Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades regions. Status of Canada lynx in the Minnesota/Great Lakes region is summarized below. Outside of Minnesota in the Great Lakes region, lynx may also occur in Wisconsin and Michigan, but there is no current evidence of reproduction there and suitable habitat is limited and disjunct from occupied habitat in Minnesota and Canada (68 Federal Register 40076-40101, July 3, 2003).

Minnesota/Western Great Lakes Region

In Minnesota, recent and historical lynx records are primarily in the northeastern part of the state, especially in the Northern Superior Uplands Ecological Section. Historically, this area was dominated by red pine (*Pinus resinosa*) and white pine (*P. strobus*) mixed with aspen (*Populus spp.*), paper birch (*Betula papyrifera*), spruce, balsam fir (*A. balsamifera*) and jack pine (*P. banksiana*) (Minnesota Department of Natural Resources [Minnesota DNR] http://www.dnr.state.mn.us/ecs/212L/index.html, accessed July 29, 2011). Unlike elsewhere within the Great Lakes and Northeast regions, most lynx habitat in northeastern Minnesota is on public lands, particularly the Superior National Forest. Mixed deciduous-boreal forest suitable for lynx habitat encompasses most of the Superior National Forest, which has been mapped into Lynx Analysis Units to promote lynx management under the SNF Land and Resource Management Plan (USDA 2004b).

Harvest and bounty records for Minnesota, which are available since 1930, indicate approximate 10-year population cycles, with highs in 1940, 1952, 1962, and 1973 (Henderson 1977; McKevley et al. in Ruggiero et al. 1999). Lynx abundance in Minnesota appears to be directly related to population levels in nearby Canada (Mech 1980) – based on trapping records, lynx abundance in Minnesota appears to lag fluctuations in Manitoba, Ontario, and Saskatchewan by about three years (McKelvey et al. in Ruggiero et al. 1999). During a 47-year period (1930–1976) before cessation of legal harvest, the Minnesota lynx harvest ranged from 0 to 400 per year (Henderson 1977) and lynx were captured in the state through periods presumed to represent both population highs and lows.

In the 1990s there were only five verified records of lynx in Minnesota (M. Don Carlos, Minnesota Department of Natural Resources, in litt. 1994; S. Loch, pers. comm. 2006). Beginning in about 2000, Minnesota lynx numbers evidently began to rebound. Genetic analyses of scat and hair samples collected primarily along lynx snow trails and tissue samples from dead specimens and live captured lynx have confirmed presence of the 104 unique lynx genotypes (46

males, 57 females, and one undetermined) and eight individual lynx-bobcat hybrids (3 females and 5 males) in Minnesota since 2000 (Catton & Loch 2010). Lynx were detected in more than 10 counties, however the majority of the lynx were detected in St. Louis, Lake and Cook Counties where most of the data collection has been focused (Catton & Loch 2010). This number represents only a subset of the actual number of lynx that have been present in the state since 2000, which is unknown.

Lynx researchers have confirmed at least nine lynx dens in Minnesota by following the activities of radio-collared females in the years 2004-2006 (R. Moen, Natural Resources Research Institute, Duluth, MN, pers. comm. 2006). Moen et al. (2008a) located kittens every year in which females were radio-collared, totaling 33 kittens from 10 litters from 2004 through 2007.

Snowshoe hare harvest in Minnesota (the only available long-term index to hare abundance in the state) shows a very inconsistent pattern from 1941-2000. Hare abundance, as indicated by harvest, peaked in the early 1940s and 1950s along with lynx harvest, but not in the early 1950s or 1960s. In contrast, hare harvest was double any previous year from 1977-1980, yet lynx did not increase. Based on surveys in northern Minnesota, snowshoe hare numbers are currently high (Erb 2009).

Canada lynx may not be legally trapped in Minnesota, where they are a protected species, but at least seventeen lynx have been captured incidentally in recent years by trappers in pursuit of other species – seven of these lynx died as a result (U.S. Fish and Wildlife Service (USFWS), Bloomington, Minnesota, unpubl. data).

In previous biological opinions for federal actions that are ongoing in Minnesota, the Service anticipated various levels of take. These anticipated levels of take are described below, along with the actual recorded take that may be ascribed to each action. The Service monitors all known take and mortality of lynx in Minnesota in cooperation with the Forest Service.

• 2004 - Up to two lynx per year, but no more than 20 in total, over the 15 years after the approval of the Revised Land and Resource Management Plans, Chippewa and Superior National Forests. These plans were approved in July 2004. Thus, the Service has anticipated that this take would occur between July 2004 and July 2019. Thus far, only one incidental take may be ascribed to the Forest Service's implementations of these plans – a lynx was killed by an automobile in April 2005 on the Superior National Forest.

• 2005 - Trunk Highway 371 North, Federal Highway Administration – One over a 30 year period (2005-2035). Thus far, no take may be ascribed to this action. 2005 - Trunk Highway 1, Federal Highway Administration – Up to three lynx, over a 30 year period (2005-2035). Thus far, no take may be ascribed to this action.

• 2005 - Trunk Highway 53, Federal Highway Administration - Three lynx over the life of the project, a period of approximately 30 years from the start of project construction. Thus far, no take may be ascribed to this action.

• 2006 - Clean Water Act permit for the discharge of dredged or fill material into navigable waters by Northshore Mine, U.S. Army Corps of Engineers – One lynx during the ten year project period (2006-2015). Thus far, no take may be ascribed to this action.

• 2007 – Paving of Forest Road (Denley Road), in St. Louis and Lake Counties, Minnesota, Superior National Forest - One lynx killed by a vehicle as frequently as once every 10 years, on the 10.4 miles of FR 424 to be reconstructed. Thus far, no take may be ascribed to this action.

• 2007 - Mittal Steel, Minorca Mine Inc. East Reserve Project, U.S. Army Corps of Engineers - One lynx killed by a vehicle once every 16 years in the action area. Thus far, no take may be ascribed to this action. Collectively, we anticipate that these actions would result in the take of approximately 3 lynx per year within their combined action areas in Minnesota. In addition, during the approximately seven years during which the Service has collected lynx mortality data in Minnesota it has recorded the deaths of twenty-four lynx due to human causes (one of these was anticipated by a biological opinion).

• 2009 – Mesabi Nugget, U.S. Environmental Protection Agency – One lynx killed by a vehicle during the 30 year project period. Thus far, no take may be ascribed to this action.

Collectively, we anticipate that these actions would result in the take of approximately 3 lynx per year within their combined actions areas.

Northeast

As it did historically, the boreal forest of the Northeast currently exists primarily in Maine where habitat is currently optimal and a resident, breeding population of lynx occurs. Maine's lynx population is directly connected to substantive lynx populations and habitat in southeastern Quebec and New Brunswick. Lynx numbers in Maine apparently increased between 1999 and 2003, coinciding with regeneration of forest clearcut in the 1970's and 1980's and high numbers of lynx in nearby Quebec (Hoving et al. 2004). The potential exists for lynx to occur in New Hampshire because of its direct connectivity with Maine, and we presume they currently occur there. Lynx in Vermont have always existed solely as dispersers. Lynx occurring in New York since 1900 have been dispersers.

Northern Rocky Mountains/Cascades

In this region, the majority of lynx occurrences are associated at a broad scale with the "Rocky Mountain Conifer Forest;" within this type, most of the occurrences are in moist Douglas fir (*Pseudotsuga menziesii*) and western spruce/fir forests (McKelvey et al. in Ruggiero et al. 1999). Most of the lynx occurrences are in the 1,500-2,000 meters (4,920-6,560 feet) elevation class (McKelvey et al. in Ruggiero et al. 1999). These habitats are found in the Rocky Mountains of Montana, Idaho, eastern Washington, and Utah, the Wallowa Mountains and Blue Mountains of southeast Washington and northeastern Oregon, and the Cascade Mountains in Washington and Oregon. A substantial proportion of the verified lynx occurrences in the United States and confirmed breeding are from this region. The boreal forest of Washington, Montana, and Idaho is contiguous with that in adjacent British Columbia and Alberta, Canada.

The Northern Rocky Mountains/Cascades Region supports the most viable resident lynx populations in the contiguous United States, while recognizing that, at best, lynx in the contiguous United States are naturally rare. Strong evidence exists to support the presence of resident lynx populations distributed throughout much of the forest types considered lynx habitat in Montana and Washington. Resident lynx populations probably exist in contiguous habitats in Idaho and northwestern Wyoming. Lynx have probably always occurred intermittently in Oregon and Utah, although the historical or current presence of resident populations in either of these States has not been confirmed.

Southern Rocky Mountains

It is unclear whether lynx in this region historically occurred as a resident population or if historic records were of periodic dispersers. If a resident lynx population occurred historically in the Southern Rocky Mountains, then this native population has been lost. Isolation from potential source populations may have led to the extirpation of lynx in this region. Although habitats in the Southern Rockies are far from source populations and more isolated, it is still possible that dispersers could arrive in the Southern Rocky Mountains during highs in the population cycle.

From 1999 through 2006, the Colorado Division of Wildlife (CDOW) reintroduced 218 lynx from Canada and Alaska into southwestern Colorado (Shenk 2009). No lynx were released in 2007, 2008 or 2009. As of August 2009, CDOW was tracking 37 of the released animals and had confirmed 118 mortalities (Shenk 2009). Reproduction was first documented in 2003 when 6 dens and a total of 16 kittens were found in southwestern Colorado. A total of 42 dens were found during 2003-2009 surveys. No dens were found in 2007 or 2008. All of the dens have been scattered throughout the high elevation areas of Colorado, except one den was found in southeastern Wyoming in 2004 (Shenk 2006, 2009)

Environmental Baseline

The environmental baseline is defined as the impacts from federal, state or private actions and other human or natural activities in the action area, the anticipated impacts from all federal projects in the action area that have already undergone formal or early section 7 consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process.

Status of the Species within the Action Area

As was true historically, northeastern Minnesota supports a substantial amount of boreal forest (roughly estimated at 4,800 miles^2) (Great Lakes Ecological Assessment, in litt, undated). In Minnesota, the deepest snows occur in the northeast corner of the state (Minnesota DNR, http://climate.umn.edu/doc/snowmap.htm). Unlike elsewhere within the Great Lakes and northeast regions, most lynx habitat in northeastern Minnesota is on public lands, particularly on the Superior National Forest.

Lynx persist in the action area. The Superior National Forest maintains a database to document the genetically confirmed Canada lynx within Minnesota, which includes samples from the Forest's survey and monitoring program and other studies (Catton & Loch 2010). Of the 112 unique genotypes documented since 2000 in the Minnesota database, 104 are individual lynx (46

males, 57 females, and one undetermined) and eight are individual hybrids (3 females and 5 males) (Catton & Loch 2010). Lynx were detected in more than 10 counties, however the majority of the lynx were detected in St. Louis, Lake and Cook Counties where most of the data collection has been focused (Catton & Loch 2010). The Minnesota Department of Natural Resources (DNR) summarized all reports of Canada lynx observations in Minnesota reported to the DNR since the species received federal threatened status in March 2000 through November 11, 2006 (Figure 5). Over that time, the DNR received 426 reports; 63 (15%) reports have been verified as lynx.

It is difficult to estimate the abundance of highly mobile species that are rare and present at low densities. Assuming that about 25% of northeast Minnesota is suitable lynx habitat, coupled with assumptions about residence time and detectability, Moen et al. (2008b) estimated the number of lynx that might be resident in northeastern Minnesota at a given time as between 190 and 250 individuals. Recent research supports the hypothesis that lynx can persist without immigration, based on reproductive rates of females, movement rates and the distribution of potential denning habitat in northeastern Minnesota (Moen et al. 2008a; Moen et al. 2004; Moen et al. 2008b).

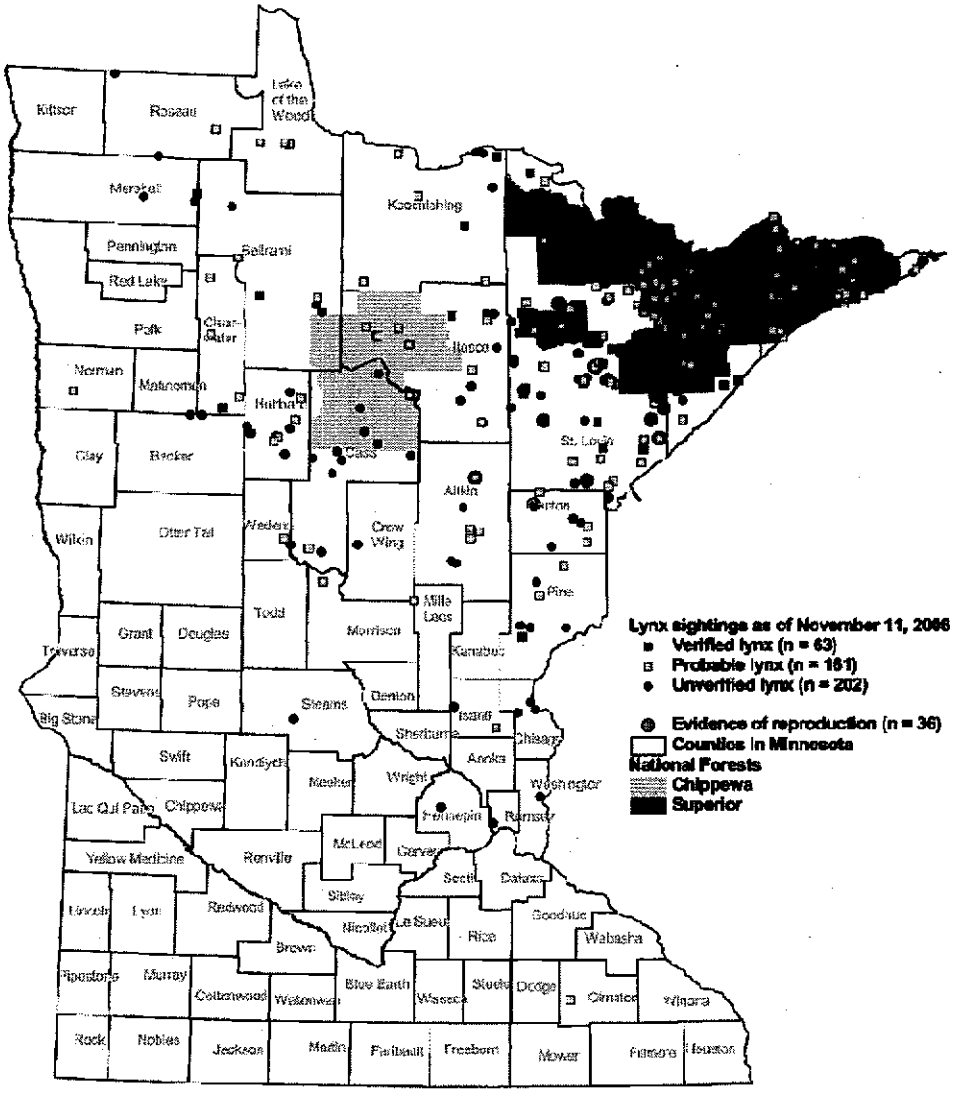


Figure 5. Lynx records in the Minnesota Department of Natural Resources' (MNDNR) database collected between March 2000 and November 11, 2006. MNDNR no longer maintains this database. MNDNR used the following criteria to determine whether to describe a record as "verified": a photo showing distinguishing characteristics was provided; conclusive behavioral observations were provided (e.g., lynx demonstrate curiosity and little fear of humans while bobcats are very secretive & elusive); DNA analysis of a tissue sample confirmed the identification; the observer is a known expert or otherwise has considerable experience with lynx; a detailed description of physical characteristics (e.g. very big feet, long hind legs, flat face, black tip of tail, etc.) was provided.

Snowshoe hare harvest in Minnesota (the only available long-term index to hare abundance in the state) shows a very inconsistent pattern from 1941 - 2000. Hare abundance, as indicated by harvest, peaked in the early 1940s and 1950s along with lynx harvest but not in the early 1950s or 1960s. In contrast, hare harvest was double any previous year from 1977 - 1980, yet lynx did not increase. Hares remained at relatively low densities through the 1990s (S. Loch, in litt. 2003). Based on surveys in northern Minnesota, snowshoe hare numbers are currently high (Erb 2009).

Unlike other Great Lakes and northeast regions of lynx range in the Unites States, most lynx habitat in northeastern Minnesota is on public lands, particularly the Superior and Chippewa National Forests. Mixed deciduous-boreal forest suitable for lynx habitat encompasses most of the Forests, which have been mapped into LAUs to promote lynx management under the LCAS. Currently, the majority of LAUs provide much more than minimum requirements for suitable habitat (Table 2). Approximately 62 percent of land in LAUs on the Superior National Forest is owned by the Forest Service; the remainder is owned by state, county, and private landowners (Forest Service 2011). Recent observations of lynx on or near the Chippewa (Moen et al. 2006) and Superior National Forests (Moen et al. 2008a; Moen et al. 2008b; Moen et al. 2010) indicate that lynx are present on these Forests at this time. The Superior National Forest has designated critical habitat; the Chippewa Forest does not.

Table 2. Current (2010) condition of LAUs on the Superior National Forest (Forest Service 2011). Percentages indicate the extent of suitable prey and denning habitat and unsuitable lynx habitat for all LAUs.

	Average Size	**Snowshoe Hare Habitat**	**Lynx Denning Habitat**	**Unsuitable Habitat**
Superior	42,910 acres	789,963 acres (61.6%)	549,507 acres (48.3%)	29,600 acres (2.2%)

Status of the Critical Habitat in Within the Action Area

On February 25, 2009 the USFWS designated revised critical habitat for the Distinct Population Segment (DPS) with northeastern Minnesota (Unit 2) being one of five units with revised critical habitat (see Figure 4). Unit 2 is located in northeastern Minnesota in portions of Lake, Koochiching, Cook, and St. Louis Counties, which includes the majority of the Superior National Forest. An overall area of federal, state and private lands of 8,226.1 sq. miles was proposed for designation. Areas of 78.2 sq. miles were excluded leaving 8,065.1 sq. miles being designated (74 CFR Feb. 25, 2009). The majority of the designated critical habitat is National Forest Land.

Excluded areas include a mining district in northeastern Minnesota known as the Iron Range because this area does not contain the biological and physical features essential to the conservation of lynx. The USFWS has stated that in much of the Iron Range mining has removed all vegetation and much of the affected area is flooded. Remaining areas that are that are still vegetated and not flooded are extensively fragmented by the mined areas and by haul roads. Additional areas disturbed by mining were identified and are not included in the final designated habitat (74 CFR Feb. 25, 2009).

The final critical habitat rule describes the Primary Constituent Elements (PCE) for lynx critical habitat, which contains the physical and biological features that are essential to the conservation of the species and that may require special management considerations or protections. As described in the rule, at the largest scale, the critical habitat units were designated due to their

functional capability to support lynx populations. Critical habitat for lynx is defined as boreal forest landscapes supporting a mosaic of differing successional forest stages and containing the following PCEs:

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

The Superior National Forest has conducted project level consultations, under Section 7 of the Endangered Species Act, on all actions that they determined may affect lynx critical habitat since critical habitat was proposed in 2008 and since the final designation in 2009. To date, all of those consultations resulted in the Service's concurrence with the Superior National Forest's may affect but not likely to adversely affect determinations for lynx critical habitat.

Factors Affecting the Species and Critical Habitat Within the Action Area

In the LCAS, the Lynx Biology Team identified potential risk factors to lynx that are within the authority and jurisdiction of the federal land management agencies. Because effects to lynx are closely tied to habitat, most of the identified risks to lynx are also potential risks to lynx critical habitat. These risk factors include management of timber, wildland or prescribed fire, recreation, roads and trails, grazing, and other human developments such as agriculture. Risk factors that have recently become more pervasive include climate change, oil and gas leasing, mining exploration and other mining activities. Roads, railroads, utility corridors, land ownership patterns, and developments may affect lynx movements. Risks of direct lynx mortality may come from trapping, shooting, predator control, vehicle collisions, and competition or predation as influenced by human activities. Other large-scale risk factors to lynx and lynx critical habitat are fragmentation and degradation of lynx habitat for example, from non-native invasive plant species invasions, climate change or changes in land ownership. Each of these potential risk factors may occur in the action area except livestock grazing; predator control is unlikely and restricted to depredating wolves in all areas except Zone 1 (50 CFR 17.40), where no predator control activities may take place. Timber management, wildland fire, recreational use, roads and trails, and developments on private land inholdings are most likely to affect lynx in this area.

The lynx critical habitat final rule described three types of Federal actions that may affect critical habitat, and therefore should result in consultation. Briefly, these are summarized as follows:

1) Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx. These activities could significantly reduce the quality of snowshoe hare habitat such that the landscape's ability to produce adequate densities of snowshoe hares to support persistent lynx populations is at least temporarily diminished.

2) Actions that would cause permanent loss or conversion of the boreal forest on a scale proportionate to the large landscape used by lynx. Such activities could eliminate and fragment lynx and snowshoe hare habitat.

3) Actions that would increase traffic volume and speed on roads that divide lynx critical habitat. These activities could reduce connectivity within the boreal landscape for lynx, and could result in increased mortality of lynx.

In matrix habitat, activities that change vegetation structure or condition would not be considered an adverse effect to lynx critical habitat unless those activities would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range, or if they adversely affect adjacent foraging or denning habitat.

Each component of the PCE, and each of the examples of "may affect" situations above, involve the breeding, feeding, or sheltering aspects of lynx behavior. Alterations of critical habitat that affect lynx behavior could affect the landscape's ability to support lynx populations, at least temporarily. The LAU is used as the basic scale within which to assess effects of actions on lynx and also serves as an appropriate scale to address effects on critical habitat.

The following is a summary of issues in the action area that are relevant to the identified risks.

Reduction in Habitat Quality or Quantity

The LCAS defines habitat characteristics that provide adequate foraging and denning habitat, particularly conditions that support adequate abundance of prey. Activities that change forest structure can affect habitat quality for lynx and snowshoe hares, their primary prey source. Thinning and other timber management practices that reduce stem density and downed material and promote more open, mature stands can reduce habitat quality and quantity. Much of the Superior National Forest outside the BWCAW has been managed in ways that have altered forest age class, stand structure and species composition. However, with the implementation of the LCAS, in the last eleven years, no more than 30 percent of potential lynx habitat on all ownerships within an LAU could be in an unsuitable condition (generally less than three years old), nor could more than 15 percent of National Forest system lands be converted to an unsuitable condition within 10 years; therefore, habitat alteration has not been a limiting factor in the action area.

Habitat Fragmentation

Throughout the Superior National Forest and northern Minnesota, human activities have reduced connectivity between patches of suitable lynx habitat. Development for residential and commercial uses, as well as roads, railroads, and utility corridors have all interrupted linkage corridors. Still, much of the land within the Forest remains undeveloped and lynx habitat remains relatively intact and well connected. This is particularly true on the Superior National Forest, which has a "high standard" (OML 3, 4 and 5) road density of 0.45 miles/mile^2 outside the BWCAW.

Additionally, changes in land ownership, such as from a land exchange, benefit lynx and snowshoe hares through Forest Plan direction D-LA-1, O-LA-1 and G-LA-2 (USDA 2004a, p. 2-50). A priority in land acquisitions is to acquire land needed for federally threatened and endangered species (G-LA-2a).

Climate change

In 2003, the Service determined that climate change was not a threat to lynx within the contiguous U.S. DPS because the best available science we had at that time (Hoving 2001) was too uncertain in nature (68 FR 40083). Since that time, new information on regional climate changes and potential effects to lynx habitat has been developed (e.g., Danby & Hik 2007; Gonzalez et al. 2007; Knowles et al. 2006), and this new information suggests that climate change may be an issue of concern for the future conservation of lynx because lynx distribution and habitat is likely to shift upward in elevation within its currently occupied range as temperatures increase (Gonzalez et al. 2007). This information, combined with the information in Hoving (2001), still needs to be evaluated further to determine how climate change might affect lynx and lynx habitat. No scientific information currently exists to predict that climate change will specifically affect the Forest conditions during the life of the Forest Plan (i.e., until 2019).

Increased Access for Competing Carnivores

Lynx have evolved a competitive advantage in deep, soft snow environments; their large paws are adapted to hunt prey in areas that are inaccessible to other predators. This capability has made winter foraging habitat available to lynx that is unavailable to other carnivores. Snow compacts under natural conditions; however, snow compacted by human activity may increase access by coyotes and bobcats to prey in deep snow conditions where historically they were excluded or rare. Winter road use, snowmobiling, cross country skiing, and dog sledding all have the effect of compacting snow. Outside the BWCAW, snowmobile activity is extensive and increasing significantly. The Superior National Forest has 705 miles of snowmobile trails and 1,562miles on all ownerships within the proclamation boundary (USDA 2011). Advances in snowmobile capabilities have raised concerns about intrusion and new snow compaction in areas previously not vulnerable to high levels of snowmobile use. In addition, new road construction in lynx habitat has made more areas accessible during winter. These routes could be used by snowmobiles even if new roads are designated as closed to motorized public travel during other seasons. The Superior National Forest has 1,927miles of low standard roads (OML 1 and 2) and

158 miles of temporary roads (USDA 2011). All of these factors have potential to reduce the deep and fluffy winter snow conditions and to reduce the competitive advantage of lynx in areas that typically receive deep snows.

Human-caused Mortality

Roads are a factor in human-caused lynx mortality where they provide access to areas where lynx occur, increasing the risk of negative interactions between people and lynx. Throughout the Forest outside the BWCAW, high and low standard roads bisect many areas that provide potential or suitable lynx habitat. Paved roads have been a mortality factor in lynx translocation efforts within historical lynx range. Other than translocated animals, there has been one documented occurrence of highway mortality in Wisconsin (Thiel 1985), and, in Minnesota since 2000, there have been three apparent highway mortalities (U.S. Fish and Wildlife Service, unpublish.data). Two additional mortalities have occurred on secondary roads and one death has occurred on a Superior National Forest road (U.S. Fish and Wildlife Service, unpublish.data). Two other mortalities documented in Minnesota can be attributed to railroads (U.S. Fish and Wildlife Service, unpublish.data). Single, rare mortality events could be significant when lynx numbers are low. In Minnesota, lynx trapping is no longer legal, though lynx are vulnerable to legal trapping for other mammals. Since 2000, there have been at least seventeen documented incidents of trapped lynx in Minnesota, and of these at least seven are known to have died (, U.S. Fish and Wildlife Service, unpublish.data). Additionally, six lynx have been documented as shot and killed in Minnesota; two of these mortalities were within the Superior National Forest proclamation (U.S. Fish and Wildlife Service, unpublish.data). Four lynx that were radio collared in Minnesota have been legally trapped and killed in Canada since 2000 and two died of unknown causes (U.S. Fish and Wildlife Service, unpublish.data).

The Superior National Forest is currently implementing the 2004 Forest Plan, which has direction based on the LCAS and Canada Lynx Conservation Agreement (CA) between the Forest Service and the Service (2000), for all forest activities that occur within LAUs. Thus, the aforementioned risk factors are being minimized and managed to promote the conservation of lynx within the Superior National Forest.

There are areas within designated critical habitat which were not mapped as LAU areas. Approximately 73,976 acres of Superior National Forest lands are outside LAUs but within designated critical habitat (USDA 2011). These areas were not included in the LAU development, primarily because of the mixed ownership patterns USDA2000). For actions that occur on Forest land that is not part of a LAU, the Forest still follows Forest Plan direction; however there is no clear way to measure lynx indicator thresholds.

Effects of the Action

Direct and Indirect Effects to Lynx and Lynx Critical Habitat

Direct effects are impacts on species and habitat that occur at the same time and place as the action and are caused by the action. Indirect effects are impacts caused by or resulting from actions of specific projects that are later in time and are reasonably certain to occur.

The Forest Plan incorporates the vast majority of the conservation measures outlined in the LCAS; Appendix B of the 2004 BA (USDA 2004a) cross references Forest Plan direction to the LCAS conservation measures. The 2011 BA (USDA 2011) provides a crosswalk between lynx critical habitat PCEs and Forest direction. In some instances, conservation measures that were recommended to be standards were incorporated into the Forest Plan as guidelines. While guidelines are not as strict as standards (i.e., to violate a standard the Forest Service must amend the Forest Plan, while exceptions to guidelines only require justification in the project planning record), any exceptions to guidelines would be evaluated on an individual project basis, and if the resulting action may affect Canada lynx, the Forest would consult with the Service. Therefore, at this time and at the programmatic scale, the Service is evaluating standards and guidelines as having essentially equal authority.

The Forest Service developed the Forest Plan as strategic rather than procedural guidance. Some conservation measures in the LCAS were not conducive to inclusion in the Forest Plan due to their strategic nature. These measures include those relating to procedures such as promoting outreach, reducing impacts of highways through identification of areas of high lynx use, and identifying and promoting linkage areas. These procedures are not prescriptive outcomes; rather, they are analyses that should be performed. These measures were included in the Lynx Appendix (E) of the Forest Plan (USDA 2004b). Other information from the LCAS and incorporated in the Lynx Appendix includes direction on development and implementation of LAUs, habitat definitions, and incorporation of new information. This appendix ensures the context and application of the LCAS is carried forward as the Forest Plan is implemented and is critical to the conservation of lynx and lynx critical habitat on the Forest.

In determining the effects of an action on lynx, we consider the effects to individual lynx and the species as a whole. In determining the effects of an action on critical habitat, we consider the effects to the PCEs within the critical habitat unit affected by the action. Impacts to lynx are closely tied to impacts to habitat; therefore the effects of habitat –based effects to lynx and lynx critical habitat may mirror each other. However, there may be differences in the effects to lynx and lynx critical habitat in terms of the potential for impacts due to trapping or roads. The function of the PCE at the LAU scale relates to the adequacy of the habitat to support breeding. In this consultation, we are not considering the effects of any one particular project within a discrete action area; rather we are looking at the implementation of the Forest Plan across the Forest.

Overall, management for and consideration of lynx in the Forest Plan is assured during project-specific actions due to the inclusion of many objectives, standards, and guidelines specifically designed for lynx conservation and management (O-WL-8-15; S-WL-1-2; G-WL-1-6, 8-9). Risks to lynx and lynx critical habitat continue to be minimized by these protective measures and by the continued use of LAUs to assess effects of proposed actions to lynx on the Forest; the use of LAUs ensures continued assessment of lynx and lynx critical habitat over time as projects are implemented under the Forest Plan.

Based on the LCAS, the Forest and the Service developed the lynx indicators to streamline consultations and help determine the effects to lynx and lynx critical habitat. Each indicator can

be measured by the one specific Forest direction or a combination of specified Forest objectives, standards or guidelines (Table 3):

Table 3: Forest indicators developed to streamline consultation on effects to lynx and lynx critical habitat. The primary Forest direction for each indicator is listed, however each indicator may be measured by a combination of specified Forest objectives, standards or guidelines.

Forest Indicator	**Forest Direction**
1a. Snowshoe hare habitat.	G-WL-3
1b. Percent of unsuitable habitat on NFS land.	S-WL-1
2. Acres of red squirrel habitat.	Dropped from further analysis.
3. Denning habitat in patches greater than 5 acres.	G-WL-4
4. Percent of lynx habitat in LAUs with adequate canopy cover upland forest greater than 4 years old and lowland forest greater than 9 years old.	S-WL-1
5. Miles of ATV trails allowed.	O-RMV-1
6. Miles of snowmobile trails allowed.	O-RMV-1
7. Miles of temp and OML 1&2 roads.	O-WL-7, S-WL-2
8. Policy on cross-country use of ATVs and snowmobiles.	S-RMV-3
9. Policy on use of ATVs and snowmobiles on OML1 and 2 roads.	G-RMV-4
10. Acres of snowshoe hare habitat in which within stand structure will be increased through diversity and under-planting of conifer on SNF lands.	O-WL-9
11. Acres and % of lynx habitat currently unsuitable on all ownerships.	G-WL-3
12. Cumulative change to unsuitable condition on NFS lands.	S-WL-1
13. Road and compacted trail density on all ownership.	G-WL-8
14. Connectivity.	D-WL-3h, O-WL-7, O-WL-11, O-WL-12 and O-WL-4

In the 2011 Biological Assessment, the Forest added Indicator 14 -Connectivity. Forest Plan land adjustment directions D-LA-1, O-LA-1 and G-LA-2 all help ensure habitat connectivity for threatened and endangered species is considered in land adjustment decisions. In addition, D-WL-3h, O-WL-7, O-WL-11, O-WL-12 and O-WL-4 help to ensure habitat connectivity within the Forest.

Since analyses for effects to lynx are largely habitat based, the same analysis indicators are appropriate for analysis of effects to lynx critical habitat. Forest Plan direction was examined to determine if the direction, standards and guidelines were adequately addressing each Primary

Constituent Element (PCEs) of lynx critical habitat, which contain the physical and biological features that are essential to the conservation of the species.

The function of PCE (a) is to maintain presence of snowshoe hares and their preferred habitat conditions. Forest Plan directions D-VG-3, D-WL-3c and D-WL-h ensure that the Forest provides the vegetative composition and age classes in sufficient quantities and distributions to support snowshoe hare. Forest Plan directions O-WL-11, O-WL-11, O-WL-12 and O-WL-13 provide naturally distributed forest conditions in patch sizes and distribution across the landscape to support dense understories of young forest for snowshoe hare habitat, which provides connectivity for snowshoe hare and lynx to disperse within the Forest, and into Canada through the BWCAW. Land ownership changes benefit snowshoe hare and hare habitat through Forest Plan direction D-LA-1, O-LA-1, G-LA-2. In addition, wildlife specific direction promotes prey species habitat by allowing for both natural and active management to retain and improve snowshoe hare habitat in LAUs, the BWCA and areas outside of LAUs that are in critical habitat. The combined direction will support and maintain snowshoe hare habitat features. Indicators 1a, 1b, 4 and 10 are appropriate measures of PCE (a).

The function of PCE (b) is to minimize the ability of competitors to access habitat areas that lynx occupy during the winter. Forest Plan directions D-RMV-1, O-RMV-1, S-RMV-3, D-REC-3, S-TS-3, and S-TS-4 ensure that the impacts of snow-compacting motorized and non-motorized recreational activities across the Forest landscape outside the BWCAW are minimized. O-RMV-1 states that a maximum of 90 additional ATV trail miles and 130 snowmobile trail miles with associated trail facilities may be added to the designated National Forest Trail system.

Wildlife-specific management direction (e.g. D-WL-3c, D-WL-3h, D-WL-5, O-WL-4, O-WL-6, O-WL-13, O-WL-14, S-WL-2, G-WL-6, G-WL-7, G-WL-8, and G-WL-9) promotes planning and implementation of snow-compacting activities that maintain habitat integrity and connectivity, and large areas of the Forest with little or no snow-compacting recreational activities by managing the Forest road and trail networks. G-WL-8 ensures that road and snow-compacting trail densities within LAUs are maintained below 2 miles per square mile to maintain the natural competitive advantage of lynx in deep snow. Forest guideline G-WL-8 ensures that in LAUs where total road and regularly-used snow-compacting trail densities are greater than 2 miles per square mile and coincide with lynx habitat, that the Forest should prioritize roads for seasonal restrictions or reclamation in those areas, where practical or feasible. Other Forest Plan direction also closes or decommissions trails, and/or unclassified, Special Use Permit (SUP) and temporary roads as soon as access use is completed, or when these trails or roads are no longer needed (S-TS-3, S-TS-4). Furthermore, 154 miles of unclassified road will be decommissioned under implementation of the Travel Management Project. Forest direction (S-WL-2, G-WL-6, and G-WL-8) conserves critical habitat by minimizing habitat from use by lynx competitors. The combined direction will support and maintain lynx habitat that is secure from competitors. Indicators 5, 6, 7, 8, 9, and 13 are appropriate measures of PCE (b). In addition, indicators 1b, and 14 can also serve as measures of PCE (b).

The function of PCE (c) is to ensure that suitable denning habitat is available. Forest Plan directions D-VG-3, D-WL-3c and D-WL3h ensure that the Forest provides an adequate quantity and distribution of vegetative composition, age classes and structure that support recruitment of

down wood that could serve as lynx denning habitat throughout the Forest outside of the BWCA. Suitable denning habitat is managed through Forest Plan directions G-WL-4 and G-WL-5. Additional Forest directions protect potential denning sites and habitat through constructing fewer OML 3-5 roads, decommissioning unclassified roads, closing or restricting access from existing or newly constructed trails to OML 1, OML 2, temporary or unclassified roads. Indicator 3 is an appropriate measure for PCE (c). The combined direction supports and maintains suitable habitat availability and distribution in the Superior National Forest.

The function of PCE (d) is to provide matrix habitat that occurs between patches of boreal forest in close juxtaposition such that lynx are likely to travel through while accessing patches of boreal forest within a home range. Forest Plan directions ensure that the Forest provides for matrix habitats through a combination of wildlife-specific (e.g. D-WL-3a, D-WL-3h, S-WL-1, G-WL-1, G-WL-3, O-WL-4-8, O-WL-11-15) and vegetation landscape ecosystem (e.g. D-VG-3). Habitat management direction (O-WL-11) also provides connectivity habitat that allows lynx and snowshoe hare to disperse within the Forest, including the BWCA, and into Canada. Lynx appear to be moving freely across the Forest and through the BWCA (Moen et al. 2010). Forest Plan direction for land ownership patterns (e.g. D-LA-1, O-LA-1, G-LA-2) enhances vegetation management objectives and provides connectivity for lynx and prey to disperse throughout the Forest. Forest Plan direction plans for consolidated motorized roads (O-TS-2), the effective closure of temporary roads and decommissioning of unclassified roads (S-TS-3, S-TS-4) and for effective barriers to prevent highway vehicles and ORVs on existing OML 1 roads (G-TS-12). The combined direction will support and maintain the ability for lynx to travel to and from patches of boreal forest habitat. Indicators 1b, 4, 11, 12 and 14 are appropriate measures of PCE d.

Following is an analysis of potential direct and indirect effects on lynx and lynx critical habitat for each of the specific management actions likely to occur under Forest Plan direction. Categories of management covered in the Forest Plan and not addressed here either have no effect on the species or critical habitat, have risks that are completely eliminated by Forest-wide direction, or are irrelevant to this analysis.

Vegetation and Minerals Management

In the model used by the Forest Service to predict vegetation changes during Forest Plan implementation, lynx habitat is broken down into several components: snowshoe hare habitat, red squirrel habitat, denning habitat and unsuitable habitat. These categories were defined in the model by the forest types that fall into descriptions of these habitats in the LCAS. Suitable hare habitat is defined as vegetation that provides food, security from predators, and thermal protection during extreme weather and may be generally described as forest that supports a high density of young trees or shrubs (> 4,500 stems or branches per acre), and tall enough to protrude above the snow (three to ten feet). In northern Minnesota these conditions may occur in a wide variety of habitats, including lowland conifer bogs and forests; early successional forest typically three to 12 years following disturbances such as fire, insect infestations, catastrophic wind events, disease outbreaks, and timber harvest; older forests with a substantial understory of shrubs and young conifer trees; and willow/alder swamps (Fuller & Heisey 1986; Koehler 1990; Pietz & Tester 1983). In addition, coarse woody debris or brush piles, especially in early

successional stages (created by harvest regeneration, management-ignited fire, or natural disturbances such as fires or blowdown) provide important cover for snowshoe hares and other prey.

Forest Plan direction was developed based on the premise that red squirrel was a key alternative prey species for lynx. Recent research concluded that the red squirrel contributed little to the diet of Canada lynx (Burdett 2007; Hanson & Moen 2008; Squires & Ruggiero 2007). Therefore, the Superior National Forest has proposed to remove the habitat indicator for red squirrel from further use. The Service concurs that this indicator can be dropped for lynx analyses, based on the recent research cited above.

Denning habitat is used by female lynx during parturition and rearing of young until they are mobile. The common component appears to be large amounts of coarse woody debris, with downed logs or root wads in sufficient amounts to provide escape and thermal cover for kittens. Denning habitat may be found in a variety of forested habitats, especially older mature forest of conifer or mixed conifer/deciduous, or in regenerating stands (greater than 20 years since disturbance). Forest disturbed by blowdown, fire, insect, or disease also may provide denning habitat.

Since the 2004 BA and BO were written, several lynx denning sites have been confirmed in the Superior National Forest (Burdett 2007; Moen et al. 2008a). Den sites found recently in Minnesota were primarily found in low- lying areas with dense vertical and horizontal cover (Moen et al. 2008a). Moen et al. (2008a) developed a model to predict the spatial distribution of suitable denning habitat at the LAU scale, which estimates that approximately 25% of the landscape in northeastern Minnesota consists of suitable lynx denning habitat. The Superior National Forest denning habitat criteria is more conservative than Moen et al. (2008a), and therefore affords greater protection for potential lynx denning habitat.

Unsuitable habitat is strictly defined in the LCAS and in the model as young forest where vegetation has not developed sufficiently to support snowshoe hare populations during all seasons. Unsuitable habitat results from either natural disturbances such as fire, flooding, blowdown, or insect and disease outbreaks or from human management activities.

Probable vegetation management practices conducted under the Forest Plan includes timber harvest, such as thinning, clear-cutting, shelterwood, partial cut, and uneven-aged cutting; wildlife restoration projects that involve tree cutting, shearing, burning, seeding, and planting; prescribed burning for ecological purposes, hazardous fuel reduction, and site preparation; mechanical site preparation (definitions of these management actions may be found in the Forest Plan). Natural processes such as succession, fire, wind, insects, disease, flooding, and nutrient cycling will also continue to affect the structure and composition of vegetation on the Forests.

Minerals exploration projects are also becoming more prevalent across the Forest recently. Drill pad site preparation includes vegetation clearing on small patches of land (average of approximately 1.6 acres). This cleared land may provide snowshoe hare habitat after it has time to revegetate. Land exchanges in proposed mining sites could have mixed impacts such as a loss of wolf prey habitat in the proposed mining sites, but a gain of habitat in others areas that are

currently in other ownerships. This could lead to a consolidation of wolf prey habitat where the US Forest Service would gain ownership. Habitat lost by large-scale mining operations would be an irreversible or irretrievable impact to wolf prey due to the large-scale changes in landscape character at the mining sites.

Vegetation, timber, and minerals management authorized under the Forest Plan has the potential to adversely affect lynx and lynx critical habitat by reducing habitat quality for denning, foraging, and dispersal; disrupting travel, resting, and foraging patterns; disturbing denning females and reducing habitat quality for lynx prey species, especially snowshoe hare. Depending on the timing, frequency, intensity, extent, amount, or other conditions, impacts may be variable among similar projects. Using the LCAS as a basis, the Forest Plan has incorporated a number of components that would reduce the risk of those impacts.

The Forest Plan includes broad direction to design and implement vegetation management projects within LAUs to maintain or restore conditions for lynx foraging and denning habitat (O-WL-4-5, 8-9; G-WL-1, 4-5) and to maintain or improve juxtaposition of required habitat types and connectivity (O-WL-4-5, 7-8, 10-12; Lynx Appendix E). Actions intended to protect structures, forest resources, and communities from fire or actions whose short-term impacts are offset by longer term benefits to lynx may be accepted from several of these standards and guidelines. The LCAS specifically states that no more than 30 percent of lynx habitat in an LAU should be in unsuitable condition if that area is to support lynx. For vegetation management actions, this provision is incorporated into the Forest Plan as G-WL-3. Because this is a guideline, exceptions may exist (e.g., on the Superior National Forest, LAUs 44 and 46 are being managed primarily for connectivity rather than foraging or denning habitat); however, any actions that may affect lynx or lynx critical habitat will be subject to project-specific consultation. Further, the Forest Plan incorporates the provision in the LCAS that states that no more than 15 percent of lynx habitat within an LAU may be converted to an unsuitable condition by the National Forest within a 10 year period (S-WL-1). No exceptions (aside from Superior National Forest LAUs 44 and 46) may occur to this standard without amending the Forest Plan.

Over the long term, the Forest Plan will alter vegetation patterns on the landscape. Suitable hare habitat was predicted to decrease over time with implementation of the Forest Plan, but has actually increased since 2004 (Table 4). Management activities that create unsuitable conditions for hare generally include clear-cut and seed tree harvest, and might include management-ignited fire, mechanical site preparation, salvage harvest, and shelterwood and commercially-thinned harvest, depending on unit size and remaining stand composition and structure. Suitable hare habitat is predicted to remain above the range of natural variation, which is essentially a description of conditions that existed prior to European settlement (1600 – 1900 A.D.) of the area (USDA 2004a). Further, unsuitable habitat for lynx would vary only slightly with continued implementation of the Forest Plan and would remain distinctly below the maximum of 15 percent unsuitable in a decade prescribed in the LCAS and incorporated into the Forest Plan (S-WL-1). Current (2010) unsuitable habitat levels are below what was predicted in the 2004 BA (Table 4). Because suitable habitat on National Forest lands alone is such a high percentage within LAUs and the Superior National Forest is the majority landowner within most LAUs, we expect that the Forest would not approach the LCAS maximum of 30 percent of lynx habitat on

all ownerships in an unsuitable condition within an LAU at any time, which would be ensured by corresponding guidance in the Forest Plan (G-WL-3).

Suitable hare habitat is high in Forest land outside of designated LAUs (USDA 2011), and unsuitable habitat is currently at very low levels.

Table 4. Projected percentage of suitable and unsuitable habitat for lynx forage on all LAUs on National Forest land after implementation of the Revised Forest Plan (USDA 2004a, b) and current (2010) conditions (USDA 2011). Percentages refer to the percent of total lynx habitat within LAUs on National Forest land. For analysis purposes, Decade 1 begins January 1, 2005 with Decade 2 beginning on January 1, 2015.

Year/Decade of Forest Plan Implementation	Superior National Forest			
	Snowshoe Hare Habitat (Acres (1000s)	Snowshoe Hare Habitat (%)	Unsuitable Habitat Acres (1000s)	Unsuitable Habitat (%)
Baseline (2004)	666.6	53.6	57.3	4.6
Current (2010)	789.9	61.6	29.6	2.3
1	602.6	48.4	47.7	3.8
2	521.3	41.9	48.0	3.9
5	373.0	30.0	49.2	4.0
10	399.9	32.1	44.7	3.6

In the 2004 BA, denning habitat was predicted to decrease across the Forest. Current (2010) data indicates that denning habitat for lynx on National Forest lands remains far above the 10 percent minimum prescribed by the LCAS and incorporated into the Revised Plan (G-WL-4), as shown in Table 5. This guidance to ensure minimum amounts of denning habitat in each LAU would further guarantee that denning habitat would be well distributed across the Superior National Forest.

Table 5. Projected availability of denning habitat in patches five acres or greater for lynx after implementation of the Revised Forest Plans (Forest Service 2004) and current (2010) conditions (Forest Service 2011). Denning habitat is calculated on all LAUs on National Forest land, and percentage refers to the percent of total lynx habitat. LAUs should have a minimum of 10 percent denning habitat. For analysis purposes, Decade 1 begins January 1, 2005 with Decade 2 beginning on January 1, 2015.

Year/Decade of Forest Plan Implementation	Denning Habitat in the Superior National Forest	
	Total Denning Habitat in Patches >5 acres	
	Acres	%
Baseline (2004)	514,600	45.1
Current (2010)	549,507	43.3
1	475,300	41.8
2	429,500	37.8
5	216,300	19.0
10	502,000	44.1

Additionally, juxtaposition of foraging and denning habitats would improve in many areas due to harvest practices creating young forest within older stands. Guidance would further provide an emphasis at project level to promote denning habitat in appropriate spatial distributions and juxtaposition to foraging habitat (O-WL-10). Within-Forest connectivity on the Superior National Forest was projected to have more than 95 percent forested cover on LAUs over the life of the Forest Plan (USDA 2004a), however current conditions provide 87.5% connectivity. Still, connectivity remains high and provides lynx travel habitat between foraging and denning areas. Connectivity is less assured between other large blocks of suitable habitat within Minnesota and in the Great Lakes geographic area, due to the extent of agriculture, roaded, or developed land use. The Superior National Forest have limited ability to influence connectivity outside of their boundaries, although guidance is provided in the Forest Plan to promote public and interagency cooperation and support for restoring or maintaining connectivity (O-WL-12). Recent research indicates that habitat connectivity may not be a limiting factor for lynx in northeastern Minnesota as demonstrated by long distance straight line paths traversed by radio collared lynx (Moen et al. 2010).

The objectives and standards and guidelines promote lynx habitat and these provisions reduce and minimize risks to lynx and lynx prey habitat. Although specific projects may render some areas less suitable for lynx and through implementation of projects could result in the potential for adverse effects to individual lynx, the Forest Plan ultimately ensures conservation of lynx and lynx critical habitat over the long term on the Forest.

Human Disturbance

There are a number of threats to lynx and lynx critical habitat from management of roads and facilities and management of recreation resources. They include increased risk of disturbance and negative human-lynx interactions (harassment and/or mortality), alteration of habitat and dispersal corridors, and snow compaction associated with winter recreation that may increase competition with other carnivores. Currently the LCAS identifies the indirect effects of human access and disturbance as a greater risk than direct impacts; this is primarily a result of increased snow compaction that may allow competing carnivores, such as bobcat or coyote, to access lynx habitat.

Direct effects of human disturbance (including dispersed recreation and low standard roads) may result from disruption of travel, resting, and foraging patterns; disturbance of denning females during construction and collision with vehicles. Travel is disrupted directly via collision with vehicles and indirectly via avoidance of roads and populated areas. Due to the extensive acreage of Forest Service land, the scattered dispersal and timing of road and trail construction, guidance to protect known dens (G-WL-2), the relatively few lynx present on the Forest at a given time, and the small area and short timing of construction, the direct effects of road and trail construction are likely to be temporary and very low in magnitude. However, vehicle collisions, particularly on high standard roads, may have a greater effect on lynx populations. Since 2000 in Minnesota, six incidents of lynx road kill in northern Minnesota have been documented: three off the National Forests on county, state and federal highways, and one on the Superior National Forest on the Gunflint Trail (a high standard road: OML 5) (USDA 2004a,b, USFWS , unpublished data). When lynx prey populations are low, hunger-related stress often compels lynx

to travel, and the likelihood of road crossings increases. Road upgrades are not proposed in the Forest Plan; however, they are likely to occur to meet human health and safety or other environmental concerns and essential management needs. Upgrading results in wider roads and generally increased travel speeds. A guideline is proposed in the Forest Plans to minimize upgrading and reduce impacts of higher standard roads (G-WL-9), although there is very little information available in the literature on road design to minimize effects to lynx or lynx critical habitat. The guideline and the Lynx Appendix require, during project-specific analysis, an assessment of linkage areas and habitat use in the project area. However, there is little opportunity to minimize the effects of high standard roads, and lynx will likely be killed in vehicle collisions at a continued low level. A greater effect is more likely to occur from increased human use of the National Forests than from direct mortality as a result of collisions with vehicles.

Indirect effects of human disturbance are more extensive: designated winter recreation trails and policies that allow recreational vehicles on low standard roads or cross country facilitate access to lynx habitat by competitors. Further, human access via these roads and trails creates the potential for incidental trapping or shooting. Recent evidence of seven incidental trapping deaths is an indicator of this potential problem (U.S. Fish and Wildlife Service, unpubl. data). These effects are generally long term on trails and low standard open roads. Temporary and low standard closed roads, if closed effectively, only contribute to these effects of increased competition and human interaction while open (generally several years or less for temporary roads, and intermittently for low standard closed roads).

The Forest Plan includes components that would minimize these risks by generally maintaining road density within LAUs below two miles/mile^2 (G-WL-8). If an LAU exceeds that density, the Forests would consider opportunities to close or seasonally restrict access. Additionally, the Forest would allow no net increase in groomed or designated trails (S-WL-2) unless such designation consolidates use. This standard includes those user-developed trails on the Superior National Forest that receive regular use each winter. Under the Forest Plan, the Superior National Forest would allow 130 additional snowmobile trail miles. When a new trail is to be developed, an equivalent amount of trail (user-developed or Forest Service designated) must be decommissioned. Alternatively, the Forest may designate new snowmobile trails on user-developed trails, which results in no on-the-ground increase in trail miles but increases the designated trails on the Forest. For this second scenario to accurately represent no net increase in on-the-ground trail miles, the use of a "baseline" map of user-developed trails is required. User-developed trails that are created after Forest Plan implementation would not be eligible for designation as an exception to the no net increase standard. Fewer restrictions are placed on the overall density of routes allowable for ATV use than snowmobile use on designated snow-compacting trails. ATV routes may invite snowmobile use, and adverse effects to lynx may occur where these routes coincide with lynx habitat. Although the standard allowing no net increase of designated over-the-snow routes (S-WL-2) would not apply to ATV trails, road and trail density would still be managed at or below two miles/mile^2 (G-WL-8).

In 2009, the Superior National Forest developed the Travel Management Plan (TMP), with the intention to manage travel in the Forest. By implementing the TMP, the Forest aims to limit the impacts of roads and trails on lynx and lynx critical habitat by designating routes and reducing

the potential for additional snow-compacting routes by decommissioning unnecessary roads. The TMP calls for the addition of 142 miles of existing unclassified roads to the Forest Service system while decommissioning 154 miles of unclassified roads, which allows for no net increase of winter trails and consolidates travel use on previously unclassified roads. The TMP aims to prevent unauthorized snowmobile use on designated ATV trails, thereby reducing the potential affects to lynx. In addition, the TMP co-designates ATV and snowmobile trails, further consolidating use and snow compaction. The consolidation of winter recreation (and associated closure of remote trails) would benefit lynx and lynx critical habitat by providing large blocks of habitat unavailable to competitors.

The Superior National Forest Revised Plan includes a large number of new temporary (754 - 764 miles over the life of the Forest Plan), and OML 1 (1,132 – 2,022 miles over the life of the Forest Plan) roads. The Forest generally allows ATV and snowmobile use on existing OML 1 and 2 roads, an activity that continues under the Forest Plan. However, effects on lynx continue to be minimized by the guidance in the Forest Plan to effectively close new OML 1 roads (O-TS-3) and all temporary roads (S-TS-3) after they are no longer necessary to support a specific action (e.g., timber harvest).

The Superior National Forest regularly receives requests for special use roads to access state, county, and private in-holdings. The 2004 BA estimated a maximum of 326 miles of special use permit roads for first 10 years of Forest Plan implementation (USDA 2004a). Since 2004, special use permit (SUP) roads have amounted to approximately 470 roads covering 213 miles (USDA 2011). Mineral exploration activities that could use existing SUP roads and require construction of new SUP roads were not discussed in the 2004 BA, and have the potential to add a significant number of road miles. For example, the draft Hard Rock Prospecting Project EIS proposes the potential to add up to a maximum of 860 miles of temporary SUP roads over its 20-year implementation. Temporary roads in mineral exploration projects may stay open for more years (1-15 years) than those predicted by the Forest Plan EIS for resource management (1-5 years). If these sites are left accessible to the public, then human-lynx conflicts may increase. Furthermore, intersections of new roads, closed temporary roads and/or roads open to the public are likely to become parking areas for up to four cars, which would indirectly increase public access. Further, these corridors increase potential competition through increased snow compaction. Effective road closures may reduce the potential effects to lynx and lynx critical habitat.

In addition to the National Forest system land traversed by the special use roads, these roads also cross state, county, and private lands, and the resource protection methods discussed above would not apply (although they would count toward road density calculations by the Forest). For example, special use roads, especially temporary roads or roads used for forest management purposes, generally must be effectively closed or gated on Forest Service land, but the portion off Forest Service land would not necessarily be effectively closed or gated. On these portions, winter use is likely to occur. All of the above types of low standard roads provide the highest potential for increased competition, den site disturbance, shooting, trapping, and vehicle collisions with lynx.

Human access occurs by foot and motorized vehicle, including RMVs and off-road vehicles, and generally occurs on trails and low standard roads developed for management operations,

particularly timber harvest. While open, these roads provide access to lynx habitat. As northern Minnesota has become more developed and the human population has increased, the Superior National Forest has sustained increased visitation in recent years (USDA 2011) which increases the opportunity for human-lynx encounters, especially by trappers. Lynx are likely to continue to be incidentally trapped at the current rate as a result of continued access via low standard roads and trails on the Forest.

Due to the ATV and snowmobile trails that currently exist on the Superior National Forest, the additional miles of each trail type to be added per the Forest Plan, the temporary roads projected to be built for access to project sites, and the new system roads that will be built, human access is expected to be fairly high on the Forest. Any corridor open to RMVs provides the potential for Forest visitors to incidentally trap, shoot, or collide with lynx. Further, these corridors increase potential competition through increased snow compaction. These effects would be minimized by the standards and guidelines directing the placement and density of roads and trails and ensuring all temporary roads and any unneeded system or unclassified roads would be closed effectively, but during the time the roads are open and available, human access (and therefore adverse effects to lynx) is likely. Further, cross country snowmobile travel is allowed on the Superior National Forest. Generally, dense forest on the Superior National Forest relegates snowmobiles to existing roads, trails, or traditional travel routes, but it is legal for snowmobiles to access a recently closed road.

The guidance for monitoring the effectiveness of road closures is critical to minimizing the adverse effects of roads and trails on lynx; road closures must be performed so as to effectively eliminate snowmobile use. All of the road and trail guidance calls for "effective" road closures or obliteration, and this, along with monitoring guidance, will ensure minimization of effects. Additionally, the guidance for monitoring the success of the Forest in achieving no net increase in groomed or designated over-the-snow routes provides a thorough inventory of effects over the life of the Forest Plan.

Although the Forest Service has no jurisdiction or authority over trappers on the Forest, the agency would manage to the limit of its authority the factors that lead to incidental trapping through effective road closures and environmental outreach efforts. Further, protocols have been developed to ensure a trapped lynx is released unharmed, which would reduce the potential for any further mortality. Although adverse effects from incidental trapping remain likely under the Forest Plan, these effects would result indirectly from the implementation of the Forest Plan and we do not expect these effects to be of a magnitude that would impair lynx population growth on the Superior National Forest or in northern Minnesota.

In summary, within LAUs total open roads and trails will remain under two miles/mile^2 (or, in those LAUs above two miles/mile^2, the Forest Service will strive to reduce to two or fewer miles/mile^2). This will minimize the potential for adverse effects to lynx from accidental trapping, increased competition, and vehicle collisions, although these effects would continue in LAUs at a low level. Due to minimization measures, we do not expect the mortality rate from open roads and trails to rise to a level that would impair population growth, even during the low portions of the hare cycle. This is primarily due to the relatively remote nature of the Superior National Forest. The BWCAW provides constant habitat for lynx during all periods of the hare

cycle and is not fragmented by roads, and trails are not regularly compacted in the winter because snowmobiles are illegal in the wilderness. Although roads and compacted winter routes will continue to exist on the remainder of the Superior National Forest, road and trail densities remain low, and the Forest provides secure habitat for lynx.

Lynx Critical Habitat Outside of LAU's

The Forest Service identified five separate units of SNF lands within designated critical. This represents about 3.5% of the total SNF acreage (2,091,947 acres, excluding water bodies) covered by the Forest Plan. Relative to the majority of SNF lands, which are in fact within designated LAU's, the 3.5% of SNF land within these five non-LAU areas is highly fragmented, with the SNF owning only about 15% of the land in the non-LAU units (USDA – Forest Service, 2011, at p. 100).

Despite the relatively small amount of SNF acreage outside of LAU's, such lands are still within designated Critical Habitat of the Canada lynx and have been treated as such during this consultation. The Forest Service analyzed the impacts of Forest Plan operations not only within LAU's, but within these non-LAU areas as well (See, USDA – Forest Service, 2011, at pp. 72-75 and 100-105). In a document summarizing and clarifying the May 17, 2011 Biological Assessment, the Forest Service identified thirty-six, lynx protective measures applicable to all SNF lands – including the 3.5% of SNF land outside LAU's. (USDA – Forest Service, 2011b). The following table indicates which measures apply on all SNF lands, and which do not:

Forest Plan Direction applicable to Canada Lynx (Source USDA – Forest Service 2011b, Table 1)	All FS Lands	LAU Only
Desired Conditions		
D-VG-3: Vegetation (live and dead) is present in amounts, distributions, and characteristics that are representative of the spectrum of environmental conditions that would have resulted from the natural cycles, processes, and disturbances under which current forest ecosystems and their accompanying biological diversity evolved. The ecosystem composition, structure, and process representation considers time frames, a variety of landscape scales, and current biological and physical environments. Resource conditions exist that minimize undesirable occurrences of non-native, invasive species.	X	
D-WL-3: Aquatic and terrestrial wildlife habitats and species populations, while constantly changing due to both management activities and naturally occurring events, are present in amounts, quality, distributions, and patterns so that National Forest lands: (a) Provide representation of the full spectrum of habitats and conditions that would have resulted from the natural cycles, processes, and disturbances under which the biological diversity of the National Forest evolved. Representation considers time frames, a variety of landscape scales, and current biological and physical communities and environments. (c) Contribute to the conservation and recovery of federally-listed threatened and endangered species and the habitats upon which these species depend. (h) Provide structure, composition, connectivity, function, and spatial patterns of aquatic and terrestrial habitats that maintain or restore opportunities for species to interact, disperse, and migrate and to reduce negative impacts associated with forest	X	

Forest Plan Direction applicable to Canada Lynx (Source USDA – Forest Service 2011b, Table 1)	All FS Lands	LAU Only
habitat fragmentation.		
D-WL-5: Roads and trails are managed to maintain native plants and animals, protect water quality, and to manage for compatible human uses and types of access.	X	
D-LA-1: The amount and spatial arrangement of National Forest System land within the proclamation boundary of the Forest are sufficient to protect resource values and interests, improve management effectiveness, eliminate conflicts, and reduce the costs of administering landlines and managing resources.	X	
D-REC-3: The Forest provides developed sites, facilities, trails, water access sites, and other recreation opportunities within health and safety, resource protection, cost, and maintenance requirements.	X	
D-RMV-1: The Forest provides RMV road and trail riding opportunities with experiences in a variety of forest environments, while protecting natural resources.	X	
Objectives (general)		
O-VG-1: Move vegetation conditions from Year 2003 conditions toward the long-term desired composition, structure, age, spatial patterns, and within-stand diversity.	X	
O-VG-11: Retain and adequate representation of naturally disturbed forest that is not salvaged, such as burned, flooded, blowdown, or insect- or disease-killed areas. Maintain these in a variety of patch sizes and distributions on the landscape.	X	
O-VG-13: Maintain a full range of age classes from young to old, including old-growth and multi-aged growth stages, for the variety of forested vegetation communities within each Landscape Ecosystem.	X	
O-LA-1: Through various land adjustment procedures (e.g., purchase, donation, and exchange) and a landownership adjustment map, secure a land ownership pattern that supports and enhances total Forest Plan resource management objectives.	X	
O-RMV-1: A maximum of 90 additional ATV trail miles and 130 snowmobile trail miles with associated trail facilities (trailhead parking, signs, toilets, etc.) may be added to the designated National Forest Trail system.	X	
Standards and Guidelines (general)		
G-LA-2: Land acquisitions will generally be guided by the following criteria: Priority 1 (a) – land needed for habitat for federally listed endangered, threatened, proposed, or candidate species or for Regional Forester sensitive species.	X	
S-RMV-3: Cross-country OHV travel is prohibited. Standards and guidelines for cross-country snowmobile use are described in Chapter 3 because for that use varies by management area.	X	
Threatened and Endangered Species		
O-WL-4: Maintain, protect, or improve habitat for all threatened and endangered species by emphasizing and working towards the objectives of federal recovery plans and management direction in Forest Plans.	X	
O-WL-5: Seek opportunities to benefit threatened and endangered species from the spectrum of management activities on NFS land.	X	
O-WL-6: Reduce or eliminate adverse effects on threatened and endangered species from the spectrum of management activities on NFS land.	X	
O-WL-7: Minimize building or upgrading of roads in areas that are important for threatened and endangered species habitat and for habitat connectivity.	X	

Forest Plan Direction applicable to Canada Lynx (Source USDA – Forest Service 2011b, Table 1)	All FS Lands	LAU Only
Canada lynx		
O-WL-8: Promote the conservation and recovery of Canada lynx and its habitat.	X	
O-WL-9: In LAUs in NFS land, manage vegetation to retain, improve, or develop habitat characteristics suitable for snowshoe hare and other important alternative prey in sufficient amounts and distributions so that availability of prey is not limiting lynx recovery.		X
O-WL-10: In LAUs in NFS land, manage vegetation to provide for foraging habitat in proximity to denning habitat in amounts sufficient to provide for lynx.		X
O-WL-11: Maintain and, where necessary and feasible, restore sufficient habitat connectivity to reduce mortality related to roads and to allow lynx to disperse within and between LAUs on NFS land.		X
O-WL-12: Through partnerships with other agencies and landowners, participate in cooperative efforts to identify, map, and maintain or restore, where feasible, linkage areas that provide habitat connectivity sufficient to allow lynx to disperse between disjunct blocks of lynx habitat at larger landscape scales (for example, among National Forests in the Great Lakes region).	X	
O-WL-13: Maintain or improve the natural competitive advantage of Canada lynx in deep snow conditions. Snow compacting activities (such as snowmobiling, snowshoeing, skiing, dog sledding) are planned and accommodated in areas best suited to the activity while maintaining large, interconnected areas of habitat with little or no snow-compacting, recreational activities.	X	
O-WL-14: Through coordination with other agencies, participate in cooperative efforts to reduce, to the extent possible, the potential for lynx mortality related to highways and other roads within the proclamation boundary of the National Forest.	X	
O-WL-15: In the Boundary Waters Canoe Area Wilderness Refugium lynx habitat conditions will predominantly result from natural ecological processes such as fire, wind, insects, disease and vegetation community succession. However, some active management, with methods compatible with wilderness values, may be needed to restore or maintain desired vegetation characteristics. Lynx and prey populations will fluctuate in response to changing environmental conditions.	n/a – There are no LAUs in the BWCAW. The BWCAW provides large amounts of lynx habitat, but is not managed using the LAU approach, and LAU management direction does not apply to the wilderness area. The 2004 BA concluded that the BWCAW Refugium met	

Forest Plan Direction applicable to Canada Lynx (Source USDA – Forest Service 2011b, Table 1)	All FS Lands	LAU Only
	the direction for minimum habitat conditions established for LAUs.	
G-WL-1: Within LAUs on NFS land, moderate the timing, intensity, and extent of management activities, if necessary, to maintain required habitat components in lynx habitat, to reduce human influences on mortality risk and inter-specific competition, and to be responsive to current social and ecological constraints relevant to lynx habitat.		X
G-WL-2: Provide for the protection of known active den sites during denning season.	X	
G-WL-3: Limit disturbance within each LAU on NFS land as follows: if more than 30% of the total lynx habitat (all ownerships) within an LAU is currently in unsuitable condition, no further reduction of suitable conditions should occur as a result of vegetation management activities by the National Forest.		X
S-WL-1: Management activities on NFS land shall not change more than 15% of lynx habitat on NFS land within an LAU to an unsuitable condition within a 10-year period.		X
S-WL-2: In LAUs on NFS land allow no net increase in groomed or designated over-the-snow trail routes unless the designation effectively consolidates use and improves lynx habitat through a net reduction of compacted snow areas.		X
G-WL-4: Within an LAU, maintain or promote well-distributed denning habitat in patches generally larger than five acres, comprising at least 10% of lynx habitat. Where less than 10% of forested lynx habitat within an LAU provides denning habitat, defer those management actions on NFS land that would delay achievement of denning habitat structure. *Only LAUs 44 and 46 are exempted from this guideline.*		X
G-WL-5: Following a disturbance on NFS land greater than 20 contiguous acres (such as blow-down, fire, insect, or disease) that could contribute to lynx denning habitat, generally retain a minimum of 10% of the affected area on NFS land unless salvage or prescribed fire is necessary to address human health and safety (such as in the Wildland Urban Interface) or scenic integrity. *Only LAUs 44 and 46 are exempted from this guideline.*	X	
G-WL-6: Where a designated trail for snow-compacting activities is desired within LAUs, the proposed route should be planned to protect or improve the integrity of lynx habitat and minimize snow compaction in lynx habitat. The trail should be designed to: Move recreational use away from more sensitive or better quality lynx habitat, Concentrate use within existing developed areas rather than developing new recreational areas in lynx habitat, and or be located within the outer boundaries of a currently used road and trail system.		X
G-WL-7: For newly constructed snow-compacting trails, effectively close or restrict to public access those trails, OML 1, OML 2, temporary, and unclassified roads that intersect the new trails unless these trails or roads are being used for other management purposes.	X	

Forest Plan Direction applicable to Canada Lynx (Source USDA – Forest Service 2011b, Table 1)	All FS Lands	LAU Only
G-WL-8: Within LAUs generally maintain road and snow-compacting trail densities below 2 miles per square mile to maintain the natural competitive advantage of Canada lynx in deep snow. Where the total road and regularly-used snow-compacting trail densities are greater than 2 miles per square mile and coincide with lynx habitat, prioritize roads for seasonal restrictions or reclamation in those areas, where practical or feasible. In this guideline "roads" include all ownerships of classified and unclassified roads and "regularly-used trails" are those that are used most years for most of the snow-season.		X
G-WL-9: Dirt and gravel roads that are under the jurisdiction of the National Forest and that traverse lynx habitat on NFS land (particularly those roads that could become highways) should generally not be paved or otherwise upgraded in a manner that is likely to lead to significant increases to lynx mortality or substantially impedes movement and dispersal. If the dirt and gravel roads described above are upgraded or paved in order to meet human health and safety or other environmental concerns and essential management needs, conduct a thorough analysis on effects to lynx and its habitat to determine minimum road design standards practical (including measures to minimize traffic speeds), to minimize or avoid foresee ably contributing to increases in human activity or adverse impacts to lynx and its habitat.	X	
Recreation		
O-RMV-1: A maximum of 90 additional ATV trail miles and 130 snowmobile trail miles with associated trail facilities (trailhead parking, signs, toilets, etc.) may be added to the designated National Forest Trail system.	X	
S-RMV-1: Motorized recreation use of designated trails is prohibited unless the trail is designated open for specific motorized uses such as for ATVs, OHMs, and snowmobiles.	X	
S-RMV-3: Cross-country OHV travel is prohibited. Standards and guidelines for cross-country snowmobile use are described in Chapter 3 because direction for that use varies by Management Areas. *Summary from Chapter 3*: For most Management Areas: Cross-country snowmobile use is generally allowed unless prohibitions or restrictions are needed for resource protection to meet management objectives. *For Unique Biological, Research Natural, and Wilderness*: Cross-country snowmobile travel is prohibited.	X	
G-RMV-4: RMV use will generally be allowed on existing unclassified, OML1 and OML 2 roads (Except ORVs will generally be prohibited on OML 1 roads). Roads that are determined through site-specific analysis to have immitigable resource and social concerns and/or do not meet management objectives would be effectively closed. (See exceptions for Management Areas: wild segments of eligible Wild, Scenic, and Recreational Rivers, semi-primitive non-motorizes recreation, Research Natural Areas, candidate Research Natural Areas, and Unique Biological Areas).	X	
Transportation System		
O-TS-2: Few new OML 3, 4 and 5 roads will be constructed.	X	

Forest Plan Direction applicable to Canada Lynx (Source USDA – Forest Service 2011b, Table 1)	All FS Lands	LAU Only
O-TS-3: New roads built to access use land for resource management will be primarily OML 1 or temporary. (*Except for road straightening, or possibly short access roads to boat launches and similar projects, no new OML 3, 4 and 5 roads would be built during the next couple of decades*)	X	
S-TS-3: As soon as access use is completed, stabilize temporary roads and effectively close them to motorized traffic. Vegetation will be established within 10 years after the termination of the contract, lease, or permit.	X	
S-TS-4: Decommission unclassified roads that are not needed in the Forest road and trail system and special use permitted roads that are no longer needed. Decommissioning will make the road unusable by motorized vehicles and stabilize the roadbed.	X	
G-TS-12: On existing OML 1 roads, an effective barrier will generally be installed as needed to prevent use by highway-licensed vehicles and ORVs, ATV and OHM use may continue to be allowed on some existing OML 1 roads.	X	
Landscape Ecosystem Objectives – Forest Plan pp. 2-55 to 2-78. This vegetation management direction influences, at the coarse- and fine-scales, lynx critical habitat amounts, quality, and distribution. Landscape Ecosystem objectives include for vegetation composition by forest type and age class, tree species diversity, Management Indicator Habitat objectives.	X	
Forest Plan Appendix E – Canada Lynx – Sections 4-7	X	

In their totality, the above measures evidence a commitment to safeguard lynx and lynx habitat not only in the LAU's, but also in the non-LAU areas of the Forest. More specifically, these measures correlate well to the primary constituent elements of critical habitat, as follows:

Table 2 – Forest Plan Management Direction that addresses the Primary Constituent Elements (PVEs) of Critical Habitat in non-LAU areas.		
Critical Habitat PCE	Forest Plan Direction that addresses the element	Is the direction adequate to address the PCE?
(a) Presence of snowshoe hares and their preferred habitat conditions, including dense understories of young trees or shrubs tall enough to protrude above the snow	D-VG-3 D-WL-3c and h D-LA-1 O-VG-1, 11 and 13 O-WL-8, 9 and 11 O-LA-1 G-LA-2 S-TS-3, 4 Landscape Ecosystem Objectives (vegetation and management indicator habitats) Appendix E, Sections 4 and 7	YES – All these Forest Plan direction provide conditions to support and sustain this Critical Habitat PCE in non-LAUs.

Table 2 – Forest Plan Management Direction that addresses the Primary Constituent Elements (PVEs) of Critical Habitat in non-LAU areas.		
Critical Habitat PCE	Forest Plan Direction that addresses the element	Is the direction adequate to address the PCE?
(b) Winter snow conditions that are generally deep and fluffy for extended periods of time;	D-WL-3c, h and 5 D-REC-3 D-RMV-1 O-WL-4-6, 13 and 15 O-RMV-1 S-RMV-3 S-TS-3, 4 G-WL-2, 6, and 7 Landscape Ecosystem Objectives (vegetation and management indicator habitats) Appendix E, Sections 4 and 7	YES – All these Forest Plan direction provide conditions to support and sustain this Critical Habitat PCE in non-LAUs.
(c) Sites for denning having abundant coarse, woody debris, such as downed trees and root wads; and	D-VG-3 D-WL-3c and h D-REC-3 D-LA-1 O-VG-1, 11 and 13 O-WL-4-6, and 10 O-LA-1 S-TS-3, 4 G-WL-1, G-WL-5 G-LA-2 Landscape Ecosystem Objectives (vegetation and management indicator habitats) Appendix E, Sections 4 and 7	YES – All these Forest Plan direction provide conditions to support and sustain this Critical Habitat PCE in non-LAUs.
(d) Matrix habitat (*e.g.*, hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range. The important aspect of matrix habitat for lynx is that these habitats retain the ability to allow unimpeded movement of	D-WL-3a, h D-VG-3 D-LA-1 O-WL-4-8, 11, and 12-14 O-TS-2, 3 O-LA-1 S-TS-3 and 4 G-WL-1 G-TS-12 G-LA-2 Landscape Ecosystem Objectives (vegetation and management indicator habitats) Appendix E, Sections 5 and 6	YES – All these Forest Plan direction provide conditions to support and sustain this Critical Habitat PCE in non-LAUs.

Table 2 – Forest Plan Management Direction that addresses the Primary Constituent Elements (PVEs) of Critical Habitat in non-LAU areas.		
Critical Habitat PCE	Forest Plan Direction that addresses the element	Is the direction adequate to address the PCE?
lynx through them as lynx travel between patches of boreal forest.		

In summary, the effects to non-LAU lands do not rise to the level of "likely to adversely affect" critical habitat, for the following reasons: 1) Numerous forest direction measures, protective of lynx habitat, apply both inside, and outside LAU's; 2) LAU's comprise a relatively small portion (3.5%) of lynx critical habitat within the SNF; 3) The Forest Service has accurately cross-referenced forest direction measures with specific PCE's for lynx critical habitat, showing how the measures support protection of the PCE's; and 4) each individual action proposed in lynx critical habitat, whether within or outside of an LAU, will be subjected to individual, site-specific Section 7, Endangered Species Act analysis. Together, these measures ensure that at this programmatic stage, lynx critical habitat is not likely to be adversely affected by the adoption of the Forest Plan.

Effects of Interrelated and Interdependent Actions

The Service has not identified any actions interrelated or interdependent to the continued implementation of the Forest Plan that has potential to affect lynx or lynx critical habitat. It is possible that future specific programs and actions implemented under the Forest Plans may have relevant interrelated and interdependent actions and they will be considered in context of future consultations for those programs or actions.

Land exchanges in proposed mining sites could have mixed impacts such as a loss of wolf prey habitat in the proposed mining sites, but a gain of habitat in others areas that are currently in other ownerships. This could lead to a consolidation of wolf prey habitat where the US Forest Service would gain ownership. Habitat lost by large-scale mining operations would be an irreversible or irretrievable impact to wolf prey due to the large-scale changes in landscape character at the mining sites.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Lynx inhabit areas on the Superior National Forest and other adjacent ownerships including private, state, county, and tribal administration. Within the proclamation boundary of the

Superior National Forest, non-federal landowners hold approximately 40 percent of land. Vegetation management on non-National Forest lands may not consider the needs of the lynx or its primary prey species. Lynx in this part of their range may also be limited by non-habitat factors such as illegal take by hunters and trappers, collision with vehicles, low population size, hybridization with bobcats, and competition with other predators.

State, county, and private land timber harvest, related road construction activities, and fire management are not regulated and would not necessarily provide the same level of protection and conservation for threatened and endangered species and their habitats as the Forest Plan does for the Forests' administered lands. Human disturbance and loss of suitable habitat could result from timber harvest, fire management, mining activities and snow-compacting activities. Recreational activities associated with state, county, and private lands will continue in the action area, and are reasonably certain to increase over the life of the Forest Plan as human population increases in northern Minnesota.

Vegetation and fire management, winter recreation and human developments will continue to occur on non-federal lands. These activities are occurring at approximately the same levels on non-federal land as on Forest Service land, and these levels are expected to remain relatively steady in the future. More detailed analysis will occur at smaller geographic scales in context with actions or programs carried out under the Forest Plan as the Forest Service considers actions and habitat on all ownerships within LAUs affected by specific projects.

Conclusions

After reviewing the current status of the Canada lynx, the environmental baseline for the proposed action area, the proposed management direction for the species, and the cumulative effects, it is the Service's biological opinion that the action as proposed is not likely to jeopardize the continued existence of the contiguous U.S. distinct population segment of the Canada lynx.

The Service's biological opinion in 2000 for effects of federal land management plans on lynx range-wide anticipated that consultations for future Forest Plan revisions would incorporate the LCAS and would tier to that document. In the 2000 opinion, the Service determined that lynx would not be jeopardized by continued land management that was consistent with interagency Conservation Agreements signed in February 2000. The Superior National Forest Plan considered here fully incorporates the LCAS and tailors it to conditions in northern Minnesota. We concur that the LCAS guidelines are sufficiently protective to ensure reproduction, numbers, and distribution of lynx will not be appreciably reduced.

The Forest Plan includes many provisions for protection and enhancement of lynx habitat, as well as measures that would maintain or reduce the risk that actions would increase human-caused mortality. Inter-specific competition with other carnivores resulting from snow-compacting activities would continue under implementation of the Forest Plan, but measures are included that would moderate those effects and curb their increase. The goals and objectives of the Forest Plan may render some areas less suitable for lynx and are likely to increase the incidences of negative interactions with humans. However, the objectives and standards and

guidelines specifically proposed for lynx will ensure that throughout implementation of the Forest Plan lynx mortality will be minimized, and the habitat conditions will remain stable or improve, even during low population cycles. Based on these considerations, the Service concludes that implementing the Forest Plan would not appreciably reduce the likelihood of survival and recovery of the contiguous U.S. DPS of Canada lynx by reducing reproduction, numbers or distribution.

Similarly, we concur that continued implementation of the Forest Plan may affect, but will not adversely affect lynx critical habitat. The Forest Plan includes many provisions for protection and enhancement of lynx critical habitat Primary Constituent Elements. Specifically, Forest Plan provides direction to maintain or improve the preferred habitat for snowshoe hare in sufficient quantities and distributions for snowshoe hare to persist. The Forest Plan direction aims to reduce and consolidate snow compacting activities, and therefore maintains deep and fluffy snow conditions essential for the competitive advantage of lynx. Furthermore, Forest Plan direction aims to provide abundant habitat for lynx denning and ample amounts of matrix habitat that allows for unimpeded movement of lynx and their prey between patches of boreal forest.

Incidental Take Statement

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Amount or Extent of the Take

The risk of incidental take of Canada lynx is not completely eliminated by provisions in the Forest Plan. Take in the form of harm from lynx habitat alterations may occur, as could harassment and/or death related to human disturbance and incidental trapping. However, the Service may only exempt incidental take that occurs as a result of discretionary actions of the Forests. The Superior National Forest does not have authority over furbearer trapping, nor do they have the discretion to allow or disallow its use on the Forest. Any take that occurs due to accidental trapping of lynx in furbearer sets is outside the jurisdiction and authority of the Forest Service and not exempted by this Incidental Take Statement.

The Service expects no more than one lynx would be taken annually on the Superior National Forest and no more than 10 would be taken over the 10-year life of the Forest Plan due to vehicle

collision on all roads on all ownerships within the Superior National Forest proclamation boundary. Because there is limited information from which to draw and we are unaware of the timing and location of roads that would be built or upgraded, this information is based on past reports of road kill. Three lynx are known to have been killed by vehicle collisions on the Superior National Forest since 2000; it is reasonable to assume we are aware of roughly half of the mortality that occurs. Therefore, an average of less than one lynx per year has been killed due to vehicle collisions and this is likely to continue under Forest Plan implementation.

As with wolves, numerous assumptions would have to be made to estimate the number of lynx that would likely be hit by vehicles on the Forest. For lynx, we do not have a study like that of Kohn et al. (2000) for wolves on which to base an estimate of the quantitative impact. Therefore, we will assume that lynx are equally susceptible to being taken by vehicles as are wolves and that the factors considered above for wolves will also determine the likely number of lynx taken, although we will use a different basis for estimating lynx density in Forest. To estimate lynx density in the Superior National Forest, we assumed that there are approximately 1.3 females per male home range, based on weighted mean home ranges of 87 sq. km for males and 68 sq. km for females [studies summarized by Moen et al. (2006)] and assuming continuous and non-overlapping home ranges among males and females, respectively. We could have used the home ranges found thus far for lynx in Minnesota, but the sample size is relatively low [i.e., two females – (Moen et al. 2006)]. Therefore, we assume that there are 2.3 lynx per 87 sq. km (i.e., 1 male and 1.3 females in each male home range) – approximately 0.03 lynx/sq. km. Although data are insufficient to estimate lynx density in the Superior National Forest, this is likely a reasonable estimate. Lynx densities in the southern boreal forest (e.g., Minnesota) are similar to those found in the taiga (the core of lynx range) during times of hare scarcity (i.e., "less than 3 lynx/100 km2, (Mowat et al. 2000)). For example, a well-studied population in Washington maintained a density of 0.02-0.026/km^2 during a 7-year study period (Aubry et al. 2000).

We would predict greater densities in the Forest if we assumed some degree of overlap among female home ranges, as has been demonstrated (Carbyn & Patriquin 1983; Mech 1980). It is unclear, however, what degree of overlap is likely to occur in the Forest and even in regions where some lynx home ranges overlap there are likely some areas not included within any lynx's home range (i.e., unoccupied habitat). Therefore, our assumption of continuous home ranges would somewhat offset the negative influence on the predicted density resulting from our assumption of non-overlapping home ranges.

Based on the above assumptions regarding road densities, susceptibility to vehicle collisions, lynx densities, and current likelihood of vehicle collisions, we estimate that the proposed action will result in about two lynx killed from road collisions annually. This gives an estimate of 10 lynx taken during the life of the Forest Plan (approximately 10 years). The likely frequency of lynx-automobile collisions may be less than for wolves due to the lower predicted densities of lynx in the Forest. In addition, lynx populations fluctuate markedly during approximately 10 year cycles, whereas wolf densities will likely be relatively stable or increasing. Therefore, the probability of lynx getting hit by vehicles in the Forest will likely vary in proportion to lynx density throughout the population cycle.

Data are currently insufficient to accurately estimate lynx densities in Minnesota, but the assumptions used above to arrive at an estimate of two dead lynx every year also allow us to estimate the proportional impact to the lynx population. To estimate lynx density at 0.03/km^2 in the Forest, we assumed that lynx home ranges were continuous and non-overlapping within sexes – that is, female home ranges did not overlap with other female home ranges and were continuous across the landscape – we assumed the same for males. Lynx Analysis Units (LAU) and the Boundary Waters Canoe Area Wilderness (BWCAW) cover approximately 12,700 km^2 and represent the approximate area occupied by lynx in and around the Superior National Forest. For the purposes of this analysis, we will assume that this is the approximate area occupied by lynx in Minnesota. There are areas within LAUs that are unsuitable for lynx, but lynx also occur in Minnesota beyond the area contained within LAUs and the BWCAW, therefore, this may be a fair approximation of total lynx range in Minnesota. If lynx occur throughout the area contained within LAUs and the BWCAW at a density of 0.03/km^2, then there are approximately 381 lynx in this area. If one lynx is killed every year, this would represent an approximate loss of 0.26% percent of the lynx population annually. As stated above, lynx abundance likely varies greatly over an approximately 10-year cycle. Therefore, the loss of two lynx would affect have a greater proportional effect during low phases of the cycle. Low lynx densities during this period, however, would also proportionately lower the likelihood of a lynx getting hit by a vehicle on the Forest. Thus, the loss of 10 lynx during the life of Forest Plan implementation is not likely to have an appreciable effect on the Canada lynx.

The Forest Plan provides descriptive management direction and is prescriptive in terms of "sideboards" that would guide or limit project design. The Forest Plan does not, however, specify what management actions would be carried out nor when or where actions will occur. Therefore, site-specific consultation will occur and section 7(o)(2) exemptions will be provided, as needed and appropriate, when these actions are expected to result in the incidental take described above.

Effect of the Take

In this biological opinion, the Service has determined that any incidental take that may result from the proposed action does not result in jeopardy to the species due to the incorporation of LCAS guidelines that limit unsuitable habitat, promote habitat for prey species, limit snow compaction, and ensure effective closure of roads. These measures will minimize take and overall provide for increasing lynx populations in northern Minnesota. Even during the low portions of the hare cycle, when lynx populations are scarce in Minnesota, road and trail densities remain low, and the Superior National Forest provides secure habitat for lynx. We do not expect any action implemented under the Forest Plan to result in levels of take that would affect the growth or stability of the contiguous U.S. DPS of Canada lynx.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize effects of incidental take of the contiguous U.S. DPS of Canada lynx:

Document and report to the Service annually any known lynx mortality within the National Forest proclamation boundaries in Minnesota due to vehicle collisions, accidental trapping, or poaching.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are non-discretionary.

1. Mortality reports should be provided to the Service by December 31 of each calendar year the Revised Forest Plans are implemented. Reports should include, to the extent known, the cause of mortality, location, and sex of lynx.

2. Rather than establishing a discrete field monitoring effort to document lynx mortality, contribute to the currently established reporting system maintained by the U.S. Fish and Wildlife Service. The Forest Service should coordinate with partners in state, tribal, county, municipal law enforcement, wildlife management agencies, lynx researchers, and the public to collect information necessary for this reporting system. Information voluntarily provided by these agencies, researchers, and others and compiled by the U.S. Fish and Wildlife Service would fulfill the requirements of the reasonable and prudent measure.

Conservation Recommendations

Section 7(a)(1) of the Act requires federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service believes that the Forest Service has initiated important efforts to increase our understanding of Canada lynx and its habitat with completion of the Science Report (Ruggiero et al. 1999) and initiation of critical research of the species in northern Minnesota. The LCAS identified known risk factors and conservation measures for Canada lynx, based on the best available knowledge to date. The following recommendations reflect those risk factors and actions needed to address them.

1. Accurately inventory and monitor areas of regular cross-country over-the-snow travel (those routes that are used most years for most of the snow season). Tracking and documenting lynx occurrences would ensure routes are assessed and analyzed as appropriate.

2. Co-location of ATV and snowmobile trails can be a benefit to lynx. Consider and co-locate, where possible, ATV and snowmobile trails to ensure no net increase of snow compaction.

3. Work with the Service, states, and tribes to help reduce incidental take of lynx by trappers in Minnesota through ongoing outreach efforts and interagency cooperation.

Reinitiation- Closing Statement

This concludes formal consultation on the action outlined in your April 29, 2011, request for consultation for the Revised Land and Resource Management Plans for the Superior National Forest. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Literature Cited

Agee, J. K. 2000. Disturbance ecology of North American boreal forests and associated northern/mixed subalpine forests. Pages 39-82 in L. F. Ruggiero, K. B. Aubry, and S. W. Buskirk, editors. Ecology and conservation of lynx in the United States. University Press of Colorado, Boulder.

Apps, C. D. 2000. Space-use, diet, demographics, and topographic associations of lynx in the southern Canadian Rocky Mountains: a study. Pages 351-372 in K. B. A. in L.F. Ruggiero, and S.W. Buskirk, editor. Ecology and conservation of lynx in the United States. University Press of Colorado, Boulder.

Aubry, K. B., G.M. Koehler, and J. R. Squires. 2000. Ecology of Canada lynx in southern boreal forests. Pages 471-474 in L. F. Ruggiero, K. B. Aubry, and S. W. Buskirk, editors. Ecology and conservation of lynx in the United States. University Press of Colorado, Boulder.

Bailey, T. N. 1974. Social organization in a bobcat population. Journal of Wildlife Management **38**.

Bailey, T. N., E. E. Bangs, M. F. Portner, J. C. Malloy, and R. J. McAvinchey. 1986. An apparent over exploited lynx population on the Kenai Peninsula, Alaska. Journal of Wildlife Management **50**:279-290.

Bangs, E. E., S. H. Fritts, J. A. Fontaine, D. W. Smith, K. M. Murphy, C. M. Mack, and C. C. Niemeyer. 1998. Status of gray wolf restoration in Montana, Idaho, and Wyoming. Wildlife Society Bulletin **26**:785-798.

Berg, B., and S. Benson. 1998. Summary report to 1997-1998 wolf survey cooperators. Page 4. Minnesota Department of Natural Resources, St. Paul, MN.

Blanco, J. C., Y. Cortes, and E. Virgos. 2005. Wolf response to two kinds of barriers in an agricultural habitat in Spain. Canadian Journal of Zoology/Revue Canadienne de Zoologie [Can. J. Zool./Rev. Can. Zool.]. **83**:312-323.

Brainerd, S. M. 1985. Reproductive ecology of bobcats and lynx in western Montana. Page 85. University of Montana, Missoula, Montana.

Brand, C. J., and L. B. Keith. 1979. Lynx demography during a snowshoe hare decline in Alberta. Journal of Wildlife Management **53**:827-849.

Brand, C. J., M. J. Pybus, W. B. Ballard, and R. O. Peterson. 1995. Infectious and parasitic diseases of the gray wolf and their potential effects on wolf populations in North America. Pages 419-429 in L. N. Carbyn, S. H. Fritts, and D. R. Seip, editors. Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, Occasional Publication No. 35, Edmonton, Alberta.

Bunnell, K. D., J. T. Flinders, and M. L. Wolfe. 2006. Potential impacts of coyotes and snowmobiles on lynx conservation in the intermountain West. Wildl. Soc. Bull. **34**:828-838.

Burdett, C. L. 2007. Hierarchical structure of Canada lynx space use and habitat selection in Northeastern Minnesota. Page 142. University of Minnesota.

Buskirk, S. W., L. F. Ruggiero, and C. J. Krebs. 2000. Habitat fragmentation and interspecific competition: implications for lynx conservation in L. F. Ruggiero, K. B. Aubry, and S. W. Buskirk, editors. Ecology and conservation of lynx in the United States. University Press of Colorado, Boulder.

Carbyn, L. N., and D. Patriquin. 1983. Observations on home range sizes, movements and social organization of Lynx, Lynx canadensis , in Riding Mountain National Park, Manitoba. Canadian field-naturalist. Ottawa ON **97**:262-267.

Catton, T., and S. Loch. 2010. Summary of the Superior National Forest's 2010 Canada lynx (Lynx canadensis) DNA database. Pages 1-2. USDA Forest Service, Ely, MN.

Clarke, G. B., P. C. L. White, and S. Harris. 1998. Effects of roads on badger Meles meles populations in south-west England. Biological Conservation **86**:117-124.

Cornicelli, L. 2007. Minnesota deer harvest report. Pages 206-256 in M. H. Dexter, editor. Status of Wildlife Populations Fall 2008. Minnesota Department of Natural Resources, St. Paul, MN.

Crawford, P. C., E. J. Dubovi, W. L. Castleman, I. Stephenson, E. P. J. Gibbs, L. Chen, C. Smith, R. C. Hill, P. Ferro, J. Pompey, R. A. Bright, and M.-J. Medina. 2005. Transmission of equine influenza virus to dogs. Science **310**:482-485.

Danby, R. K., and D. S. Hik. 2007. Variability, contingency, and rapid change in recent subarctic alpine tree line dynamics. Journal of Ecology **95**:352-363.

Erb, J. 2008a. Distribution and abundance of wolves in Minnesota, 2007-2008. Page 11. Minnesota Department of Natural Resources, Grand Rapids, MN.

Erb, J. 2008b. Furbearer Winter Track Survey Summary, 2007. Page 6. Minnesota Department of Natural Resources, Grand Rapids, MN.

Erb, J. 2009. Furbearer Winter Track Survey Summary, 2008. Page 7. Minnesota Department of Natural Resources, Grand Rapids, MN.

Erb, J., and S. Benson. 2004. Distribution and abundance of wolves in Minnesota, 2003-2004. Page 5. Minnesota Department of Natural Resources.

Fain, S. R., D. J. Straughan, and B. F. Taylor. 2010. Genetic outcomes of wolf recovery in the western Great Lakes states. Conservation Genetics **11**:1747-1765.

Frair, J. L. 1999. Crossing paths: gray wolves and highways in the Minnesota-Wisconsin border region. Page 58. University of Wisconsin - Stevens Point, Stevens Point, WI.

Fritts, S. H., R. O. Stephenson, R. D. Hayes, and L. Boitani. 2003. Wolves and humans. Pages 289-316 in L. D. Mech, and L. Boitani, editors. Wolves: Behavior, ecology, and conservation. University of Chicago Press, Chicago, IL.

Fuller, A. J., D. J. Harrison, and A. D. Vashon. 2007. Winter Habitat Selection by Canada Lynx in Maine: Prey Abundance or Accessibility. Journal of Wildlife Management **71**:1980-1986.

Fuller, T. K. 1989. Population dynamics of wolves in north-central Minnesota. Wildlife Monographs **105**:1-41.

Fuller, T. K., and D. M. Heisey. 1986. Density-related changes in winter distribution of snowshoe hares in north central Minnesota. Journal of Wildlife Management **50**:261-264.

Fuller, T. K., L. D. Mech, and J. F. Cochrane. 2003. Wolf population dynamics. Pages 161-191 in L. D. Mech, and L. Boitani, editors. Wolves: Behavior, ecology, and conservation. University of Chicago Press, Chicago, IL.

Galatowitsch, S., L. Frelich, and L. Phillips-Mao. 2009. Regional climate change adaptation strategies for biodiversity conservation in a mid-continental region of North America. Biological Conservation **142**:2012-2022.

Gogan, P. J. P., J. F. Cochrane, and E. M. Olexa. 1997. Home ranges and survival of gray wolves in and adjacent to Voyageur's National Park, Minnesota. Page 493 in D. Harmon, editor.

Making Protection Work: proceedings of the 9th Conference on Research and Resources Management in Parks and on Public Lands. The George Wright Society, Hancock, MI.

Gogan, P. J. P., W. T. Route, E. M. Olexa, N. Thomas, and D. Kuehn. 2004. Gray wolves in and adjacent to Voyageurs National Park, Minnesota: research and synthesis 1987-1991. Page 80. Technical Report NPS/MWR/RRTR/2004-01. Denver Service Center, National Park Service, P.O. Box 25287, Denver CO 80225-0287.

Gonzalez, P., R. P. Neilson, K. S. McKelvey, J. M. Lenihan, and R. J. Drapek. 2007. Impacts of climate change on potential habitat and conservation priority areas for *Lynx canadensis* (Canada Lynx). Page 19. Forest Service, U.S. Department of Agriculture and The Nature Conservancy, Washington, DC.

Hanson, K., and R. Moen. 2008. Diet of Canada Lynx in Minnesota Estimated from Scat Analysis. Department of Biology University of Minnesota Duluth. Page 14. NRRI Technical Report No. NRRI/TR-2008/13. NRRI, Duluth, MN.

Hatler, D. F. 1988. A lynx management strategy for British Columbia. Prepared for British Columbia Ministry of Environment, Victoria.

Henderson, C. 1977. Minnesota 1977 Canada lynx status report. Page 23. Report by the Minnesota Department of Natural Resources. Minnesota Department of Natural Resources, St. Paul, MN.

Hodges, K. E., and A. R. E. Sinclair. 2005. Browse site selection by snowshoe hares: effects of food supply and predation risk. Canadian Journal of Zoology **83**:280-292.

Homyack, J. A., D. J. Harrison, and W. B. Krohn. 2007. Effects of Precommercial Thinning on Snowshoe Hares in Maine. Journal of Wildlife Management **71**:4-13.

Homyack, J. A., J. H. Vashon, C. Libby, E. L. Lindquist, S. Loch, D. F. McAlpine, K. L. Pilgrim, and M. K. Schwartz. 2008. Canada Lynx-bobcat (Lynx canadensis 3 L. rufus) hybrids at the southern periphery of Lynx range in Maine, Minnesota and New Brunswick. American Midland Naturalist **159**:504-508.

Hoving, C. L. 2001. Historical occurrence and habitat ecology of Canada lynx (Lynx canadensis) in eastern North America. Page 200. Wildlife Ecology. University of Maine, Orono, ME.

Hoving, C. L., D. J. Harrison, W. B. Krohn, W. J. Jakubas, and M. A. McCollough. 2004. Canada lynx (*Lynx canadensis*) habitat and forest succession in northern Maine, USA. Wildlife Biology [Wildl. Biol.]. **10**:285-294.

Hoving, C. L., D. J. Harrison, W. B. Krohn, R. A. Joseph, and M. O'Brien. 2005. Broad-scale predictors of Canada lynx occurrence in eastern North America. Journal of Wildlife Management **69**:739-751.

Huntzinger, B. A., J. A. Vucetich, T. D. Drummer, and R. O. Peterson. 2005. Wolf recovery in Michigan, 2002-2005 Summary Report. Michigan Technological University, Houghton, MI.

Knowles, N., M. D. Dettinger, and D. R. Cayan. 2006. Trends in snowfall versus rainfall in the western United States. Journal of Climate **19**:4545-4559.

Koehler, G. M. 1990. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Can. J. Zool./J. Can. Zool. **68**:845-851.

Koehler, G. M., and K. B. Aubry. 1994. Chapter 4: Lynx. Pages 74-98 in L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, editors. American Marten, Fisher, Lynx, and Wolverine in the Western United States. U.S. Forest Service, Gen. Tech. Rpt. RM- 251.

Koehler, G. M., and J. D. Brittell. 1990. Managing spruce-fir habitat for lynx and snowshoe hares. Journal of Forestry **88**:10-14.

Kohn, B. E., J. L. Frair, D. E. Unger, T. M. Gehring, D. P. Shelley, E. M. Anderson, and P. W. Keenlance. 2000. Impacts of the US Highway 53 expansion project on wolves in northwestern Wisconsin. Page 55. Wisconsin Department of Natural Resources, Rhinelander, WI.

Kolbe, J. A., and J. R. Squires. 2007. Activity Patterns of Canada Lynx in Western Montana. Journal of Wildlife Management **71**:1607-1611.

Kreeger, T. J. 2003. The internal wolf: physiology, pathology, and pharmacology. Pages 192-217 in L. D. Mech, and L. Boitani, editors. Wolves: Behavior, ecology, and conservation. University of Chicago Press, Chicago, IL.

Lichtensteiger, C. A., K. Heinz-Taheny, T. S. Osborne, R. J. Novak, B. A. Lewis, and M. L. Firth. 2003. West Nile Virus Encephalitis and Myocarditis in Wolf and Dog. Emerging Infectious Diseases **9**:1303-1306.

McCord, C. M., and J. E. Cardoza. 1982. Bobcat and lynx. Pages 728-766 in J. A. Chapman, and G. A. Feldhamer, editors. Wild Mammals of North America. John Hopkins Univ. Press, Baltimore, Maryland.

Mech, D. 1974. Mammalian Species: Canis lupus. American Society of Mammologists **37**:1-6.

Mech, D., S. H. Fritts, D. L. Radde, and W. J. Paul. 1988a. Wolf distribution and road density in Minnesota. Wildl. Soc. Bull. **16**:85-87.

Mech, D., S. M. Goyal, C. N. Bota, and U. S. Seal. 1986. Canine parvovirus infection in wolves (Canis lupus) from Minnesota. Journal of Wildlife Diseases **22**:104-106.

Mech, D., S. M. Goyal, W. J. Paul, and W. E. Newton. 2008. Demographic effects of canine parvovirus on a free-ranging wolf population over 30 years. Journal of Wildlife Diseases **44**:824-836.

Mech, D., and H. J. Kurtz. 1999. First record of coccidiosis in wolves, Canis lupus. Canadian Field Naturalist [Can. Field Nat.]. **113**:305-306.

Mech, D., R. P. Thiel, S. H. Fritts, and W. E. Berg. 1985. Presence and effects of the dog louse Trichodectes canis (Mallophaga, Trichodectidae) on wolves and coyotes from Minnesota and Wisconsin. American Midland Naturalist **114**:404-405.

Mech, L. D. 1973. Wolf numbers in the Superior National Forest of Minnesota. Page 10. North Central Forest Experiment Station, USDA Forest Service, St. Paul, MN.

Mech, L. D. 1977a. Productivity, mortality and population trend of wolves in northeastern Minnesota. Journal of Mammalogy [J. Mammal.]. **58**:559-574.

Mech, L. D. 1977b. Record movement of Canadian lynx. Journal of Mammalogy **58**:676-677.

Mech, L. D. 1980. Age, sex, reproduction, and spatial organization of lynxes colonizing northeastern Minnesota. J. Mammal. **61**:261-267.

Mech, L. D. 1986. Wolf population in the central Superior National Forest, 1967-1985. Page 6. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station, St. Paul, MN.

Mech, L. D. 2001. Managing Minnesota's recovered wolves. Wildlife Society Bulletin [Wildl. Soc. Bull.]. **29**:70-77.

Mech, L. D. 2004. Wolf numbers in the central Superior National Forest, Winter 2003-2004. Page 8. U.S. Geological Survey, St. Paul, MN.

Mech, L. D. 2006. Wolf numbers in the central Superior National Forest, Winter 2005-2006. Page 4. USGS - Biological Resources Division, St. Paul, MN.

Mech, L. D. 2008. Wolf numbers in the central Superior National Forest, winter 2007-2008. Page 4. U.S. Geological Survey, St. Paul, MN.
Mech, L. D., S. H. Fritts, G. L. Radde, and W. J. Paul. 1988b. Wolf distribution and road density in Minnesota. Wildlife Society Bulletin **16**:85-87.
Mech, L. D., and S. Goyal, M. 1993. Canine parvovirus effect on wolf population change and pup survival. Journal of Wildlife Diseases **29**:330-333.
Mech, L. D., and S. M. Goyal. 1995. Effects of canine parvovirus on gray wolves in Minnesota. Journal of Wildlife Management **59**:565-570.
Mech, L. D., and P. D. Karns. 1977. Role of the wolf in a deer decline in the Superior National Forest. Page 23. USDA Forest Service, North Central Forest Experiment Station, St. Paul, MN.
Michigan Department of Natural Resources. 1997. Michigan Gray Wolf Recovery and Management Plan. Page 63, East Lansing, MI.
Michigan Department of Natural Resources. 2008. Michigan Wolf Management Plan. Pages 1-96.
Wildlife Division Report 3484. Michigan Department of Natural Resources, Lansing, MI.
Minnesota Department of Natural Resources. 2001. Minnesota wolf management plan. Page 36, St. Paul, MN.
Mladenoff, D. J., R. G. Haight, T. A. Sickley, and A. P. Wydeven. 1997. Causes and implications of species restoration in altered ecosystems. Bioscience **47**:21-31.
Mladenoff, D. J., T. A. Sickley, R. G. Haight, and A. P. Wydeven. 1995. A regional landscape analysis and prediction of favorable gray wolf habitat in the northern Great Lakes region. Conservation Biology **9**:279-294.
Mladenoff, D. J., T. A. Sickley, and A. P. Wydeven. 1999. Predicting gray wolf landscape recolonization: Logistic regression models vs. new field data. Ecological Applications [Ecol. Appl.]. **9**:37-44.
Moen, R., C. L. Burdett, and G. J. Niemi. 2008a. Movement and habitat use of Canada lynx during denning in Minnesota. Journal of Wildlife Management **72**:1507-1513.
Moen, R., G. Niemi, C. Burdett, and L. D. Mech. 2004. Canada Lynx in the Great Lakes Region 2004 Annual Report. Page 29. U.S. Forest Service, Duluth, MN.
Moen, R., G. Niemi, and C. L. Burdett. 2008b. Canada lynx in the Great Lakes Region. Page 48. Center for Water and Environment, Natural Resources Research Institute, University of Minnesota, Duluth, MN.
Moen, R., G. Niemi, C. L. Burdett, and L. D. Mech. 2006. Canada lynx in the Great Lakes region: 2005 annual report to USDA Forest Service and MN Cooperative Fish and Wildlife Research Unit and Minnesota Department of Natural Resources. Page 28. Natural Resources Research Institute, Duluth, MN.
Moen, R., L. Terwilliger, A. Dohmen, and S. Catton. 2010. Habitat and road use by Canada lynx making long-distance movements. Page 29. NRRI Technical Report No. NRRI/TR-2010-02 Release 1.0. Center for Water and Environment, Natural Resources Research Institute, University of Minnesota, Duluth, MN.
Monthey, R. W. 1986. Responses of snowshoe hares, *Lepus americanus*, to timber harvesting in northern Maine. Canadian Field-Naturalist **100**:568-570.

Mowat, G., K. G. Poole, and M. O'Donoghue. 2000. Ecology of lynx in northern Canada and Alaska. Pages 265-306 in L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, G. M. Koehler, C. J. Krebs, K. S. McKelvey, and J. R. Squires, editors. Ecology and conservation of lynx in the United States. RMRS-GTR-30WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Naughton-Treves, L., R. Grossberg, and A. Treves. 2003. Paying for Tolerance: Rural Citizens' Attitudes toward Wolf Depredation and Compensation. Conservation Biology [Conserv. Biol.]. **17**:1500-1511.

Newbury, T. L., and N. P. P. Simon. 2005. The effects of clear-cutting on snowshoe hare (Lepus americanus) relative abundance in central Labrador. Forest Ecology and Management **210**:131-142.

O'Donoghue, M. 1997. Responses of coyotes and lynx to the snowshoe hare cycle. Page 180. Zoology. University of British Columbia, Vancouver, B.C.

O'Donoghue, M., S. Boutin, C. J. Krebs, D. L. Murray, and E. J. Hofer. 1998a. Behavioural responses of coyotes and lynx to the snowshoe hare cycle. Oikos **82**:169-183.

O'Donoghue, M., S. Boutin, C. J. Krebs, G. Zuleta, D. L. Murray, and E. J. Hofer. 1998b. Functional responses of coyotes and lynx to the snowshoe hare cycle. Ecology **79**:1193-1208.

Peterson, R. O., N. J. Thomas, J. M. Thurber, J. A. Vucetich, and T. A. Waite. 1998. Population limitation and the wolves of Isle Royale. Journal of Mammalogy **79**:828-841.

Pietz, P. J., and J. R. Tester. 1983. Habitat selection by snowshoe hares in north central Minnesota. Journal of Wildlife Management **47**:686-696.

Poole, K. G. 1994. Characteristics of an unharvested lynx population during a snowshoe hare decline. Journal of Wildlife Management **58**:608-618.

Poole, K. G. 1997. Dispersal patterns of lynx in Northwest Territories. Journal of Wildlife Management **61**:497-505.

Potvin, M. J., T. D. Drummer, J. A. Vucetich, D. E. Beyer, R. O. Peterson, and J. H. Hammill. 2005. Monitoring and Habitat Analysis for Wolves in Upper Michigan. Journal of Wildlife Management **69**:1660-1669.

Quinn, N., W.S., and G. Parker. 1987. Lynx. Pages 683-694 in M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch, editors. Wild Furbearer Management and Conservation in North America. Ontario Ministry of Natural Resources, Toronto, ON.

Quinn, N. S., and J. E. Thompson. 1987. Dynamics of an exploited Canada lynx population in Ontario. Journal of Wildlife Management **51**:297-305.

Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada lynx conservation assessment and strategy, 2nd edition. Page 142pp. Forest Service Publication #R1-00-53. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service, Missoula, MT.

Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, G. M. Koehler, C. J. Krebs, K. S. McKelvey, and J. R. Squires. 1999. Ecology and conservation of lynx in the United States. University Press of Colorado, Boulder, CO.

Schwartz, M. K., K. L. Pilgrim, K. S. McKelvey, E. L. Lindquist, J. J. Claar, S. Loch, and L. F. Ruggiero. 2004. Hybridization between Canada lynx and bobcats: Genetic results and management implications. Conservation Genetics **5**:349-355.

Shenk, T. M. 2006. Post release monitoring of lynx (*Lynx canadensis*) reintroduced to Colorado. Page 45. Colorado Division of Wildlife, Fort Collins, CO.
Shenk, T. M. 2009. Post release monitoring of lynx (Lynx canadensis) reintroduced to Colorado. Page 55. Widlife Research Report. Colorado Division of Wildlife.
Slough, B. G., and G. Mowat. 1996. Lynx population dynamics in an untrapped refugium. Journal of Wildlife Management **60**:946-961.
Smith, D. W., D. R. Stahler, E.Albers, M. Metz, L. Williamson, N. Ehlers, K. Cassidy, J. Irving, R. Raymond, E. Almberg, and R. McIntyre. 2009. Yellowstone Wolf Report. Pages 1-32. Annual Report, 2008. National Park Service, Yellowstone National Park, Wyoming.
Smith, D. W., D. R. Stahler, and D. S. Guernsey. 2005. Yellowstone Wolf Report. Pages 1-25. Annual Report, 2004. National Park Service, Yellowstone National Park, Wyoming.
Squires, J. R., N. J. Decesare, J. A. Kolbe, and L. F. Ruggiero. 2008. Hierarchical den selection of Canada lynx in Western Montana. Journal of Wildlife Management **72**:1497-1506.
Squires, J. R., N. J. Decesare, J. A. Kolbe, and L. F. Ruggiero. 2010. Seasonal Resource Selection of Canada Lynx in Managed Forests of the Northern
Rocky Mountains. Journal of Wildlife Management **74**:1648-1660.
Squires, J. R., and T. Laurion. 2000. Lynx Home Range and Movements in Montana and Wyoming: preliminary results. Pages 337-350 in L. F. Ruggiero, K. B. Aubry, and S. W. Buskirk, editors. Ecology and conservation of lynx in the United States. University Press of Colorado, Boulder.
Squires, J. R., and L. F. Ruggiero. 2007. Winter prey selection of Canada lynx in Northwestern Montana. Journal of Wildlife Management **71**:310-315.
Stebler, A. M. 1944. The status of wolves in Michigan. Journal of Mammalogy **25**:37-43.
Thiel, R. P. 1985. The relationship between road densities and wolf habitat suitability in Wisconsin. American Midland Naturalist **113**:404-407.
Thompson, I. D., I. J. Davidson, S. O'Donnell, and F. Brazeau. 1989. Use of track transects to measure the relative occurrence of some boreal mammals in uncut forest and regeneration stands. Canadian Journal of Zoology/Revue Canadien de Zoologie **67**:1816-1823.
Tumlison. 1987. Mammalian Species: Felis rufus. The American Society of Mammalogists **269**:1-8.
U.S. Fish and Wildlife Service. 1992. Recovery Plan for the Eastern Timber Wolf. Page 73, Ft. Snelling, MN.
USDA. 2004a. Federally Listed Threatened and Endangered Species Programmatic Biological Assessment (BA) for the Revised Forest Plans: Chippewa and Superior National Forests. Page 252 in M. S. a. W. P. Russ, editor. USDA-Forest Service - Region 9. Chippewa and Superior National Forests, Duluth, MN.
USDA. 2004b. Forest Plan Revision. Superior National Forest. U.S. Forest Service, Duluth, MN.
USDA. 2009. Nira Road Decommissioning. B. Anderson - Forest Monitoring Coordinator, USDA-Forest Service, Superior National Forest, Supervisors Office., Duluth, MN.
USDA. 2011. Federally Listed Threatened and Endangered Species Programmatic Biological Assessment (BA) for the Revised Forest Plan: Superior National Forest. Page 171pp. in A. Dohmen, and M. Shedd, editors. USDA-Forest Service - Region 9. Superior National Forests, Duluth, Minnesota.
USDA. 2011b. Canada Lynx Management Direction for Non-LAU Area (provided via email from Alan Dohman, USFW to Tony Sullins, FWS, Aug. 10, 2011).

USDA - APHIS - Wildlife Services. 2008. Wolf damage management in Minnesota - 2008. Page 9, Grand Rapids, MN.

USDA - APHIS - Wildlife Services. 2009. USDA-Wildlife Services wolf damage management in Minnesota - 2009. Page 9, Grand Rapids, MN.

Ward, R. M. P., and C. J. Krebs. 1985. Behavioural responses of lynx to declining snowshoe hare abundance. Can. J. Zool. **63**:2817-2824.

Wheeldon, T. J., B. R. Patterson, and B. N. White. 2010. Sympatric wolf and coyote populations of the western Great Lakes region are reproductively isolated. Molecular Ecology **19**:4428-4440.

Wirsing, A. J., T. D. Steury, and D. L. Murray. 2002. A demographic analysis of a southern snowshoe hare population in a fragmented habitat: evaluating the refugium model. Canadian Journal of Zoology/Revue Canadienne de Zoologie [Can. J. Zool./Rev. Can. Zool.]. **80**:169-177.

Wisconsin Department of Natural Resources. 1999. Wisconsin Wolf Management Plan. Pages 1-75. Wisconsin Department of Natural Resources, Madison, WI.

Wolfe, M. L., N. V. Debyle, C. S. Winchell, and T. R. McCabe. 1982. Snowshoe hare cover relationships in northern Utah. Journal of Wildlife Management **49**:662-670.

Wydeven, A. P. 1998. Status of the timber wolves in Wisconsin. Page 21. Wisconsin Endangered Resources Report. Wisconsin Department of Natural Resources, Madison, WI.

Wydeven, A. P., D. J. Mladenoff, T. A. Sickley, B. E. Kohn, P. A. Thiel, and A. J. Hansen. 2001. Road density as a factor in habitat selection by wolves and other carnivores in the Great Lakes Region. Endangered Species UPDATE **18**:110-114.

Wydeven, A. P., R. N. Schultz, and R. P. Thiel. 1995. Monitoring of a recovering gray wolf population in Wisconsin, 1979-1991. Pages 147-156 in L. N. Carbyn, S. H. Fritts, and D. R. Seip, editors. Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, Occasional Publication No. 35., Edmonton, Alberta.

Wydeven, A. P., and J. E. Wiedenhoeft. 1999. Status of the timber wolves in Wisconsin. Page 18. Wisconsin Endangered Resources Report. Wisconsin Department of Natural Resources, Madison, WI.

Wydeven, A. P., and J. E. Wiedenhoeft. 2000. Status of the timber wolves in Wisconsin. Page 24. Wisconsin Endangered Resources Report. Wisconsin Department of Natural Resources, Madison, WI.

Wydeven, A. P., and J. E. Wiedenhoeft. 2001. Status of the timber wolves in Wisconsin. Page 22. Wisconsin Endangered Resources Report. Wisconsin Department of Natural Resources, Madison, WI.

Wydeven, A. P., and J. E. Wiedenhoeft. 2005. Status of the timber wolves in Wisconsin. Page 33. Wisconsin Endangered Resouces Report. Wisconsin Department of Natural Resources, Madison, WI.

Wydeven, A. P., J. E. Wiedenhoeft, R. N. Schultz, R. P. Thiel, S. R. Boles, and E. Heilhecker. 2006. Progress report of wolf population monitoring in Wisconsin for the period October 2005 - March 2006. Page 13. Wisconsin Department of Natural Resources, Park Falls, WI.

Wydeven, A. P., J. E. Wiedenhoeft, R. P. Thiel, R. N. Schultz, and S. R. Boles. 2007. Progress report of wolf population monitoring in Wisconsin for the period, October 2006 - March 2007. Page 25. Wisconsin Department of Natural Resources, Park Falls, WI.