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## APPENDIX E. CANADA LYNX

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This appendix provides information related to Canada lynx management:

1. Implementation of Forest Plan: Promoting Lynx Conservation on National Forest System Land.
2. Basis of Forest Plan direction (conservation measures) for lynx recovery.
3. Endangered Species Act Section 7 Conferencing and Consultation and Coordination with Fish and Wildlife Service
4. New information: How Forest Plan lynx conservation approach will be adapted or updated.
5. Scales of Analysis: Geographic Areas and Lynx Analysis Units
6. Lynx Conservation Assessment and Strategy: Recommended Procedures
7. Lynx Habitat Definitions and Descriptions
8. References

### 1. Implementation of Forest Plan: Promoting Lynx Conservation on National Forest System Land

The Forest Plan desired conditions, objectives, standards, and guidelines for Canada lynx, together with the integrated management direction for other Forest resources, have been developed to meet the Forest Service objective and intent of promoting a consistent and effective approach to conservation and recovery of Canada lynx on National Forest System land.

Plan direction addresses risk factors affecting lynx: productivity; mortality; movement; and other large landscape scale factors such as habitat degradation by non-native invasive species. These risk factors are addressed at applicable landscape scales, including: range-wide, Great Lakes geographic area, National Forest, and home range.

Projects and activities that implement the Forest Plan are generally not expected to have adverse effects on lynx and implementation is expected to lead, at relevant scales, to conservation of the species.

Because it is impossible to provide management direction at the programmatic or Plan level that will address all possible actions in all locations that may affect lynx, project specific analysis and design will be completed for all actions that have the potential to affect lynx. Circumstances unique to individual projects or actions and their locations may still result in adverse effects on lynx. In these cases, additional or modified mitigating measures may be necessary to avoid or minimize adverse effects.

The Forest Plan conservation approach is intended to provide guidance that retains future options, provides management consistency, offers necessary flexibility, and ultimately will accomplish the objective of conserving the lynx.

### 2. Basis of Forest Plan Direction (conservation measures) for Lynx Recovery

As per the Canada Lynx Conservation Agreement between Forest Service and Fish and Wildlife Service (USDA FS 2000), for all NFS lands identified as having lynx habitat, measures considered necessary to conserve lynx are

incorporated into the Plan. They are based on consideration of the scientific information, guiding principles, and recommended conservation measures of:

- Lynx Conservation Assessment and Strategy (Ruediger *et al.* 2000) and its official modifications (August 2000, April 2002)
- Lynx Science Report (Ruggiero *et al.* 2000)
- Relevant information from local sources (federal, State, tribal)
- Fish and Wildlife Service's final listing decision document (USDI Fish and Wildlife Service 2000)
- Fish and Wildlife Service's notice of remanded determination status for lynx (USDI Fish and Wildlife Service 2003)

The above information acknowledges that little research has been conducted on the lynx in the contiguous United States and thus there is a lack of conclusive or specific knowledge about lynx. Until conclusive information concerning lynx management becomes available from research, scientific assessments, lynx surveys, and effectiveness monitoring, Forest Plan conservation measures are intended to fulfill the purpose of a useful, proactive plan. The Plan is intended to err on the side of maintaining and restoring lynx habitat for lynx and their prey.

Forest Plan direction is consistent with existing applicable authorities and federal laws including, but not limited to, Endangered Species Act of 1973, Fish and Wildlife Coordination Act, National Forest Management Act and its regulations (36 CFR 219.19), and National Environmental Policy Act. It is also consistent with Forest Service policy, including Forest Service Manual 2670.

### 3. Endangered Species Act Section 7 - Conferencing and Consultation and Coordination with Fish and Wildlife Service

The Plan provides a basis for reviewing the adequacy of Forest Service management with regard to lynx conservation and to facilitate Section 7 conferencing and consultation with the Fish and Wildlife Service at the programmatic and project-levels.

Direction specific to interagency coordination, consultation, and conferencing is described in more detail in the Endangered Species Consultation Handbook (NMFS/USFWS, March 1998) with further guidance from national interagency Memorandum of Understanding (MOU) (94-SMU-058) and Forest Service Manual (2670).

### 4. New Information: How the Forest Plan Lynx Conservation Approach Will Be Updated

**Future lynx recovery plan:** When a lynx recovery plan is developed by the Fish and Wildlife Service, the Forest Service would manage the National Forest to meet the goals and applicable objectives of the recovery plan.

**Population goals for the planning area:** A federal recovery plan for threatened and endangered species generally, though not always, includes criteria for the long-term survival of species based on population goals. After a recovery plan is developed for the lynx, the Forest Service, in consultation with the Fish and Wildlife Service, may consider establishing population goals specific to the planning area in support of the recovery plan's population goals.

**Designation of critical habitat:** When critical habitat is designated by the US Fish and Wildlife Service, the Forest Service would manage NFS land to assure that critical habitat is conserved to support lynx recovery.

**New and relevant scientific information:** Forest conservation management for lynx will be adaptive. Knowledge and scientific certainty about lynx and its habitat and effectiveness of management are expected to increase in the future based on:

- Experience implementing conservation measures,
- Research, inventory, monitoring and evaluation, and
- Other local information relevant to lynx

The National Forest, in coordination with the Fish and Wildlife Service, will consider, and where appropriate, incorporate new and relevant information into lynx conservation management. This may be accomplished within the context of the current Plan and project-level planning, or, if needed, through amendment to the Forest Plan.

**Update of the Lynx Conservation Assessment and Strategy (LCAS):** Given the limited information currently available regarding lynx distribution and ecology, interagency review may be conducted periodically to assess and adjust the LCAS to reflect new scientific information and experience implementing conservation measures (Ruediger *et al.* 2000, p. 4-Introduction). The Forest will consider any adjustments as new information and will document how these are addressed by the Plan or, if necessary, will amend the Plan to incorporate changes.

## 5. Scales of Analysis: Geographic Areas and Lynx Analysis Units

Potential risk factors (programs, practices, and activities that may influence lynx or lynx habitat) may affect lynx productivity, mortality, and movement, and may need to be addressed during analysis and consultation. Risk factors may interact, and their relative importance may vary in different areas and at different spatial scales. Based on the scale of a project, analysis of effects may consider applicable risk factors at the appropriate analysis scale.

### Geographic Areas

Geographic areas are large land areas identified for purposes of analysis and development of conservation measures for lynx. Geographic areas do not represent distinct lynx populations or isolated sub-populations, or even currently occupied habitat. Each area has uniquely different forest ecosystems, management histories, and current lynx population status.

The National Forests of Minnesota fall into the Great Lakes Geographic Area. This area encompasses northeastern and north-central Minnesota, northern Wisconsin, and the Upper Peninsula and northern portions of Michigan. An important biological feature of the Great Lakes Geographic Area is its adjacency and interrelationship to lynx habitat and lynx populations in Canada.

To evaluate and monitor effects of management actions, lynx population status, habitat conditions, and risk factors for lynx on the National Forest will generally be addressed at the Lynx Analysis Unit scale on National Forest System land (see below). However, population connectivity and some risk factors (such as features of habitat connectivity or fragmentation, incidental or illegal shooting, mortality due to vehicle collisions) may be best addressed at the geographic area scale. At the geographic scale, lynx conservation generally must be considered in coordination with other landowners and management agencies, including those in Canada.

### Lynx Analysis Units

#### Definitions

Lynx Analysis Units (LAUs) are the smallest landscape scale analysis units upon which direct, indirect, and cumulative effects analyses for lynx will be performed. LAUs encompass lynx habitat (on all ownerships) within the administrative unit that has been mapped (in coordination with adjacent management agencies and Fish and Wildlife Service) using specific criteria to identify appropriate vegetation and environmental conditions. In

addition, LAUs are intended to provide the fundamental scale with which to begin monitoring and evaluation of effects of management actions on lynx habitat.

LAUs encompass land that may or may not provide habitat or environmental conditions considered necessary to support lynx reproduction and survival. Land within the LAU falls into two categories (see 7. Habitat Definitions and Descriptions in this Appendix for more detailed description):

- 1. Lynx habitat includes:**
  - 1.1 Habitat that is currently in condition suitable to provide for denning, foraging, or other habitats considered necessary to support lynx reproduction and survival, and
  - 1.2 Habitat that is not currently in condition suitable to provide for lynx denning, foraging, or other habitats considered necessary to support lynx reproduction and survival, but is expected with time to develop those necessary conditions.
- 2. Lynx habitat includes:** (termed “unsuitable areas” in LCAS): These are areas that are not considered to be capable of providing lynx habitat, such as lakes or human developments

## Management and analysis scale

### Within LAUs

Objectives, standards, and guidelines (conservation measures) generally apply only to lynx habitat on National Forest System land within LAUs.

Management at LAU scale allows blocks of quality lynx habitat to be maintained within each LAU, thereby maintaining a good distribution of lynx habitat at scales appropriate for lynx conservation.

### Exceptions

Exceptions to management and analysis at the LAU scale may be warranted for some projects if it is determined that an individual LAU does not provide a large enough analysis area within which to manage for lynx or address direct, indirect, and cumulative effects of particular actions. In some cases, project impacts should be assessed within the context of two or more LAUs. Certain projects may also entail consideration of landscape patterns across large areas, including NFS land outside of LAUs (for example, promoting habitat connectivity, management-ignited fire). Additionally, naturally occurring events such as fire or blowdown may impose changes across many LAUs.

### Outside LAUs

Pursuant to the Endangered Species Act of 1973 as amended (section 7(a)(2), exceptions to management and analysis at the LAU scale may also be warranted for some projects where it is determined that lynx may occur in areas outside of mapped LAUs and projects may affect the lynx..

### Refining LAU boundaries

LAU boundaries will not be adjusted for individual projects. They will remain constant to facilitate planning and allow effective monitoring of habitat changes over time. However, as locally specific information from national lynx surveys, lynx research, and other sources (including State and Tribal) becomes available, LAUs may be refined. Refinements would be coordinated with Fish and Wildlife Service, and, where appropriate, with adjacent management agencies.

If minor adjustments to LAUs are made within currently mapped LAUs, the changes will usually be made administratively. If significant LAU adjustments or revisions are made, including adding land previously outside of LAUs, this would be proposed in accordance with the National Forest Management Act, including National Environmental Policy Act disclosure and public participation.

## 6. Lynx Conservation Assessment and Strategy: Procedural Guidance

The LCAS recommends both substantive and procedural guidance for lynx conservation management. Applicable LCAS substantive guidance (such as requiring that certain amounts of habitat always be maintained) has been incorporated into the Forest Plan. Most of the LCAS procedural guidance (such as recommendations for conducting certain analyses, mapping, and inventory aimed at both programmatic and project level scales of decision-making) is not specifically incorporated into the Plan. This is because much of the procedural guidance identified in the LCAS is found in the Forest Service Directive System and other applicable laws and authorities that are part of Forest Plan management direction.

However, some of specific procedural guidance from the LCAS is reprinted below because:

1. The LCAS suggests that following these procedural guides may facilitate accomplishing the substantive direction of the Plan and,
2. they are not specifically found elsewhere in the Forest Service Directive System or other laws or authorities.

Including this procedural guidance below does not constitute Forest Plan management direction or supplant the need to conduct other required analyses. It provides potential considerations identified by the Lynx Biology Team for supporting lynx conservation management (Ruedigger *et al.* 2000).

### Procedural Guidance to Address Mortality Risk Factors

#### *Shooting, Trapping (legal and non-target)*

Trapping, shooting, and predator control is generally regulated by the Fish and Wildlife Service, the State of Minnesota, and the Tribes. However, the National Forest does have some ability to coordinate with other agencies to reduce these mortality risks.

- Federal agencies should work cooperatively with States and Tribes to reduce incidental take of lynx related to trapping. (Lynx may be more vulnerable to trapping near open roads [Koehler and Aubry 1994, Bailey et al. 1986].)
- Initiate interagency information and education efforts throughout the range of lynx in the contiguous states. Utilize public education such as: trailhead posters, magazine articles, news releases, state hunting and trapping regulation booklets, trapper guidance, etc., to inform the public of the possible presence of lynx, field identification, and their status.

### Highway Crossings

Direct mortality from vehicular collisions may be detrimental to lynx populations in the lower 48 states. Mortality levels can drastically increase with relatively small increases in traffic volumes and speed.

- Within lynx habitat, identify linkage areas and potential highway crossing areas.
- Where needed, develop measures such as wildlife fencing and associated underpasses or overpasses to reduce mortality risk.

### Procedural Guidance to Address Movement and Dispersal Risk Factors

It is essential to provide landscape connectivity so that all or most habitat has the potential of being occupied, and populations remain connected. At the southern periphery and eastern portions of lynx range, habitat occurs in

narrow fragmented bands (man-made or naturally-occurring), or has been fragmented by human developments. Connected forested habitats allow lynx, and other large and medium size carnivores, to easily move long distances in search of food, cover and mates. Highways and private land that are subdivided for commercial or residential developments or have high human use patterns can interrupt existing habitat connectivity and further fragment lynx habitat, reducing the potential for population interchange. In some areas, particularly the eastern United States, habitat connectivity may be difficult to achieve because of mixed ownerships. Land exchanges and cooperative management with private landowners may be the only options available to provide landscape connectivity.

- Identify linkage areas that may be important in providing landscape connectivity within and between geographic areas, across all ownerships.
- Develop and implement a plan to protect linkage areas on federal land from activities that would create barriers to movement. Barriers could result from an accumulation of incremental projects, as opposed to any one project.
- Where feasible, maintain or enhance native plant communities and patterns, and habitat for potential lynx prey, within identified linkage areas. Pursue opportunities for cooperative management with other landowners.

### *Highways*

Highways impact lynx and other carnivores by fragmenting habitat and impeding movements. As traffic lanes, volume, speeds, and right-of-way width increase, the effects on lynx and other carnivores are magnified. As human demographics change, highways tend to increase in size and traffic density. Special concern must be given to the development of new highways (gravel roads being paved), and changes in highway design, such as additions in the number of traffic lanes, widening of rights-of-way, or other modifications to increase highway capacity or speed. Within linkage areas, highway crossing structures should be employed to reduce effects on wildlife. Information from Canada (Trans-Canada Highway) suggests crossings should generally be at ½-mile intervals and not farther than 1 mile apart, depending on topographic and vegetation features.

- Federal land management agencies will work cooperatively with the Federal Highway Administration and State Departments of Transportation to address the following within lynx geographic areas:
  - Identify land corridors necessary to maintain connectivity of lynx habitat.
  - Map the location of linkage areas where highway crossings may be needed to provide habitat connectivity and reduce mortality of lynx (and other wildlife).
- Evaluate whether land ownership and management practices are compatible with maintaining lynx highway crossings in linkage areas. On public lands, management practices will be compatible with providing habitat connectivity. On private lands, agencies will strive to work with landowners to develop conservation easements, exchanges, or other solutions.
- Identify, map, and prioritize site-specific locations, using topographic and vegetation features, to determine where highway crossings are needed to reduce highway impacts on lynx.

### *Land Ownership*

Lynx exemplify the need for landscape-level ecosystem management. Contiguous tracts of land in public ownership (national forests, national parks, wildlife refuges, and BLM lands) provide an opportunity for management that can maintain lynx habitat connectivity. Throughout most of the lynx range in the lower 48 states, connectivity with habitats and populations in Canada is critical for maintaining populations in the U.S.

- Identify linkage areas by management jurisdiction(s) in management plans and prescriptions.
- In land adjustment programs, identify linkage areas. Work towards unified management direction via habitat conservation plans, conservation easements or agreements, and land acquisition.
- Evaluate proposed land exchanges, land sales, and special use permits for effects on linkage areas.

## 7. Lynx Habitat Definitions and Descriptions

Definitions below are based on LCAS definitions but may have been modified or expanded to provide clarification or to better reflect conditions on the National Forest. These definitions may change based on new scientific information.

The planning records for implementation of the Forest Plan at the project level will provide information on the quantifiable and spatial parameters used to model and analyze lynx habitat, lynx non-habitat, and management activities (such as roads and trails) that affect lynx.

**1. Lynx Habitat** – In the Great Lakes states lynx occur in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare. Most lynx occurrences fell within the Mixed Deciduous/Conifer Forest province (McKelvey et al. 2000). Lynx habitat includes boreal, coniferous, and mixed coniferous/deciduous vegetation types dominated by pine, balsam fir, black and white spruce, northern white cedar, tamarack, aspen, paper birch, conifer bogs and shrub swamps.

Lynx habitat includes vegetation that is considered necessary or contributes to support lynx reproduction and survival. Lynx habitat includes a) habitat that may currently be in condition suitable to provide for denning, foraging, diurnal security, dispersal and movement or other life history requirements or b) habitat that is expected to develop with time those necessary conditions.

For management purposes, lynx habitat may be subdivided into categories based on their role in supporting lynx reproduction and survival. The key categories for which management direction is found in the Forest Plan include:

- A. Foraging habitat:
  - 1) snowshoe hare (primary prey)
  - 2) red squirrel (important secondary prey)
- B. Unsuitable habitat
- C. Denning habitat
- D. Linkage areas and connectivity habitat

Definitions for other habitats that contribute to support lynx reproduction and survival, such as other alternate prey species habitat or diurnal security habitat, are not included here. If applicable, those habitats may be defined and analyzed at project level.

### A. Foraging Habitat

Habitat that supports primary prey (snowshoe hare) and/or important alternate prey (especially red squirrels) that is available to lynx.

#### A.1 Snowshoe hare:

The highest quality snowshoe hare habitats are those that provide food, security from predators, and thermal protection during extreme weather (Wolfe et al. 1982; Pietz and Tester 1983; Fuller and Heisey 1986; Monthey 1986; Koehler and Aubrey 1994; Wirsing et al. 2002): forest that supports a high density of young trees or shrubs (> 4,500 stems or branches per acre), tall enough to protrude above the snow (1-3 meters) (Hodges 2000, Parker, 1986).

In northern Minnesota these conditions may occur in a wide variety of habitats, including: lowland conifer bogs and forests; early successional forest typically 3-12 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 (Jaakko Pöyry 1992, Kilgore and Heinselman 1990, Koehler 1990, 1991, Krenz 1988, Fuller and Heisey 1986, Pietz and Tester 1983).

In addition, coarse woody debris or brush piles, especially in early successional stages (created by harvest regeneration or management-ignited fire or natural disturbances such as fires or blowdown); provide important cover for snowshoe hares and other prey.

Other research shows that landscape pattern and habitat juxtaposition are important in identifying hare habitat (Pietz and Tester 1983, Conroy et. al. 1979, Kernz 1988). Clearcut edges with good understory cover were heavily used while open clearcuts were poorly used and acted as barriers to movement and habitat use (Conroy et. al. 1979). In addition, high hare densities were found on the edge between lowland conifer and upland deciduous stands, concluding that hare densities were positively correlated with coniferous cover, especially if clumped with interspersed deciduous cover (Kernz 1988).

#### ***A.2 Red squirrel:***

Red squirrels are an important alternate prey species. They are found in a variety of habitat types, but their densities tend to be highest in mature cone-bearing forests with substantial quantities of coarse woody debris (Ruediger et al. 2000). Red squirrels prefer mature conifer forests because of their forage preference for conifer seeds, but also may also be found in hardwood or younger forests that provide mast forage such as oak and hazel, fruits, mushrooms, and other seeds. (Jaako-Poyry 1992).

#### **B. Unsuitable habitat**

Areas of lynx habitat within LAUs that are in initial stages of forest growth (early successional) 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. Management activities that create openings that are unsuitable for hare generally include clearcut and seed tree harvest, and might include management-ignited fire, mechanical site preparation, salvage harvest, and shelterwood and commercially-thinning harvest, depending on unit size and remaining stand composition and structure.

#### **C. Denning Habitat**

Habitat used during parturition and rearing of young until they are mobile. The common component appears to be large amounts of coarse woody debris, with down 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 types or regenerating stands (>20 years since disturbance). Forest disturbed by blowdown, fire, insect, or disease also may provide denning habitat. Denning habitat should be well distributed within the LAU. Foraging and denning habitat must be located within daily travel for breeding females. Denning generally occurs from birth of kittens in late May to early July until kittens are mobile six to eight weeks later in late July or August.

#### **D. Linkage Areas/Landscape Connectivity Habitat**

Habitat that provides landscape connectivity between blocks of lynx habitat. Such habitat is provided by cover (vegetation) in sufficient quantity and arrangement to allow for the movement of lynx. Linkage areas occur both within and between geographic areas where blocks of lynx habitat are separated by intervening areas of non-lynx habitat such as agricultural lands, developed land, or where lynx habitat naturally narrows between blocks. Connectivity provided by linkage areas can be degraded or severed by human infrastructure such as highways, subdivisions, or other developments.

**2. Lynx non-habitat** – (termed “unsuitable areas” in LCAS): Areas such as lakes and human developments, that do not support snowshoe hare populations and are not considered capable of providing lynx habitat.



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