United States
Department of
Agriculture

Forest
Service

Clearwater National
Forest Supervisors
Office

File Code: **2670** **Date:** **November 21, 2001**
Route To: **1950 –NLF Supplemental EIS**
Subject: **Canada Lynx Biological Assessment**
To: **Forest Supervisor**

INTRODUCTION

The USF&WS species list of 06/01/01 (1-4-01-SP-760) identified Canada lynx as a 'Threatened Species'. Canada lynx habitat occurs in approximately 25% of the 128,000 acre North Lochsa Face (NLF) analysis area. This Biological Assessment (BA) updates the environmental baseline and potential effects of the planned actions on Canada Lynx and its habitat in the NLF analysis area.

The purpose and need for action in the NLF Analysis Area was developed from a comparison between desired future conditions (DFC's) in the area and the existing conditions. DFC's were developed using the: 1) Clearwater Forest Plan management goals, standards and guidelines; 2) An assessment of vegetation and land types to characterize historic and existing resource conditions; 3) Ecologic processes appropriate to the analysis area; and, 4) Scientific information from the Interior Columbia Basin Ecosystem Management Project (ICBEMP). Specific management practices were developed to address desired ecologic conditions with the NLF. The following describes the practices and associated ecologic conditions in the NLF analysis area, upon which the need for management actions are based:

Prescribed Burning: Historically, the breaklands have had a short-term fire regime of approximately 25 to 50 years. Frequent fires maintained a very diverse structure and composition, keeping stands open and allowing Douglas fir, western larch, and, to a lesser extent, ponderosa pine to dominate a stand and regenerate. Over 60 years of fire suppression has caused these species to become less dominant in the overstory and replaced by uniform stands of trees with dense understories of western red cedar, grand fir, and Douglas fir. Under these conditions, the potential for an extreme, large fire, uncharacteristic of the breaklands increases. Understory burns will help perpetuate the types of stand composition and structure that may occur when fire was an active ecological process on the landscape.

Timber Harvest: Many years of fire suppression have allowed a majority of the timbered stands to have basal areas higher than the normal range of variability. Increased stand densities, combined with the drought conditions of recent years, have stressed the trees, making them more susceptible to attack by bark beetles, root rots, and other pests. As the incidence of insects and disease has increased, higher fuel loads have resulted, increasing the risk of higher intensity fires. Also, many of these acres are on the breaklands, where we want to bring fire back into the

ecosystem. Timber harvest can be used to reduce the stand densities on the breaklands, which would allow more favorable conditions for prescribed burning.

Shrubfield Reforestation: Seral shrubfields, comprised of ninebark, mountain maple, alder, snowberry, ocean spray, willow, and other species, have come to dominate those areas affected by repeated large wildfires. These past fires eliminated tree seed sources and reduced site productivity through changing soil physical and chemical properties along with surface soil erosion losses. Forest vegetation is slowly returning to areas with deeper soils, but without treatment, some of the shrubfields may remain for many years.

Noxious Weeds: Invasive nonnative plants are rapidly establishing on arid and semiarid grasslands, roadsides, recreational sites and semiarid wildlands within the Columbia Basin. According to the recent scientific assessment of the Interior Columbia Basin, invading weeds can alter ecosystem processes, including productivity, decomposition, hydrology, nutrient cycling, and natural disturbance patterns such as frequency and intensity of wildfires. Changes in these processes can result in displacement of native plant species, impacting wildlife, recreation, and scenic values. The spread of weeds can be primarily attributed to human activities: roads and trails act as transportation corridors; the use of contaminated livestock feed; contaminated seed sources used in revegetation practices; and ineffective revegetation practices on disturbed lands. Wildlife and birds also contribute to the spread of non-native plants.

Watershed Restoration (Riparian Planting And Road Obliteration): The stream terraces within the Pete King and Fish Creek drainages would typically have a high percentage of old-growth trees. However, only remnants remain due to the 1934 fire and past timber harvest in these areas. With shade being limited, stream temperatures in both Pete King Creek and Fish Creek are currently above water quality standards. The re-establishment of shade providing trees is needed to reduce stream temperatures to desired levels. Re-establishing trees in the riparian areas of these streams will add to stream bank stability and potential large instream wood. Past land management practices have left a legacy of unneeded, unstable, redundant roads across the landscape. These roads are a chronic source of sediment to streams and have the potential for mass failures. Stabilizing these unneeded roads through obliteration can reduce this source of sedimentation.

II. PLANNED MANAGEMENT ACTIONS

To address the above management needs, Alternative 6 applies management activities on approximately 21,120 acres (17 percent of the land in the NLF Decision Area). Prescribed fire would occur on approximately 12,835 acres. Timber harvest on 7,290 acres, through five timber sales would produce a total of 66 MMBF. Approximately 3.2 miles of temporary road would be constructed and 13 miles of road would be reconstructed to improve surface drainage and provide for safe use.

No old growth habitat will be harvested and no pre-commercial thinning will occur in Alternative 6 in lynx habitat. Approximately 170 acres of mixed severity burning and 135 acres of under-burning are added under Alternative 6. Unit 12, a mixed severity burn is expanded to follow a logical topographical break. Unit 169, an under-burn, was added from Alternative 3a.

Approximately 325 acres of regeneration harvest, 485 acres of commercial thin, and 150 acres of commercial timber were dropped. Most of the units dropped were in old growth. One pre-commercial thin unit that was located in lynx habitat was dropped.

Alternative 6 includes a programmatic Forest Plan Amendment, Appendix C to change the maximum burned acres from 'wildfire' to 'unscheduled' for certain management areas having primary resource emphasis other than timber. This is being done to balance fire suppression costs with resource values lost while also considering firefighter safety. This amendment also allows the use of alternative suppression strategies (confine and contain within the Lochsa Research Natural Area). Tables 1a and 1b, summarize the management prescriptions and general sites features associated with Alternative 6.

Table 1a: Summary of Specific Features for Alternative 6

Prescribed Fire	
Mixed Severity Burn	**5,655 acres**
Underburn	**7,180 acres**
Timber Harvest	
Regeneration Harvest	**2,720 acres**
Off-Site Conversion (Clearcut)	**2,220 acres**
Commercial Thinning	**2,035 acres**
Commercial Timber Salvage	**315 acres**
Pre-commercial Thinning	**995 acres**
Roads	
Permanent Road Construction	**0 miles**
Temporary Road Construction (8 temporary roads)	**3.2 miles**
Reconstruction	**13 miles**
Road Obliteration	**66 miles**
Roads in long-term maintenance	**54 miles**

Table 1b Acres of Vegetation Treatment by Landform

Type of Treatment	Breaklands	Colluvial Mid-slopes	Frost Churned Uplands	Old Surfaces	Stream Terraces
Mixed Severity Burn	**1490**	**710**	**2155**	**1260**	**40**
Underburn	**4585**	**1160**	**260**	**1035**	**140**
Regeneration	**1070**	**680**	**0**	**970**	**0**
Off-site Harvest	**20**	**0**	**200**	**2000**	**0**
Commercial Thinning	**445**	**435**	**0**	**1155**	**0**
Commercial Timber Salvage	**0**	**95**	**0**	**220**	**0**
Pre-commercial Thinning	**50**	**25**	**0**	**920**	**0**
Total Treatment	**7680**	**3105**	**2615**	**7560**	**180**

The following monitoring would continue on the Forest and/or District. Monitoring techniques, methods, and results (including an annual report) that pertain to TES species will be coordinated with NMFS and FWS:

a. Ten percent of all units on the Forest are monitored for compliance with the rules and regulations of the Idaho Forest Practices Act.

b. Annually, at least one completed timber sale project is monitored by the District and Forest to determine if: (1) requirements of the EA or EIS and decision document were implemented correctly; and (2) desired/predicted results and effects occurred. These results are retained in the District files and used for future reference. Of particular interest are successful application of planned vegetative management practices (including roading practices) in or near sensitive areas, erosion control, and access management.

c. For timber sales, certified sale administrators would monitor the requirements of the timber sale contract, which reflect the requirements described in the Record of Decision and the FEIS.

d. All eight major watersheds within the project area that flow into the Lochsa River are currently being monitored for summer water temperatures. These streams and a number of tributaries would be monitored for water temperatures. Substrate monitoring is currently ongoing and would continue in the Pete King Creek, Canyon Creek, and Deadman Creek drainages. Ongoing fish population monitoring projects would continue in the Pete King Creek, Canyon Creek, Deadman Creek, and Fish Creek (including Hungery Creek) drainages. Stream channel and habitat conditions were surveyed in 1991 and 1997 in the Pete King Creek and Canyon Creek drainages; these would be repeated in 2002. Follow up surveys are planned in the Deadman Creek (1999) and Fish Creek (2000) drainages.

e. Pacific dogwood plants would be monitored during reconstruction of the access road to Bimerick helicopter landing, and prior to, during, and following the prescribed burning in the Lochsa RNA. Sensitive plants that are of a concern in the RNA will be monitored prior to, during and after the burning in the RNA. The RNA monitoring would be done in conjunction with the Research Station scientists.

f. New plantations, established after harvest, would be monitored for five years following planting to ensure that the land is successfully reforested (funded by KV).

g. The CNF would monitor sediment delivery from road obliteration to better quantify the effects of this activity. A subset of the road obliteration activities, which have the potential to deliver sediment to the streams, would be monitored. The monitoring would be designed to quantify sediment delivery, and to the extent possible allow inference to the application of this activity in other areas. The results shall be submitted to the National Marine Fisheries Service each March following the field season data was collected.

h. The CNF would monitor the effects of the first two years of mixed severity burns. Specifically the CNF would monitor the effects of the burns on Riparian Habitat

Conservation Areas to determine if additional mitigation should be applied. A report would be produced that describes where, when, acreage, and method of treatment, methods of evaluating effects, the effects of the prescribed burning, and any additional mitigation that should be applied to future burns. The CNF would report their findings and any added mitigation measures to the National Marine Fisheries Service and the U. S. Fish and Wildlife Service for concurrence prior to proceeding with the next year's burns..

i. Monitor prescribed burning in Fish "C" reaches (see staggering of units in Design Section). If burning the first year does not result in any changes to stream reaches, then burning does not need to be staggered.

j. See design criteria for heritage resources for the following sites: 10-IH-558, 10-IH-2370, 10-IH-2371, 10-IH-2372, 10-IH-2373, 10-IH-2374, 10-IH-2145, 10-IH-2146, 10-IH-1649

k. In consultation with the Idaho State Historical Preservation Office (SHPO), and in participation with the Nez Perce National Historic Park, develop a heritage resource management and monitoring plan that will protect culturally modified trees and other historic properties from effect. This plan will develop monitoring and mitigation measures for individual sites and will be submitted to the Idaho SHPO for review and approval by February 1, 2002. On an annual basis, no later than March 1, reports will be prepared and submitted to Idaho SHPO and the Nez Perce National Historic Park that will document accomplishments under the plan, results of monitoring, and recommendations for amendments. The plan may be updated annually as needed, and the Nez Perce Tribe will be invited to comment and provide input to the development and updating of this plan.

l. Where pre-burning activities have been performed (e.g. fuels reduction, back burning, or wrapping), and in specified cases in other types of treatment areas such as commercial timber salvage or thinning units, monitoring of resource conditions may be required during project implementation. A qualified archeologist would monitor resource conditions and in the case of burn units; a fire crew would be pre-positioned in strategic locations to protect the resource.

m. The Level 1 team will conduct field reviews prior to the implementaton of the marking guidelines to insure that the appropriate amount of large coarse woody material is retained in regeneration harvest units. Additional field reviews and monitoring by the Level 1 team may be necessary as new information on lynx habitat is developed.

Management Requirements and Design Features

The measures identified on the following table serve to further reduce impacts of the specific resources identified. Most are considered design features and are included in all action alternatives.

Table 1 - Management Requirements And Design Features

Objective	Task	Effectiveness
Wildlife Design Measures		
Provide standing and down, dead and alive wood for variety of wildlife species.	The following criteria assumes planned timber management practices would retain: A minimum of 25 percent of the current tree canopy in the most heavily harvested (regeneration areas); Large live trees and snags would be retained in PACFISH buffers; Snags created by prescribed burning would not be harvested. The following are based on the Northern Region Snag Management Protocol (SMP, 2000) which was developed to provide adequate cavity habitat based on habitat needs of wildlife that require cavity habitat. Where available retain a minimum of two to four (SMP, p 6) Types 1, 2, or 3 snags (refer to Reserve Tree Marking Guide, pp 10-11) per acre over 21" diameter and greater than 50' tall, including at least 1 ½ snags per acre greater than 28" (Bull, et al, 1997, pp 21-29). Where snags are not large enough to meet the above diameter criteria, retain two to four snags per acre of the largest snags (if available). In addition to the above (and where available) retain a minimum of 6-8 (SMP, p 6), Type 1 and 2 snags per acre over 9" to 21+" in diameter.	*High*. These guidelines favor retention of broken top live trees for snags. These trees do not present the safety risk to loggers and are likely to prevail much longer than well-decayed snags. Broken top trees, therefore have a higher probability of being retained within treatment units. (See Wildlife Report, pp 15-20 for more information)
Provide standing and down, dead and alive wood for variety of wildlife species. (Continued)	Retain a minimum of 5 to 10 live trees (i.e. "post burn") (>50' tall and 9-21" DBH) per acre in all harvest units (Bull, et.al., 1997 pp 21-29) Favor retention of: Live and dead trees with broken boles, greater than 8" at the break (Types 2 and 4 snags); Larger, greater than 21" dbh, hollow trees; Trees which contain witches brooms. Favor retention of ponderosa pine, western larch, Douglas-fir on ridges and drier sites. In moist habitats, favor retention of western red cedar, larch and grand fir. Assure a variety of dead trees, well distributed, of varying diameter, height, density and decay. Apply snag density determinations, which can include RCHAs, at the stand level. Live trees in riparian areas included in the interior of the harvest unit can be used to supplement the count of a minimum of snags and live trees remaining within the harvest units. Favor retention of: 1) Live and dead trees with broken boles, greater than 8" at the break (Types 2 and 4 snags); 2) Large greater than 21" dbh), hollow trees; and 3) Trees that contain witches brooms. Favor retention of ponderosa pine, western larch, and Douglas-fir on ridges and drier sites. In moist habitats, favor retention of western red cedar, larch, and grand fir. Assure a variety of dead trees, well distributed, of varying diameter, height, density and decay. Apply snag determinations, which can included RHCAs, at the stand level. Live trees in riparian areas included in the interior of the harvest unit can be used to supplement the count of a minimum of snags and live trees remaining within the harvest unit. Favor retention of snags in patches (clumps), mixed with live trees. Avoid marking snags near log landings and firelines. Recognize terrain, unit boundaries, and logging system limitation that can constrain or remove opportunities for retaining snags and replacement snags. Do not retain snags which are obvious threats to tree faller safety. "High stump" snags to be felled; fall trees away from snag patches to reduce	

Objective	Task	Effectiveness
	risk of damage during logging and prescribed fire. Develop planned fire prescriptions which retain at least 2 to 4 per acre (>15" dbh and >50' tall) and 5 more live trees per acre. Blind leads, benches and/or in the interior of the unit are likely sites for retaining patches. Do not plan to retain snags within 100 feet below and 200 feet above, an open road. Retain all damages reserve trees. Where there is a need to replace a live tree, replace "in-kind".	
Promote optimum levels of browse production and utilization.	Develop and employ dry-season prescribed fire on productive (forested) winter range sites. Each site would be reviewed (at a minimum) in the field by a wildlife biologist, ecologist/silviculturist and fire manager to assure dry-site burning is feasible to meet elk winter range and other resource management objectives.	*Low to High*. Where dry-season fire is applied the effectiveness would be high because it emulates historic vegetation disturbances, and produces the largest quantities of high quality browse. However, dry-season fire may not be applied to all prescribed burns in the winter range because certain areas may have a high risk of stand replacement fire, or concerns over smoke or degraded visual quality. Spring burning may have to be applied in these areas with the result of less than optimum levels of browse production.

II. ANALYSIS AREA

The North Lochsa Face analysis area covers approximately 128,000 acres of mostly forested, steep mountains on the Lochsa Ranger District of the Clearwater National Forest, just north of the small communities of Lowell and Syringa, Idaho. The Lochsa District boundary and the Lolo Motorway form the northeast and northern boundary of the analysis area. The Pete King Creek drainage forms the southwest boundary. U.S. Highway 12 and the Lochsa River, a designated Wild and Scenic River, form the south/southeast boundary up to Fish Creek, and the remaining boundary is the eastern watershed divide of Fish Creek.

IV. CANADA LYNX EFFECTS ANALYSIS

Analysis Protocol: Much of the current lynx ecology discussions require that some assumptions or inferences be made based on the collective experience and professional judgment of wildlife biologists. It is also believed that a blending of ecological process and species-centered approaches is the most likely to maintain lynx habitat diversity, species viability and sustainability. Conclusions described in this report are derived from the ***Lynx Science Report*** (USDA Forest Service Gen. Tech. Rep. RMRS-GTR, 1999) and ***Lynx Conservation Assessment and Strategy*** (August 2000).

Lynx Habitat

Lynx occur in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare (Ruggiero et al. 1999*b*). Both snow conditions and vegetation type are important factors to consider in defining lynx habitat. Snow in Idaho lynx habitats may be subjected to more freezing and thawing than in the taiga (Buskirk et al. 1999*b*). Crusting of snow may reduce the competitive advantage that lynx have in soft snow, with their long legs and low foot loading (Buskirk et al. 1999*a*).

In north-central Idaho and northwestern Montana, lynx habitat generally occurs above 1,220 m (4,000 feet) in association with lodgepole, sub-alpine fir, and spruce habitat types. (Koehler and Brittell 1990). Lodgepole pine habitat types are not widespread, but do commonly appear on more gentle terrain, toe-slopes, and valley bottoms wherever the species can dominate the site (Steele et al. 1981). Such stands usually grade into subalpine fir or Douglas fir habitat types on adjacent steeper or higher slopes. Subsequent to disturbances such as fire, these lodgepole pine communities often provide good quality lynx foraging habitat.

The sub-alpine fir habitat type occurs at upper elevations throughout most of central Idaho (Steele et al. 1981). Large stands of fire-induced lodgepole pine commonly dominate much of this type and, especially when interspersed with unburned islands of subalpine fir, often provide very good quality lynx habitat. Undergrowth is variable and ranges from tall shrub layers of huckleberry (*Vaccinium* spp.) and menziesia (*Menziesia ferruginea*) to low, depauperate layers of grouse whortleberry (*Vaccinium scoparium*) or heartleaf arnica (*Arnica cordifolia*). Thus, the

quality of lynx foraging habitat (i.e., snowshoe hare habitat) often varies greatly by habitat type. Engelmann spruce stands commonly occur along streams and valley bottoms where cool air drainage allows them to extend into the adjacent, lower elevation Douglas-fir communities. Habitat types within the series often occur on very wet sites and on steep northerly aspects where snow accumulates (Steele et al. 1981). Though a minor habitat type, Engelmann spruce habitat types commonly provide good lynx travel corridors and denning habitat.

Snowshoe hares are the primary prey of lynx, comprising 35-97% of the diet throughout the range of the lynx (Koehler and Aubry 1994). Red squirrels have been shown to be an important alternate prey species; especially during snowshoe hare population lows (Koehler 1990, O'Donoghue 1997). Summer food habits of lynx have been poorly defined, but McCord and Cardoza (1982) indicated that the diet might include other species such as mice, squirrels, and grouse. Lynx at the southern periphery of the range may prey on a wider diversity of prey because of differences in small mammal communities and lower average hare densities, as compared with northern taiga.

The common component of natal den sites appears to be large woody debris, either down logs or root wads (Koehler 1990, Mowat et al. 1999, Squires and Laurion 1999). These den sites may be located within older regenerating stands (>20 years since disturbance) or in mature conifer or mixed conifer-deciduous (typically spruce/fir or spruce/birch) forests (Koehler 1990, Slough *in press* cited in Mowat et al. 1999). Stand structure appears to be of more importance than forest cover type (Mowat et al. 1999).

Lynx presence has been documented in Idaho. In 1998, a survey for lynx using hair-snagging techniques and DNA analyses was conducted in the Priest Lake, Bonners Ferry, and Sandpoint areas of northern Idaho. Lynx hair was collected at 5 separate locations across the survey area (Weaver 1999). Interviews of Idaho residents documented additional records of lynx in the Salmon, Upper Snake, and Bear River watersheds as well (Lewis and Wenger 1998). Approximately 20 observations of potential lynx or lynx tracks have been reported on the Clearwater National Forest over the last 25 years (Appendix A). Three snowmobile surveys were conducted on 12 miles of the 500 road (between Mex Mt. and Rocky Ridge Lake) during the winters of 1999 and 2000. No sign of lynx was found.

Lynx Analysis Units

Lynx analysis units (LAUs) are intended to provide the fundamental or smallest scale with which to begin evaluating and monitoring the effects of management actions on lynx habitat. LAUs do not depict actual lynx home ranges, but their scale should approximate the size of an area used by an individual lynx.

Several of the conservation measures require analysis units within which rather specific parameters can be measured (e.g., limits on human alteration of habitat; no net increase in groomed over-the-snow routes). LAUs provide this analysis unit. Application of certain conservation measures at the LAU scale allows blocks of quality lynx habitat to be maintained within each LAU, thereby maintaining a good distribution of lynx habitat at the

scale of a lynx home range. Limits on impacts at the LAU scale are necessary until a more complete understanding of landscape level events and their effects on lynx can be obtained.

LAUs will likely encompass both lynx habitat (may or may not be currently in suitable condition for denning or foraging habitat) and other areas (such as lakes, low elevation ponderosa pine forest, and alpine tundra). Conservation measures (objectives, standards, and guidelines) generally apply only to lynx habitat on Federal lands within the LAUs.

The LAU may not provide a large enough analysis area within which to address direct, indirect, and cumulative effects of particular actions. In many cases, project impacts must be assessed within the context of two or more LAUs.

Two Lynx Analysis Units (LAUs) occur in the NLF. Quantifiable habitat features of these LAUs are depicted in Table 2. In conducting an assessment of lynx habitat, Lynx Analysis Unit (LAU) was identified, per the guidelines described in the ***"Canada Lynx Assessment and Conservation Strategy"*** (pp 7-2 to 7-4). Generally, lynx conservation guidelines apply only to lynx habitat within LAUs, although considerations related to connectivity may be appropriate for other areas. Habitat data from the curent CNF data base is also provided in Table 3, for use in the cumulative effects analysis.

Lynx in the NLF area occurs in mesic coniferous forests that have cold, snowy winters. Average snow depths range from 3 to 10 feet in the 4000 to 7000 feet elevation zone. Snow in the NLF lynx habitats may be subjected to more freezing and thawing than in other areas. Crusting of snow may reduce the competitive advantage that lynx have in soft snow, with their long legs and low foot loading.

In the NLF area lynx habitat generally occurs above 1,220 m (4,000 feet) in association with lodgepole, sub-alpine fir, and spruce habitat types. Lodgepole pine habitat types are not widespread, but do commonly appear on more gentle terrain, toe-slopes, and valley bottoms wherever the species can dominate the site. Such stands usually grade into subalpine fir or Douglas fir habitat types on adjacent steeper or higher slopes. Subsequent to disturbances such as fire, these lodgepole pine communities often provide good quality lynx foraging habitat.

The sub-alpine fir habitat type occurs at upper elevations throughout most of the study area. Large stands of fire-induced lodgepole pine commonly dominate much of this type and, especially when interspersed with unburned islands of subalpine fir, often provide very good quality lynx habitat. Undergrowth is variable and ranges from tall shrub layers of huckleberry (*Vaccinium* spp.) and menziesia (*Menziesia ferruginea*) to low, depauperate layers of grouse whortleberry (*Vaccinium scoparium*) or heartleaf arnica (*Arnica cordifolia*). Thus, the quality of lynx foraging habitat (i.e., snowshoe hare habitat) often varies greatly by habitat type. Engelmann spruce stands commonly occur along streams and valley bottoms where cool air drainage allows them to extend into the adjacent, lower elevation Douglas-fir communities. Habitat types within the series often occur on very wet sites and on steep northerly aspects where snow accumulates. Though a minor habitat type, Engelmann spruce habitat types commonly provide good lynx travel corridors and denning habitat.

Snowshoe hares are the primary prey of lynx within the NLF study area. Red squirrels have been shown to be an important alternate prey species, and there is a well distributed population within the NLF study area

The common component of natal den sites appears to be large woody debris, either down logs or root wads. These components are fairly abundant and well distributed within the NLF study area

Approximately 28,100 acres of potential available lynx habitat occurs in the NLF. Of this amount, approximate 13,000 acres (46%) occurs as denning habitat and 14,700 acres (52%) as foraging habitat. An additional 300 to 400 acres (<2%) is considered unusable habitat within the combined LAUs. Unusuitable habitats are large meadows, lake/ponds, rock/talus outcrops.

Tables 2 and 3, depict Lynx Habitat Features by Lynx Analysis Unit. Table 2 depicts current lynx habitat features (by LAU). Table 3 depicts estimated changes in denning and the availability of snowshoe hare habitat, as the result of implementing the planned actions

Table 2 - Lynx Habitat Features (by Lynx Analysis Unit) - Current vs NLF Combined

Lynx Analysis Unit	LAU Area (ac & mi^2)	Not Habitat[1/]	Lynx Habitat within LAU[/]	Denning Habitat (% of LAU)	Foraging Habitat (% of LAU)	Unusable Habitat[/] (% of LAU)
Upper Fish Creek	17,200 ac (28 mi^2)	4900 ac (8 mi^2)	12,300 ac (20 mi^2)	7500 ac (61%)	4800 ac (39+%)	<100 ac (<1%)
Upper Hungery Cr	19,000 ac (30 mi^2)	3400 ac (5 mi^2)	15,600 ac (25 mi^2)	5500 ac (35%)	9900 ac (63%)	<300 ac (<2%)
NLF Totals	36,400 ac (58 mi^2)	8300 ac (13 mi^2)	27,900 ac (45 mi^2)	13,000 ac (46%)	14,700 ac (52%)	<400 ac (<2%)

1/ "Not habitat" are forest types that generally meet the elevation criterion but are not generally acknowledged in the LCAS as suitable for lynx habitat. Forest types in this category on the CNF are typically western red cedar habitats.

Table 3 — Lynx Habitat Changes Due Planned NLF Actions, by LAU --- NLF SEIS

		Current Conditions	Alternative 6
Upper Fish Creek LAU	Denning Habitat (% of LAU)	7500 ac 61%	6620 ac 54%
	Foraging Habitat	4800	6800 ac
Upper Hungery Creek LAU	Denning Habitat (% of LAU)	5500 ac 35%	4580 ac 29%
	Foraging Habitat	9900	12350 ac
Totals	Denning Habitat	13,000 ac 46%	19150 ac 40%
	Foraging Habitat	14,700	4450 ac

Reported lynx sightings on the CNF are rare (23 reports on record since the early 1900's). ICDC records for the Lochsa Ranger District indicate there is one potential reported sighting of lynx in the NLF. Records of lynx sightings from the early 1900's indicated that three more confirmed sightings could be from within the NLF, but information is to generalized to confirm. Two un-confirmed, independent sightings were reported in late January 1993, near Lowell, Idaho, approximately 1 mile from the extreme western perimeter of the NLF. In the past ten years the Idaho Department of Fish and Game has recorded only two lynx, both harvested by trappers within the Clearwater and Nez Perce National Forests.

Risk Factors

A list of risk factors potentially affecting lynx or lynx habitat is presented below. Risk factors that apply to NLF planned activities **(numbered and bold)** are addressed in detail in this BA. Risk factors not in bold are not directly, indirectly or cumulatively affected by planned NLF project activities. A minor amount of livestock grazing occurs within the NLF area but is outside of lynx habitat.

Factors affecting lynx productivity, mortality, movement and habitat features inlcude:

1. **Timber Management**
2. **Wildland Fire Management**
3. **Recreation**
4. **Forest/Backcountry Roads and Trails**
   Livestock Grazing
   Other Human Developments (oil and gas leases; mining; reservoirs; agriculture).
5. **Trapping (legal and non-target)**
   Predator Control
6. **Incidental or Illegal Shooting**
7. **Competition and Predation as Influenced by Human Activities**
   Highways (vehicular collisions)
   Highways, Railroads and Utility Corridors
   Land Ownership Pattern
   Ski Areas and Large Resorts

Other Large-Scale Factors

8. **Fragmentation and Degradation of Lynx Refugia**
   Lynx Movement and Dispersal Across Shrub-Steppe Habitats
   Non-native Invasive Plant Species

The following sections present the information related to each of the above, applicable factors related to lynx and lynx habitat for the North Lochsa Face Supplemental Environmental Impact Statement.

1. TIMBER MANAGEMENT

Both timber harvest and natural disturbance processes can provide foraging habitat for lynx when resulting understory stem densities and structure meet the forage and cover needs of snowshoe hare (Keith and Surrendi 1971, Fox 1978, Conroy et al. 1979, Wolff 1980, Parker et al. 1983, Livaitis et al. 1985, Monthey 1986, Bailey et al. 1986, Koehler 1990 and 1991). These characteristics include a dense, multi-layered understory that maximizes cover and browse at both ground level and at varying snow depths throughout the winter (crown cover within the lower 4.5 m (15 feet) in order to provide cover and food for snowshoe hares to 6 feet high at maximum snow depths).

Timber harvest is not an ecological substitute for natural disturbance processes. For example, timber harvest may result in:

?? Removal of most standing biomass, especially larger size classes of trees, from the site;
?? Smaller, more dispersed patch sizes and concentrated harvest at lower elevations, resulting in a greater degree of habitat fragmentation;
?? Selective removal of particular tree species;
?? Soil disturbance and compaction by heavy equipment, which may result in increases of exotic plants that can compete with native vegetation;
?? Harvest, planting and thinning treatments that may give a competitive advantage to certain tree species; and
?? Construction of roads that may be used during winter as designated or groomed travel routes for snowmobiles or cross-country skiers.

Commercial timber salvage logging may negatively affect habitat for lynx and lynx prey if most large-diameter trees are removed. After they fall to the ground, large dead trees are important in providing cover for foraging in the short term and potentially for denning habitat in the longer term, depending on post-fire stand conditions.

Following timber harvest, remaining large woody debris provides some level of habitat for snowshoe hares and other small mammals, primarily as cover during the summer season. Large down trees left on-site could provide cover for lynx movements across openings, if they occur at very high density and live vegetation also is present. Where large-sized woody debris is piled and burned, the opportunity for use is reduced.

NLF Actions Related to Timber Management in Lynx Habitat:

Approximately 435 acres of lynx habitat in the Upper Fish Creek LAU (LAU 39) would be treated by regeneration timber harvest. Approximately 159 acres of the 435 acres, would occur in currently suitable lynx denning habitat. The remaining 276 acres of regeneration timber harvest would occur in foraging lynx habitat. Although the harvest sites would appear natural with many trees remaining, the size of possible openings created from regeneration harvest would range from approximately 60 to 390 acres. In the Upper Fish Creek LAU, 25% or more of the trees in the harvest unit would be retained for land stability, nutrient cycling and wildlife. Regeneration timber harvest would improve foraging habitat on

approximately 435 acres and decrease lynx denning habitat in the Upper Fish Creek LAU by approximately 2 percent. Sufficient denning habitat will be retained.

No other timber management practices, including pre-commercial thinning, are planned within either the Upper Fish or Upper Hungery Creek LAUs.

2. WILDLAND FIRE MANAGEMENT

Wildland fire management activities include suppression and pre-suppression activities, as well as prescribed fire (natural and management ignitions). Wildland fire and insects have historically played the dominant role in maintaining a mosaic of forest successional stages in lynx habitat. Stand-replacing fires were infrequent and affected large areas. In areas with a mixed fire regime, moderate to low intensity fires also occurred in the intervals between stand-replacing events.

Periodic vegetation disturbances maintain the snowshoe hare prey base for lynx. Fire exclusion may have altered the pattern and composition of vegetation in subalpine forests. In the period immediately following large stand-replacing fires, snowshoe hare and lynx densities are low. Populations increase as the vegetation grows back and provides dense horizontal cover, until the vegetation grows out of the reach of hares. Low to moderate intensity fires may also stimulate understory development in older stands.

Wildland fire historically played an important role in maintaining the mosaic of forest successional stages that provide habitat for both snowshoe hare and lynx (Fox 1978, Bailey et al. 1986, Quinn and Thompson 1987, Koehler and Brittell 1990, Poole et al. 1996, Slough and Mowat 1996). For the first few years after a burn, there appears to be a negative correlation between lynx use and the amount of area burned (Fox 1978). This short-term effect is likely due to the reduction of snowshoe hare populations, removal of cover, and possibly also to increased competition from coyotes in open habitats (Stephenson 1984, Koehler and Brittell 1990). The lag time until the peak of hare population increase is generally about 15 to 30 years (this varies depending on tree species, habitat type and severity of disturbance). Re-sprouting of broadleaf species occurs more quickly, in 3 to 12 years. Hare populations again decrease as the forest canopy develops and shades out the understory. Forest gap processes, such as large wind throws, insect infestations, and outbreaks of disease, produce similar effects (Agee 2000).

In much of the Rocky Mountains, the fire regime is variable in lynx habitat, with both frequent (35-100 years) stand-replacing or mixed severity fires, and infrequent (200+ years) stand-replacement fires (Hardy et al. 1998). Disturbance interval and fire severity varied by cover type, with xeric pine types such as lodgepole typically experiencing more frequent and more severe fires than mixed conifer types and spruce/fir.

Land management agencies began effective fire suppression with the advent of aircraft support, approximately 60 years ago. Over time, continued fire exclusion alters vegetative mosaics and species composition, and may have reduced the quality and quantity of habitat for snowshoe hares. Fire exclusion may alter the natural mosaic of forest successional

stages, and thereby result in less snowshoe hare habitat over time. Road construction to facilitate suppression of wildfires may increase human access into lynx habitat, and could lead to increased competition from other predators such as coyotes. Creation of fuel breaks on ridges eliminates cover and may discourage use by lynx. Fire exclusion in areas with a history of infrequent fire returns has probably not had much impact (Habeck 1985, Agee 1993). On the other hand, areas where the fire regime was historically frequent or mixed have generally shifted to more intense fire regimes (Quigley et al. 1996, Morgan et al. 1998). As a result, forest composition and structure have changed in these areas, becoming more homogeneous, composed of more shade-tolerant species with more canopy layers, and being more susceptible to severe fires, insects, and diseases (Quigley et al. 1996).

Following timber harvest, broadcast burning typically stimulates increased regrowth by many herbaceous plants beneficial to snowshoe hares during summer, and provide heat to release seeds of conifers with serotinous cones. Burning may also result in establishment of more tree seedlings per acre (especially lodgepole pine, jack pine, and aspen). Potential for development of denning habitat would be reduced if pockets of heavy debris burn up. Retention of unburned debris piles on the landscape may provide habitat for lynx prey.

NLF Actions Related to Wildland Fire Management in Lynx Habitat:

Approximately 450 acres of mixed severity burning and 250 to 280 acres of underburning would occur in currently suitable lynx denning habitat in the Upper Fish Creek LAU. Approximately 865 acres of mixed severity burning and 50 to 55 acres of underburning would occur in currently suitable lynx denning habitat in the Upper Hungery Creek LAU. An additional 500 to 600 acres of mixed severity and underburning would occur in general lynx habitat in the Upper Fish Creek LAU. 1500 to 1600 acres of mixed severity and underburning would occur in foraging lynx habitat in the Upper Hungery Creek LAU. Prescribed fire practices would promote younger stands of dense forest and increase snowshoe hare habitat. Mixed severity burning would reduce lynx denning habitat by approximately 6 and 16, in the Upper Fish and Upper Hungery Creek LAUs, respectively. No detectible effect on lynx populations or its respective habitat, however, are expected.

3. RECREATION

Recreational activities are becoming increasingly more widespread across the landscape, but the understanding of their effects on lynx is rudimentary. Few studies have investigated the complex interactions between humans and wildlife. Some anecdotal information suggests that lynx are tolerant of humans and that a wide variety of behavioral responses to human presence can be expected (Mowat et al. 1999, Roe et al. 1999, Staples 1995, J. Squires per commun. 1999, G. Byrne per commun. 1999).

The demand for outdoor recreation opportunities by the public has grown rapidly since the revival of the U.S. economy following World War II (Knight and Gutzwiller 1995). Since the mid-1960's, public parks and recreational facilities have reported an annual growth rate in visitation exceeding 10% (Walsh 1986). The rapid growth in outdoor recreation has resulted in conflicts with the goals of natural resource conservation and wilderness preservation in

some cases (Nash 1995, 1982). The concurrent trends of rising public demand and decreasing available places for outdoor recreation implies greater pressure on federal and state-owned lands to support a variety of outdoor recreation activities.

Non-consumptive recreational activities are growing in popularity over the more traditional consumptive recreation uses of hunting and fishing (Duffus and Dearden 1990). Trends indicate that land-based activities occurring within developed recreation sites or near roads had the highest number of people participating. However, there have been vast improvements in bicycle and off-road vehicle technology, and a growing popularity in motorized off-road activities. Most increases in recreational activities are attributed to the technological advances allowing more inexperienced people to participate (Knight and Gutzwiller 1995) and the accessibility of remote areas (Cordell et al. 1990, Cordell and Bergstrom 1991).

Developed Recreation: To date, most lynx investigations have not shown human presence to influence how lynx use the landscape (Aubry et al. 1999). An exception to this may be activities around a den site that may cause abandonment of the site, possibly affecting kitten survival (Ruggiero et al. 1999). Anecdotal information (Roe et al.1999, J. Squires pers. commun. 1999, G. Byrne pers. commun. 1999) suggests that individual lynx behave differently in response to the presence of humans and their associated activities, depending on the environmental setting where the interaction occurred. Intuitively, we assume that some threshold exists where human disturbance becomes so intense that it precludes use of an area by lynx.

A variety of factors may influence the effects of recreation on lynx. The following list may be helpful in evaluating how an activity might influence lynx.

a) *Type and quality of lynx habitat in which an activity occurs*. For instance, human activity in denning or diurnal security habitats may have a greater effect on lynx than within other habitat components.

b) *Time of year activity occurs.* For example, fall hunting in prime lynx denning habitat may have far less effect than spring alpine skiing, cross-country skiing, or snowboarding in such habitat. Lynx have been observed using portions of ski areas in Colorado (Thompson and Halfpenny 1989, 1991) and western Canada (Roe et al. 1999) throughout most months of the year. Recreational facilities designed for summer time use, such as developed campgrounds or amphitheaters, most likely have very little effect on lynx.

c) *Time of day activity occurs.* At developed facilities that receive high, concentrated human use, lynx may rest during the day in secure habitats while people use the remainder of the landscape. Lynx could emerge after dark to use the landscape when human activity has ceased or receded to acceptable levels. If extensive recreational activities occur at night in lynx habitat, this may diminish or preclude habitat use by lynx.

d) *Type of Activity*. The type of activity, pattern of human use, associated habitat impacts, and area of influence can affect the suitability of the landscape for lynx.

e) *Pattern of Activity*. Some animals can adapt to predictable human activities. That is, if the activity generally occurs at predictable time periods at the same places or along the same routes, animals may become habituated to the activity. Response of the animal depends on the context within which a human-animal encounter takes place, the behavioral state of the animal, the type of human activity, and the time and location of the recreational activity (Bowles 1995, Gutzwiller 1995, Gabrielson and Smith 1995, Knight and Cole 1995*a*, 1995*b*).

f) *Intensity and Frequency of Activity*. How often the activity occurs and the number of people involved in the activity may influence the way lynx respond and use the surrounding environment. Encounters with a limited number of users might elicit a different behavioral response than frequent encounters with large groups of users.

Recreational activities may exert a variety of influences and effects on lynx and their habitat. Some highly developed and heavily used facilities not only have direct effects on the land, but may also facilitate other indirect effects outside of the activity zone.

Developed Nordic Ski Huts - Most backcountry ski hut sites are small and primitive in nature. In the short term, these sites probably result in a minor reduction of lynx habitat quality or quantity. They are generally located along designated cross-country ski routes, but have the potential of promoting off-trail travel, creating larger areas of compacted snow conditions that may facilitate access by lynx competitors. The location of these facilities and type of trail systems may play an important factor in how lynx use the landscape.

Snowmobile Warming Huts – Snowmobile warming huts can be highly developed facilities where grooming equipment and fuel storage exist, or they can be quite primitive. Snowmobile clubs and general public use is often focused or concentrated around these facilities. Many have developed trail systems that loop around the facility or provide access to other remote areas. Location of these facilities could play a role in encouraging more recreational use off designated snowmobile trails. At sites where this potential exists, there is also the potential of providing access to lynx competitors/predators through additional areas of compacted snow. Generally, these facilities are located close to year-round road access and not often located in more remote areas. Huts located in more remote locations might have the same effects on lynx as those described for Nordic ski huts.

Dispersed Recreation*:* Dispersed recreational uses and activities, such as snowmobiling, cross-country skiing, and snowshoeing, are increasing within higher elevation environments. Advances in snowmobile technology are allowing the public to operate these new machines in deeper snow and rougher terrain than many of the older models. As mentioned earlier, snowmobile use across the United States has increased substantially over the last 20 to 30 years. Agencies, counties, states, and the public have requested or promoted more access into many of the more remote areas.

The number of forest visitors exploring undeveloped backcountry areas is increasing. Dispersed winter recreation activities may be associated with huts, parking areas

(snowmobiling, snowboarding and cross-country skiing), roadside rest areas, and other developed recreational facilities. Most of the opportunities for snowmobiling and backcountry skiing use tend to occur in the higher elevation landscapes where adequate snow conditions exist. Many remote areas are being visited more frequently because of improved snowmobile technology, availability of hut systems, and increased user trails.

Most traditional dispersed recreational uses occurred during daylight hours. However, nighttime activities and overnight trips are becoming more commonplace, possibly increasing the potential for disturbance at night when lynx had been more secure. Lynx have generally been thought to be nocturnal (active at night) or crepuscular (active at dawn and dusk), but some studies have shown that lynx may be active at all hours (Roe et. al. 1999). Apps (1999) hypothesized that weather may be the primary factor that determines when lynx are most active.

In contrast to the facilities provided at developed recreation sites, dispersed recreation typically involves very little infrastructure. Trails or roads often provide recreational access either as an intended or unintended consequence. Dispersed recreation activities seldom result in a direct loss of habitat, but are more likely to impart indirect effects (such as increased competition resulting from snow compaction).

Dispersed Campsites - These sites can be scattered anywhere across the landscape, but often occur as clusters around scenic (high alpine meadows, lakes, rivers) or geologic (mountains) features. Some sites are seldom used during the winter season. Sites where more use occurs can result in snow compaction spanning large areas, possibly providing lynx competitors with access to search for scarce prey resources.

Nordic Ski Huts - In contrast to highly developed Nordic ski huts, these are generally primitive. Backcountry use promoting large areas of snow compaction may occur in the vicinity of these sites. If heavy use occurs in lynx habitat, then lynx competitors may have an avenue to search for scarce prey along snow compacted trails.

NLF Actions Related to Recreation Management in Lynx Habitat:

A “warming hut” is located at Beaver Dam Saddle (approximately 1 mile north Pete’s Fork Junction). This warming hut is located at the junction of several groomed snowmobile trails and receives an estimated 1500 to 2000 snowmobile vistors per season. Two “play areas” (typically openings --- meadows, hillsides or ridges --- relatively unrestricted to snowmobile travel) occur in the headwaters of Obia Creek (Upper Hungery Creek LAU). These are Weitas Meadows and the “Fern Patch” (on Rocky Ridge below the Lolo Motorway).

The Mex Mountain (Forest Service) Work Center is under special use permit (late-December through February) for snowmobile outfitting. The special use permit allows up to eight overnight guests (plus outfitter employees). Use is limited to Friday through Sunday. Past annual use totals between 15 and 35 guests (C. Hennessey, Pers. Comm.) for the 2-3 month season. Snowmobile recreation access to Mex Mountain is via approximately 20 miles of

groomed snowmobile trail. Alternate access routes require approximately the same travel distance but are not over groomed trails.

The potential to affect lynx habitat, due to the Lewis and Clark Trail bi-centennial celebration is unclear at this time. The CNF is considering limiting access along this route for safety and resource protection. It is anticipated that increased human disturbance from this activity would be limited to the immediate trail corridor from July through September. The effect of current or future snowmobile access and winter recreation on lynx and lynx habitat on the CNF is unclear at this time. Actions within the NLF would not alter current conditions or management actions related to snowmobile and other winter recreation on the CNF.

4. FOREST/BACKCOUNTRY ROADS AND TRAILS

There is little information available on the effects of roads and trails on lynx or their prey (Apps 1999, McKelvey et al. 1999*d*). Construction of roads may reduce lynx habitat by removing forest cover. On the other hand, along less-traveled roads where vegetation provides good snowshoe hare habitat, lynx may use the roadbed for travel and foraging (Koehler and Brittell 1990).

Roads and trails may facilitate snowmobile and other human uses in winter. As described previously in the recreation section, snow compaction on roads or trails may allow competing carnivores, such as coyotes and mountain lions, access into lynx habitat (Buskirk et al. 1999*a*). In the absence of roads and trails, snow depths and snow conditions normally limit the mobility of these other predators during mid-winter.

Recreational, administrative, and commercial uses of forest roads are known to disturb many species of wildlife (Ruediger 1996). However, preliminary information suggests that lynx do not avoid roads (Ruggiero et al. 1999*a*), except at high traffic volumes (Apps 1999). Summer use of roads and trails through denning habitat may have negative effects if lynx are forced to move kittens because of associated human disturbance (Ruggiero et al. 1999*b*).

There is no compelling evidence at this time to suggest management of road density is necessary to conserve lynx. However, new road construction continues to occur in many watersheds within lynx habitat, many of which are already highly roaded, and the effects on lynx are largely unknown. Further research directed at elucidating the effects of road density on lynx is needed.

Lynx may be more vulnerable to human-caused mortality near open roads (Koehler and Aubry 1994). This risk is discussed in a later section (Factors Affecting Lynx Mortality). Snowmobiling, off-road driving and bicycling are projected to grow at substantial rates. (Knight and Gutzwiller 1995). Recreational snowmobile use has expanded dramatically over the past 25 years in the contiguous United States. Knight and Gutzwiller (1995) reported 20 percent growth per year in recreational snowmobile use across the United States. In Idaho, a 1991 survey reported 9,357 km (5,600 mi) of snowmobile trails, which increased to 11,520 km (6,900 mi) as of 1994 (Idaho Department of Parks and Recreation 1997). The 4-year

increase in trails within several counties of Idaho, was due to improved reporting and new grooming programs.

The growth of snowmobile use and an expanded trail system over the past 2-3 decades imply an increase in human presence in lynx habitat in Idaho. Technological advances in recreational equipment have allowed a broader spectrum of users to access more remote backcountry areas. Sporting events that promote extreme recreational activities (typically outside the usual geographic and temporal constraints of most traditional uses) are on the upswing in popularity within the range of the lynx. The effects of these and other recreational activities on the long-term survival of the species are unknown.

NLF Actions Related to Backcountry Road and Trails in Lynx Habitat:

Road density within these two LAUs is approximately 0.3 mi/mi^2, as estimated from elk summer habitat analyses for this general area. No road development of designated roadless areas is being considered or implemented. Planned trail management practices are directed at maintaining existing trails and not constructing new trails. Motorized and snowmobile trail access may increase in some areas outside of lynx habitat, due to improved maintenance and Forest Service administrative decisions to approve theses use on some trails. Likewise, as with some portions of the NLF, motorized access may be restricted due to resource conflicts and trail suitability for safe motorized travel. Approximately 3.2 miles of existing road in the Upper Fish Creek LAU would be obliterated and 5.4 miles placed into long-term maintenance. Road obliteration, though largely outside of suitable lynx habitat, would continue to benefit the restoration of Forest health (via improved water quality, reforestation and decreased motorized access).

There are approximately 20 miles of groomed snowmobile trail (Forest Road 500; aka Lolo Motorway) from Mex Mountain east (to 12 Mile Saddle), which transect the perimeters of the Fish Creek and Hungery Creek LAUs. This trail is groomed by the Clearwater County Groomer Advisory Board and Ridge Runners Snowmobile Club (N. Johnson, pers. comm.). Grooming occurs 2 to 4 times per month, from early December to mid-April, depending on snow conditions (N. Johnson, pers. comm.). An additional 25 miles (estimated) of Forest Road (Mex Mountain to Fish Butte and Boundary Peak) in interior of these two LAUs are also available for snowmobiling. No increases in groomed snowmobile trails or snowmobile access is planned or anticipated in lynx habitat within the NLF.

5. TRAPPING (legal and non-target)

Lynx are vulnerable to trapping and easily overexploited (Mech 1980, Carbyn and Patriquin 1983, Parker et al. 1983, Ward and Krebs 1985, Bailey et al. 1986, Slough and Mowat 1996, Quinn and Thompson 1987). Ward and Krebs (1985) stated that trapping was the single most important mortality factor for lynx in their Yukon study area, where lynx harvest was responsible for seven of eight observed deaths. In another study, 65% of the estimated population was trapped in one winter and all marked lynx were harvested (Parker et al. 1983). Lynx populations may be even more susceptible to overexploitation as a result of expanding or abandoning their home ranges during years of low prey availability (Ward and

Krebs 1985). At low population levels, or in situations where reproduction or recruitment are low, trapping mortality can be additive and lead to population declines (Brand and Keith 1979, Poole 1994, Slough and Mowat 1996, Mowat et al. 1996. Finally, road access may increase the vulnerability of lynx to trappers (Bailey et al. 1986). Incidental trapping of lynx can occur in areas where regulated trapping for other species, such as coyote, marten, and bobcats occurs.

NLF Actions Related to Trapping in Lynx Habitat:

The actual amount of trapping that occurs at NLF and in the general area is unknown. Lynx trapping is currently prohibited in Idaho. Some limited trapping for coyotes, bobcats, and pine marten occurs in the NLF area. This trapping could pose a potential risk to the incidental capture of lynx.

No increase in trail or road access that would increase trapping effort or success is planned or anticipated in lynx habitat within the NLF.

6. INCIDENTAL OR ILLEGAL SHOOTING

Lynx could be shot mistakenly by hunters or illegally poached. The actual magnitude of shooting mortality is unknown, but incidents were reported by Saunders (1963*b*), Mech (1973), Parker et al. (1983), Slough and Mowat (1996), and Lewis and Wenger (1998). Two of the lynx trans-located into Colorado in 1999 were illegally shot (Shenk, pers. comm. 1999).

NLF Actions Related to Incidental or Illegal Shooting in Lynx Habitat:

Given the type of activities, the remote location, and level of human activities, this is a highly probable risk factor for the NLF area. No increase in trail or road access that would increase risks associate with incidental or illegal shooting is planned or anticipated in lynx habitat within the NLF.

7. COMPETITION AND PREDATION AS INFLUENCED BY HUMAN ACTIVITIES

In the western United States, biologists have suggested that unique morphological differences between coyotes and lynx should spatially segregate these species by snow conditions (Murray and Boutin 1991, Litvaitis 1992). Lynx and coyotes are generally thought to separate along elevation gradients in the western United States (Buskirk et al. 1999*b*). Murray et al. (1994) suggested "that coyotes were more selective of snow conditions than lynx, probably as a result of their high foot-load (ratio of body mass to foot area) relative to that of hares."

However, lynx and carnivore biologists (Bider 1962, Ozoga and Harger 1966, Murray and Boutin 1991, Koehler and Aubry 1994, Murray et al. 1995, Lewis and Wenger 1998, and Buskirk et al. 1999) have suggested that packed trails and extensive "play areas" created by snowmobiles and cross-country skiers may serve as travel routes for potential competitors

and predators of lynx, especially coyotes. In Oregon, coyote tracks were “common” along wolverine survey routes (C. Lee, USFWS, per commun 1999), suggesting that certain snow conditions could permit coyotes to also travel into lynx habitat. Buskirk et al. (1999*a*:12) hypothesize that the usual spatial segregation of lynx and coyotes “may break down where human modifications to the environment increase access by coyotes to deep snow areas. Such modifications include expanded forest openings throughout the range of the lynx in which snow may be drifted, and increased snowmobile use in deep snow areas of the western mountains." Recent advances in snowmobile technology allow snowmobiles to travel through deeper snow and into areas that were not accessible with the older machines. The sport of snowmobile “high marking” and “hill climbing” are increasing in popularity, encouraging snowmobile travel into more remote areas in search of suitable “play” terrain.

Fuller and Kittredge (1996) noted that the distribution and numbers of coyotes have dramatically expanded in recent decades. Gier (1975) and Nowak (1979) suggested that coyotes are thought to have originated in areas where snow cover was minimal, and it is only within the last century that they have colonized the boreal forests.

Buskirk et al. (1999*a*) hypothesized that coyotes may be locally or regionally important competitors for lynx food resources, possibly exerting interference competition on lynx. O'Donoghue et al. (1998) also suggested coyotes exert potentially important exploitation competition on lynx. Predation rates by coyotes on snowshoe hares exceeded those of lynx in the Yukon Territory during high hare densities. Todd et al., 1981 reported that coyotes shifted their prey preference from snowshoe hares to carrion because of intolerance to deep snow conditions. Coyotes have been shown to increase their use of open habitats between November and March due to the increase in packed snow conditions and the load-bearing strength of snow in openings. It is this strong prey- and habitat-switching ability of the coyote that may contribute to its success as a competitor with lynx (Buskirk et al. 1999*a*).

Murray and Boutin (1991) reported that both lynx and coyotes used travel routes with shallow snow, but that coyotes traveled on harder snow more frequently. They also reported that the use of trails in the snow not only reduced the depth to which an animal sinks into the snow, but aided coyotes and lynx in obtaining additional food. Keith et al. (1977) suggested that during peak hare densities, the density of trails in snow facilitates coyote movement. Murray and Boutin (1991) reported similar results where hare densities were high.

Lynx interact with other carnivores throughout their range. Competition with, or predation by coyotes, gray wolves, mountain lions, bobcats, and birds of prey have been inferred or documented throughout the range of the lynx. Coyotes have expanded their range in recent decades (Fuller and Kittredge 1996). Mech (1970) reviewed reports of the response of coyotes to wolf eradication. It appeared that coyotes expanded their range and increased in number as wolves were reduced in range and number. Certain timber harvest practices increase edges and openings within forest stands, which may improve foraging conditions for generalist predators such as coyotes, bobcats, and great horned owls. This, in turn, increases the potential for both exploitation and interference competition with lynx to occur.

As described previously (see recreation section), snow compaction due to resource management or recreation activities may facilitate movement of coyotes and other potential competitors and predators into lynx habitat, potentially increasing competition for primary lynx prey (Buskirk et al. 1999*a*). Some human activities, particularly those related to timber harvest and over-the-snow access routes, have the potential to alter natural relationships between lynx and other predators. A consideration for lynx in winter landscapes is exploitation or interference competition from other predators/competitors (Buskirk et al. 1999) and human disturbance (e.g., large developed recreational sites or areas of concentrated winter recreational use). Lynx may be able to adapt to the presence of regular and concentrated recreational use, so long as critical habitat needs are met.

Gray wolves reintroduced into central Idaho use the NLF area. Bobcats, cougars, fisher, marten, wolverine, and coyotes occur in the NLF area. What effect these predators have on the snowshoe hare population and other prey species is unknown. The extent that human activities such as snow compaction facilitate animal movements is also unknown in the NLF.

NLF Actions Related Competition and Predation in Lynx Habitat:

No increases in groomed snowmobile trails or snowmobile access is planned or anticipated in lynx habitat within the NLF.

Potential gopher poisoning projects would occur outside of NLF LAUs. If a lynx is discovered within the project area, the Forest would immediately consult USFWS and take special measures in administering the baiting contract.

8. FRAGMENTATION AND DEGRADATION OF LYNX REFUGIA

A common strategy to avoid excessive habitat loss and overexploitation of wildlife populations has been to provide "refugia." In general, refugia are defined as large, contiguous areas encompassing the full array of seasonal habitats, and are connected to each other across landscapes (Weaver et al. 1996). McKelvey et al. (2000*d*) argued that a system of reserves embedded in a fragmented and non-natural landscape would not be sufficient to sustain lynx populations.

A strategy that encompasses the entire landscape may be necessary. Although the minimum size is unknown, evidence from Alaska and Manitoba indicate that areas as large as 3,000 km^2 (1,170 mi^2) may not be large enough for cyclic and heavily exploited populations (Carbyn and Patriquin 1983, Bailey et al. 1986). In north-central Washington, a lynx population of about 25 lynx has persisted in an area of about 1,800 km^2 (700 mi^2); this area is connected to additional lynx habitat and populations in Canada.

Given its susceptibility to human-caused mortality (e.g., trapping) and relatively specialized foraging strategy, refugia were identified as a possible element in a long-term conservation strategy for the lynx. However, we lacked sufficient time and information to establish mapping criteria and management recommendations for refugia. The identification of refugia

will undoubtedly require the coordination and cooperation both public agencies and private landowners.

NLF Actions Related Competition and Predation in Lynx Habitat:

Vegetative management practices, consistent with historic landscape patterns, forest succession and disturbance regimes, are expected to provide sustained availability of quality prey habitat. Denning and foraging habitats would remain connected within and between LAUs, including LAUs north and east of the NLF. NLF actions would comply with habitat assessment and protection from potentially adverse effects from land management practices, described in the August 2000***, Lynx Conservation and Assessment Strategy.*** The planned NLF actions assure the continued availability of connected LAUs, each containing well distributed denning habitat; isolation from human disturbance; and snowshoe hare and red squirrel habitats.

CONSERVATION MEASURES

Conservation measures were developed to address each risk factor, in order to conserve the lynx, and to avoid or reduce adverse effects from the spectrum of management activities on federal lands. Projects that implement these conservation measures, are generally not expected to have adverse effects on 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. These conservation measures applicable to the NLF area will be initiated when the NLF decision is approved.

A Guiding Principle in the LCAS is: ***"Until conclusive information is developed concerning lynx management, land management agencies should retain future options. That is, choose to err on the side of maintaining and restoring habitat for lynx and their prey. In particular, managers should avoid making an irretrievable commitment of resources that could ultimately prove crucial in maintaining or restoring viable, self-sustaining lynx populations within an ecosystem."***

CONSERVATION MEASURES APPLICABLE TO THE NLF PROJECT

Table 4 - Objectives, Standards and Guidelines Associated with Lynx Habitat Assessment

Objectives, Standards and Guidelines	... How Applied to NLF Management
Conservation measures will generally apply only to lynx habitat on federal lands within LAUs.	All lynx habitat within the NLF project area is located on USFS managed lands.
To facilitate project planning, delineate LAUs. To allow for assessment of the potential effects of the project on an individual lynx, LAUs should be at least the size of area used by a resident lynx and contain sufficient year-round habitat.	LAUs that meet the criteria outlined in the LCSA have been delineated for the Clearwater National Forest. Two LAUs are located in the NLF in the project area.
Lynx habitat will be mapped using criteria appropriate to each geographic area.	Lynx habitat was mapped per LCAS protocols, using the habitat types described for the Northern Rocky Mountains Geographic Area in the LCSA.
Within each LAU, map lynx habitat. Identify potential denning habitat and foraging habitat (primarily snowshoe hare habitat, but also habitat for important alternate prey such as red squirrels), and topographic features that may be important for lynx movement (primary ridge systems, prominent saddles, and riparian corridors). Also, identify non-forest vegetation (meadows, shrub-grassland communities, etc.) adjacent to and intermixed with forested lynx habitat that may provide habitat for alternate lynx prey species.	Potential denning and foraging habitat have been identified and are depicted on the attached maps. Continue to monitor the distribution and abundance of snowshoe hares and red squirrels across the NLF LAUs.
Maintain habitat connectivity within and between LAUs.	All planned NLF vegetative management practices within LAUs have been designed and selected to emulate historic landscape patterns, forest succession and disturbance regimes. No new roads or trail would be constructed in these LAUs. Alternative 6, would obliterate or place unneeded roads into long term maintenance in the Upper Fish Creek LAU, thereby reducing human access into otherwise suitable habitat. In all alternatives, the combination of denning, foraging and snowshoe hare habitat would exceed 97% of each LAU as useable habitat.

1. Timber Management

Conservation Measures to Mitigate Risks Associated with Timber Management:

✍✍Narrow forested mountain ridges, plateaus, or forest stringers that link more extensive areas of lynx habitat may provide landscape connectivity. The integrity of such habitat features should be maintained.

✍✍Minimizing disturbance around denning habitat is important from May to August.

How applied to NLF:

Prescribed silvicultural practices would promote more rapid tree growth (diameter and height) in younger stands of dense forest. In the long-term, vertical diversity (multi-storied canopy, snags, down logs, etc.) would increase and provide denning, resting, nesting and foraging habitat for prey species.

Restrictions to minimize disturbance during May to August would be implemented where denning habitat is known or suspected occupied by lynx.

Table 5 - Objectives, Standards and Guidelines Associated with Timber Management

Objectives, Standards and Guidelines	... How Applied to NLF Management
Federal agencies should work cooperatively with States and Tribes to ensure that important lynx prey are conserved.	Providing a continued supply of snowshoe hare habitat in the NLF, however, depends on future forest management actions (vegetative disturbance through timber management), prescribed fire and wildfire. The likelihood of these disturbances occurring in the future, which are frequent enough and within lynx habitat, is uncertain.

2. Wildland Fire Management

Conservation Measures to Mitigate Risks Associated with Wildland Fire Management:

✍✍Minimizing disturbance around occupied denning sites from May to August.

How applied to NLF:

Because of fuel and moisture conditions attributed to higher elevations and shaded terrain, prescribed fires within lynx habitat are not expected to carry into moist or northern aspects prior to August. This fire behavior is typical of historic fire behavior within NLF LAUs.

Table 6 - Objectives, Standards and Guidelines Associated with Wildland Fire Management

Objectives, Standards and Guidelines	... How Applied to NLF Management
Federal agencies should work cooperatively with States and Tribes to ensure that important lynx prey are conserved.	Available snowshoe hare habitat would be increased and interspersed within denning and foraging habitats. Available red squirrel habitat would increase with advancing succession within those portions of the LAUs extensively burned by wildfire in the early 1900's. All planned NLF vegetative management practices within LAUs have been designed and selected to emulate historic landscape patterns, forest succession and disturbance regimes. Providing a continued supply of snowshoe hare habitat in the NLF, however, would depend on future forest management actions and wildfire. The likelihood of these disturbances occurring in the future, which are frequent enough and within lynx habitat, is uncertain.

3. Recreation Management

Conservation Measures to Mitigate Risks Associated with Recreation Management:

✍✍To maintain a competitive habitat for lynx, it may be necessary to minimize or even preclude snow compacting activities in and around quality snowshoe hare habitat. Failure to do so may lead to the elimination of lynx, or preclude the ability to re-establish them in these landscapes.

✍✍In areas of concentrated recreation use, it may be necessary to maintain or provide "diurnal security habitat." Most human activity occurs during daylight hours, while lynx appear to be most active from dusk to dawn, although weather may affect the time period when lynx are most active (Apps 1999). A key to providing temporal segregation of use may be in ensuring there are places in the landscape where lynx can bed during the day relatively undisturbed. Sites that are similar to denning habitat (i.e., areas that are tangled with large woody debris) will tend to exclude most human activity because of the inherent difficulty they pose for human movement.

✍✍Minimizing disturbance around denning habitat is important from May to August.

Table 7 - Objectives, Standards and Guidelines Associated with Recreation Management

Objectives, Standards and Guidelines	... How Applied to NLF Management
Plan for and manage recreational activities to protect the integrity of lynx habitat by initiating the following actions: a) Minimize snow compaction in lynx habitat. b) Concentrate recreational activities within existing developed areas, rather than developing new recreational areas in lynx habitat. c) Ensure that development or expansion of developed recreation sites On federal lands, address landscape connectivity and lynx habitat needs.	The CNF will initiated a program to map (using local knowledge and GIS technology) and monitor the location and intensity of all snow compacting activities (including snowmobiling, snowshoeing, cross-country skiing, dog sledding, etc.) for a minimum of 5 years in the NLF LAUs when Alt. 6 is implemented. To date the major of the snowmobile use appears to be on the 500 road between Mex Mountain and Rocky Ridge Lake. The CNF has committed to annually prepare and send a progress report that evaluates the new information collected and, if necessary, reinitiate consultation with the US Fish and Wildlife Service (FWS). Recommendations of adaptive management strategies, site-specific mitigation measures, and/or the implementation of needed restrictions would be considered in the progress report.
Allow no net increase in groomed or designated over-the-snow routes and snowmobile play areas by LAU on federal lands.	No net increase in groomed or designed over-the-snow routes and snowmobile play areas would occur as the result of implementing NLF Alternative 6 planned actions.
Provide a landscape with inter-connected blocks of foraging habitat where snowmobile, cross-country skiing, snowshoeing, or other snow compacting activities are minimized or discouraged.	The Upper Fish Creek and Upper Hungery Creeks would be unchanged with respect to current human access. No new trails are planned; no roads (including temporary roads) would be constructed; no increase in groomed snowmobile trails or snowmobile “play areas” are planned or anticipated. Denning and foraging habitats would remain inter-connected, with no expected changes from current patterns of human disturbance.

As information becomes available on the impact of snow-compacting activities and disturbance on lynx, limit or discourage this use in areas where it is shown to compromise lynx habitat. Such actions should be undertaken on a priority basis considering habitat function and importance.	New information related to snow-compacting activities and disturbance related to human influence within lynx habitat in the NLF would prompt re-consultation with the USFWS.
Design trails and roads to direct winter use away from diurnal security habitat.	Not applicable to NLF. No new trails, roads on groomed snowmobile trails are anticipated or planned in lynx habitat within the NLF.
To protect the integrity of lynx habitat, evaluate (as new information becomes available) and amend as needed, winter recreational special use permits (outside of permitted ski areas) that promote snow compacting activities in lynx habitat.	New information related to winter recreational use permits within lynxhabitat in the NLF would prompt re-consultation with the USFWS.

4. Forest/Backcountry Roads and Trails

Table 8 - Objectives, Standards and Guidelines Associated with Forest/Backcountry Roads and Trails

Objectives, Standards and Guidelines	... How Applied to NLF Management
Determine where high total road densities (>2 miles per square mile) coincide with lynx habitat, and prioritize roads for seasonal restrictions or reclamation in those areas.	Evaluate the open road densities on public lands in the NLF LAUs and determine if roadside brushing or seasonal restrictions are necessary.
Minimize roadside brushing in order to provide snowshoe hare habitat.	Not applied in the NLF
Locate trails and roads away from forested stringers.	No applicable; no roads or trails would be constructed or planned in lynx habitat within the NLF
Limit public use on temporary roads constructed for timber sales. Design new roads, especially the entrance, for effective closure upon completion of sale activities.	Not applicable. Eight temporary roads, averaging ½ mile in length, are being constructed, used and then obliterated. None are located with lynx habitat.
Minimize building of roads directly on ridge-tops or areas identified as important for lynx habitat connectivity.	Not applicable. No winter logging lynx habitat is anticipated in the NLF. If, however, is does occur, using Rd 483 between Mex Mountain and Middle Butte, consultation would be re-initiated.

5. Trapping (legal and non-target)

Table 9 - Objectives, Standards and Guidelines Associated with Trapping

Objectives, Standards and Guidelines	... How Applied to NLF Management
Federal agencies should work cooperatively with States and Tribes to reduce incidental take of lynx related to trapping.	The Clearwater National Forest will cooperatively work with Idaho Fish and Game and the Level 1 Team to collect information to determine what level of trapping is currently being conducted in the NLF LAUs and make recommendations to reduce the potential incidental take of lynx.

6. Incidental or Illegal Shooting

Table 10 - Objectives, Standards and Guidelines Associated with Incidental or Illegal Shooting

Objectives, Standards and Guidelines	... How Applied to NLF Management
Reduce lynx mortalities related to mistaken identification or illegal shooting.	The Clearwater National Forest will continue to make available to sportsmen lynx and bobcat identification information.
Initiate interagency information and education efforts throughout the range of lynx in the contiguous states. A variety of methods should be used to inform the public about the identification and status of lynx.	The CNF will take a lead role in developing the appropriate information and educational material necessary to help reduce accidental killing of lynx on Highway 12 between Lowell, Id and Lolo Hot Springs, Mt.

7. Competition and Predation as Influenced by Human Activities

Conservation Measures to Mitigate Risks Associated with Competition and Predation as Influenced by Human Activities:

✍✍It is essential that an interconnected network of foraging habitat be maintained that is not subjected to widespread human intervention or competition from other predator species.

Table 11 - Objectives, Standards and Guidelines Associated with Competition and Predation as Influenced by Human Activities

Objectives, Standards and Guidelines	... How Applied to NLF Management
Federal agencies should work cooperatively with States and Tribes to ensure that important lynx prey are conserved.	Providing a continued supply of snowshoe hare habitat in the NLF, however, depends on future forest management actions (vegetative disturbance through timber management), prescribed fire and wildfire. The likelihood of these disturbances occurring in the future, which are frequent enough and within lynx habitat, is uncertain.
Maintain the natural competitive advantage of lynx in deep snow conditions.	The CNF has initiated a program to map (using local knowledge and GIS technology) and monitor the location and intensity of all snow compacting activities (including snowmobiling, snowshoeing, cross-country skiing, dog sledding, etc.) for a minimum of 5 years in the NLF LAUs.
Allow no net increase in groomed or designated over-the-snow routes and snowmobile play areas by LAU on federal lands. This is intended to apply to dispersed recreation, rather than existing ski areas.	No net increase in groomed or designed over-the-snow routes and snowmobile play areas would occur as the result of implementing NLF Alternative 6 planned actions.

8. Fragmentation and Degradation of Lynx Refugia

Conservation Measures to Mitigate Risks Associated with Fragmentation and Degradation of Lynx Refugia:

Diurnal security habitat should be sufficiently large to provide effective and visual insulation from human activity, and must be well distributed and in proximity to foraging habitat. Where such diurnal security sites exist, they should be protected from actions or activities that would destroy or compromise their functional value. In landscapes where these areas are lacking or inadequate, it may be desirable to create them, focusing on location, adequate size, and an abundance of large woody debris.

How applied to NLF:

An estimated 54% of the Fish Creek LAU and 29% of the Hungery Creek LAU would retain lynx denning habitat features. Total available denning habitat would exceed an estimated 11,200 (40%) acres of the nearly 28,000 acres of suitable lynx habitat within the NLF LAUs. Of all action alternatives considered, this alternative would cause the largest decrease in denning habitat and the largest increase in snowshoe hare habitat.

Denning habitats would continue to be interspersed and connected via foraging habitats (forest patches capable of providing cover that adjoin) and retention of default PacFish buffers. Available snowshoe hare habitat would be increased and interspersed within denning and foraging habitats. Available red squirrel habitat would increase with advancing succession within those portions of the LAUs extensively burned by wildfire in the early 1900's. All planned NLF vegetative management practices within LAUs have been designed and selected to emulate historic landscape patterns, forest succession and disturbance regimes. No new roads or trail would be constructed in these LAUs. Alternative 6, would obliterate or place unneeded roads into long term maintenance in the Upper Fish Creek LAU, thereby reducing human access into otherwise suitable habitat. In all alternatives, the combination of denning, foraging and snowshoe hare habitat would exceed 97% of each LAU as useable habitat.

ANALYSIS OF CUMULATIVE EFFECTS

The basis of cumulative effects analysis is that the combined number, type, and juxtaposition of human activities and natural disturbances may have a significant effect, even though each individual action appears to have minimal effects. LAUs provide the smallest unit within which to begin tracking or evaluating cumulative effects. Depending on the scale of the project, measurement of cumulative effects may consider activities occurring in one or more LAUs.

The LCAS directs that broad-scale assessments should maintain at least 85% of lynx habitat by: 1) Retaining at least 10% of an LAU in denning habitat in patches generally larger than 5 acres; 2) Maintaining or enhancing snowshoe hare habitat and red squirrel habitat (in proximity to denning habitat); 3) Designing vegetative management practices which are consistent with historic landscape patterns, forest succession and disturbance regimes; and 4) Maintaining

habitat connectivity within and between LAUs.

The following projects are considered for the lynx cumulative effects analysis because their home range requirements could extend beyond the NLF. Present and foreseeable future management actions within the vicinity of the NLF study area include: Knoll Creek Bugs and NiMiiPu Connector Trail construction; Snowmobile Trail Grooming Roads 500, 103, 104; and Mex Mountain Work Center Winter Outfitter Rental. The following discussion also recognizes that the possibility of significant increases in summer recreation use on the margins of the NLF on Road 500, in response to the approaching Lewis and Clark Bi-centennial celebration. Projects occurring in potential lynx habitat and directly or indirectly associated with the bi-centennial include: Lolo Trail Portals and Resource Protection; Weitas Butte Loop Trails; and Smithsonian Lewis and Clark Outfitted Tours. Projects for which no specific proposal has been developed (Eldorado, Lolo and Knoll Camp EISs) were not be addressed in this analysis.

The measures of cumulative effects on lynx are:

i. Compliance with LCAS in assuring denning habitat availability; and

ii. Trends in maintaining or improving the sustained availability of a productive prey base.

Within each LAU, patches of denning habitat (greater than 5 acres in area) are expected to be retained on most north aspects and moist habitats. Fire intensity on these north aspects is expected to be low or extinguished, due to moist fire fuel conditions. Denning habitats would continue to be interspersed and connected via foraging habitats (forest patches capable of providing cover that adjoin) and retention of default PacFish buffers. Available snowshoe hare habitat would be increased and interspersed within denning and foraging habitats. Available red squirrel habitat would increase with advancing succession within those portions of the LAUs extensively burned by wildfire in the early 1900's. All planned NLF vegetative management practices within LAUs have been designed and selected to emulate historic landscape patterns, forest succession and disturbance regimes. No new roads or trail would be constructed in these LAUs. Alternative 6, would obliterate or place unneeded roads into long term maintenance in the Upper Fish Creek LAU, thereby reducing human access into otherwise suitable habitat. In all alternatives, the combination of denning, foraging and snowshoe hare habitat would exceed 97% of each LAU as useable habitat.

Alternatives 6 complies with the LCAS by:

iii. Maintaining at least 85% of lynx habitat in suitable conditions;

iv. Retaining at least 10% of each LAU in denning habitat generally larger than 5 acres in area;

v. Maintaining or enhancing snowshoe hare habitat and red squirrel habitat, in proximity to denning habitat (consistent with historic landscape patterns, forest succession and disturbance regimes); and

vi. Maintaining habitat connectivity within and between LAUs, both within the NLF and adjoining the NLF to the north and east.

BIOLOGICAL DETERMINATION

The direct, indirect, and cumulative effects in NLF LAUs associated with prescribed fire would benefit lynx by creating more snowshoe hare habitat. A significant amount of the forest landscape would be retained as denning habitat. No increases in human disturbance or risks of direct or indirect lynx mortality are expected. The planned actions are consistent with the lynx conservation measures, objectives, standards and guidelines. The planned actions will "**not likely to adversely effect"** lynx and lynx habitat within the North Lochsa Face project area.

/s/ *Dennis E. Talbert*, 10/19/01
DENNIS E. TALBERT
Wildlife Biologist

/s/ *Dan L. Davis,* 11/19/01
DAN L. DAVIS
Forest Wildlife Biologist

Attachment: NLF Alternative 6 vs LAUs (map)

APPENDIX A—CDC lynx observations for the Clearwater National Forest

County	Date	Location	Observer	Data Source
Clearwater	1942 Confirmed Specimen	Pierce	Lynx trapping record; pelt was brought to IDFG 1979 for CITES tagging.	Terr-Berns, M., compiler. 1997. Lynx trapping and sighting records.
Clearwater	1964 Unconfirmed Specimen	Gorman Hill	Charles Hall, Kamiah, trapped 1 lynx	Idaho Conservation Data Center
Clearwater	1965 Unconfirmed Specimen	Gorman Hill	Charles Hall, Kamiah, trapped 1 lynx	Terr-Berns, M., compiler. 1997. Lynx trapping and sighting records. 5pp.
Clearwater	1967-1968 Sighting	Hollywood	(winter): Don Jenni, a trapper from Orofino, saw a single lynx; reported by Jenni to Gary Will, IDFG	Idaho Conservation Data Center
Clearwater	1969 Sighting	North Fork Clearwater River/Pack Cr	Don Jenni, a trapper from Orofino, saw one lynx on the river ice; reported by Jenni to Gary Will, IDFG	Idaho Conservation Data Center
Clearwater	1978 Confirmed Specimen	Kelly Creek/Pileup Creek	A single lynx was trapped by Don Jenni, a trapper from Orofiino, and Donna Rounds; reported to Gary Will, IDFG	Idaho Conservation Data Center
Clearwater	1983 Confirmed Specimen	The Cedars	Kevin Shroeder shot 1 female lynx near the Cedars. The lynx was checked by IDFG for CITES tagging.	Idaho Conservation Data Center
Clearwater	1991 sighting	North Fork	Don Jenni, a trapper	Idaho

County	Date	Location	Observer	Data Source
		Clearwater River/Game Cr	from Orofino, saw 3 lynx kittens on the road along the North Fork Clearwater River; reported by Jenni to Gary Will, IDFG	Conservation Data Center
Clearwater	1995 Sighting	Cayuse Creek	Daryl Alred, guide and outfitter, reported to Lyle Lewis, BLM, that he saw several sets of tracks along Cayuse Creek.	Idaho Conservation Data Center
Idaho	1909 Confirmed Specimen	Clearwater River	F. Kube collected 2 animals, sex unknown.	U.S. National Museum
Idaho	1910 Confirmed Specimen	Lowell	F. Kube collected 1 male; specimen label reads “Lochsa River.”	U.S. National Museum
Idaho	1910 Confirmed Specimen	Clearwater River	F. Kube collected 1 animal, sex unknown, date unknown.	U.S. National Museum
Idaho	1915 Confirmed Specimen	Clearwater River	An unknown collector took 1 female; specimen label reads “Clearwater”	U.S. National Museum
Idaho	1936 Confirmed Specimen	Indian Graves Creek	Lynx trapping record; pelt was brought to IDFG 1978-02-03 for CITES tagging	Terra-Berns, M., compiler. 1997. Lynx trapping and sighting records. 5pp.
Idaho	1962 Confirmed Specimen	Packer Meadows	William Schleiper trapped 1 lynx. Copy of newspaper clipping from Clearwater Progress, Kamiah, includes William Schleiper, Kooskia trapper with a harvested lynx giving the location of Packer Meadows and a date of December 1962	Idaho Conservation Data Center

County	Date	Location	Observer	Data Source
Idaho	1972 Sighting	Noseeum Creek	Don Mcpherson, IDFG saw a road-killed lynx on Hwy 12 where Noseeum Creek comes in to the Lochsa River	Idaho Conservation Data Center
Idaho	1983 Confirmed Specimen	Lochsa River	lynx trapping recorded; pelt was brought to IDFG for CITES tagging.	Idaho Conservation Data Center
Idaho	1992 Sighting	Lowell	Jacque and Don Moore saw a lynx at about 30 yards distance while it was eating a fawn. The sighting was made at their residence, about 50 yards off Hwy 12. Reported by Dennis Talbert, Selway RD.	Nez Perce National Forest, Selway RD.
Idaho	1993 Sighting	Snowbank Camp East	Kim and Betty Ragotzkie observed 1 adult from 40 yards for about 2 minutes. Animal was coyote-sized and mostly gray-colored with slight brown tint; has black tail and large feet; crossed FS RD 500.	Clearwater National Forest, Powell Ranger District
Idaho	1994 Sighting	Haskell Creek	1 adult of unknown sex was treed by hounds; hunters Ron Harmon and Allan Jones observed animal from within 30 feet, noticing ear tufts, long hair, solid black tail tip, size larger than bobcat's; reported by Dane Cook, IDFG CO, Powell RS.	Clearwater National Forest Powell Ranger District
Idaho	1994 Sighting	Brushy Fork	Jim Garrison, Powell RD, observed from 50-75 yards 1 adult in an	Clearwater National Forest, Powell RD.

County	Date	Location	Observer	Data Source
			opening (old clearcut) cross FS Rd 5671 and head uphill to the NW.	
Idaho	1994 Sighting	Crooked Fork of the Lochsa	Ron Harmon, Lolo, MT, saw tracks which he assumed were made by lynx that had been treed 4 days before. Sighting was reported by Dane Cook, IDFG, no additional information on the treed lynx was reported	Clearwater National Forest, Powell RD.
Idaho	1995 Sighting	Woodrat Mountain	Anna Owsiak, IDFG, saw a single animal walking on the road and was able to observe it for 20 seconds; reported by Kamiah Ranger Station	Clearwater National Forest, Lochsa Ranger District.
Idaho	1996 Sighting	Tom Beal Park	Joe Avery saw 2-3 sets of tracks together during a snowmobile trip. Jones reported that "tracks there are rare."	Idaho Conservation Data Center

LITERATURE CITED

Apps, C. D. 1999. Space-use, diet, demographics, and topographic associations of lynx in the southern Canadian Rocky Mountains: a study. Chapter 12 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

Aubry, K. B., G. Koehler, and J. R. Squires. 1999. Ecology of Canada lynx in southern boreal forests. Chapter 13 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

Bailey, R. G. 1995. Descriptions of the ecoregions of the United States. 2nd ed. USDA Forest Service, Misc. Publ. No. 1391. Wash., D.C. 108 pp. + map.

_____. 1998. Ecoregions maps of North America: Explanatory note. Misc. Publ. No. 1548. USDA Forest Service, Wash., D.C. 10 pp.

_____, P. E. Avers, T. King, and W. H. McNab, eds. 1994. Ecoregions and subregions of the United States. USDA Forest Service, Wash., D.C. 1:7,500,000, colored with suppl. table of map unit descriptions.

Bider, J. R. 1962. Dynamics and the tempero-spatial relations of a vertebrate community. Ecology 43:634-646.

Bowles, A. E. 1995. Responses of wildlife to noise. Pages 109-156 *In* R. L. Knight and K. J. Gutzwiller, editors. Wildlife and recreationists: coexistence through management and research. Island Press, Washington, D.C.

Brand, C. J. and L. B. Keith. 1979. Lynx demography during a snowshoe hare decline in Alberta. J. Wildl. Manage. 43(4):827-849.

Buskirk, S. W., L. F. Ruggiero, and C. J. Krebs. 1999. Fragmentation and interspecific competition: implications for lynx conservation. Chapter 4 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

Buskirk, S. W., L. F. Ruggiero, K. B. Aubry, D. E. Pearson, J. R. Squires, and K. S. McKelvey. 1999. Comparative ecology of lynx in North America. Chapter 14 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

Carbyn, L. N. and D. Patriquin. 1983. Observations on home range sizes, movement, and social organization of lynx, *Lynx canadensis* in Riding Mountain National Park, Manitoba. Can. Field-Nat. 97:262-267.

Cordell, H. K. and J. C. Bergstrom. 1991. A methodology for assessing national outdoor recreation demand and supply trends. Leisure Sciences 13:1-20.

_____, L. A. Hartmann, and D. B. K. English. 1990. An analysis of the outdoor recreation and wilderness situation in the United States: 1989-2040. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-189. Fort Collins, CO.

Duffus, D. A. and P. Dearden. 1990. Non-consumptive wildlife-oriented recreation: a conceptual framework. Biological Conservation 53:213-231.

Fuller, T. K. and D. B. Kittredge, Jr. 1996. Conservation of large forest carnivores. Pages 137-164 *In* R. M. DeGraaf and R. I. Miller, eds. Conservation of faunal diversity in foreted landscapes. Chapman and Hall, London.

Gabrielson, G. W. and E. N. Smith. 1995. Physiological responses of wildlife to disturbance. Pages 95-107 *In* R. L. Knight and K. J. Gutzwiller, eds. Wildlife and recreationists: coexistence through management and research. Island Press, Washington, D.C.

Gutzwiller, K. J. 1995. Recreational disturbance and wildlife communities. Pages 169-181 *In* R. L. Knight and K. J. Gutzwiller, eds. Wildlife and recreationists: coexistence through management and research. Island Press, Washington, D.C.

Idaho Department of Parks and Recreation. 1997. Idaho statewide comprehensive outdoor recreation and tourism planning (SCORTP): assessment and policy plan. Idaho Department of Parks and Recreation, Boise, Idaho.

Keith, L. B., O. J. Rongstad, and E. C. Meslow. 1966. Regional differences in reproductive traits of the snowshoe hare. Can. J. Zool. 44:953-961.

_____ and D. C. Surrendi. 1971. Effects of fire on a snowshoe hare population. J. Wild. Manage. 35:16-26.

_____, A. W. Todd, C. J. Brand, R. S. Adamcik, and D. H. Rusch. 1977. An anlysis of predation during cyclic fluxation of snowshoe hares. Proc. XIII Int. Cong. Game Biol. Pages 151-175.

Knight, R. L. and D. N. Cole. 1995*a*. Wildlife responses to recreationists. Pages 51-70 *In* R. L. Knight and K. J. Gutzwiller (eds.) Wildlife and recreationists: coexistence through management and research. Island Press, Washington, D.C.

____ and _____. 1995*b*. Factors that influence wildlife responses to recreationists. Pages 71-79 *In* R. L. Knight and K. J. Gutzwiller, eds. Wildlife and recreationists: coexistence through management and research. Island Press, Washington, D.C.

_____ and K. J. Gutzwiller. 1995. Wildlife and recreation: Coexistence through management and research. Island Press. Washington, D.C. 372 pp.

Koehler, G. M. 1990. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Canadian Journal of Zoology 68: 845-851.

_____. 1991. Snowshoe hare, *Lepus americanus*, use of forest successional stage and population changes during 1985-1989 in north-central Washington. Can. Field-Nat. 105:291-293.

_____ and K. B. Aubry. 1994. Pages 74-98 *In* Ruggiero and others 1994. The scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine in the western United States. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-254. 184 pp.

Lewis, L. and C. R. Wenger. 1998. Idaho's Canada lynx: pieces of the puzzle. Idaho Bureau of Land Management, Technical Bulletin No. 98-11. 21 pp.

Litvaitis, J. A. 1992. Niche relations between coyotes and sympatric Carnivora. Pages 73-85 *In* A. H. Boer, ed. Ecology and management of the eastern coyote. University of New Brunswick Wildlife Research Unit, Fredericton, NB.

McCord, C. M. and J. E. Cardoza. 1982. Bobcat and lynx. Pages 728-766 *In* J. A. Chapman and G. A. Feldhamer (eds.). Wild Mammals of North America. Johns Hopkins University Press, Baltimore, MD.

McKelvey, K. S., S. W. Buskirk, and C. J. Krebs. 1999*a*. Theoretical insights into the population viability of lynx. Chapter 2 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds.

The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

_____, K. B. Aubry, and Y. K. Ortega. 1999*b*. Historic and current distribution of lynx in the contiguous United States. Chapter 8 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

_____, Y. K. Ortega, G. Koehler, K. Aubry, and D. Brittell. 1999*c*. Canada lynx habitat and topographic use patterns in north central Washington: a reanalysis. Chapter 10 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

_____, K. B. Aubry, J. K. Agee, S. W. Buskirk, L. F. Ruggiero, and G. M. Koehler. 1999*d*. Lynx conservation in an ecosystem management context. Chapter 15 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

Mech, L. D. 1970. The wolf. University of Minnesota Press. 384 pp.

_____. 1973. Canadian lynx invasion of Minnesota. Biol. Conservation 5:151-152.

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

Mowat, G., K. G. Poole, and M. O'Donoghue. 1999. Ecology of lynx in northern Canada and Alaska. Chapter 9 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

_____. G. Slough, and S. Boutin. 1996. Lynx recruitment during a snowshoe hare population peak and decline in southwest Yukon. J. Wildl. Manage. 60:441-452.

Murray, D. L. and S. Boutin. 1991. The influence of snow on lynx and coyote movements: does morphology affect behavior? Oecologia. 88:463-469.

_____, _____, and M. O'Donoghue. 1994. Winter habitat selection by lynx and coyotes in relation to snowshoe hare abundance. Canadian Journal of Zoology 72:1444-1451.

_____,_____, _____, and V. O. Nams. 1995. Hunting behavior of sympatric felid and canid in relation to vegetative cover. Animal Behavior 50:1203-1210.

Nash, R. 1995. Wilderness and the American mind. Pages 3-16 *In* Wildlife and recreation: Coexistence through management and research. R. L. Knight and K. J. Gutzwiller, eds. Island Press, Washington, D.C. 372 pp.

Nash, R. 1982. Wilderness and the American mind. 3rd ed. Yale Univ. Press. New Haven, CT. 425 pp.

Nowak, R. M. 1979. North American quaternary *Canis*. Monograph No. 6, Museum of Nat. Hist., University of Kansas. 154 pp.

O'Donoghue, M. 1997. Responses of coyotes and lynx to the snowshoe hare cycle. Ph.D. Diss., Univ. of British Columbia. Vancouver, B.C.

_____, S. Boutin, C. J. Krebs, and E. J. Hofer. 1997. Numerical responses of coyotes and lynx to the snowshoe hare cycle. Oikos 74:115-121.

_____, _____, _____, G. Zuleta, D. L. Murray, and E. J. Hofer. 1998. Functional responses of coyotes and lynx to the snowshoe hare cycle. Ecology 79(4):1193-1208.

Ozoga, J. J. and E. M. Harger. 1966. Winter activities and feeding habits of northern Michigan coyotes. J. Wildl. Manage. 30 (4):809-818.

Parker, G. R., J. W. Maxwell, L. D. Morton, and G. E. J. Smith. 1983. The ecology of the lynx (*Lynx canadensis*) on Cape Breton Island. Can. J. Zool. 61:770-786.

Poole, K. G. 1994. Characteristics of an unharvested lynx population during a snowshoe hare decline. J. Wildl. Manage. 58:608-618.

Quinn, N. W. S. and J. E. Thompson. 1987. Dynamics of an exploited Canada lynx population in Ontario. J. Wildl. Manage. 51:297-305.

Roe, A. N., K. G. Poole, and D. L. May. 1999. A review of lynx behavior and ecology and its relation to ski area planning and management. Unpubl. Report, IRIS Environmental Systems. Calgary, Alberta, Canada. 67 pp.

Ruediger, B. 1996. The relationship between rare carnivores and highways. Pages 24-38 *In* G. Evink, D. Ziegler, P. Garret, and J. Berry (eds). Transportation and wildlife: reducing wildlife mortality/ improving wildlife passageways across transportation corridors. Proc. Transportation-Related Wildlife Mortality Seminar, 30 April- 2 May 1996, Orlando, FL. Florida Dept. Trans./ Fed. Highway Admin.

_____, J. Claar, and J. Gore.1999. Restortation of Carnivore Habitat Connectivity in the Northern Rocky Mountains. Unplubished Report, 12 pp.

Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, tech. eds. 1994. The scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine in the western United States. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-254. 184 pp.

Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. 1999*a*. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

_____, _____, _____, G. Koehler, C. Krebs, K. McKelvey, and J. Squires. 1999*b*. The scientific basis of lynx conservation: qualified insights. Chapter 15 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

Saunders, J. K., Jr. 1963*a*. Food habits of the lynx in Newfoundland. J. Wildl. Manage. 27(3):384-390.

Slough, B. G. and G. Mowat. 1996. Lynx population dynamics in an untrapped refugium. J. Wildl. Manage. 60:946-961.

Squires, J. R. and T. Laurion. 1999. Lynx home range and movement in Montana and Wyoming - preliminary results. Chapter 11 *In* Ruggiero, L.F., K. B. Aubry, S. W. Buskirk, et al., tech. eds. The scientific basis for lynx conservation in the contiguous United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMS-GTR-30. Ogden, UT.

Staples, W. R. 1995. Lynx and coyote diet and habitat relationships during a low hare population on the Kenai Peninsula, Alaska. M.S. Thesis, Univ. of Alaska, Fairbanks.

Steele, R., R. D. Pfister, R. A. Ryker, and J. A. Kittams. 1981. Forest habitat types of central Idaho. USDA Forest Service, Intermountain Forest and Ranger Experiment Station, General Technical Report INT-114. Ogden, UT. 138 pp.

Thompson, R. W. and J. C. Halfpenny. 1989. Canada lynx presence on the Vail ski area and proposed expansion areas. Unpubl. Rep. Western Ecosystems, Inc. Lafayette, CO. 29 pp.

Todd, A. W., L. B. Keith, and C. A. Fischer. 1981. Population ecology of coyotes during a fluctuation of snowshoe hares. J. Wildl. Manage. 45:629-640.

Walsh, R. G. 1986. Recreation economic decisions: comparing benefits and costs. Pages 3-16 *In* Wildlife and recreation: Coexistence through management and research. R. L. Knight and K. J. Gutzwiller, eds. Island Press, Washington, D.C. 372 pp.

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

Weaver, J. L., 1999. Results of 1998 lynx hair snagging survey and DNA analysis for northern Idaho. Unpubl. Report. 1p.

_____, P. C. Paquet, and L. F. Ruggiero. 1996. Resilience and conservation of large carnivores in the Rocky Mountains. Cons. Biol. 10(4):964-976.