Management of Canada Lynx in the Cascades Geographic Areas of Oregon and Washington

A White Paper Prepared by
the Offices of Region 1 of the Fish and Wildlife Service

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ISSUE STATEMENT

The Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000) and the *Conservation and Management of Lynx in the United States* (Ruggerio et al 2000; hereafter referred to as the Science Report) state that lynx are strongly associated with early seral vegetation and use a variety of habitats. These documents also state that site-specific information should be used, future options should be retained, and new information will be incorporated to ensure adequate protection and conservation of the species throughout its range. Changes in the criteria used to define lynx habitat have resulted in the majority of the Cascades Geographic Area (as referred to in the LCAS) and portions of the Rocky Mountain Geographic Area in Oregon falling outside the boundaries of designated lynx analysis units (LAUs). We feel that the information provided will help clarify lynx habitat mapping and management issues in these areas.

This paper provides a summary of information on lynx in the Cascades and large portions of Oregon, and poses a series of questions that can be used to resolve these concerns. We would appreciate your review of the following issues and background information. Resolving these issues as quickly as possible is important so that clear and consistent guidance can be provided.

Issue I: Appendix 8.1 of the Science Report lists various sources of lynx occurrence data that were incorporated into the Report, including museum specimens, harvest/bounty records, federal agency records, data from local counties, visual occurrence reports, track observations, published/unpublished reports, interviews of knowledgeable trappers/hunters, historical data, reports from newspaper articles, personal accounts, and records from a forest carnivore sightings database compiled by the Forest Service.

There is concern that similar occurrence information may not have been obtained and evaluated consistently across the range of the species. For example, in our review of the information presented in the Science Report, it became apparent that the occurrence data may be biased towards areas where lynx research studies have been conducted (particularly for Washington), that lynx trapping records may not have been considered as verified for all geographic areas, and that not all of the known sighting locations were used.

1. It is unclear how information and records that were not considered or may not have been available when the Science Report was printed will be incorporated. For example, at least 50 additional lynx sighting reports and bounty records for fifteen counties were obtained for Oregon and Washington after the Science Report was published. All of the additional lynx occurrence data and information that were recently obtained are discussed and summarized in Appendices A through C and are shown in Figure 1 (see p. 7). Please review this information and describe the procedures that might be in place, or which will be used, to analyze and incorporate additional material indicating occurrence in various areas.

2. There are many contributing relevant historical events, including the fur trade, trapping, and intensive predator/rodent control programs, that likely influenced the current distribution of lynx. Did the Science Team consider how the cumulative effects of predator control activities and the isolation of residual populations due to highways and dam construction and increased human populations may have affected the distribution of lynx in this region?

3. Once the material has been evaluated, please provide an updated analysis of lynx occurrence data (with focus on Oregon and Washington) utilizing the information provided in this paper, appendices, and attachments.

Issue II: As more information is gathered on lynx, we are concerned about how lynx habitat is being delineated. The current mapping criteria does not appear to truly represent all areas capable of supporting the species. Under the original mapping criteria, over 80 percent of the lynx occurrences in Oregon and Washington fell within or very close to areas mapped as habitat (see Figure 2, p. 10). However, under the current mapping direction, less than half of the lynx locations and only one third of the Cascades Geographic Area are included in areas now being managed for lynx (see Figure 3, p. 11).

1. The land management units are currently directed to use figure 8.20 in the Science Report as the outer boundary for mapping lynx habitat. However, these broad-scale maps were used to model and correlate lynx occurrences for the entire western United States and are not accurate at the state and local scale. Was the analysis conducted in Chapter 8 of the Science Report intended to be applied to habitat mapping at the local site-specific level? If this was the intent, please provide the rationale for how this best represents lynx habitat in the Cascades and Rocky Mountain Geographic Areas of Washington, Idaho and Oregon.

2. Given that the subalpine fir plant association is not a subtype of the Kuchler vegetation types (1964) or the broader forms that define the Pacific Northwest/Rocky Mountain Conifer types, please explain the data used to restrict primary lynx habitat to the subalpine fir series. What "cross-walk" was used to correlate each of the Kuchler vegetation types (Douglas-fir, western spruce/fir, and fir/hemlock) with the subalpine fir series? Did the team compare the location of lynx occurrences in each Kuchler vegetation type with the current National Forest plant associations throughout the western United States and Oregon and Washington in particular?

3. According to the *Natural Vegetation of Oregon and Washington* (Franklin and Dyrness 1973), the subalpine regions of the Cascade mountain in these states include a variety of potential vegetation series, including mountain hemlock, Pacific silver fir, and subalpine fir. Did the Biology Team consider using Franklin to delineate lynx habitat in Oregon and Washington?

4. The terms "subalpine forests, subalpine fir series, plant associations, habitat type, forests, vegetation, and zones" are used throughout the LCAS. Please explain the rationale for why the

team restricts the subalpine zone to the subalpine fir series.

5. Using examples from the literature on lynx, please provide the rationale and an explanation for why certain plant associations and vegetation types were defined as "primary" or "secondary" lynx habitat.

6. Given that lynx are strongly associated with early seral habitat, please explain why current vegetation and the early seral condition of other plant associations are not being mapped and used to infer habitat suitability and evaluate habitat conditions for lynx.

7. The terms "adjacent" and "intermingled" have not been clearly defined. What biological rationale was used to determine the distances for mapping "adjacent" and "intermingled" habitats? Please demonstrate how this direction is being or will be applied consistently in all areas. We would like the Steering Committee to consider the recommendations provided in this report or define these terms based on a rationale that is supported by the literature on lynx throughout the range of the species.

8. None of the research studies that evaluated daily movement patterns of radio-collared lynx correlated home ranges to a single plant association. What is the basis that was used to restrict the criteria for delineating LAUs to 10 square miles (mi^2) of primarily subalpine fir plant associations?

9. Subalpine fir is a common tree species found in several subalpine forest plant associations, besides the subalpine fir plant association (e.g. the grand fir, Pacific silver fir, and mountain hemlock plant associations). Please explain why these other subalpine forest plant associations were excluded from consideration as primary lynx habitat.

Issue III: Given the uncertainty and paucity of data on lynx for many areas throughout the range of the species in the contiguous United States, we are concerned that the current management direction may preclude the conservation of the species in areas where lynx occurrences have been documented, but no surveys or studies have been conducted.

10. How will future options for lynx management be retained using the current management guidelines? For example, several ski area and dispersed winter recreation expansions are being proposed in locations that are no longer within areas mapped as lynx habitat. These and other projects may affect connectivity and the conservation of the species. Many land management units in this region have been directed not to manage for lynx outside of LAUs.

11. Did the Biology or Science Teams determine how application of the new mapping criteria will affect connectivity and conservation of lynx in the Cascade Mountains (i.e. north to south) and between geographic areas such as the Cascades and the Northern Rocky Mountain

Geographic Area to the east? How will restricting lynx management under the current guidelines ensure conservation of the species throughout the Cascade Mountains Geographic Area?

12. A large percentage of lynx occurrences fall outside of the areas delineated as habitat under the new mapping direction. How will the current management direction affect the conservation of the species in areas such as the southern Cascades, where approximately 50 lynx reports have been documented?

Issue IV: Both the LCAS and the Science Report recognize that new information should be incorporated, but a framework needs to be developed in order for this to happen. For example:

The Fish and Wildlife Service (Service) has identified several areas of concern that are no longer being managed for lynx under the current guidelines. The majority of these areas were mapped as potential lynx habitat under the original mapping criteria and/or have documented lynx occurrences (including both verified and high reliability reports). Lynx surveys are ongoing in many of these areas. These areas have been tentatively termed "Evaluation Areas" by the Service and an interim guidance strategy was developed at a meeting in Spokane in August 2000 so that future options for lynx management in these areas are not precluded. It is expected that sufficient information will be obtained within the next 5 years to determine if these areas warrant inclusion for lynx management.

A process needs to be developed to provide a framework for how new information is evaluated and incorporated in the future. We encourage the Lynx Steering Committee to ensure that this framework is developed and implemented in a timely manner.

BACKGROUND

- In June 1999, the Forest Service (FS) issued the original lynx habitat mapping criteria for Oregon and Washington (Attachment 1). The vegetation types used to delineate potential habitat included the high-elevation plant associations capable of supporting snowshoe hares and providing similar habitat conditions and winter snowpacks found in areas where lynx are known to occur. Both the potential and current condition of the vegetation was mapped. Using these mapping criteria, National Forests delineated lynx analysis units (LAUs) and initiated consultations. Lynx surveys were initiated in some of these areas in 1998 and are still ongoing.

- Numerous meetings with the Forest Service, members of the Lynx Biology Team and the Service were held from the time the first mapping direction was issued through the following summer (2000).

- In June 2000 the Regional Forester for Region 6 sent a letter to the Regional Director for

Region 1 of the Service requesting concurrence with the statements that: 1) resident lynx populations do not exist (and likely never existed) west of the Cascade crest; 2) there is no lynx habitat west of the crest; 3) the LCAS should not be applied; and 4) LAUs should not be delineated west of the crest (Attachment 3).

- At a July 2000 meeting in Spokane, representatives of the Service and members of the Biology and Science Teams agreed that Pacific silver fir and mountain hemlock would be mapped as lynx habitat where these vegetation types occur adjacent to or intermingled with subalpine fir. These areas would be included within LAUs and the full LCAS would be applied. Surveys would continue in areas previously mapped as lynx habitat and programmatic consultations would be conducted in these areas. It was also agreed that new information would be used to determine if these areas warranted inclusion for lynx management in the future.

- The LCAS (August 2000) states that Pacific silver fir, grand fir, moist Douglas fir and other vegetation types found on both sides of the crest contribute to lynx habitat when interspersed with subalpine fir. It also states that habitat descriptions for the west side of the Cascade Range should include considerations of vegetation (both species and structure), snow, and topographic conditions that appear to provide suitable conditions for lynx and snowshoe hare.

- In August 2000, the Biology Team presented new mapping guidelines that narrow the definition of lynx habitat to the subalpine fir plant association and vegetation immediately adjacent to or intermingled with this series and directs units to use figure 8.20 in Chapter 8 of the Science Report (McKelvey et al. 2000) as the outer boundary for delineating habitat in the west. For Oregon and Washington, the Biology Team recommended that the Pacific silver fir/mountain hemlock plant associations should not be mapped as lynx habitat and that LAUs, and thus the LCAS, would not be applied west of the Cascade crest (Attachment 2). This direction specific to the western Cascades is contradictory to agreements that were made in Spokane and is being applied inconsistently across the Cascade crest.

- In November 2000, the Service responded to the June 2000 letter stating that there is insufficient information to agree with the statements that lynx and lynx habitat do not occur west of the crest. The letter identified that both the Biology Team and the Lynx Steering Committee acknowledge that mesic Douglas-fir, grand fir, silver fir/mountain hemlock and other plant series, when intermingled with or adjacent to the subalpine fir series, contribute to lynx habitat and should be mapped as lynx habitat whether they occur east or west of the Cascade crest. These areas would be delineated within LAUs and full implementation of the LCAS would apply. The Service also stated that measures to minimize impacts to lynx outside of LAUs would be appropriate and that the LCAS should be used to evaluate effects of proposed actions outside of LAUs at the site-specific level (Attachment 4).

RATIONALE FOR THE ISSUES PRESENTED:

Issue I: Lynx Occurrence Data

Lynx research has been conducted across Canada and Alaska, but the only lynx research projects that have been completed to date in the contiguous United States are in north-central Washington, Minnesota, and western Montana. Ongoing studies in north-central Washington, Montana, Wyoming, Maine, and tracking information for the relocated lynx in Colorado, may provide more information in the near future. Surveys are also scarce throughout most of the range of the species in the contiguous United States. The species occurs at low densities, is primarily nocturnal, has inconspicuous behavior, resides in remote areas, and is thus difficult to detect in the wild. Unless they are commercially harvested or intensive surveys are conducted, their presence often goes unnoticed (Zielinski and Kucera 1995). The paucity of data on lynx was acknowledged in the LCAS, the Final Rule for listing, and the Science Report. Due to a general lack of research information and surveys from within the contiguous United States, sighting data are limited to trapping records, anecdotal information, incidental reports, and information obtained from prior and on-going research.

Confirmed lynx reports have been documented on both sides of the Cascade crest in Oregon and Washington (Dalquest 1948, McKelvey et al. 2000, Stinson 2000, Verts and Carraway 1998) and an additional specimen was recently confirmed from northern California. However, intensive surveys over a large geographic area have not been conducted throughout most of the states where the species occurs. Thus all lynx sightings in these areas are from incidental reports and trapping records. The sighting reports and trapping records are more thoroughly discussed in Appendices A, B, and C.

Data is readily available in areas where lynx research has been conducted, resulting in a potential bias towards these areas. For example, of the 1105 lynx occurrence records in the Washington State Heritage Database, all but 123 records (11 percent) are from radio-telemetry locations or tracking surveys conducted in the Okanogan, Colville and Loomis Forest study areas. Although the Science Team tried to minimize this effect by condensing the study locations to single point locations per animal per year, this still represents significantly more data points than are available for areas where no surveys or studies have been conducted. Figure 1 shows documented lynx occurrences and trapping records (by county) for Oregon and Washington. To eliminate the bias of the research studies in north-central Washington, we omitted the radio-telemetry and point locations that were directly associated with these studies. Due to significant differences in the way reports are rated between states, we were unable to group the occurrences based on reliability.

There also appear to be some inconsistencies in how data was used from state to state. For example, Appendix 8.1 of the Science Report states that telemetry locations of individual animals from the Washington study areas were used (McKelvey, pers. com. 2000), but only the initial trap locations were included for a similar study in Minnesota. In addition, trapping data may not have been considered valid in areas where records for lynx are scarce, even when bobcat and lynx records were tabulated separately.

Figure 1

The following address lynx occurrences west of the Cascade crest. In Washington, there are about 22 documented reports of lynx on the west side of the Cascade crest. Nearly half of these are recent reports (since 1985), including a verified report of tracks from an adult lynx with two juveniles in 1991. There are also 50 trapping records for western Washington, including 10 verified specimens (WDFW 1993; Washington State Archives; National Museum of Natural History) and 27 lynx recorded in Washington State Bounty Claim Registers from areas west of the Cascade crest. In Oregon, there are 23 documented reports of lynx on the west side of the Cascades and more than half of these are recent reports. There is a verified report of an adult lynx with a juvenile reported in January 2000 and there is a verified report of a juvenile female in 1974. There are 56 lynx recorded in Oregon State Bounty Claim Registers and nine lynx recorded in the diaries of trappers working west of the Cascade crest.

None of the historic bounty records for Oregon/Washington and less than half of the lynx reports from west of the Cascade crest were known of prior to completion of the current LCAS and the Science Report. The information pertaining to sightings, trapping, and bounty records throughout Oregon and Washington is more thoroughly described in Appendices A-C.

Issue II: Lynx Habitat Mapping:
All of the research studies conducted on lynx throughout its range in North America state that lynx occupy boreal, sub-boreal and western montane forests (McCord and Cardoza 1982; Quinn and Parker 1987) and use a wide variety of forest types. In Canada, lynx use black and white spruce forests (Poole 1994); in Alberta, lynx use aspen, poplar, black spruce, larch, birch, aspen, and willow habitats (Brand et al. 1976); in Wyoming, they are associated with lodgepole pine, aspen, and spruce-fir forests (Squires and Laurion 2000); in northeastern Washington and central Idaho, they use cedar/hemlock and riparian hardwood stands (S. Zender, WDFW, pers comm.); and they use a variety of mixed conifer and hardwood forests in the Great Lakes and Northeastern geographic areas (McKelvey et al. 2000). Research indicates that lynx are almost always associated with a mosaic of age classes, especially young stands that support snowshoe hares (Koehler and Aubry 1994, Mowat et al. 2000, Thompson 1988, Thompson et al. 1989).

Perhaps the most undisputed lynx habitat association is the tie between lynx and young or mid-successional forests (Quade 1996). The literature is nearly unanimous in supporting this relationship (Saunders 1961, Koehler et al. 1979, Kesterson 1988, Major 1989, Thompson et al. 1989, Johnson 1997, Slough 1995, Breitenmoser et al. 1993). More recently, the value of late-successional forests as habitat for lynx, hares, and red squirrels has also been emphasized in the southern part of lynx range (Buskirk et al. 2000). With respect to snowshoe hare, Hodges (2000) found that hare habitat use is based on understory cover. Stands with shrubs, stands that are densely stocked, and stands at ages where the branches provide more lateral cover are more heavily used by hares (Hodges 2000). Hodges contends that hare use is more closely correlated with understory structure than the species composition in a stand. If the availability of snowshoe hare is truly a critical component of lynx habitat, and if snowshoe hare's use of habitat is more highly correlated with understory structure than with species composition, then it follows that the actual tree species present is not as important as the

structural component of a stand.

Hares, much like lynx, use a wide variety of habitat types across their range (Hodges 2000). In Canada, hares use dense, black spruce and willow-alder thickets. In Utah and Colorado, they use mixed spruce-fir, lodgepole and aspen (Dolbeer and Clark 1975). In the western Oregon Cascades, Black (1965) and Mozejko (1972) found hares prefer Douglas-fir, western hemlock, huckleberry, willow, and lupine. Hodges (2000) reported that no particular tree species is more important to hares and that some forest types occur only in one area, so information cannot be extrapolated from one area to another across broad regions.

Lynx habitat in the Montana study area differs significantly from that on the Okanogan National Forest (McKelvey et al. 2000); habitat on the Okanogan differs from habitat in northern Idaho (T. Layser, USFS, pers. comm.); and lynx habitat in northern Idaho differs from that in Colorado (G. Patton, FWS, pers. comm.). Plant associations vary from forest to forest, so perhaps it may be more useful to assess the early seral or existing structural characteristics of a stand in order to determine if it provides lynx/hare habitat rather than simply focusing on the potential vegetation/plant association. The inclusion/exclusion of certain forested plant associations should be based on site-specific knowledge and expertise provided by biologists that are familiar with the local area, habitat, plant associations, prey availability, and snow depths.

The original mapping guidelines directed Forests to map current and potential vegetation using a wide range of plant associations, whereas the revised mapping criteria only relies on "potential" vegetation types directly associated with subalpine fir plant associations. Therefore, maps of existing conditions are no longer being used to define habitat for a species that depends on early seral vegetation for foraging and that occurs in forests comprised of a wide variety of tree species and successional stages. While the Service recognizes that certain tree species or plant associations may be indicative of boreal-like or subalpine ecosystems, lynx are not clearly associated with any single plant association. In *Natural Vegetation of Oregon and Washington* (Franklin 1973) , Franklin identifies a variety of potential vegetation series that together represent the boreal/subalpine zone, including mountain hemlock, silver fir, and subalpine fir. The rationale for focusing on one plant association and eliminating the use of existing vegetation maps is unclear. The revised guidance does not appear to provide the flexibility for using site specific knowledge, expertise, and interpretations regarding local habitat suitability for lynx and their prey. The impacts of the new mapping direction is significant for the Cascades Geographic Area: Under the original criteria, over 80 percent of the lynx occurrences were included in areas mapped as habitat (Figure 2). Under the current mapping direction, less than half of the lynx locations and only one third of the Cascades Geographic Area are now within areas managed for lynx (Figure 3).

Figure 2

Figure 3

Several agencies have mapped lynx habitat, defined lynx habitat and/or have lynx management guidelines (Appendix D). While all of these agencies recognize the value of early seral vegetation for foraging, and mature forests for denning, none of them restrict lynx habitat to a single climax plant association. These agencies include the Washington Department of Fish and Wildlife Management Recommendations for Lynx (Lloyd 1999) and draft Recovery Plan for the Canada Lynx (Stinson 2000), Boise Cascade and Plum Creek Lynx Habitat Model (Roloff 2000), the Interagency Lynx Habitat Field Reference Notebook (USFS et al. 1999), the Washington State Lynx Habitat Management Plan for DNR Managed Lands (Quade 1996), the Kootenai National Forest Lynx Conservation Strategy (Johnson 1997), the British Columbia Wildlife Habitat Handbook (Ritcey et al.1988), the Lynx Management Strategy for British Columbia (Hatler 1988), and the Colville National Forest Land and Resource Management Plan (USDA 1988).

National Forests in Idaho, central and northeastern Washington, as well as lands administered by the Washington Department of Natural Resources (DNR), the National Park Service (North Cascades NP and Ross Lake National Recreation Area, Mount Rainier NP, Crater Lake NP), the Washington Department of Fish and Wildlife, Boise Cascade, Plum Creek, the FWS (Little Pend Oreille National Wildlife Refuge), and the Tribes (Colville, Yakama, Warm Springs), all recognize that a variety of high elevation, montane coniferous, as well as deciduous forest types, provide suitable lynx habitat. Administrative units in these areas recognize Douglas-fir, lodgepole pine, grand fir, aspen, western red cedar, western and mountain hemlock, riparian shrub habitats (such as alder and willow), shrub-steppe habitats, western larch, Engelmann spruce, subalpine fir, mountain hemlock, Pacific silver fir, and other tree species as lynx habitat. Additional discussion regarding lynx habitat delineation by various agencies appears in Appendix D.

In the western United States, lynx often use forests wherein subalpine fir is one of several tree species in the stand, but none of the studies conducted throughout the range of the species supports an exclusive limitation to a single climax plant association as “primary” habitat. Although the current direction limits lynx habitat mapping to subalpine fir potential vegetation types, the following examples further portray the actual diversity of lynx habitat use, management, and plant associations.

The large scale assessment of lynx habitat associations, found in Chapter 8 of the Science Report, indicates that 79 percent of the lynx occurrences were within the Douglas-fir and spruce/fir forests (of the Rocky Mountain Conifer forest type) and the subalpine fir/mountain hemlock forests (of the Pacific Northwest Conifer forest type). These broad vegetation types overlap many different plant associations. The land management units are directed to use figure 8.20 as the outer boundary of lynx

habitat. This figure incorporates approximately 67 percent of the lynx occurrences and was derived using an elevational cut-off of 4000 feet, and the Lenahan groupings for Rocky Mountain Conifer. The broadscale maps and percent of occurrences calculated in Chapter 8 were for the entire western United States and may not be accurate for individual geographic areas. Restricting mapping to figure 8.20 excludes a significant number of lynx occurrences and precludes using local knowledge regarding vegetation that supports high hare densities, as well as site-specific snow condition data and geographic vegetation maps in some areas.

The Service conducted an assessment which correlated lynx occurrence locations with the various vegetation types listed by Kuchler (1964) for the states of Oregon and Washington (data for Idaho was unavailable) as well as the GAP current vegetation analysis (1997). To eliminate the strong bias from the long-term/10-year research projects in north-central Washington, we excluded the radio telemetry and survey locations directly associated with the studies. All other occurrence information, including the data used in the Science Report, current state and federal databases, spatially referenced trapping records, and locations for specimens, were used.

Figure 4 illustrates that over one half of the locations fell within stands that are dominated by Douglas-fir and less than one third of the points were in mixed conifer stands containing subalpine fir (Kuchler did not have a category that included solely subalpine fir). Another assessment was conducted for the same area using the same point locations, but based on existing vegetation maps (GAP analysis, 1997). As shown in Figure 5, less than one third of the locations are within subalpine fir stands. Lynx locations were found in all of the forested montane vegetation types, including: Douglas-fir (18 percent), lodgepole/ponderosa pine (17 percent), cedar/hemlock (13 percent), and Pacific silver fir/mountain hemlock (7 percent). Except in north-central Washington, there was no overwhelming preference for any given vegetation type when these percentages were compared to the relative availability of the vegetation types across the landscape.

- Over 80 percent of the lynx occurrences on the Idaho Panhandle National Forest (IPNF) are in lower elevation cedar/hemlock plant associations, although subalpine fir habitat is available in the higher elevations (T. Layser, USFS, pers. comm.). Both the IPNF and the WDFW area biologist acknowledge that the western red cedar/hemlock plant association provides some of the best lynx habitat (S. Zender, WDFW, pers comm).

- Information on lynx den sites is very limited in the lower 48 states. The largest data set for lynx maternal den sites was recorded by Slough (1999), who inspected 39 dens in the Yukon Territory. Every den except for three were in live/dead stands of mixed lodgepole pine/spruce/willow that either completely lacked subalpine fir (61 percent) or only had a minor component of subalpine fir (31 percent) in the overstory. Slough concluded that the common feature of lynx maternal den sites is the amount of down woody debris, not the overstory tree composition of the stands.

- A review of the Science Report and the LCAS indicates that lynx commonly select lodgepole pine forest types over other forest types, including subalpine fir. Lynx preference for lodgepole pine appears to be linked with snowshoe hares which are found at higher densities in this forest type than in others (Koehler 1990). Lodgepole pine is a common seral species that occurs in the subalpine fir plant association, which may account for it being deemed primary habitat, but lodgepole pine is also a common seral species in many other plant associations.

Figure 4

Figure 5

Appendix F provides more detailed information on the value of lodgepole pine as lynx/hare habitat and examples of other plant series/associations, besides subalpine fir, that include lodgepole pine as a seral species.

The Biology Team uses the terms "interspersed", "intermingled", and "adjacent" to describe secondary lynx habitat that could be associated with primary lynx habitat, but has not defined these terms in relation to lynx conservation. It seems reasonable that the scientific literature should provide the basis for defining these terms in such a way that facilitates lynx conservation and recovery. However, it appears that these terms are interpreted differently from forest to forest, at the field level. The terms could be defined by using spatial-use pattern data for lynx located in the southern portion of the range of the species. As a surrogate, daily travel distances could be used to approximate the distance that a lynx would typically travel to reach suitable habitat. Daily movement distances vary from 2.7 km (1.7 mi) to 20.5 km (12.7 mi) during a winter of cyclic hare decline (Breitenmoser et al. 1993). In Montana, the mean daily straight-line distance traveled by a male lynx averaged 2.8 km (1.7 mi) during summer (mid-May to August 1998) and in Wyoming, the mean daily-travel distance of a male averaged 4.1 km (2.5 mi) during summer (Squires and Laurion 2000). It is suggested throughout the Science Report that lynx in the southern portion of their range may exhibit daily movements similar to those in the north during periods of low or declining hare densities. Additional information regarding travel distances as noted in the scientific literature appear in Appendix E.

The LCAS states that the distribution of habitat across a LAU should consider daily movement distances of resident females. The glossary of the LCAS states that denning habitat must be located within daily travel distance of foraging habitat (typical maximum daily distance for females is 3 to 6 miles) (Ruediger et al. 2000). The USFS Lynx Biological Assessment (BA) (USDA 1999) selected 10 km (6.25 mi) as the rule for evaluating the distance that a lynx would travel between habitat patches. Aubry et al. (2000) suggested that the patchy and disjunct distribution of hare habitat in the southern portion of lynx range may force lynx to travel greater distances in search of prey. Therefore, it seems reasonable to define interspersed, intermingled, or adjacent habitat as any primary/secondary habitat that is located up to 3 miles from primary habitat.

It should be noted that categorizing lynx habitat as either "primary"or "secondary" is a distinction that is almost entirely absent from the scientific literature on lynx. The LCAS and the BA (USDA 1999) defined primary lynx habitat as those Kuchler vegetation types that contain 67 percent (LCAS) to 75 percent (BA) of lynx occurrences, but the percent of occurrences was calculated for the entire western United States, not for each geographic region/state and vegetation types vary across the United States. If primary habitat is truly intended to represent those habitats that are most heavily used by lynx, then a step-down analysis should be conducted for each geographic region to determine what percent of occurrences appear in each Kuchler vegetation type in that particular area. This would ensure that the primary habitat that overlaps lynx occurrences in local areas is adequately represented and that local conditions are reasonably reflected. Otherwise, the categorization is based on the extrapolation of data from other portions of the species range, particularly in areas where studies have been conducted. The categories (primary/secondary) should be used with great caution as they place an untested emphasis on qualifying habitat in portions of the species range where there is very little information to support any such distinction.

The new mapping criteria requires that each LAU must have at least 10 square miles of primary habitat (i.e. subalpine fir). LAUs were created to facilitate the evaluation of management actions and not to depict actual home ranges. It may not be possible to establish a minimum/maximum home range size threshold of primary habitat, especially considering the current uncertainty regarding what constitutes suitable habitat in the southern portion of the range and the fact that lynx home range sizes vary widely depending on habitat conditions and prey availability. Koehler (1990) documented female and male home ranges of 39 km^2 and 69 km^2 (24 mi^2 and 43 mi^2 respectively), respectively, in Washington. He suggests that decreased prey may increase home range size. In Alberta, home range sizes varied from 11.3 to 30.6 km^2 (7 to 17 mi^2) (Nellis et al 1972); in the Yukon, home range size increased with decreasing hare populations and ranged from 7.9 to 243 km^2 (5 to 151 mi^2) (Ward & Krebs 1985); and in the Northwest Territories of Canada, lynx home range size was 17 km^2 to 62 km^2 (11 to 38 mi^2) (Poole 1994). All of the home ranges within these study areas consisted of a wide variety of habitat types.

One of the most common threads in the Science Report is the pervasive uncertainty, incomplete understanding, data gaps, and unknowns related to lynx conservation in the contiguous United States. Based on the discussions above regarding habitat delineation, plant associations, the assigned distinction of primary/secondary habitat, the concepts of intermingled/adjacent habitat, and the extent of variation in home range sizes, we recommend clarification from the Biology Team on how they determined that 10 mi^2 of primary habitat should be used as a standard and that a preference for the subalpine fir series should be extrapolated across the entire western region.

Issue III: Conservation of Lynx Outside of LAUs

At a Service meeting held in August 2000 in Spokane it was agreed that areas that were originally mapped as habitat and/or areas with a number of lynx occurrences, that no longer meet the criteria for inclusion in LAUs under the current mapping direction, would continue to be evaluated to determine if

they should be managed for lynx in the future. These areas were later termed "Evaluation Areas" by the Service. In the November 2000 letter from the Service to the Regional Forester, the Service stated that use of the LCAS would be appropriate within the "Evaluation Areas" to evaluate effects of proposed actions and to identify measures to minimize impacts and potential take of lynx.

In Washington, areas that we consider "Evaluation Areas" include: 1) the area around Mount Baker and Baker Lake which contain numerous recent reports of lynx; 2) the area around Crystal Mountain Ski Resort northeast of Mount Rainier National Park (this area likely will be included within an LAU that is shared by the Wenatchee NF); and 3) a zone starting just north of the Goat Rocks Wilderness and surrounding area and connecting this wilderness with the Indian Heaven Wilderness south-west of Mount Adams on the Gifford Pinchot NF (based on trapping records, topography, vegetation and climatic influence).

In Oregon, areas that warrant management as "Evaluation Areas" include: 1) the high elevation flats starting just west of the Mount Jefferson Wilderness area and extending south to the Sky Lakes Wilderness Area. This zone contains a number of reliable recent lynx reports and trapping records, as well as the topography, vegetation, prey, and climatic conditions favorable for lynx; 2) the habitat and connectivity corridor joining the Cascades and Blue Mountains on the Deschutes, Ochoco and Malheur National Forests. Because the I-84 corridor and dams on the Columbia are considered to be a movement barrier, this is the only way for genetic exchange to occur to the southern Cascades; 3) the area around Mt. Hood and Bennett Pass due to a cluster of 14 lynx sightings in the area and proposed ski area developments; and 4) previously mapped habitat on the Winema and Fremont National Forests due to clusters of recent reliable sightings, confirmed specimens in/or south of these clusters, and past records indicating a presence.

Conclusion

Current and historical sighting records, historical documents, and anecdotal evidence suggest that lynx occurred on both sides of the Cascade Mountains in Oregon and Washington. These records show that lynx may have been more wide-spread and abundant than was previously considered and indicate that it is likely that both resident as well as transient animals occurred in both states. While there is insufficient data to ascertain population size or trends in Oregon or Washington, this is also true of all of the other geographic regions where lynx occur. It is important to recognize that the Endangered Species Act (ESA) does not differentiate between resident and transient individuals nor does it require "resident, reproductive populations" as the threshold for consideration during consultation. Thus the obligation to minimize effects and the potential for incidental take applies where the species is documented or suspected to occur. This is particularly important in areas where the vegetation types, prey availability, and climatic conditions resemble those conditions found in areas where lynx are known to occur.

We request that the Steering Committee, the Science Team, and the Biology Team review the information provided, respond to the questions presented in this report, provide guidance on how new

information will be incorporated, and consider how the current guidelines will ensure the conservation of lynx in the Cascades Geographic Areas. Your assistance is greatly appreciated and we look forward to your response.

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