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March 23, 2007

Kathy McAllister, Acting Regional Forester
U.S. Forest Service, Northern Regional Office
200 East Broadway
Missoula, Montana 59802

Dear Ms. McAllister:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the effects of the Northern Rocky Mountains Lynx Amendment on the Distinct Population Segment (DPS) of Canada lynx (*Lynx canadensis*)(lynx) in the contiguous United States, in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). The Service received your November 23, 2005, request for formal consultation on behalf of the U.S. Forest Service (Forest Service) and Bureau of Land Management (BLM) on November 29, 2005. We received your revised biological assessment on December 13, 2006, indicating that Forests and/or areas identified as not currently occupied by lynx would not have specific management direction for lynx until such time as those areas are occupied. We also note that on December 20, 2006, we were notified that the BLM had decided to withdraw from this particular amendment process, as they manage relatively minor amounts of lynx habitat within the project area, and were involved in separate planning efforts in Idaho and Utah (Ray Smith, U.S. Forest Service, pers.comm. 2006). In response, on January 10, 2007 we received your January 4, 2007 revised biological assessment (reflecting the withdrawl of BLM lands).

This biological opinion is based primarily on information provided in the January 4, 2007 revised Biological Assessment (BA) (U.S. Forest Service 2007); various supplemental information supplied by the Forest Service and contained in this document or in our project file; the Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000); the Lynx Conservation Agreement of which the Forest Service and the Service are signatories (U.S. Forest Service and U.S. Fish and Wildlife Service 2005 and 2006); the Lynx Science Report (Ruggiero et al. 2000a); and more recent research and information. We also considered information in our files, including but not limited to information related to the final listing rule (March 24, 2000; 65 FR 16052), the clarification of findings (July 3, 2003; 68 FR 40076), the final critical habitat designation (November 9, 2006; 71 FR 66008), our remanded determination in our clarifications of findings of our final rule (January 10, 2007; 72 FR 1186), the lynx recovery plan outline (U.S. Fish and Wildlife Service 2005), and various agency correspondence as part of our deliberations. A complete record of this formal consultation is on file at the Service's Regional and Montana Fish and Wildlife Offices.

The Service concurs with the Forest Service's determinations that the proposed action is not likely to adversely affect the following federally listed species: gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos horribilis*), woodland caribou (*Rangifer tarandus caribou*), chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*Oncorhynchus nerka*), and bull trout (*Salvelinus confluentus*). We concur with the rationale for these findings found in the BA.

Consultation History

On October 25, 2000, we issued a biological opinion on the National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans on Canada lynx in the contiguous United States. The Forest Service/BLM proposal was designed to moderate the effects of the plans on lynx on Forest Service and BLM lands until their management plans could be amended to incorporate lynx management strategies. In the interim, the Plans would be implemented under the Conservation Agreements (see (3) below), which required the use of the best available information, including the LCAS, to determine whether projects were likely to adversely affect lynx or not. Projects that were likely to adversely affect lynx were deferred until Plans were amended to consider the conservation of lynx (with a few exceptions for third party projects). The 2000 biological opinion considered the effects of implementing the Forest Plans under the interim strategy (i.e. implementing the Plans under the Conservation Agreements) on a national basis and determined that its effects did not jeopardize the continued existence of the species, and in fact, constituted a benefit over the status quo (i.e. current Forest Plan direction). Furthermore, our 2000 biological opinion also concluded that if Plans were amended or revised to incorporate the conservation measures in the LCAS (see below), or an equivalent thereof, the Plans would not likely jeopardize the continued existence of lynx.

Thus, the Forest Service has increased lynx conservation efforts since 2000 on an interim basis, in part by following the Conservation Agreements (2000; 2005; 2006). The Conservation Agreements were very conservative in that it required deferral of most projects that would likely adversely affect lynx, which was considered an appropriate interim direction until full consideration could be given to amending or revising Forest Plans to conserve lynx overall.

The 2000 consultation built upon the efforts of the National Interagency Lynx Steering Committee (comprised of representatives from the Service, Forest Service, BLM, and NPS), a coordination effort that directed or resulted in the compilation of the following documents considered essential for understanding lynx ecology and implementing appropriate conservation measures on Federal lands:

(1) Lynx Science Report—A Science Team was selected to prepare a scientific report that amassed and interpreted all available scientific knowledge regarding Canada lynx, lynx prey, and lynx habitats. This report was first distributed to the public electronically in 1999, and subsequently published as a book entitled "Ecology and Conservation of Lynx in the United States" (Ruggiero et al. 2000a). Hereafter, this publication will be referred to as the Science Report.

(2) Canada Lynx Conservation Assessment and Strategy—(LCAS) An interagency Lynx Biology Team used information provided in the Science Report to develop a conservation strategy for Canada lynx on Federal lands. This effort was initiated through an action plan approved by the affected Regional Foresters of the Forest Service, State Directors of the BLM, and Regional Directors of the Service by memorandum dated June 5, 1998. Publication of the LCAS (Ruediger et al. 2000) culminated this effort. A revision of the LCAS by the cooperating agencies is underway.

(3) U.S. Forest Service Canada Lynx Conservation Agreements—The Forest Service (Regions 1, 2, 4, 6, and 9) and the Service (Regions 1, 3, 5, and 6) entered a Canada Lynx Conservation Agreement on February 7, 2000, to promote the conservation of lynx and lynx habitat on lands managed by the Forest Service (U.S. Forest Service and U.S. Fish and Wildlife Service 2000).

The agreement was revised and extended in May 2005 (U.S. Forest Service and U.S. Fish and Wildlife Service 2005). In the revised agreement, one change from the original was that the conservation agreement would apply only to those National Forest lands mapped as "occupied lynx habitat." In May 2006, the revised conservation agreement was amended to include a definition of "occupied lynx habitat" (U.S. Forest Service and U.S. Fish and Wildlife Service 2006). The Service issued internal guidance for coordination and consultation with the Forest Service in 2006 (U.S. Fish and Wildlife Service in litt. 2006).

(4) Bureau of Land Management Canada Lynx Conservation Agreement—The BLM (Colorado, Idaho, Montana, Oregon/Washington, Utah, and Wyoming) and the Service (Regions 1 and 6) entered a Canada Lynx Conservation Agreement on August 18, 2000, to promote the conservation of lynx and lynx habitat on Federal lands managed by the BLM. Although this conservation agreement expired in December 2004, the BLM continues to adhere to their original agreement (70 FR 68308).

In 1999, the Deputy Regional Forester, Northern Region, in her capacity as Chair of the National Interagency Lynx Steering Committee, provided the affected Forests with direction and information for proceeding with conferencing (or consultation should the lynx be listed) (U.S. Forest Service in litt. 1999). Each National Forest was advised to begin mapping lynx habitats in coordination with respective Service field offices. Specific tasks outlined in the memorandum included the preparation of maps of lynx habitat on National Forests and BLM districts, and the delineation of Lynx Analysis Units (LAUs) (as recommended in the then draft LCAS) within mapped lynx habitat.

Lynx habitat maps were developed using the best available information regarding lynx habitat types, as well as the best mapping resources available to the Forest Service at the time. The types of mapping resources and technology available on each Forest varied, and thus the accuracy and precision varied as well. Further examination and refinement of lynx habitat mapping followed. During 1999, interagency meetings were held, including state-specific meetings with local Service, Forest Service and BLM representatives to refine lynx habitat maps and LAU designations. Since then, the Service, Forest Service and BLM, aided by the Lynx Biology Team and lynx scientists, have further refined lynx maps through better mapping

techniques and several ground truthing exercises (Jim Claar, U.S. Forest Service pers. comm. 2006). Thus, we expect that lynx habitat maps and LAUs would be further refined and improved as information becomes available. It is important to note that lynx habitat types, were identified on all National Forests, without consideration at that time, of whether or not lynx were actually present in those areas.

Between 1999 and 2002 the Forest Service conducted an extensive National Lynx Survey to detect the presence of lynx on National Forests throughout the range of the United States lynx DPS (J. Claar, pers. comm. 2007).

In 2005 the Service, along with representatives from the Forest Service, completed a Recovery Outline for the Contiguous United States Distinct Population Segment of the Canada Lynx (recovery outline) (U.S. Fish and Wildlife Service 2005). This recovery outline is to serve as an interim strategy to guide recovery efforts until a final recovery plan is completed. The outline identifies core, secondary, and peripheral areas for lynx and preliminary recovery actions.

This current consultation addresses proposed amendments to the Land and Resource Management Plans on 18 National Forests in the Northern Rocky Mountains analysis area. The proposed amendments will replace the interim strategy of implementing the 18 Forest Plans under the Conservation Agreements (2000, 2005 and 2006). The proposed amendments were designed to address the significant factor causing the lynx to be listed as a threatened species, which was the lack of Federal land management plan guidance to conserve lynx and the potential for these plans to allow or direct actions that adversely affect lynx (March 24, 2000; 65 FR 16052). This biological opinion replaces the previous national consultation (U.S. Fish and Wildlife Service 2000) for the Land and Resource Management Plans on 18 National Forests in Idaho, Montana, and Wyoming (see Appendix A for list).

Similar to the 2000 biological opinion, this consultation on the amended Forest Plans represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx as implemented under the amended Forest Plans being the second tier of consultation. Second tier biological opinions would be issued as appropriate, where proposed actions would result in adverse effects to lynx. These second tier biological opinions would reference back to this biological opinion to ensure that the effects of specific projects under consultation, taken together with all other second tier projects are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier biological opinion, the cumulative total of incidental take exempted would be tracked along with all other take that had been exempted.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Action Area

The Forest Service proposes to amend Land and Resource Management Plans (Plans) of 18 National Forests to manage lynx habitat as described and detailed in the BA and supplemental information. This action area includes the 18 National Forests within the states of Idaho, Montana, Utah, and Wyoming. See Appendix A of this document for a list of National Forests covered by this biological opinion. A map of the action area is included as Appendix B (or see http://www.fs.fed.us/r1/planning/lynx.html). The NRLA area encompasses approximately 38,530,000 acres of National Forest System lands. A subset of these acres constitute lynx habitat. Of the acreage in the NRLA area, 18,470,000 acres of National Forest lands are considered lynx habitat.

Proposed Action

The Forest Service proposes to amend the Plans on the 18 National Forests listed in Appendix A to incorporate management direction from the LCAS, with modifications and additions based on recent information. The Forest Service manages lands in the action area under many programs; however, not all of these programs affect lynx. This biological opinion only addresses forest management programs that have the potential to affect lynx. Forest Service land management has the *potential* to influence 15 factors that impact lynx: denning habitat, foraging habitat, habitat conversions, vegetation thinning, fire management, landscape patterns, road management, developed recreation, non-winter recreation, winter recreation, minerals, connectivity, land adjustments, coordination, and monitoring (Hickenbottom et al. 1999). Thus, the Forest Service proposes to amend existing management plans by incorporating additional management direction to address these factors to protect lynx where they occur. The amendment affects the following programs: vegetation management, including pre-commercial thinning, timber harvest, fuels management, and salvage harvest, and forest roads, livestock grazing, minerals, developed recreation, non-winter dispersed recreation, habitat connectivity, and winter recreation.

The NRLA draft Environmental Impact Statement (DEIS) (U.S. Forest Service 2004) proposed that amendment management direction be applied to all habitats that could support lynx. In 2005 and 2006, the revised Canada Lynx Conservation Agreement (U.S. Forest Service and U.S. Fish and Wildlife Service 2005 and 2006) directed that the agreement would apply only to those National Forest lands mapped as "occupied lynx habitat". The 2006 amended conservation agreement defined occupied lynx habitat:

> **"All lynx habitat on an entire Forest is considered "occupied" by lynx when:**
> 1) There are at least two verified lynx observations or records since 1999 on the national forest unless they are verified to be transient individuals; or
> 2) There is evidence of lynx reproduction on the national forest."

The Forest Service applied this concept to develop the current proposed action. The BA explains that for areas identified as **occupied lynx habitat** in the conservation agreement (U.S. Forest Service and U.S. Fish and Wildlife Service 2006), management direction would include the objectives, standards, guidelines, and monitoring identified under the proposed action (see Appendix C). Areas identified as **unoccupied lynx habitat** would not have any mandatory management direction for lynx until such time as those Forests and areas become occupied; until then, the amendment direction would be "considered". The Service notes that verification of lynx to be transient would likely take additional surveys of the area in which the records were acquired, or some other action in order to discount the possibility that the animal has an established territory or home range. If and when lynx occupy Forests that are currently unoccupied, or portions of Forests in disjunct areas with unoccupied lynx habitat, the Forests would begin implementing the direction in the proposed action.

Appendix C of this document contains a comparison provided in the BA of the baseline management, Alternative B (the NRLA LCAS-based Forest Plan alternative) and the proposed action, Alternative F. Note that the Forest Service *would not* apply the measures in the proposed action in areas unoccupied by lynx, until lynx are determined to be present in those areas. This factor is not reflected in the comparison of Alternatives contained in our Appendix C.

Occupied lynx habitat

Within the NRLA area, 12 National Forests, encompassing 12,150,000 acres (BA), are considered **occupied** by lynx (U.S. Forest Service and U.S. Fish and Wildlife Service 2006) and full amendment direction would apply (Table 1.) Further, all Forests within the NRLA that were designated core area, as defined in the lynx recovery outline, are occupied by lynx (U.S. Forest Service and U.S. Fish and Wildlife Service 2006). Nine of the 12 occupied Forests are entirely or partially in lynx core area (C) (U.S. Fish and Wildlife Service 2005), three are in secondary area (S), and three have lynx habitat in both core and secondary areas:

- Bridger-Teton National Forest (C)
- Clearwater National Forest (S)
- Custer National Forest (C and Peripheral)
- Flathead National Forest (C)
- Gallatin National Forest (C and S)
- Helena National Forest (C and S)
- Idaho Panhandle National Forest (S)
- Kootenai National Forest (C)
- Lewis and Clark National Forest (C, S and Peripheral)
- Lolo National Forest (C)
- Shoshone National Forest (C)
- Targhee National Forest (S)

Unoccupied lynx habitat

Of the 18 National Forests within the action area, 6 encompass 6,320,000 acres of lynx habitat (BA) that are currently **unoccupied** by lynx (U.S. Forest Service and U.S. Fish and Wildlife

Service 2006). Amendment management direction would not be mandatory, but may be "considered". None of these six Forests are within the core areas identified in the lynx recovery outline. Of these six, four are in secondary area and two are in peripheral areas only:

- Ashley National Forest (Peripheral lynx habitat only)
- Beaverhead-Deerlodge National Forest (S)
- Bighorn National Forest (Peripheral lynx habitat only)
- Bitterroot National Forest (S)
- Nez Perce National Forest (S)
- Salmon-Challis National Forest (S)

- Further, portions of the Helena, Lewis and Clark and Gallatin Forests are also considered unoccupied. These areas include several disjunct mountain ranges in eastern Montana; some are in secondary areas (Big Belts, Little Belts, Castle, Bridger, Crazy, and Elkhorn Mountain ranges) and others are entirely within peripheral areas (Big Snowy, Pryor and Highwood Mountains).

Relationship of proposed action to existing management

For the past six years, the Forest Service has been managing lands in accordance with the Conservation Agreements (U.S. Forest Service and U.S. Fish and Wildlife Service 2000; U.S. Forest Service and U.S. Fish and Wildlife Service 2005; U.S. Forest Service and U.S. Fish and Wildlife Service 2006). According to the Conservation Agreements, most projects with adverse effects on lynx would be deferred until Plans were revised or amended, and the recommendations of the LCAS would be considered when amending Plans. Because the lands in the action area have been managed according to the Conservation Agreements for six years, the Forest Service considered management consistent with the Conservation Agreements to be the baseline condition (see BA).

This amendment would change management from baseline management because it would allow Forest Service actions with adverse effects on lynx to proceed in occupied habitat, after appropriate consultation. However, compared to direction under the current Conservation Agreements, the direction to be applied in occupied habitat, including all core area within the NRLA area, includes proactive management objectives with implementing standards and guidelines intended to promote the conservation of lynx and lynx habitat. The proposed amendment would allow some adverse effects to lynx primarily from the following: 1) fuels management projects that are exempted from vegetative management standards inside wildland-urban interface (WUI) in up to six percent of occupied lynx habitat; and 2) exceptions to vegetative standards for some pre-commercial thinning projects that are conducted for fuels treatment or other resource benefits (e.g., whitebark pine restoration) in up to 64,320 acres of occupied lynx habitat over a 10-year period (U.S. Forest Service in litt. 2007b)(Appendix D-Table 1). In unoccupied lynx habitat, existing Plan direction would continue. The amendment could be considered in such areas, but the existing Forest Plan direction would allow actions that could negatively impact unoccupied lynx habitat.

Some LCAS standards were changed to guidelines because the Forest Service considers guidelines more appropriate for those risk factors the Service determined were not negatively affecting the contiguous U.S. lynx DPS as a whole (March 24, 2000; 65 FR 16052), and therefore the Forest Service determined that that level of constraint [implied by standards] is not warranted (R. Smith, pers. comm. 2006). The Service notes that where we determined in our finding that certain risk factors did not negatively affect the lynx DPS, the risks may impart adverse affects to individual lynx depending upon site specific conditions. Further, the Forest Service modified the some standards from that in the LCAS to include the exemptions and exceptions noted above or to clarify the intent of a standard. Finally, in some cases there was a lack of scientific or reliable information to indicate that certain standards were needed in most cases to avoid adverse effects to lynx (see Appendix C).

Guidelines would be implemented in most cases (BA; U.S. Forest Service 2004). The 2004 DEIS defines a "guideline" as follows: "A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations may be documented, but amending the plan is not required." A standard is defined as follows: "A standard is a required action in a land management plan specifying how to achieve an objective or under what circumstances to refrain from taking action. A plan must be amended to deviate from a standard." The BA indicates that guidelines would be adhered to in most cases, except where compelling reasons, such as the protection of other species at risk or protection of public safety, are an issue. Finally, the amendment includes a vegetation standard to conserve multi-storied forested stands, which was not included in the LCAS.

Elements of the Proposed Action

The following direction, objectives and implementing standards and guidelines, would apply to the areas of 12 National Forests that encompass occupied lynx habitat (about 12.2 million acres) (see Table 1). For those areas on National Forests that have lynx habitat that is currently unoccupied (about 6.3 million acres), the direction would be applied if and when lynx are determined to occupy the areas. In the meantime, the direction may be "considered". An area would be determined "occupied" if it met the criteria in the amendment to the Canada Lynx Conservation Agreement (US Forest Service and U.S. Fish and Wildlife Service 2006), which are two verified lynx reports since 1999, and/or evidence of lynx reproduction. In both occupied and unoccupied lynx habitat in nondevelopmental allocations, management actions such as vegetation alterations would be substantially curtailed, if they occur at all, and natural processes and disturbances would predominate (Appendix F). Refer to Appendix C for the complete proposed action for occupied lynx habitat (Alternative F).

Habitat Connectivity The Forest Service proposes to require all new or expanded permanent developments and vegetation management activities to maintain or enhance habitat connectivity. This direction is designed to enhance the ability of lynx to move freely across the landscape during periods of dispersal or food scarcity and reduce mortality risk associated with highways. The proposed action includes an objective to pursue conservation easements, land exchanges, and other actions to reduce adverse impacts on lynx and lynx habitat within linkage zones

(**LINK O1** and **HU O6**). The proposed action includes two standards and two guidelines for managing lands to implement this objective by considering lynx movement within and between blocks of suitable habitat:

- New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area (**All S1**).
- When highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings (**LINK S1**).
- National Forest Service lands should be retained in public ownership (**LINK G1**).
- Livestock grazing in shrub-steppe habitats should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes (**LINK G2**).

Vegetation Management

Timber harvest and thinning

Vegetation management in the NRLA area includes timber harvest, pre-commercial thinning, and commercial thinning. Within lynx habitat, the Forest Service proposes to limit vegetation management that changes habitat to a "stand initiation structural stage" (described in the LCAS as "lynx habitat in unsuitable condition") to within no more than 30 percent of the lynx habitat within an LAU, with the exception of fuels management projects within the WUI, which are exempted from this standard (see details in *Fuels Management* section below).

The Forest Service conducts and/or permits silvicultural thinning to reduce dense horizontal structure and encourage growth of remaining trees. Pre-commercial thinning projects during the stand initiation stage reduce the quality of snowshoe hare habitat and thus reduce prey for lynx. Within occupied lynx habitat, the Forest Service proposes to not conduct pre-commercial thinning, with exceptions for specific circumstances. Within the NRLA area approximately 21,870 to 64,320 acres (2,100 to 6,420 acres/year) of lynx habitat may be pre-commercially thinned under these special circumstances over the next 10 years, primarily to benefit other resources such as whitebark pine (see Appendix D, Table 1). If full funding is obtained, the amount constitutes an increase of more than three times over the current average of about 2,190 acres per year. Based upon recent information from Montana (1994-1998) however, the Forest Service has received about 35 percent of the funding needs identified (note historic averages in , Appendix D, Table1). Although funding for pre-commercial thinning could increase, it is unlikely that full funding to treat all acres identified would be realized.

Thinning or reduction of the understory of older multi-story structural stages would also reduce the quality of snowshoe hare habitat and thus reduce lynx prey and foraging habitat. Within lynx habitat, the Forest Service proposes to not conduct projects that reduce snowshoe hare habitat in multi-storied mature or late success ional forests that provide snowshoe hare habitat, with exceptions for specific circumstances during salvage operations and research.

The Forest Service proposes to manage vegetation and fuels within the NRLA area according to the following standards and guidelines to minimize the effects of vegetation management on lynx and lynx habitat:

- Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages limit disturbance in each LAU as follows: if more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat no additional habitat may be regenerated by vegetation management projects **(VEG S1)**.
- Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS or BLM lands in an LAU in a ten-year period **(VEG S2)**. *Note:* The Forest Service defines "regeneration" as cutting trees and creating an entire new age class; an even-age harvest. The major methods are clearcutting, seed tree, and shelterwood cuts (R. Smith, pers. comm. 2006).
- Pre-commercial thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat only: 1) within 200 feet of administrative sites, dwellings, or outbuildings; or 2) for research studies or genetic tree tests evaluating genetically improved reforestation stock; or 3) based on new information that is peer reviewed and accepted by the regional/state levels of the Forest Service and FWS, where a written determination states: a) that a project is not likely to adversely affect lynx; or b) that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat.; or 4) for conifer removal in aspen, or daylight thinning around individual aspen trees, where aspen is in decline; or 5) for daylight thinning of planted rust-resistant white pine where 80% of the winter snowshoe hare habitat is retained; or 6) to restore whitebark pine **(VEG S5)**.
- Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests may occur only: within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or for research studies or genetic tree tests evaluating genetically improved reforestation stock; or for incidental removal during salvage harvest (e.g. removal due to location of skid trails). *Note:* Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover (e.g. uneven age management systems could be used to create openings where there is little understory so that new forage can grow)**(VEG S6)**.
- Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority should be given to stem-exclusion, closed-canopy structural stage stands for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat should be near denning habitat **(VEG G1)**.
- Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU **(VEG G5)**.
- Fuel treatment projects in the WUI as defined in HFRA should be designed considering standards VEG S1, S2, S5 and S6 to promote lynx conservation **(VEG G10)**
- Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future **(VEG G11).**

Fuels treatment projects within the WUI are exempted from the vegetation standards described above. The Forest Service added the following language to **VEG S1, S2, S5, and S6**, (described above) to limit the acreage of lynx habitat that could be treated by fuels management projects that may adversely affect lynx (described below):

- Cumulative total of fuel treatment projects within the WUI that do not meet the vegetation standards shall not affect more than six percent of lynx habitat per Forest in the amendment area. For fuel treatment projects within the WUI follow guideline **VEG G10**.

Fuels management

Fire management includes wildland fire use, prescribed fire, and mechanical treatment of fuels. It is generally acknowledged that in the Northern Rocky Mountains fire suppression has altered historic vegetative patterns. This effect has been most pronounced within vegetation communities that have fire regimes that are of low intensity or of mixed severity. Many of these are drier community types and are not considered lynx habitat. Spruce-fir habitats (lynx habitat) appear to have been little or less affected by fire suppression because the fire regimes within this type tend to be stand replacing events occurring at low frequencies (i.e. every 100 years or more) (Agee 2000). Depending on the moisture regime, large stand-replacing fires within lynx habitat may produce dense regenerating growth, providing high quality snowshoe hare foraging habitat after approximately 10 to 30 years. This vegetative condition provides high quality snowshoe hare habitat, but mature forests are also very important as winter foraging habitat (John Squires, U.S.D.A. Intermountain Research Station, pers. comm. 2005; McKelvey et al. 2000d).

The Forest Service has been giving increased attention to fuel management within the WUI as directed by the Healthy Forest Restoration Act (HFRA). The Federal Register defines a community at risk as areas with greater than 28 people per square mile. The Forest Service uses the definition of WUI as found in the HFRA, which is variable in extent depending upon the terrain and other factors. In order to determine effects, the Forest Service estimated the WUI zone as encompassing an area generally extending an average of 1 mile from a community at risk, but can vary based upon the specific community. The Forest Service projects that the cumulative total of fuel treatment projects within the combined WUI areas, as implemented under the proposed action, will not affect more than 6 percent of all lynx habitat per Forest within the amendment area. Fuels management projects are proposed to occur wherever necessary, both inside and outside the WUI. The Forest Service anticipates that the majority of these projects would occur within the WUI but would need flexibility in some cases.

Standards **VEG S1, S2, S5, and S6** apply to fuels management projects that would occur outside the WUI, as described in the following amendment language:

- Standard **VEG S1** applies to all vegetation and fuel treatment projects outside the wildland urban interface as defined by HFRA.
- Standard **VEG S2** applies to all vegetation and fuel treatment projects that use timber harvest to achieve objectives, outside the wildland urban interface as defined by HFRA.
- Standard **VEG S5** applies to precommercial thinning projects that use precommercial thinning to achieve objectives, outside the wildland urban interface as defined by HFRA.

- Standard **VEG S6** applies to all vegetation and fuel treatment projects outside the wildland urban interface as defined by HFRA.

The following language immediately follows in each of the above standards to limit the acreage treated by exceptions for fuels management:

- ...Cumulative total of fuel treatment projects within the WUI that do not meet the vegetation standards shall not exceed six percent of mapped lynx habitat per Forest in the amendment area. For fuel treatment within the WUI follow guideline **VEG G10**.

A maximum of six percent of lynx habitat within WUI areas across the NRLA area could be treated through fuel treatment projects that would not meet the standards. This limit was derived from approximating the percent of mapped lynx habitat that falls within the cumulative area of the WUIs (generally extending an average of 1 mile from a community at risk). In order to meet the goals of community protection in the Healthy Forest Restoration Act, the Forest Service is assuming that the entire WUI *could* be treated under the amendment. However, the need to treat the entire area within the WUI, equaling six percent, as well as obtaining the funding necessary to do so, is unlikely (BA). Therefore, to estimate the amount of area most likely to be treated, as compared to the six percent within the WUI, the Forest Service obtained actual estimates of needed treatments from each Region to determine the acreage more likely to be treated within the WUI within the NRLA (for more information, see Appendix E). These estimates are shown in Table 1. Note that the total amount of lynx habitat likely to be treated during the 10 years this biological opinion is in effect within the amendment area is approximately 1.8 percent, substantively less than the 6 percent maximum proposed by the Forest Service. "Treatments" include all management activities that could be used to conduct fuel management, including prescribed fire, wildland fire use, thinning, and timber harvest.

Table 1. Acres of occupied lynx habitat likely to be treated to reduce hazardous fuels in the NRLA area (from U.S. Forest Service in litt. 2007 – Appendix E).

Area	Acres Treated/Decade (% of Lynx Habitat)
Within the 1-mile WUI zone (> 28 people mi^2)	170,270 (1.4%)
Outside 1 mile WUI zone	392,860 (3.2%)
Total	**563,130 (4.6%)**

In addition to the standards and exceptions listed above for vegetation management, the Forest Service proposes to apply the following guidelines to further minimize the effects of the proposed action on lynx:

- Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided. (**VEG G4**).

Roads and Highways Table 2 displays a breakdown of road categories and past and current planned activities within lynx habitat in the NRLA. Appendix D, Table 7 displays the projections per occupied and unoccupied Forests.

Table 2. Categories of road management activities within lynx habitat in the NRLA area (U.S. Forest Service in litt. 2007-Appendix D).

Category	Miles
Maintained for high clearance vehicles (Maintenance level 2)	8,664.0
Maintained for low clearance vehicles (Maintenance levels 3-5)	6,929.0
Roads of 2+ lanes which have been paved within past 10 years	14.7
Roads of 2+ lanes which are planned to be paved during the next 5 years	45.4
Roads of 1 lane which have been paved for environmental concerns over the past 5 years	2.0
Roads of 1 lane which are planned to be paved for environmental concerns over the next 5 years	2.0
Roads constructed during past 5 years that remain open	14.4
Roads planned to be constructed that would remain open over next 5 years	4.9
Roads planned to be upgraded over the next 5 years	237.4
Roads planned on ridge tops that would remain open	7.0

The Services's final rule listing the lynx determined that forest roads were not known to negatively impact resident lynx populations (March 24, 2000; 65 FR 160052). The proposed action includes the following guidelines that would reduce the potential effects of forest roads on lynx and lynx habitat:

- Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses or overpasses (**ALL G1**).
- Methods to avoid or reduce effects to lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development (**HU G6**).
- New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers (**HU G7**).
- Cutting brush along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety (**HU G8**)
- On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives (**HU G9**).

Recreation The Forest Service proposes to manage approximately 13,375 miles of designated and groomed snowmobile/cross-country ski routes within the NRLA area; 7,975 miles (60 percent) of that total are within mapped lynx habitat (U.S. Forest Service in litt. 2007)(Appendix D). Twenty-eight existing downhill and cross-country ski areas encompass 21,259 acres in lynx habitat. Ten of these areas have plans for expansion and one new ski area is planned within lynx habitat. The effects of nine of these expansions were previously addressed in a biological opinion (U.S. Fish and Wildlife Service 2001). The remaining two would impact a total of 1,000 acres (R. Smith, pers. comm. 2006). The NRLA contains 2,722 special use permits and

agreements. Three hundred and fifty-nine of those permits and agreements are for winter activities; of those, 338 (94%) are within lynx habitat.

The Service's final rule listing the lynx determined there was no evidence that competition from coyotes, bobcats, or mountain lions, as facilitated by compacted snow trails, was negatively affecting lynx at a population-level scale (March 24, 2000; 65 FR 16052). The Forest Service proposes to implement the following guidelines to minimize the potential effects of the proposed action on lynx and lynx habitat:

- Developed Recreation:
  - When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris, so winter snowshoe hare habitat is maintained (**HU G1**)
  - When developing or expanding ski areas, nocturnal foraging should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes (**HU G2**).
  - Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat (**HU G3**).
  - When developing or expanding ski areas and trails, access roads and lift termini should be located to maintain and provide lynx diurnal security habitat (**HU G10**).

- Winter Recreation Designated over-the-snow routes, or designated play areas, should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This guideline does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by guideline **HU G12** (**HU G11**).

Minerals

Leaseable minerals

The Forest Service manages approximately 820,000 acres under lease for oil and gas with additional acreage pending for lease. Only three wells have been drilled on public lands within lynx habitat during the past ten years (U.S. Forest Service in litt. 2007)(Appendix D); all have been plugged and abandoned. Recent estimates of foreseeable oil and gas development suggest that approximately 39 wells may be drilled within lynx habitat in the NRLA area. In addition, one exploratory well is expected to be drilled. About 75 percent of the wells would occur in occupied lynx habitat.

Locatable minerals (gold, silver, copper, etc.) and mineral materials (gravel, rock, sand)

During FY 2000, 142 Plans of Operations and 550 Notices of Intent to operate were processed on the Forests involved in the NRLA effort (BA). Over the past 15 years (1990 – 2004) approximately one-third of the Plans of Operation and Notices of Intent were located in lynx habitat. Most current activities are related to maintenance of existing facilities. Most disturbances associated with locatable minerals are less than 20 acres in size, although there are five large (100 to 600 acres) operations on National Forest System lands within lynx habitat in the NRLA area. Five mineral operations exist within the entire NRLA (see table 6, Appendix D for break out of occupied and unoccupied Forests). Two of these are operating and the other

three are in the care and maintenance or reclamation phases. Four to nine may be developed within the next decade. The potential for future mineral discovery is considered low (BA).

The Forest Service manages approximately 2,600 active mineral material pits within the NRLA area (BA). Of these, about two to three percent (52-78) of the sites are within lynx habitat. Currently only one site within lynx habitat has winter operations. Sites are typically from less than one acre to five acres in size.

We found no evidence that mineral development was a factor threatening lynx, therefore, we did not address mineral development in the final listing rule (March 24, 2000; 65 FR 16052). The proposed action contains the following guidelines designed to minimize the impacts of minerals-related activities on individual lynx and lynx habitat:

- For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction (**HU G4**).
- Manage human activities, such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors, to reduce impacts on lynx and lynx habitat (**HU G5**).
- Methods to avoid or reduce effects to lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development (**HU G6**).
- On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives (**HU G9**).
- Winter access for non-recreation special uses, and mineral and energy exploration and development, should be limited to designated routes or designated over-the-snow routes (**HU G12**).

Grazing The Forest Service manages all or portions of 1,420 allotments within lynx habitat in the NRLA area. Table 2, Appendix D, displays these allotments by unoccupied and occupied Forests. The extent of grazing on these lands is not expected to increase over the time frame addressed in this biological opinion. If anything, a decrease in grazing of 5 to 10 percent per year within lynx habitat is possible (Terry Nevius, U.S. Forest Service, pers. comm. 2007). Eighty-five percent of these allotments are managed under some type of aquatic/riparian management strategy (INFISH, PACFISH, etc.) that have some objectives that are similar to those identified in the LCAS for lynx habitat management. Because the Plan amendments are designed to incorporate only new management direction, management direction contained in the LCAS that was redundant with existing management direction is not part of this amendment. Further, measures contained in other Plan direction or agreements that have riparian management strategies also provide benefits to lynx (see BA pages 44 and 45).

We found no evidence that grazing was a factor threatening lynx, therefore, grazing was not addressed in the final listing rule (March 24, 2000; 65 FR 16052). The proposed action includes four new guidelines for grazing management practices that provide for the regeneration of trees, shrubs and aspen clones in lynx habitat. These guidelines are:

- In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating (**GRAZ G1**).
- In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen. (**GRAZ G2**)
- In riparian areas and willow carrs, livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes (**GRAZ G3**).
- In shrub-steppe habitats, livestock grazing should be managed in the elevation ranges of forested lynx habitat in lynx analysis units (LAU), to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes (**GRAZ G4**).

STATUS OF THE SPECIES

The lynx was added to the list of threatened species on March 24, 2000 (65 FR 16052). We concluded that the single factor threatening the contiguous United States DPS of lynx was the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in National Forest Land and Resource Management Plans and BLM land Use Plans. On July 3, 2003, we published a clarification of findings published in the Federal Register (68 FR 40076) determining that threatened species designation was appropriate for the lynx. We published a final rule to designate critical habitat for the Canada lynx in the contiguous United States on November 9, 2006 (71 FR 6600766008). The final critical habitat designation did not include Forest Service lands that are covered by the proposed amendments. Therefore, this biological opinion will not analyze effects to critical habitat, as none will be affected. The Service's various listing rules provide a good resource for a more thorough discussion of life history information on lynx that is summarized below.

Species Description

The lynx is a medium-sized cat with long legs; large, well-furred paws; long tufts on the ears; and a short, black-tipped tail (McCord and Cardoza 1982). The winter pelage of the lynx is dense and has a grizzled appearance with grayish-brown mixed with buff or pale brown fur on the back, and grayish-white or buff-white fur on the belly, legs, and feet. Summer pelage of the lynx is more reddish to gray-brown (Koehler and Aubry 1994). Adult males average 22 pounds in weight and 33.5 inches in length (head to tail), and females average 19 pounds and 32 inches (Quinn and Parker 1987). The lynx's long legs and large feet make it highly adapted for hunting in deep snow.

Home Range and Dispersal

Individual lynx maintain large home ranges (reported as generally ranging between 12 to 83 square miles (Koehler 1990; Aubry et al. 2000; Squires and Laurion 2000; Squires et al. 2004b; Vashon et al. 2005a). The size of lynx home ranges varies depending on abundance of prey, the animal's gender and age, season, and the density of lynx populations (Koehler 1990; Poole 1994; Slough and Mowat 1996; Aubry et al. 2000; Mowat et al. 2000; Vashon et al.

2005a). When densities of snowshoe hares decline, for example, lynx enlarge their home ranges to obtain sufficient amounts of food to survive and reproduce. Preliminary research supports the hypothesis that lynx home ranges at the southern extent of the species' range are generally large compared to those in the core of the range in Canada (Koehler and Aubry 1994; Apps 2000; Squires and Laurion 2000). In northwestern Montana, female home ranges average 34 square miles while male's average 83 square miles (Squires et al. 2004b).

Lynx are highly mobile and have a propensity to disperse long distances, particularly when prey becomes scarce (Mowat et al. 2000). Lynx also make long distance exploratory movements outside their home ranges (Aubry et al. 2000; Squires et al. 2001; Moen et al. 2004). Areas or habitats used by lynx during dispersal or exploratory movements are poorly understood at this time. Evidently lynx are able to traverse expanses of diverse habitat types and conditions during their movements. Dispersing lynx may colonize suitable but unoccupied habitats, augment existing resident populations, or disperse to unsuitable or marginal habitats where they cannot survive. Lynx are capable of dispersing extremely long distances (Mech 1977; Washington Department of Wildlife 1993); for example, a male was documented traveling 370 miles (Brainerd 1985). Lynx disperse primarily when snowshoe hare (*Lepus americanus*) populations decline (Ward and Krebs 1985; Koehler and Aubry 1994; O'Donoghue et al. 1997; Poole 1997). Subadult lynx disperse even when prey is abundant (Poole 1997), presumably as an innate response to establish home ranges.

During the early 1960's and 1970's, numerous lynx were documented in atypical habitat, such as in North Dakota. In those years, harvest returns indicated unprecedented cyclic lynx highs for the 20th century in Canada (Adams 1963; Harger 1965; Mech 1973; Gunderson 1978; Thiel 1987; McKelvey et al. 2000b). Many of these unusual observations were probably dispersing animals that either were lost from the population or later returned to suitable habitat.

Cover is important to lynx when searching for food (Brand et al. 1976). Lynx have been observed (via snow tracking) to avoid large openings (Koehler 1990; Staples 1995) during daily movements within the home range, seeming to prefer to move through continuous forest, using the highest terrain available such as ridges and saddles (Koehler 1990; Staples 1995). Lynx often hunt along edges (Mowat et al. 2000). Kesterson (1988) and Staples (1995) reported that lynx hunted along the edges of mature stands within a burned forest matrix, and Major (1989) found that lynx hunted along the edge of dense riparian willow stands. In Montana, lynx preferentially foraged in spruce-fir forests with high horizontal cover, abundant hares, and large diameter trees during the winter (Squires et al. 2006). Lynx tended to avoid sparse, open forest and forest stands dominated by small-diameter trees during the winter.

The primary factor driving lynx behavior and distribution is the distribution of snowshoe hare, their primary prey. Snowshoe hares prefer boreal forest stands that have a dense horizontal understory to provide food, cover and security from predators. Snowshoe hares feed on conifers, deciduous trees and shrubs (Hodges 2000b). Snowshoe hare density is correlated to understory (horizontal) cover between approximately 3 to 10 feet above the ground or snow level (Hodges 2000b). Habitats most heavily used by snowshoe hares are stands with shrubs, stands that are densely stocked, and stands at ages where branches have more lateral cover (Hodges 2000b). Generally, earlier successional forest stages support a greater density of horizontal understory

and more abundant snowshoe hares (Buehler and Keith 1982; Wolfe et al. 1982; Koehler 1990; Hodges 2000b; Homyack 2003; Griffin 2004). Mature, multistoried stands also can have adequate dense understory to support abundant snowshoe hares (Hodges 2000a; Hodges 2000b; Griffin 2004, Squires et al. 2006).

Diet

Snowshoe hares are the primary prey of lynx, comprising 35 to 97 percent of the diet throughout the range of the lynx (Koehler and Aubry 1994). Other prey species include red squirrel (*Tamiasciurus hudsonicus*), grouse (*Bonasa umbellus*, *Dendragopus* spp., *Lagopus* spp.), flying squirrel (*Glaucomys sabrinus*), ground squirrel (*Spermophilus parryii*, *S. Richardsonii*), porcupine (*Erethrizon dorsatum*), beaver (*Castor canadensis*), mice (*Peromyscus* spp.), voles (*Microtus* spp.), shrews (*Sorex* spp.), fish, and ungulates as carrion or occasionally as prey (Saunders 1963a; van Zyll de Jong 1966; Nellis et al. 1972; Brand et al. 1976; Brand and Keith 1979; Koehler 1990; Staples 1995; O'Donoghue et al. 1998). The primary winter prey species of lynx in Colorado are snowshoe hare and red squirrel, with other mammals and birds forming a minor part of the winter diet (CDOW 2004). Winter food items in Montana included snowshoe hare (96 percent), red squirrel and grouse (Squires and Ruggiero, in press).

During the cycle when hares become scarce, the proportion and importance of other prey species, especially red squirrel, increases in the diet (Brand et al. 1976; O'Donoghue et al. 1998; Apps 2000; Mowat et al. 2000). However, a diet of red squirrels alone might not be adequate to ensure lynx reproduction and survival of kittens (Koehler 1990).

Most research has focused on the winter diet. Summer diets are poorly understood throughout the range of lynx. Mowat et al. (2000) reported through their review of the literature that summer diets have less snowshoe hare and more alternate prey species, possibly because of a greater availability of other species.

In northern regions, when hare densities decline, the lower quality diet causes sudden decreases in the productivity of adult female lynx and decreased survival of kittens, which causes the numbers of breeding lynx to level off or decrease (Nellis et al. 1972; Brand et al. 1976; Brand and Keith 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997). Relative densities of snowshoe hares at southern latitudes are generally lower than those in the north, and differing interpretations of the population dynamics of southern populations of snowshoe hare have been proposed (Hodges 2000b).

Snowshoe hares have evolved to survive in areas that receive deep snow (Bittner and Rongstad 1982). Primary forest types that support snowshoe hare are subalpine fir, Englemann spruce, Douglas fir, and lodgepole pine in the western United States, and spruce/fir, pine, and deciduous forests in the eastern United States (Hodges 2000b). Within these habitat types, snowshoe hares prefer stands of conifers with shrub understories that provide forage, cover to escape predators, and protection during extreme weather (Wolfe et al. 1982; Monthey 1986; Koehler and Aubrey 1994). Hares' use of habitat is correlated with understory cover (Hodges 2000a). Early successional forest stages generally have greater understory structure than do mature forests and therefore support higher hare densities (Hodges 2000a, b). Mature forests also provide snowshoe

hare habitat as openings are created in the canopy when trees succumb to disease, fire, wind, ice, or insects, and the understory develops (Squires et al. 2006). In northwest Montana, connectivity of dense patches of boreal forests interspersed with open habitat, within the forest matrix benefited snowshoe hares (Ausband and Baty 2005).

Den Site Selection

Lynx use a variety of types of large woody debris, such as downed logs, root wads, and windfalls, to provide denning sites with security and thermal cover for kittens (McCord and Cardoza 1982; Koehler 1990; Koehler and Brittell 1990; Mowat et al. 2000; Squires and Laurion 2000; U.S. Fish and Wildlife Service, in litt. 1999; Squires et al. 2006; Merrill and Schenk 2006; Mark McCollough, U.S. Fish and Wildlife Service, pers. comm. 2007). During the first few months of life, kittens are left alone at these sites when the female lynx hunts. Downed logs and overhead cover provide protection of kittens from predators, such as owls, hawks, and other carnivores during this period.

The age of the forest stand does not seem as important for denning habitat as the amount of horizontal structure available, e.g. downed, woody debris (Mowat et al. 2000; M. McCollough, pers. comm. 2007), which provides hiding cover and shelter for kittens. 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. In Montana, lynx selected den sites with higher horizontal cover than elsewhere in the animal's home range (Squires et al. 2006). Seventy-three percent of lynx dens were found in mature, mesic forests. Dens were also located in regenerating mesic forests (18 percent) and boulder fields (7 percent). In Washington, lynx used *Pinus contorta* (lodgepole pine), *Picea* spp. (spruce), and *Abies lasiocarpa* (subalpine fir) forests older than 200 years with an abundance of downed woody debris for denning (Koehler 1990). A den site in Wyoming was located in a mature subalpine fir/ lodgepole pine forest with abundant downed logs and a high amount of horizontal cover (Squires and Laurion 2000). In the northeast United States, lynx dens were found in a several stand types including softwood mid/late regeneration, mature forest mixed regeneration, mature softwood, other regeneration, and hardwood/softwood mid/late regeneration. The structural components of lynx den sites are common features in managed (logged) and unmanaged (spruce budworm damaged areas, wind-throw) stands. Tip-up mounds (root wads) were the most common predictor of den sites (M. McCullough, pers.comm. 2007). A key component for suitable lynx denning habitat appears to be horizontal structural.

Denning habitat in or near foraging habitat is likely to be most functional and selected by females. The hunting range of females is restricted at the time of parturition, and their need to feed kittens requires an abundance of prey. Lynx, like other felids, frequently move their kittens until they are old enough to hunt with their mother. Multiple nursery sites are used that provide kittens with overhead cover and protection from predators and the elements. Downed logs and overhead cover throughout the home range provides security when lynx kittens are old enough to travel (Bailey 1974).

Recruitment

Breeding occurs through March and April in the north (Quinn and Parker 1987). Kittens are born in May to June in southcentral Yukon (Slough and Mowat 1996). The male lynx does not help with rearing young (Eisenberg 1986). Slough and Mowat (1996) reported yearling females giving birth during periods when hares were abundant; male lynx may be incapable of breeding during their first year (McCord and Cardoza 1982).

In northern study areas during the low phase of the hare cycle, few if any live kittens are born, and few yearling females conceive (Brand and Keith 1979; Poole 1994; Slough and Mowat 1996). However, Mowat et al. (2000) suggested that in the far north, some lynx recruitment occurs when hares are scarce and this may be important in lynx population maintenance during hare lows.

During periods of hare abundance in the northern taiga, litter size of adult females averages four to five kittens (Mowat et al. 1996). In Montana, the average litter size in the Seeley Lake study area was 2.3 kittens, and 3.2 kittens in the Purcell Mountains (Squires et al. 2006). Koehler (1990) suggested that the low number of kittens produced in northcentral Washington was comparable to northern populations during periods of low snowshoe hare abundance. In his study area, two radio-collared females had litters of three and four kittens in 1986, and one kitten in 1987 (the actual litter size of one of the females in 1987 was not determined) (Koehler 1990). Of the known-size litters in Washington, one kitten survived the first winter. In Wyoming, one female produced four kittens in 1998, but snow tracking indicated that the kittens were not with the female in November and were presumed dead (Squires and Laurion 2000). The same female produced two kittens in 1999.

Mortality

Reported causes of lynx mortality vary between studies. The most commonly reported causes include starvation of kittens (Quinn and Parker 1987; Koehler 1990), and human-caused mortality, mostly fur trapping (Ward and Krebs 1985; Bailey et al. 1986). In a Montana study, 49 lynx mortalities were recorded, 29 percent due to starvation, 18 percent due to trapping or shooting, 31 percent due to predation (primarily mountain lion), and 22 percent due to unknown causes (Squires et al. 2006).

Significant lynx mortality due to starvation has been demonstrated in cyclic populations of the northern taiga, during the first 2 years of hare scarcity (Poole 1994; Slough and Mowat 1996). Various studies have shown that, during periods of low snowshoe hare numbers, starvation can account for up to two-thirds of all natural lynx deaths. Trapping mortality may be additive rather than compensatory during the low period of the snowshoe hare cycle (Brand and Keith 1979). Hunger-related stress, which induces dispersal, may increase the exposure of lynx to other forms of mortality such as trapping and highway collisions (Brand and Keith 1979; Carbyn and Patriquin 1983; Ward and Krebs 1985; Bailey et al. 1986).

Paved roads have been a mortality factor in lynx translocation efforts within historical lynx range. In New York, 18 translocated lynx were killed on highways (Brocke et al. 1990). Translocated animals may be more vulnerable to highway mortality than resident lynx (Brocke et al. 1990). Nine lynx were killed on 2- and 4-lane Colorado highways following their release as part of a reintroduction effort (CDOW 2005).

Other than translocated animals, two highway mortalities have been documented in Wisconsin (Theil 1987) and Minnesota (Don Carlos, unpubl. report 1997). Twelve resident lynx were documented being killed on highways in Canada and Alaska (Staples 1995; Gibeau and Heur 1996; T. Clevenger, pers. comm. 1999; Alexander, pers. comm. 1999). Lynx were killed on graveled, high-speed forest roads in flatter terrain in Maine (Mark McCollough, U.S. Fish and Wildlife Service, pers. comm. 2006).

Predation on lynx by mountain lion, coyote (*Canis latrans*), wolverine (*Gulo gulo*), gray wolf (*Canis lupus*), and other lynx has been confirmed (Berrie 1974; Koehler et al. 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997; Apps 2000; Squires and Laurion 2000; Squires et al. 2006). Squires et al. (2006) reported 15 lynx mortalities in their Montana study area, greater than 90 percent of which were due to mountain lion predation. Observations of such events are rare, and the significance of predation on lynx populations is unknown.

Interspecific Relationships with Other Carnivores

The two major competition impacts to lynx are likely exploitation (competition for food) and interference (avoidance). Several predators (birds of prey, coyote, gray wolf, mountain lion, bobcat, and wolverine) consume snowshoe hares and therefore compete at some level with lynx for prey. Lynx have adaptations for surviving in areas that have cold winters with deep, fluffy snow for extended periods; these adaptations provide lynx a competitive advantage in hunting snowshoe hare over a number of potential competitors, such as bobcats (*Lynx rufus*) or coyotes (*Canis latrans*) (McCord and Cardoza 1982; Buskirk et al 2000a; Ruediger et al. 2000; Ruggiero et al. 2000). In one paper, coyotes were theorized to most likely pose local or regionally important exploitation impacts to lynx, and coyotes and bobcats were deemed to possibly impart important interference competition effects on lynx (Buskirk et al.2000a). Mountain lions were described as interference competitors, possibly impacting lynx during summer and in areas lacking deep snow in winter, or when high elevation snow packs develop crust in the spring. Long-term snow conditions presumably limit the winter distribution of potential lynx competitors such as bobcats (McCord and Cardoza 1982) or coyotes. Further, bobcats and coyotes have a higher foot load (more weight per surface area of foot), which causes them to sink into the snow more than lynx. Therefore, bobcats and coyotes cannot efficiently hunt in fluffy or deep snow and are at a competitive disadvantage to lynx.

Exploitation competition may contribute to lynx starvation and reduced recruitment. During periods of low snowshoe hare numbers, starvation accounted for up to two-thirds of all natural lynx deaths in the Northwest Territories of Canada (Poole 1994). As described previously, major predators of snowshoe hare include lynx, northern goshawk, great horned owl, bobcat, coyote, red fox, fisher, and mountain lion. In southern portions of snowshoe hare range, predators may

limit hare populations to lower densities than in the taiga (Dolbeer and Clark 1975; Wolff 1980; Koehler and Aubry 1994).

Based on only anecdotal evidence, Parker et al. (1983) discussed competition between bobcats and lynx on Cape Breton Island. Lynx were found to be common over much of the island prior to bobcat colonization. Concurrent with the colonization of the island by bobcats, lynx densities declined and their presence on the island became restricted to the highlands, the one area where bobcats did not become established.

Population Dynamics

Lynx populations in the contiguous United States occur at the southern periphery of a widely-distributed metapopulation whose core is located in the northern boreal forest of central Canada (McCord and Cardoza 1982; Quinn and Parker 1987; McKelvey et al 2000a). The boreal forest of central Canada is vast and extends into Alaska. Lynx in the contiguous United States are at the southern margins, or periphery, of its range. Here, the southernmost extent of the boreal forest that supports lynx occurs in the in the Northeast, western Great Lakes, northern and southern Rockies, and northern Cascades (Ruediger et al. 2000).

The center of North American lynx range is in north-central Canada. Lynx occur in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare (Ruggiero et al. 2000). These forests are generally described as boreal forests. Boreal forests provide optimal habitat for snowshoe hares. In North America, the distribution of lynx is nearly coincident with that of snowshoe hares (Bittner and Rongstad 1982; McCord and Cardoza 1982). Lynx survivorship, productivity and population dynamics are closely related to snowshoe hare density in all parts of its range. In the extensive boreal forests of Canada, snowshoe hare densities reach peak densities of roughly four to six hares per hectare (or 1.6 to 2.4 per acre) and decline to about 0.1 to 1 per hectare (0.04 to 0.4 per acre) during cyclic lows (Krebs et al. 1995, Slough and Mowat 1996, Hodges 2000a). A minimum density of snowshoe hares (greater than 0.5 hares per hectare or1.2 hares per acre (Ruggiero et al. 2000)) distributed across a large landscape is necessary to support survival of lynx kittens and recruitment into and maintenance of a lynx population.

In Canada and Alaska, lynx populations undergo extreme fluctuations in response to the cycling of snowshoe hare, enlarging or dispersing from their home ranges and ceasing the recruitment of young into the population after hare populations decline (Mowat et al. 2000). However, in the contiguous United States, the boreal forest transitions into other vegetation communities and becomes more patchily distributed. As a result, the southern boreal forests generally support lower snowshoe hare densities, hare populations do not appear to be as highly cyclic as snowshoe hares further north, and lynx densities are lower compared to the northern boreal forest. Although snowshoe hare populations in the southern portion of the range (i.e. in the contiguous United States) may fluctuate, they do not show strong, regular population cycles as in the north (Hodges 2000). In the contiguous United States, the degree to which regional local lynx population fluctuations are influenced by local snowshoe hare population dynamics is unclear.

In the contiguous United States, the boreal forest transitions into other vegetation communities and becomes more naturally patchily distributed (fragmented), and provides much less productive hare habitat. Thus lynx populations here are naturally limited by the low availability of snowshoe hares, as suggested by large home range size, high kitten mortality due to starvation, and greater reliance on alternate prey. These characteristics appear to be similar to those exhibited by lynx populations in Canada and Alaska during the low phase of the population cycle (Quinn and Parker 1987, Koehler 1990, Aubry et al. 2000). This is likely due to the inherently patchy distribution of lynx and hare habitat in the contiguous United States and correspondingly lower densities of hares.

In the United States, lynx inhabit conifer and conifer-hardwood habitats that support their primary prey, snowshoe hares. Both timber harvest and natural disturbance processes, including fire, insect infestations, catastrophic wind events, and disease outbreaks, can provide foraging habitat for lynx when resulting understory stem densities and structure provide the forage and cover needs of snowshoe hare (Keith and Surrendi 1971; Fox 1978; Conroy et al. 1979; Wolff 1980; Parker et al. 1983; Litvaitis et al. 1985; Bailey et al. 1986; Monthey 1986; Koehler 1990, 1991; Agee 2000). These characteristics also 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 meters [15 feet] in order to provide cover and food for snowshoe hares to 2 meters (6 feet) high at maximum snow depths). Despite the variety of habitats and settings, good snowshoe hare habitat has a common denominator – dense, horizontal vegetative cover 1 to 3 meters (3 to 10 feet) above the ground or snow level (Hodges 2000). Multi-layered forests provide this structure, as well as high levels of cover preferred by lynx.

Lynx population dynamics may emanate from the core in Canada to the southern periphery in the contiguous United States, as evidenced by a lagged correlation of lynx trap records and observations in the United States (related to cyclic highs in lynx populations in Canada) (McKelvey et al. 2000b; Mowat et al. 2000). In Canada, the Hudson Bay Company maintained fairly accurate annual lynx pelt data across the range of lynx, which reflect dramatic population cycles. In the Great Lakes Geographic Area, population dynamics in recent decades appear to be strongly driven by immigration from Canada (McKelvey et al. 2000b). However, in other areas and time periods it is not known to what extent the correlation is due to immigration from Canada, population responses to the same factors controlling northern populations, or a combination of the two.

A lack of accurate historic data limits our understanding of lynx population dynamics in the contiguous United States and precludes drawing definitive conclusions about lynx population trends. Historically, formal surveys designed specifically to detect lynx were rarely conducted. Many reports of lynx (e.g., visual observations, snow tracks) have been collected incidentally to other activities, but cannot be used to infer population trends. Long-term trapping data have been used to estimate population trends for various species. In the United States however, trapping returns are strongly influenced by trapper effort, which varies between years and, therefore, may not accurately reflect population trends. Another important problem to note is that trapping records of many States did not differentiate between bobcats and lynx, referring to both as "lynxcats." Overall, the available data are too incomplete to infer much beyond simple occurrence and distribution of lynx in the contiguous United States (McKelvey et al. 2000b)

Lynx are highly mobile and have a propensity to disperse long distances, particularly when prey becomes scarce (Mowat et al. 2000). Lynx also make long distance exploratory movements outside their home ranges (Aubry et al. 2000; Squires et al. 2001; Moen et al. 2004). Areas or habitats used by lynx during dispersal or exploratory movements are poorly understood at this time. Dispersing lynx may colonize suitable but unoccupied habitats, augment existing resident populations, or disperse to unsuitable or marginal habitats where they cannot survive. Numerous lynx mortality records exist from anomalous habitats or habitats where no records support evidence (either current or historical) of a reproducing population (McKelvey et al. 2000a). Many of these records correspond to post-population peaks in Canada, with some lag time for immigration (McKelvey et al. 2000a). We find no evidence of lynx populations becoming established in such areas.

We suspect that some areas in the contiguous United States naturally act as "sources" of lynx (recruitment is greater than mortality) that are able to disperse and potentially colonize other patches (McKelvey et al. 2000a). Other areas may function as "sinks" (mortality is greater than recruitment) where lynx are lost from the overall population. Sink habitats are most likely those places on the periphery of the southern boreal forest where habitat becomes more fragmented and more distant from larger lynx populations. Fluctuations in prey populations may cause some habitat patches to change from being sinks to sources, and vice versa. The ability of naturally dynamic habitat to support lynx populations may change as the habitat undergoes natural succession following natural or manmade disturbances (i.e., fire, clearcutting).

Individual lynx maintain large home ranges (reported as generally ranging between 31 to 216 km^2 [12 to 83 mi^2]) (Koehler 1990; Aubry et al. 2000; Squires and Laurion 2000; Vashon et al. 2005). Thus, a lynx population can only persist in a large boreal forested landscape that contains appropriate forest types, snow depths and high snowshoe hare densities. In the Northeast, lynx were most likely to occur in areas that support deep snow (greater than 268 centimeters [106 inches] annual snowfall) associated with regenerating boreal forests in landscapes 100 square kilometers (40 square miles) or greater in area (Hoving 2001; Hoving et al. 2004). We assume areas with smaller patches of boreal forest are unlikely to provide a sufficient amount of habitat suitable to support a lynx population.

Lynx populations in the contiguous United States seem to be influenced by lynx population dynamics in Canada (Thiel 1987; McKelvey et al. 2000a,c). Many of these populations in Canada are directly interconnected U.S. populations, and are likely a source of emigration into contiguous United States lynx populations. Therefore, we assume that retaining connectivity with larger lynx populations in Canada is important to ensuring long-term persistence of lynx populations in the U.S. We assume that, regionally, lynx within the contiguous United States and adjacent Canadian provinces interact as metapopulations and, therefore, assessments of population viability must be made at this larger scale and not solely based on populations within the contiguous United States.

Based on our examination of historical and recent evidence, lynx habitat and occurrence within the contiguous U.S can be categorized as: 1) core areas, 2) secondary areas, and 3) peripheral areas (U.S. Fish and Wildlife Service 2005). Core areas are those with the strongest long-term

evidence of the persistence of lynx populations within the contiguous United States, having both persistent, verified records of lynx occurrence over time and recent evidence of reproduction.

Status and Distribution

The historical and present range of the lynx north of the contiguous United States includes Alaska and that part of Canada that extends from the Yukon and Northwest Territories south across the United States border and east to New Brunswick and Nova Scotia. In the contiguous United States, lynx historically occurred in the Cascades Range of Washington and Oregon; the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado; the western Great Lakes Region; and the northeastern United States region from Maine southwest to New York (McCord and Cardoza 1982; Quinn and Parker 1987). A thorough discussion and interpretation of lynx records through time is found in the Service's final rule ((March 24, 2000, 65 FR 16052) and clarification of our findings (July 2003; 68 FR 40076).

The distribution of lynx in North America is closely associated with the distribution of North American boreal forest (Agee 2000). In Canada and Alaska, lynx inhabit the classic boreal forest ecosystem known as the taiga (McCord and Cardoza 1982; Quinn and Parker 1987; Agee 2000; McKelvey et al. 2000b). The range of lynx extends south from the classic boreal forest zone into the subalpine forest of the western United States, and the boreal/hardwood forest ecotone in the eastern United States (Agee 2000; McKelvey et al. 2000b). Forests with boreal features (Agee 2000) extend south into the contiguous United States along the Cascade and Rocky Mountain Ranges in the west, the western Great Lakes Region, and along the Appalachian Mountain Range of the northeastern United States. Within these general forest types, lynx are most likely to persist in areas that receive deep snow, to which the lynx is highly adapted (Ruggiero et al. 2000b). Lynx are rare or absent from the wet coastal forests of Alaska and Canada (Mowat et al. 2000).

At its southern margins in the contiguous United States, forests with boreal features, or southern boreal forests, become naturally fragmented as they transition into other vegetation types. Southern boreal forest habitat patches are small relative to the extensive northern boreal forest of Canada and Alaska, which constitutes the majority of lynx range. Many southern boreal forest habitat patches within the contiguous United States cannot support resident populations of lynx and their primary prey species.

The complexities of lynx life-history and population dynamics, combined with a general lack of reliable population data for the contiguous United States, make it difficult to ascertain the past or present population status of lynx in the contiguous United States. It is difficult to determine with certainty whether reports of lynx in many States were (1) animals dispersing from northern populations that were effectively lost because they did not join or establish resident populations, (2) animals that were a part of a resident population that persisted for many generations, or (3) a mixture of both resident and dispersing animals.

The final rule determining threatened status for the lynx in the contiguous United States summarized lynx status and distribution across four regions that are separated from each other by

ecological barriers consisting of spans of area lacking lynx habitat (March 24, 2000, 65 FR 16052). These distinct regions are the Northeast, the Great Lakes, the Northern Rocky Mountains/Cascades, and the Southern Rocky Mountains. The recovery outline for the species split these regions into six "core" areas for lynx, with the southern Rocky Mountains area designated as an additional "provisional core" area. While these regions are ecologically unique and discrete, the lynx is associated with only the southern boreal forest in each and, with the exception of the Southern Rocky Mountains Region, each area is geographically connected to the much larger population of lynx in Canada.

The following summarizes status and distribution information of the lynx DPS in the contiguous United States:

Northeast Region (Maine, New Hampshire, Vermont, New York)—Based on an analysis of cover types and elevation zones containing most of the lynx occurrences, McKelvey et al. (2000b) determined that, at the broad scale, most lynx occurrence records in the Northeast were found within the "Mixed Forest-Coniferous Forest-Tundra" cover type at elevations ranging from 250 to 750 meters (820 to 2,460 feet). This habitat type in the northeast United States occurs along the northern Appalachian Mountain range from southeastern Quebec, western New Brunswick, and western Maine, south through northern New Hampshire. This habitat type becomes naturally more fragmented and begins to diminish to the south and west, with a disjunct segment running north-south through Vermont, an extensive patch of habitat in the Adirondacks of northern New York, and with a few more distant and isolated patches in Pennsylvania (see Figure 8.23 in McKelvey et al. 2000b).

In the northeast, information on the presence of lynx was limited at the time of listing in 2000. In 1999, 6 lynx were radio-collared in northern Maine (March 24, 2000; 65 FR 16052). As of 2004, Maine Department of Inland Fisheries and Wildlife had radio-collared 43 lynx and documented 30 litters (Vashon et al. 2005b) Records show lynx to currently be distributed throughout northern Maine (November 9, 2005; 70 FR 68294). Lynx in Maine currently have high productivity; 91 percent of available adult females older than 2 years produced litters averaging 2.83 kittens (Vashon et al. 2005b). This area is the only area in the northeastern region of the lynx's range within the contiguous United States that currently supports breeding lynx populations and likely acts as a source or provides connectivity for peripheral portions of the lynx's range in the Northeast.

The preponderance of lynx habitat in this region occurs on private lands in the State of Maine. Federal agencies manage a minor amount of lynx habitat in this region. The White River National Forest has amended or revised its Plan and so addressed in part, on National Forest lands, the major factor threatening the lynx: inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in National Forest Plans and BLM Plans. The final rule for critical habitat summarizes a number of private land conservation efforts for lynx in the region (November 9, 2006, 71 FR 66009).

Great Lakes Region (Minnesota, Wisconsin, Michigan)—The majority of lynx occurrence records in the Great Lakes Region are associated with the "mixed deciduous-coniferous forest" type (McKelvey et al. 2000b). Within this general forest type, the highest frequency of lynx

occurrences were in the *Acer saccharum* (sugar maple), *Tilia* spp. (basswood), *Pinus banksiana* (jack pine), *P. strobus* (white pine), and *P. resinosa* (red pine) forest types (McKelvey et al. 2000b). These types are found primarily in northeastern Minnesota, northern Wisconsin, and the western portion of Michigan's upper peninsula.

Mixed deciduous-coniferous forest covers an extensive area in this region, but much of this area is considered marginal habitat for lynx because it is a transitional forest type at the edge of the snowshoe hare range. Habitat at the edge of hare range supports lower hare densities (Buehler and Keith 1982) that may not be sufficient to support lynx reproduction. Snow depths within appropriate habitat that allow lynx a competitive advantage over other carnivores (i.e., coyotes) occur only in limited areas in northeastern Minnesota, extreme northern Wisconsin, and Michigan's upper peninsula.

At the time of listing, we were unsure of whether the Great Lakes Region supported resident populations of lynx or if lynx documented in these areas were simply dispersing from Canada (March 24, 2000; 65 FR 16052) (McKelvey et al. 2000b; R. Sando, Minnesota Department of Natural Resources, in litt. 1998). Since that time, numerous lynx have been verified from northeastern Minnesota through DNA analysis, radio- and GPS-collared animals, and documentation of reproduction (November 9, 2005; 70 FR 68294). Northeastern Minnesota is the only area in the Great Lakes region for which we have evidence of recent lynx reproduction; as such, it likely acts as a source or provides connectivity for more peripheral portions of the lynx's range in this region.

The Forest Service in Minnesota manages a preponderance of lynx habitat in this region. All National Forests in the region have amended or revised their Plans, and so addressed in part, on National Forest lands, the primary factor threatening the lynx: inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in National Forest Plans and BLM Plans. These include the Chippewa, Superior, Hiawatha, and Ottawa National Forests. Voyageurs National Park in Minnesota was designated as lynx critical habitat in 2006. This designation will ensure that lynx habitat within the park will be managed to conserve lynx.

The final rule for critical habitat summarizes other private land conservation efforts for lynx in the region (November 9, 2006, 71 FR 66009).

<u>Northern Rocky Mountain/Cascades Region (Washington, Oregon, Idaho, Wyoming, Utah)</u>—In this region, the majority of lynx occurrences are associated at a broad scale with the "Rocky Mountain Conifer Forest;" within this type, most of the occurrences are in moist Douglas fir (*Pseudotsuga menziesii*) and western spruce/fir forests (McKelvey et al. 2000b). Most of the lynx occurrences are in the 1,500-2,000 meters (4,920-6,560 feet) elevation class (McKelvey et al. 2000b). These habitats are found in the Rocky Mountains of Montana, Idaho, eastern Washington, and Utah, the Wallowa Mountains and Blue Mountains of southeast Washington and northeastern Oregon, and the Cascade Mountains in Washington and Oregon. The majority of verified lynx occurrences in the United States and the confirmed presence of resident populations are from this region. The boreal forest of Washington, Montana, and Idaho is contiguous with that in adjacent British Columbia and Alberta, Canada.

Northwestern Montana and the north Cascades in Washington currently have resident lynx populations, and strong evidence exists to support the presence of resident lynx distributed throughout much of the forest types considered lynx habitat in Montana and Washington (November 9, 2005; 70 FR 68294). Resident lynx populations exist in contiguous habitats in Idaho, Montana and northwestern Wyoming in the Greater Yellowstone Area (e.g., Murphy et al. 2004). Lynx have probably always occurred only intermittently in peripheral areas of Oregon and Utah, although the historical or current presence of resident populations in either of these States has not been confirmed.

The North Cascades, Yellowstone and Glacier National Parks manage substantial amounts of lynx habitat in this region. Lynx occur in all three National Parks. Through National Park Service management, provide lynx habitat that is generally managed in ways that promotes natural ecological processes, which benefits lynx. Glacier National Park provides a large expanse of lynx habitat that is contiguous with lynx habitat in Canada. Of the three Parks, Glacier and North Cascades were determined to meet the habitat criteria requirements for critical habitat, and were designated critical habitat in 2006. This designation will further ensure that lynx habitat within the Parks will be managed to conserve lynx.

The BLM Spokane District in Washington manages lynx habitat. Its Resource Management Plan was modified in 2003 to incorporate the provisions of the LCAS. On November 30, 2006, we completed consultation with the BLM for the revision of their Coeur d'Alene Resource Management Plan in which lynx were addressed. The BLM has not yet published the ROD on the plan revision, but anticipates it will be published this spring. The Cottonwood BLM in southern Idaho is in the process of amending their plan for lynx; they are at the DEIS stage, with a BA and request for consultation expected by early summer. The Missoula BLM district has also amended their plan to abide by the standards and guides in the LCAS.

The Forest Service manages the preponderance of lynx habitat in this region. Through the proposed action, 18 National Forests in the region intend to address in part, on National Forest lands, the primary factor threatening the lynx: inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in National Forest Plans and BLM Plans. These include the 18 National Forests listed in Appendix A of this document. The Boise, Payette, and Sawtooth National Forests of Idaho have amended or revised their plans to address this factor, as have the Uinta and Wasatch-Cache National Forests in Utah. Region 6 of the Forest Service in Washington intends to address this factor through Forest Plan revision, which has started for the Okanogan-Wenatchee and Colville (all occupied by lynx), and the Malheur, Wallowa-Whitman, Umatilla (unoccupied) National Forests. The Mount Baker National Forest Plan is not yet in revision.

The final rule for critical habitat summarizes other private land conservation efforts for lynx in the region (November 9, 2006, 71 FR 66009). See also the discussion in this biological opinion, under *Cumulative Effects*.

Southern Rocky Mountains Region (Colorado, southeastern Wyoming)—Colorado represents the extreme southern edge of the range of the lynx. A majority of the lynx occurrence records in Colorado and southeastern Wyoming were associated with the "Rocky Mountain Conifer Forest"

type. The occurrences in the Southern Rockies were generally at higher elevations (8,000-12,000 feet) than were all other occurrences in the West (Ruediger et al. 2000).

A resident lynx population likely occurred historically in the Southern Rocky Mountains Region, based on the records of lynx in Colorado and the persistence of contiguous habitat in southeastern Wyoming with the Colorado habitat. This resident population may have been extirpated, which led the Colorado Division of Wildlife to undertake a reintroduction effort that is currently in progress. Due to CDOW's efforts, 218 adult lynx were released between 1999 and 2006. Of these, 93 mortalities have been documented, and the State is currently tracking 82 of the 125 reintroduced lynx still possibly alive. Reproduction has been documented each year since 2003; 116 kittens have been documented (Tanya Shenk, Colorado Division of Wildlife, pers. comm. 2006).

The southern boreal forest of Colorado and southeastern Wyoming is isolated from boreal forest in Utah and northwestern Wyoming by the Green River Valley and the Wyoming basin (Findley and Anderson 1956 in McKelvey et al. 2000b). We believed that these areas likely reduce opportunities for genetic interchange with the Northern Rocky Mountains/Cascades Region and Canada (Halfpenny et al. 1982; Koehler and Aubry 1994). However, although habitats in the Southern Rockies are far from source populations and more isolated, it is still possible that dispersers could arrive in the Southern Rocky Mountains during highs in the population cycle. A number of lynx from the reintroduced population in Colorado have recently dispersed great distances, with occurrences located in Kansas, Nevada, South Dakota, Arizona, Idaho, Nebraska, Montana, Wyoming and New Mexico (T. Shenk, pers. comm. 2007). Thirty-three different individuals were located in Wyoming, seven in Montana and six in Nebraska.. Such information indicates that dispersing lynx are able to traverse long distances across extremely variable terrain.

The Forest Service manages the preponderance of lynx habitat in this region. All National Forests in the region intend to address through amending or revising their Plans, on National Forest lands, the primary factor threatening the lynx: inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in National Forest Plans and BLM Plans. The Forests are currently preparing a Final Environmental Impact Statement for the Southern Rocky Lynx Amendment is preparing a biological assessment for consultation under section 7(a)2. These include the Medicine Bow, Routt, Arapaho-Roosevelt, Pike and San Isabel, Rio Grande,White River, Grand Mesa, Uncompahgre, Gunnison, and the San Juan National Forests.

Reports from other locations—During the early 1960's, concurrent with an unprecedented cyclic high in Canada, lynx moved into the Great Plains and the Midwest Region of the United States (Gunderson 1978; Mech 1980; DeStefano 1987; South Dakota Natural Heritage Program, in litt. 1994). These records are outside of the southern boreal forests where most lynx occurrences are found (McKelvey et al. 2000b). We consider lynx observations in Nevada, North Dakota, South Dakota, Iowa, Nebraska, Indiana, Ohio, and Virginia to be individuals dispersing subsequent to periods of cyclic high lynx numbers in Canada (Hall and Kelson 1959; Burt 1954 in Brocke 1982; McKelvey et al. 2000b; S. Johnson, Indiana Department of Natural Resources, in litt. 1994; P. Jones, Ohio Department of Natural Resources, in litt. 1994; W. Jobman, U.S. Fish and

Wildlife Service, in litt. 1997; Smithsonian Institute, in litt. 1998). We do not consider these States to be within the contiguous United States range of lynx (65 FR 16052, March 24, 2000).

Recovery Outline

We developed a recovery outline for lynx in the contiguous United States (Service 2005). The purpose of the outline is to serve as an interim strategy to guide recovery efforts until a final recovery plan is completed. The lynx recovery outline presents our current understandings of historical and current lynx distribution, ecology, and population dynamics.

The outline introduces concepts regarding the relative importance of different geographic areas to the persistence of lynx in the contiguous United States, identifying areas as either core, provisional core, secondary or peripheral based on lynx records over time and evidence of reproduction. Six core areas were identified in the recovery outline, along with a provisional core area within the Southern Rockies (Colorado and southern Wyoming). The recovery outline provides four preliminary recovery objectives, which are accompanied by recovery actions needed to attain objectives.

In addition to determining whether an area is occupied by lynx, the Service examined lynx habitat and designated areas according to their known or projected quality and importance in lynx recovery. The lynx recovery outline stratified lynx habitat in the contiguous United States into **core, provisional core, secondary, and peripheral areas:** "Based on our examination of historical and recent evidence, lynx habitat and occurrence within the contiguous U.S can be categorized as: 1) core areas, 2) secondary areas, and 3) peripheral areas. The areas with the strongest long-term evidence of the persistence of lynx populations within the contiguous United States are defined as "**core areas.**" Core areas have both persistent verified records of lynx occurrence over time and recent evidence of reproduction. Six core areas and one "provisional" core area are identified within the contiguous United States. The provisional core area in the Southern Rockies was identified because it contains a reintroduced population. Reproduction has been documented in this introduced population; however, it is too early to determine whether a self-sustaining lynx population will result. Focusing lynx conservation efforts on these core areas will ensure the continued persistence of lynx in the contiguous U.S by addressing fundamental principles of conservation biology"

The recovery outline continues "At this time, the role of areas outside of **core areas** in sustaining lynx populations in the contiguous United States is unclear. The fluctuating nature of lynx population dynamics and the ability of lynx to disperse long distances have resulted in many individual occurrence records outside of core areas, without accompanying evidence of historic or current presence of lynx populations. Areas classified as "**secondary areas**" are those with historical records of lynx presence with no record of reproduction; or areas with historical records and no recent surveys to document the presence of lynx and/or reproduction. If future surveys document presence and reproduction in a secondary area, the area could be considered for elevation to core. We hypothesize that secondary areas may contribute to lynx persistence by providing habitat to support lynx during dispersal movements or other periods, allowing animals to then return to "core areas". In "**peripheral areas**" the majority of historical lynx records is

sporadic and generally corresponds to periods following cyclic lynx population highs in Canada. There is no evidence of long-term presence or reproduction that might indicate colonization or sustained use of these areas by lynx. However, some of these peripheral areas may provide habitat enabling the successful dispersal of lynx between populations or subpopulations. At this time, we simply do not have enough information to clearly define the relative importance of secondary or peripheral areas to the persistence of lynx in the contiguous United States".

A discussion of the how the proposed action relates to the recovery outline can be found later in this document, under the *Effects of the Action* section.

Analysis of the Species Likely to be Affected

Lynx are a wide-ranging species requiring large, interconnected areas of suitable habitat. Habitat connectivity within geographic areas and with Canada may be important for long-term lynx population viability and maintenance of the contiguous United States DPS. While blocks of lynx habitat occurs across broad areas of the west, certain areas appear more important to supporting a viable resident lynx population. The lynx recovery outline distinguishes between core, secondary and peripheral lynx areas, and describes the relative importance of each to the recovery of the lynx DPS.

Lynx on Forest Service lands may be affected by management activities that reduce or degrade essential habitat elements used by lynx for denning, foraging, and recruitment, or that increase habitat fragmentation and lynx mortality. Effects may occur and/or continue without appropriate management direction at broad scales. This biological opinion evaluates the proposed action with respect to the threats and recovery needs for lynx.

ENVIRONMENTAL BASELINE

Status of the Species within the Action Area

Within the NRLA area, lynx habitat within 12 National Forests is considered core lynx area (U.S. Fish and Wildlife Service 2005) (Appendix A) and all are occupied by lynx (U.S. Forest Service and U.S. Fish and Wildlife Service 2006) (Table 3). Of the 18 National Forests within the action area, six are currently unoccupied by lynx (U.S. Forest Service and U.S. Fish and Wildlife Service 2006). None of the six unoccupied Forests are within the core areas identified in the recovery outline (U.S. Fish and Wildlife Service 2005). Of these six, four are in secondary area and two are in peripheral lynx area only. The Lewis and Clark, Gallatin and Helena National Forests have several disjunct mountain ranges in eastern Montana that has some lynx habitat in secondary area that is currently unoccupied (U.S. Forest Service and U.S. Fish and Wildlife Service 2006). See earlier discussion under "Proposed Action" section of this document for details.

Currently, we lack population data or information for any of the occupied areas. Within the NRLA area, only one research effort (Squires et al. 2006) is studying lynx demography. This effort has produced several publications and researchers are only now finalizing chapters on lynx population information.

Table 3. Lynx habitat in the NRLA area by occupied/unoccupied status (U.S. Forest Service 2007).

National Forest	NF acres	Lynx habitat	Occupied Core	Occupied secondary	Unoccup. secondary	Unoccup. peripheral	% Occupied
Ashley	1,384,136	700,000	0	0	0	700,000	0
Beaverhead-Deerlodge	3,360,825	2,060,000	0	0	2,060,000	0	0
Bighorn	1,107,671	310,000	0	0		310,000	0
Bitterroot	1,580,948	640,000	0	0	640,000	0	0
Bridger-Teton	3,437,527	2,000,000	2,000,000	0	0	0	100
Clearwater	1,825,397	930,000	0	930,000	0	0	100
Custer	1,187,621	230,000	200,000	0	0	30,000	87
Flathead	2,355,592	1,730,000	1,730,000	0	0	0	100
Gallatin	1,806,565	870,000	770,000	0	100,000	0	89
Helena	975,387	440,000	330,000	0	110,000	0	75
Idaho Panhandle	2,498,234	1,170,000	0*	1,170,000	0	0	100
Kootenai	2,242,486	1,010,000	1,010,000	0	0	0	100
Lewis and Clark	1,862,289	970,000	380,000	0	500,000	90,000	39
Lolo	2,082,784	1,110,000	1,110,000	0	0	0	100
Nez Perce	2,224,230	810,000	0	0	810,000	0	0
Salmon-Challis	4,350,827	1,800,000	0	0	1,800,000	0	0
Shoshone	2,436,850	640,000	640,000	0	0	0	100
Targhee	1,810,854	1,050,000	0*	1,050,000	0	0	100
Total	**38,530,223**	**18,470,000**	**8,170,000**	**3,150,000**	**3,320,000**	**1,130,000**	**61**

Note 1: A minor amount of lynx habitat is core.

Factors Affecting the Species Environment within the Action Area

The action area includes lynx habitat on the following 18 National Forests in the Northern Rockies in Montana, Idaho, Wyoming, Utah, and a small portion of Washington: Beaverhead-Deerlodge, Bitterroot, Clearwater, Custer, Flathead, Gallatin, Helena, Idaho Panhandle, Kootenai, Lewis and Clark, Lolo, Nez Perce, Bighorn, Shoshone, Ashley, Bridger-Teton, Salmon-Challis, and Targhee. This lynx habitat forms the environmental baseline against which future Forest actions will be measured and assessed. In the NRLA area, Federal land accounts for the preponderance of lynx habitat. Of this habitat the Forest Service manages the vast majority of acres, the BLM and private land owners manage only a small portion of lynx habitat. In the NRLA area, Federal land management, specifically under the Forest Service Plans, has the potential to exert substantive effects on lynx populations in geographic areas.

Lynx are currently known to exist in Idaho, Montana and Wyoming, but not in Utah. As stated earlier, lynx have probably always occurred only intermittently in Utah. Like most of the geographic areas that support lynx within the contiguous United States, the Northern Rockies are directly contiguous with lynx habitat and populations in Canada. In the Northern Rocky Mountains, the majority of lynx occurrences is associated with the Rocky Mountain Conifer Forest vegetative class (Kuchler 1964; McKelvey et al. 2000b) and occur above 1,250 m (4,101 ft) elevation (Aubry et al. 2000; McKelvey et al. 2000b). The dominant vegetation that constitutes lynx habitat in these areas is subalpine fir, Engelman spruce and lodgepole pine (Aubry et al. 2000; Ruediger et al. 2000). Lodgepole pine is an earlier successional stage of subalpine fir and Engelman spruce climax forest cover types.

The largest proportion of lynx habitat on Federal lands in west are in nondevelopmental land allocations, where natural processes predominate. Sixty-seven percent of lynx habitat on Federal lands within the NRLA area is within nondevelopmental land allocations (Table 4). Approximately 12,369,833 acres of lynx habitat within the NRLA area (Forest Service lands) occur in non-developmental allocations (wilderness, primitive, non-motorized area, roadless etc.) and 7,940,000 acres (32 percent) occur within developmental allocations.

Table 4. Lynx habitat on National Forest (FS) lands within the Northern Rockies lynx amendment area (data from U.S. Forest Service 2007).

Total FS acres w/i the Northern Rockies amendment area [a]	Acres of FS lynx habitat [b] (% of total FS acres)	Acres of FS lynx habitat w/i non-developmental land allocations including wilderness (% of lynx habitat) [c]	Acres of FS lynx habitat w/i developmental land allocations (% of lynx habitat) [d]
38,530,000	18,470,000 (48%)	12,396,833 (67%)	6,073,167 (32%)

[a] Total acreage of National Forest lands within the NRLA area.
[b] Total acres mapped by National Forest based upon interagency mapping direction memo of August 2000.
[c] Allocations where natural disturbance processes predominate (wilderness, roadless, semi-primitive non-motorized areas).
[d] Allocations other than those identified as non-developmental

Further, nondevelopmental land allocations are found on each of the 18 National Forests. Large proportions of lynx habitat, occupied and unoccupied by lynx, occurs within these allocations (Table 5). In nondevelopmental allocations, such as wilderness, ecological processes such as fire, insects, and disease operate relatively free from human intervention (see Appendix F). Diversity resulting from natural succession and disturbance predominate and non-native vegetation is rare. Such allocations are beneficial to lynx. Roadless designation limits construction of roads and timber harvest, two substantial human impacts on wildlife habitat in general, so in such areas natural succession and disturbance are also likely to predominate.

Table 5. Overlap of lynx habitat with wilderness and roadless areas by Forest (U.S. Forest Service 2007).

FOREST	Acres wilderness in lynx habitat (% lynx habitat)	Acres roadless in lynx habitat (% lynx habitat)	Total acres wilderness/ roadless in lynx habitat	Total acres lynx habitat	% of lynx habitat in wilderness or roadless
Occupied by lynx					
Bridger-Teton	691,927 (35)	859,530 (43)	1,551,457	2,000,000	**78%**
Clearwater	144,3421 (6)	578,859 (62)	723,202	930,000	**78%**
Custer	77,418 (34)	75,243 (33)	152,661	230,000	**66%**
Flathead	730,935 (42)	364,011 (21)	1,094,946	1,730,000	**63%**
Idaho Panhandle	9,8785 (1)	468,295 (40)	478,173	1,170,000	**41%**
Kootenai	45,826 (5)	390,250 (39)	436,076	1,010,000	**43%**
Lolo	117,742 (11)	466,279 (42)	584,021	1,110,000	**53%**
Shoshone	319,1485 (0)	148,545 (23)	467,694	640,000	**73%**
Targhee	68,585 (7)	448,646 (43)	517,231	1,050,000	**49%**
Mixed occupied/unoccupied					
Gallatin	290,554 (33)	343,404 (39)	633,958	870,000	**73%**
Helena	64,989 (15)	221,197 (50)	286,186	440,000	**65%**
Lewis & Clark	223,089 (23)	505,347 (52)	728,436	970,000	**75%**
Total occupied	**23%**	**40%**			**63%**
Unoccupied by lynx					
Ashley	148,266 (21)	421,358 (60)	569,623	700,000	**81%**
Bighorn	45,898 (15)	191,645 (62)	237,544	310,000	**77%**
Bitterroot	144,342 (23)	228,819 (36)	373,162	640,000	**58%**
Beaverhead-Deerlodge	144,342 (7)	1,151,161 (56)	1,295,503	2,060,000	**63%**
Nez Perce	398,824 (49)	211,035 (26)	609,859	810,000	**75%**
Salmon-Challis	611,777 (34)	798,961 (44)	1,410,738	1,800,000	**78%**
Total unoccupied	**24%**	**48%**			**71%**
Total acres occ/unoccupied	**4,497,105**	**7,872,728**	**12,369,833**	**18,470,000**	**67%**

Wilderness – are those areas designated as wilderness by Congress
Roadless – are those areas identified as roadless areas in the 2001 Roadless rule – some areas may have roads as the inventories were not adjusted; however the 2001 roadless rule applies, which limits road construction and reconstruction in these areas.
Of the 12, 370,000 acres in roadless about 1,840,000 are in management areas that could be developed; however these areas are now constrained by the 2001 roadless rule, which limits road construction and timber harvest in roadless areas.

Factors identified in the Final Listing Rule and Remanded Decision The final rule (March 24, 2000; 65 FR 16052) concluded that the primary factor threatening the lynx DPS is the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in federal land management Plans. The Service concluded that the lack of Plan guidance for conservation of lynx, as evidenced by the fact that, at the time of listing, Plans allowed or directed actions that cumulatively adversely affect lynx, was a significant threat to the contiguous United States DPS of lynx. Our remanded determination in our clarifications of findings of our final rule (July 2003; 68 FR 40076) affirmed the findings in the final rule.

Land Management Authorities

The 1982 National Forest Management Act regulations (36 CFR 219.19) provided the following direction to the Forest Service, "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species." The lynx has been listed as a sensitive species by the Forest Service. The Forest Service policy (FMS 2670.32) is to "avoid or minimize impacts to sensitive species; if impacts cannot be managed to maintain viable populations, a decision must not result in loss of existing native and desired non-native vertebrate species viability or create a significant trend toward Federal listing."

As described previously, the final rule identified the single factor threatening the contiguous United States DPS of lynx as the inadequacy of existing regulatory mechanisms; specifically the lack of guidance provided in the Plans for avoiding adverse impacts to lynx and for the conservation of lynx on Forest Service administered lands. National Forests encompass a preponderance of lynx habitat, especially in the western States. Thus, Forest Service land management practices can significantly influence the maintenance of lynx habitat and their prey. Many of the existing Plans had general provisions for conservation/management of wildlife and wildlife habitats, but very few specifically address lynx (Hickenbottom et al. 1999). Plans that had specifically addressed lynx at the time of listing had not incorporated the information in the Science Report or LCAS, which were then considered to be the most current knowledge regarding lynx conservation.

Risk factors within federal authority and jurisdiction

Lands under Federal management are clearly necessary to sustain lynx populations in the NRLA area. Federal lands account for the majority of lynx habitat in the area, and therefore Federal land management has the potential to highly influence lynx conservation. In the LCAS, the Lynx Biology Team identified potential risk factors to lynx that are within the authority and jurisdiction of the Federal land management agencies to control. As written, the existing Plans allow, but do not necessarily require or direct, actions that could result in risks to lynx. Some of these risk factors occur within the NRLA area. Lynx risk factors listed in the BA include:

I. FACTORS AFFECTING LYNX PRODUCTIVITY
- Conversion or alteration of native plant communities
- Fire suppression and hazardous fuels reduction
- Grazing
- Pre-commercial thinning

- Recreational use
- Road and Trail Access
- Timber management

II. FACTORS AFFECTING LYNX MORTALITY

- Highways
- Predation by other species
- Predator control activities
- Shooting
- Trapping

III. FACTORS AFFECTING LYNX MOVEMENTS

- Highways and associated developments
- Private land development

These factors have varying effects on lynx, depending upon the nature, location, duration and timing of the activity. Some present more likelihood of risks to lynx, others are relatively benign in effects. In nondevelopmental allocations and roadless areas, a number of these factors would not. affect lynx. Importantly, the rather substantial risks to lynx habitat that are often associated with some vegetation management actions (e.g. timber management and precommercial thinning) typically do not arise in areas in nondevelopmental allocations or roadless areas. Factors affecting lynx mortality, including those associated with highways, predator control, and private land development activities generally are not an issue. Factors such as trapping or shooting, while not entirely eliminated, are lessened significantly in nondevelopmental and roadless areas due to limited access for people. Approximately 67 percent of all lynx habitat in the action area, including occupied and unoccupied, is in wilderness or roadless allocations and is distributed across the 18 Forests (Table 5). This provides a significant amount of protection for lynx and lynx habitat within the NRLA area.

The Forest Service has varying levels of authority and jurisdiction over the factors listed above, especially as they relate to risks to lynx. For instance, the Forest Service typically has little influence on highways and associated development, or private land development but has substantial influence on lynx through vegetation management actions on National Forests.

Since 2000, the Forests have managed lynx habitat under existing Forest Plans as implemented through the Conservation Agreements, described earlier. This management has benefited lynx habitat during that time. Few of the factors listed above have resulted in adverse effects to lynx or lynx habitat on Forest Service lands, as the Conservation Agreement required deferral of projects that were likely to adversely affect lynx. Vegetation management projects such as precommercial thinning or timber harvest resulting in more than 30 percent of lynx habitat being in early seral conditions within an LAU, did not occur on National Forest lands under the agreements up until 2006, with the new direction to apply the agreements to occupied lynx habitat. Hillis et al. (2003) analyzed the effects that past timber harvest on National Forests (and other lands in Region One) has historically had on creating these early seral stages, or stand initiation phases. Based upon analysis areas that approximated a multiple LAU scale, a 4th code hydrologic unit, 9.2 percent of National Forest lands and 8.9 percent of lands of all ownerships

were in a stand initiation or early seral phase. Only 2.5 percent of the 4th code hydrologic units were determined to have exceeded the LCAS standard that requires management actions change no more than 15 percent of lynx habitat in an LAU to stand initiation phase per decade. Fire was determined to be the dominant influence in creating early seral conditions in lynx habitat. Note that fire in lynx habitat is generally considered beneficially to creating the mosaic of mixed-age stands desirable for promoting snow shoe hare populations and high quality lynx hunting conditions. The BA indicates that the analysis was conducted using data from 1986 through 2001, and included years when timber harvest was very extensive in some areas. This indicates that the overall baseline condition of lynx habitat, in regards to vegetation, is in good condition at the regional scale.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the species. Direct effects are impacts on species that occur at the same time and place as the action and are caused by the action. Indirect effects are impacts caused by or resulting from actions of specific projects, but they occur later in time and are reasonably certain to occur.

The Forest Service proposes to amend the 18 Plans within the NRLA area to include lynx conservation measures. Our 2000 biological opinion concluded that if Plans were amended or revised with the conservation measures the LCAS, or an equivalent thereof, then the Plans would not likely jeopardize lynx. The proposed amendment would incorporate the primary conservation benefits of the LCAS conservation measures into management direction. However, the Forest Service proposes to relax some of the restrictions on activities in lynx habitat compared to the LCAS management standards analyzed in the 2000 biological opinion. In some cases, standards were changed to guidelines because the Forest Service considers guidelines more appropriate for those risk factors the Service determined were not negatively affecting the contiguous U.S. DPS as a whole (68 FR 40076), because that level of constraint [implied by standards] is unwarranted (R. Smith, pers. comm. 2006). Further, in some cases there was limited scientific or other information that indicated standards were needed in most cases to avoid adverse effects to lynx or lynx habitat (see Appendix C). Guidelines would be implemented in most cases (BA) and where not adhered to for compelling reasons, adverse effects to lynx are not necessarily inevitable. Thus, this analysis will highlight differences in LCAS direction (as analyzed in the 2000 biological opinion) contained in the proposed action, and concentrate on the effects related to those differences.

The Forest Service based effects determinations on what the Plans permit or prohibit, as well as, when information was available, a quantitative assessment of the effects to lynx of actions that had the most potential to negatively affect lynx. Information included estimated projections of future actions, as well as projected or needed funding in comparison to past funding. The Forest Service analyzed what the proposed action would allow and what was anticipated to occur. However, many actions that are allowed and projected may not actually occur. For instance, many Plans allow timber harvest. However, timber harvest levels on Federal land across the western United States had declined consistently and dramatically (approximately 80 percent) over past decades or longer, even though Plans allowed more harvest (R. Gay, U.S. Forest

Service, in litt. 1999 *in* U.S. Fish and Wildlife Service 2000). The same trend holds in forest types that provide lynx habitat (B. Bollenbacher, U.S. Forest Service, in litt. 1999; B. Ferguson, U.S. Forest Service, pers. comm. 1999; F. Zenson, U.S. Forest Service, pers. comm. 1999; B. Short, U.S. Forest Service, in litt. 1999; all *in* U.S. Fish and Wildlife Service 2000). Forest Service Plans allow, but do not necessarily direct, actions to occur. Many activities that are allowed by the current and proposed Plans are never fully carried out for a variety of reasons, such as funding limitations and environmental or policy considerations. The BA provided details on likely scenarios for future actions, given the expectations for future funding. Future implementation of the Plans as currently written is partly dependent on political, economic, and local considerations.

Another factor considered in this effects analysis was our limited knowledge of some areas of lynx ecology specific to the contiguous United States. Some uncertainty exists regarding the level and type of effects that land use management decisions at both project and programmatic levels may have on the contiguous United States lynx DPS. We observe that researchers have suggested that land management plans should thus be conservative in their retention of known important lynx habitat components (McKelvey et al. 2000a).

Between 1998 and 2000, in the face of these uncertainties and knowledge gaps, the Service, Forest Service, BLM, and the National Park Service accumulated available information on lynx through development of the Science Team Report and the LCAS. These efforts demonstrate a commitment by the Federal action agencies to cooperate to improve knowledge of lynx ecology. Since the LCAS was written, additional information became available regarding lynx, snowshoe hares, and their habitat (see Appendix C in BA). Ongoing research efforts in Montana, Washington, and Wyoming should provide additional lynx and lynx habitat information in the near future. If research or other efforts provide information that reveals effects to the species not considered in this biological opinion, additional consultation may be required (50 CFR 402.16).

The BA indicates the importance of the LCAS for guiding management of lynx habitat on federal lands. Since issuance of the LCAS in 2000, additional research and information has become available to inform our management of lynx habitat. Appendix C of the BA lists available lynx research information for the United States, including that in progress or completed after 2000. While still a relevant source of information, as noted earlier, the 2000 LCAS is being updated and clarified with this information and additional information as it becomes available (James Claar, U.S. Forest Service pers. comm. 2006). We used the LCAS and research and information from before and after 2000 to develop this opinion, depending upon its relevance, status and availability.

Assumptions in the Forest Service's Biological Assessment

The Forest Service analyzed the effects of their proposed action based on several assumptions. These assumptions are outlined on page 16 of the BA. Two factors weigh heavily into the effects analysis in this biological opinion. These are: 1) the analysis of effects is primarily based on projections of changes in future Forest Service activities resulting from the proposed standards and guidelines; and 2) guidelines are assumed to be followed except where compelling

reasons such as the protection of other species at risk or protection of public safety are an issue (see Assumption 6 from BA).

Some of the differences between the proposed action and existing baseline management (existing forest plans with interim guidance to follow the Conservation Agreements) have to do with the conversion of "standards" to "guidelines." Under the Forest Service regulations, standards are mandatory but do not compel project activities to occur. A site specific Forest Plan amendment is required where standards are not adhered to. Guidelines, on the other hand, are not mandatory but are normally followed. If guidelines are not followed, a rationale should be documented but an amendment to the Plan is not required. The DEIS on page 6, states:

The Proposed Action would add or modify management direction in existing plans and would consist of one or more of the following:

- *Goals,* which are general descriptions of desired results;
- *Objectives,* which are descriptions of desired resource conditions;
- *Standards,* which are management requirements designed to meet the objectives; and
- ***Guidelines,* which are management actions normally taken to meet the objectives.**

This interpretation, supported by the Forest Service's assumption (see BA page 16) that guidelines will be followed except where compelling reasons exist, is important in our analysis. As did the Forest Service in its BA, we will also assume that guidelines will be followed unless such compelling reasons exist. If this assumption is determined to be incorrect as projects and second tier consultations proceed, consultation on the Plans may need to be reinitiated to determine whether this assumption resulted in additional effects to lynx that were not considered and analyzed in this biological opinion (50 CFR 402.16).

Additional Assumption

In addition to the assumptions contained in the Forest Service's BA, our analysis depended on an additional assumption. As written, the proposed action allows for up to six percent of occupied lynx habitat within any one Forest to be exempted from the vegetation standards to conduct fuels management projects. This amount corresponds to about 729,000 acres of occupied lynx habitat. The Forest Service did not indicate how these acres would be distributed across a Forest. If a large amount of that habitat to be treated under the fuels exemptions was concentrated within an area of known high importance to lynx or on several adjacent LAUs, the effects to lynx could be considerable. However, the Forest Service indicates that "Based upon the analysis in the BA and funding limitations, it is unlikely that any one LAU would be affected to a great degree (Tim Bertram and Ray Smith, U.S. Forest Service, in litt. 2006)." Further, funding available to conduct hazardous fuel treatments is limited and would be spread among the various Forests within the NRLA area to protect the WUI, according to need, making it unlikely that a large number of acres would be treated in any one limited geographic area (R. Smith, pers. comm. 2006). The BA supports this assumption, as Tables 10 and 11 indicate a distribution of fuel treatment needs amongst administrative units within the amendment area. Therefore, while it is theoretically possible that a number of adjacent LAUs would be rendered unsuitable, it is reasonable to assume this scenario is unlikely.

For the purposes of this biological opinion, the Service assumes that fuel management projects within the WUI would be distributed throughout a Forest and would not be excessively concentrated within adjacent LAUs. If this assumption is determined to be incorrect as projects and project level consultations (second tier) proceed, this consultation may need to be reinitiated to determine whether this assumption resulted in additional effects to lynx that were not considered and analyzed in this biological opinion. The proposed action includes monitoring requirements to report and track actions conducted under exceptions by each Forest. Further, site specific consultation (second tier) is required for actions that may affect listed species, including those conducted under the exceptions and exemptions. Therefore, the monitoring and reporting required in the proposed action, along with routine project specific consultation, provides the Service a means to assess the validity of our assumptions.

Analysis of Effects of the Proposed Action in Occupied Lynx Habitat

The following analysis pertains to the effects of the amendment affecting those 12 Forests that manage occupied lynx habitat, and only to those portions of the Forests where lynx habitat is occupied. The use of the term "lynx habitat" will be synonymous with "occupied lynx habitat" for the following effects analysis. The amendment would be implemented in occupied lynx habitat on all Forests following the final record of decision.

Since lynx are not known to occur in "unoccupied" lynx habitat at this time, the proposed action would not affect individual lynx in those areas. The Lewis and Clark, Gallatin and Helena National Forests manage areas of occupied lynx habitat (all of which is in core area), but also manage a number of small or disjunct mountain ranges with lynx habitat that are unoccupied (all are in lynx secondary or peripheral area). Six other Forests manage only lynx habitat that is presently unoccupied (all are in secondary or peripheral area) (see Table 1.). An analysis of potential effects to lynx, and lynx recovery, pertaining to those six Forests and unoccupied lynx habitat on the Lewis and Clark, Gallatin, and Helena National Forests will follow under the section titled: *Effects of the Proposed Action in Relationship to Recovery.*

The following sections analyze the effects of the measures in the proposed action on lynx, by primary areas of concern.

Habitat Connectivity Incorporating standard **ALL S1** (Appendix C) would address the impacts to lynx from loss of connectivity within occupied habitat in the NRLA area. This standard requires that new or expanded permanent developments and vegetation management projects in a LAU or linkage area maintain habitat connectivity. Thus, under this standard, Forest Service actions will not be permitted to degrade connectivity in lynx habitat or in linkage areas. Further, the Forest Service has also incorporated objectives, standards and guidelines for management direction to improve connectivity (**LINK 01, S1, G1** and **G2**, and **HU O6, G3, G7**) (see Appendix B).

This direction is consistent with recommendations in the LCAS. Many actions that affect connectivity in or between blocks of lynx habitat are primarily conducted under the authority of other agencies, such as highway departments or private landowners. The proposed direction

promotes maintenance and improvements in connectivity to the extent that the Forest Service has authority to influence or control actions that affect connectivity. There may be instances where Forest Service actions, such as permitting the expansion of ski areas, result in indirect adverse effects on connectivity for individual lynx, due to associated development on private lands. However, given the geographic extent of lynx habitat within the NRLA area, and the number, location and size of existing ski areas (Table 5, Appendix D), we anticipate that the level of adverse effects to connectivity expected from these sorts of actions would be insignificant or discountable on the population as a whole, as the standards and guidelines require maintenance of connectivity in lynx habitat.

The objectives, standards and guidelines described above would reduce or minimize the potential for adverse effects to lynx in most cases, and therefore the Plans would ultimately conserve adequate connectivity with occupied lynx habitat. Therefore, the proposed action, related to effects on connectivity, would not contribute to appreciably diminishing survival or recovery of lynx within occupied lynx habitat in the NRLA area. (See also discussion under Effects of the Proposed Action in Relationship to Recovery.) The specific effects of these types of projects would be analyzed during project-specific consultation.

Vegetation Management including (Timber Harvest and Management, Salvage Harvest, Fuels Treatment) The primary factors driving lynx populations, behavior and distribution is the abundance and distribution of their snowshoe hare prey. As noted earlier, vegetation management or natural fire can set back vegetation succession to an early seral stage, which may be used by hares during the summer but is snow-covered and thus unavailable to hares during the winter. The LCAS defines "lynx habitat in unsuitable condition" as those areas within mapped lynx habitat that are in these early successional stages as a result of recent fires or vegetation management, in which the vegetation has not yet developed sufficiently to support snowshoe hare populations during all seasons (Ruediger et al. 2000). However, eventually these stands regenerate and provide high stem densities and horizontal structure extending above snowpack during the winter, and become high quality snowshoe hare habitat. High quality lynx habitat contains an abundance of this early successional habitat in "unsuitable condition" (up to 30 percent of an LAU) within a mosaic of mid- to late-seral stands. For purposes of this amendment, "stand initiation structural stage" is synonymous with "lynx habitat in unsuitable condition" (as used in the LCAS).

Older forested stands also provide high quality winter habitat when they provide multi-story structure that provides forage and horizontal cover, for both lynx and snowshoe hare (Murray et al. 1994). In Montana, these stands were used consistently by both lynx and snowshoe hare during the winter (Squires et al. 2006). These stands, along with stands in a stand initiation structural stage and intervening successional stages, provide the landscape mosaic of habitat conditions needed for snowshoe hare production and lynx foraging (hunting) habitat, and thus for recovery and survival of lynx.

The Forest Service has identified four objectives related to vegetation management that would improve the quality of lynx habitat by improving conditions for prey: 1) manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx (**VEG O1**); 2) provide a mosaic of habitat

conditions through time that support dense horizontal cover and high densities of snowshoe hare, and provide winter snowshoe hare habitat in both the stand initiation structural stage and in the mature, multi-story conifer vegetation (**VEG O2**); 3) conduct fire use activities to restore ecological processes and maintain or improve lynx habitat (**VEG O3**); and 4) focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover (**VEG O4**).

Standards **VEG S1, VEG S2, VEG S5**, and **VEG S6** would lead to attainment of the objectives above by ensuring that enough habitat within each LAU would be available to provide lynx with sufficient snowshoe hare prey and lynx foraging (hunting) habitat conditions. The direction for **VEG S1** and **S2** is consistent with the LCAS. Under **VEG S1**, the majority of the lynx habitat in the action area (94 percent) would be managed so that LAUs would have no more than 30 percent of area in early seral stand initiation stages that do not yet provide snowshoe hare winter foraging habitat. Additionally, **VEG S2** requires that timber management will not "regenerate" (i.e., change to early seral stand initiation stage) more than 15 percent of lynx habitat in an LAU in a 10-year period. It is important to note that early seral stand initiation stages are not considered adverse if they occur in less than 30 percent of an LAU. Indeed, these young stands typically contain high stem densities and horizontal cover, which provides summer habitat and eventually grows into essential mid-to-later seral winter foraging habitat for snowshoe hares. The 30 percent per LAU limit on stand initiation phase habitat and the 15 percent change per decade limit promote a balance, a mosaic, of young and older stands within each LAU.

Standard **VEG S5** further ensures that high quality snowshoe and lynx habitat is not degraded by deferring precommercial thinning during the stand initiation structural stage, until the stand no longer provides winter snowshoe hare habitat. This direction is consistent with the LCAS. This standard protects and maintains the high stem densities that provide high quality snowshoe hare forage during both summer and winter seasons. Thinning can reduce horizontal cover that is critical to maintain the snowshoe hare prey base. Horizontal cover is important to hares and lynx. In summer, lynx broaden their habitat use from older, multi-storied forest stands to include younger forest stands with an abundance of shrub cover (Squires et al. 2006). The researchers assumed "this shift in habitat use [by lynx] during summer is due to hares being abundant in young forest stands with deciduous vegetation providing high horizontal cover." Reducing dense horizontal structure through silvicultural thinning would likely reduce an area's carrying capacity for snowshoe hares (Ruggiero et al. 2000b). In the southern portion of the range of lynx in the contiguous United States, lynx populations appear to be naturally limited by the availability of snowshoe hare prey, as evidenced by large home range size, high kitten mortality due to starvation, and greater reliance on alternate prey (Aubry et al. 2000). Deferring thinning in young dense conifer stands until they reach older age classes maintains the inherent capacity of the habitat to produce snowshoe hares.

Standard **VEG S6** similarly conserves lynx habitat by precluding vegetation management actions that reduce snowshoe hare habitat in multi-storied mature or late successional forests. This standard represents an important conservation measure in addition to those in the LCAS. Standard **VEG S6** was based in part on recent information gained through on-going research (Squires et al. 2006) within the NRLA, which was not available during development of the LCAS. Lynx preferentially foraged in spruce-fir forests with high horizontal cover, abundant

hares, deep snow, and large-diameter trees during the winter (Squires et al. 2006). The high horizontal cover found in multistory conifer stands was a major factor affecting winter hare densities (Hodges 2000a, b *in* Squires et al. 2006). During winter, snowshoe hares were consistently found in multi-storied forest stands. These older, multi-storied stands provide forage, hiding cover, and likely thermal cover for both snowshoe hares and lynx. This new standard is a significant improvement in conserving lynx in addition to the vegetation management measures in the earlier LCAS.

Guideline **VEG G1** is consistent with the LCAS and directs that vegetation management projects recruit high density of conifers and management focus on those stands currently not providing snowshoe hare habitat (e.g. mature monotypic lodgepole pine stands). Guideline **VEG G11** directs that denning habitat be distributed in each LAU.

VEG S1, S2, S5 and **S6** and **VEG G1 and G11** would work together promote vegetation management objectives. Based on the best available information, the Service concludes that combined, this direction would conserve the most important components of lynx habitat: a mosaic of early, mature and late successional staged forests, with high levels of horizontal cover and structure. These components ensure habitat that maintains its inherent capability to support both snowshoe hare prey base and adequate lynx foraging habitat (and denning habitat, discussed later) during all seasons. These standards are required for all vegetation management actions on at least 94 percent of lynx habitat within the NRLA area. Areas within the WUIs (totaling six percent of lynx habitat) are exempt from these standards, however **VEG G10** would apply and requires at least some consideration of the standards in designing fuel reductions treatments. Where these standards are applied to vegetation management projects, we anticipate few projects, if any, would have adverse effects on lynx. Collectively, application of these standards for vegetation management is expected to avoid adverse effects to lynx and promote the survival and recovery of lynx populations.

<u>Exemptions and exceptions to vegetation standards for fuels management and precommercial thinning</u>

The proposed amendment includes exemptions from standards **VEG S1, S2, S5, and S6** to allow for fuels management within the WUI. Also, exceptions listed in **VEG S5 and S6** would allow some precommercial thinning to protect structures, for research and to promote the conservation of tree species such as whitebark pine and aspen. These exemptions and exceptions would allow actions that may have adverse effects on lynx by reducing the horizontal structure of natural forest succession phases, and/or affecting the mosaics of the forested landscape in localized areas. The total area that *could* be impacted by the exemptions is limited to no more than about 729,000 acres (or about six percent of lynx habitat) in occupied lynx habitat, and exceptions could impact approximately another 64,320 acres (about 0.5 percent of occupied lynx habitat) (Appendix D, Table 1).

Exemptions from **VEG S1** for fuel management would affect the forest mosaic by allowing more than 30 percent of lynx habitat within an LAU to be in a stand initiation structural phase. Further, the exemption for fuel management in **VEG S2** would allow more than 15 percent of an LAU to be converted from suitable to stand initiation structural stage within a decade. Where

exemptions from **VEG S1** or **S2** are used within the WUI, there would be likely be adverse effects to lynx by reducing the quality and productivity of lynx and snowshoe hare habitat for at least 10 to 15 years, depending upon location, until treated stands regenerate to provide winter snowshoe hare habitat. Further, depending upon the fuel loading, location and funding, these stands may be treated again to retain them as fuel breaks and not allowed to regenerate, extending the length of time they remain in early seral conditions. This is most likely in those areas closest to communities or structures (generally < .25 miles); in most other cases, the Forest Service would consider moving the openings around to reduce fire size and intensity (Joan Dickerson, U.S. Forest Service, pers. comm. 2007). These openings would be allowed to regenerate.

The exemption from **VEG S5** for fuel management would reduce natural levels of horizontal structure in early successional phases by allowing precommercial thinning during the stand initiation structural stage, prior to when the stand no longer provides winter snowshoe hare habitat. It is well documented that such thinning in hare habitat results in a corresponding decrease in the abundance of snowshoe hares (see Ruggiero et al. 2000; see also BA Appendix C). Thinning dense stands of young trees would adversely affect lynx by reducing the capacity of these stands to produce snowshoe hares. Similarly, the exemption for fuel management from **VEG S6** would likewise allow management actions that would reduce the horizontal cover and thus quality of snowshoe hare habitat in older, multi-layered stands. Research has recently documented the importance of these older stands as foraging habitat for lynx and for hares in the NRLA area (Squires et al. 2006), especially during the winter months. Thus, exemptions in either **VEG S5** or **S6** may reduce the capacity of an LAU to support lynx reproduction and/or occupancy. The impact would depend upon the size of the treated area as well as the inherent capacity of the site to produce snowshoe hares. Overall, the amendment limits the exemptions from **VEG S5 and S6** to areas within the WUI, and so the anticipated adverse effects would occur in no more than six percent of lynx habitat.

Over the next ten years, the proposed action would also allow exceptions to **VEG S5 and S6** for thinning projects that would protect structures from wild fire or to conserve other vegetation communities such as whitebark pine and aspen. The amount of pre-commercial thinning that could reduce the quality of snowshoe hare habitat in occupied lynx habitat would range from a total of approximately 21,170 to 64,320 acres, or 2,117 to 6,432 acres per year for the life of the Plans. The pre-commercial thinning allowed under **VEG S5** would be dispersed across the National Forests in the NRLA area (see Table 1, Appendix D). The Idaho Panhandle National Forest proposes to treat substantially more acres than other Forests: 40,280 acres (4,028 acres per year) would be treated over 10 years. However, 36,400 acres of this thinning is slated to restore western white pine habitat; 80 percent of the cover in western white pine stands would be retained (Table 1, Appendix D). Other Forests have estimated substantially less need for such projects.

A maximum of six percent of occupied lynx habitat (about 729,000 acres) within the NRLA could be treated through the exemptions and additional 0.5 percent (about 64,000 acres) through the exceptions described above for both fuels management and vegetation management to benefit other resources during the next ten years. This amounts to a total of about 6.5 percent of occupied lynx habitat in the action area. However, given likely funding scenarios, it is unlikely

that this much lynx habitat would actually be treated (BA). Based upon projected funding levels, the Forest Service suggests a more likely estimate of 563,130 acres of lynx habitat treated to reduce hazardous fuels over a 10-year period (Appendix E). This equates to about 4.6 percent of *all* occupied lynx habitat, versus the maximum exemption of 6 percent within the WUI. More likely, about 170,270 acres (1.4 percent) of occupied lynx habitat is likely to be treated within the next decade within the WUI, where exemptions could be used (Appendix E). Another 392,860 acres (3.2 percent) of occupied lynx habitat is expected to be treated outside the WUI, but objectives, standards and guidelines would apply. Therefore, while we assume the worst case scenario of six percent of lynx habitat being treated under exemptions, it is most probable that a) the entire WUI (six percent of occupied lynx habitat) would not be treated with fuel reduction projects (treated area would be more on the order of 1.4 percent of lynx habitat in the WUI; see Appendix E), and b) not all fuel treatment projects within this area would require use of the exemptions and so would not result in adverse effects to lynx. It is likely that many fuel treatment projects could either comply with the standards, and or would adhere to **VEG G10** and be designed considering **VEG S1, S2, S5,** and **S6**, reducing the level of adverse effects. Similarly, it is unlikely that full funding would be obtained for the work allowed under the exceptions listed in **VEG S5 and S6**.

For perspective on the total area likely treated with projects that may adversely affect lynx, the average home range size of a lynx in the NRLA area was reported as 53,375 acres for males and 21,745 acres for females (Squires et al. 2004). Actions conducted under exemptions and exceptions would be distributed among the 12 individual National Forests with over 12,500,000 acres of occupied lynx habitat across the NRLA area. Adverse effects, while possible, are likely to affect only portions of any individual lynx home range. If acres of these treatments were concentrated in an area the effects to individual lynx may be more significant, but would affect fewer lynx. Further, many of the WUI areas occur at lower elevation (i.e. near the lower edge of lynx habitat) and are less likely to be the highest quality lynx habitat, which may reduce the potential overall effect of the exemptions (T. Bertram, pers. comm. 2007). Under the proposed action, vegetation treatments that adversely affect the essential components of lynx habitat would not be allowed in ninety-four percent of occupied lynx habitat.

Under the assumption that the exemptions and exceptions for fuels management and vegetation management would be spread across the administrative units within the action area, the worst case scenario of six percent of lynx habitat being subject to treatments that do not comply with **VEG S1, S2, S5 or S6** would adversely affect foraging for individual lynx, but as limited, the number of individuals affected would not result in adverse impacts to the survival and recovery of the lynx, either within the NRLA area or to the species as a whole. The proposed management would allow for the action area as a whole to serve its role in the conservation of lynx, by maintaining its inherent capacity to provide a prey base and foraging habitat for a breeding population of lynx and connectivity for lynx movement within home ranges, and dispersal.

The BA (Table 18) states that the baseline condition (referring to current Plan management under the Conservation Agreements) contributes to conserving lynx, and that the proposed action "partially" contributes to conserving lynx, due to exemptions and exceptions to vegetation standards for fuel treatment and thinning that result in adverse effects. However, other than fuel

treatments in the WUI or for exceptions analyzed above, the proposed action would continue to preclude pre-commercial thinning and understory removal in the majority of lynx habitat within the action area and thereby reduce the potential for degradation of existing snowshoe hare habitat. Additionally, **VEG S6** is a new standard designed to conserve multi-storied stands and represents a substantial improvement over the baseline condition, existing Plans, and recommendations in the LCAS. **VEG S6** is a standard not included in the 2000 LCAS and based upon recent research efforts on use of habitat by lynx (Squires et al. 2006). This standard will further retain and promote important lynx habitat components, foraging and denning habitat.

On the whole, the potential for adverse effects in up to six percent of lynx habitat would be offset by the vegetation management direction that applies to the remaining 94 percent, which would provide objectives, standards and guidelines for appropriate long-term management of lynx and snowshoe hare habitat. The vegetation objectives, standards and guidelines would contribute to sustaining and growing snowshoe hare and lynx populations within the both core areas and occupied secondary areas within the NRLA area, and would therefore avoid an appreciable reduction in the reproduction, numbers, and distribution of lynx in the NRLA area.

Fire Management In the western United States, 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). Periodic fire maintains this mosaic by reducing forest stands to early seral stages. Suitable vegetation management can also contribute to maintaining a mosaic of successional stages. Early successional stages lack horizontal cover, and snowshoe hare densities within them are typically low. However, snowshoe hare populations increase as the vegetation (trees and/or understory trees and shrubs) grows back to provide dense horizontal cover. Hare populations decrease if the stand matures and the lowest limbs of trees grow out of the reach of hares, and/or the understory is suppressed by the stand's closed canopy. A typical example of the importance of fire within the NRLA area is fires' role in a mature stand of lodgepole pine, which provides little snowshoe hare forage. Fire in such stands is typically very hot, resulting in stand replacement. Such stands typically regenerate into large, dense stands of lodgepole pine seedlings and then saplings, which provide quality snowshoe hare habitat. Low to moderate intensity fires also may stimulate understory development in older, mixed conifer stands.

Fire exclusion may have altered the pattern and composition of vegetation in some lynx habitat within the action area (Hillis 2003; Losensky 2002). Others suggest that fire suppression has not been as significant in lynx habitat vegetation types as in other regimes (Agee 2000). Within nondevelopmental land allocations (67 percent of lynx habitat in the NRLA area) (see Table 5), natural processes are expected to predominate. In these areas, fire would continue to play a significant role in creating natural mosaics of vegetation valuable to lynx.

The direction and intent in the LCAS for wildland fire management is well represented in the proposed action, although direction formerly found in one standard and a guideline was integrated into vegetation management objectives. The amendment clarifies vegetation management objectives **VEG O1, O2,** and **O4,** and **VEG O3** (specific to fire use) remains unchanged. All are consistent with the direction in the LCAS to restore fire as a natural

ecological process in lynx habitat. These objectives are attained through application of the vegetation management standards and guidelines described earlier. The objectives for vegetation management would provide guidance to allow fire to contribute to sustaining snowshoe hare habitat in all occupied lynx habitat (both core areas and occupied secondary area), and thus would improve the reproduction, numbers, and distribution of lynx in the core areas (and all occupied lynx habitat) in the NRLA area. This would avoid an appreciable reduction in the reproduction, numbers and distribution with the NRLA area.

Landscape Patterns In general, the proposed action would promote forested landscape patterns that maintain or restore lynx habitat. This positive effect would occur everywhere but the lands associated with the fuel and vegetation management exceptions discussed previously. As discussed earlier, lynx use a variety of forest age and structure classes within dynamic forest ecosystems. Snowshoe hares generally reach highest abundance in younger seral stages, although mid- to late seral, multistoried forests provide lynx foraging and denning habitat and produce both snowshoe hares and red squirrels. Multistoried forests provide important snowshoe hare habitat during the winter months, providing forage and thermal and hiding cover. The spatial and temporal interspersion of habitat is influenced both by natural disturbance events, such as wind and wildland fire, and by vegetation management activities, including timber harvest and prescribed fire. Because lynx occur at low densities and occupy large home ranges, conservation objectives cannot be achieved on small parcels of land (McKelvey et al. 2000a).

The direction in the LCAS for landscape patterns is well represented in the proposed vegetation management objectives. Vegetation management objectives **VEG O1, O2, O3** and **O4** (described above) are all consistent with the direction in the LCAS These objectives are attained through application of the vegetation management standards and guidelines.

As described earlier, the proposed action contains a suite of vegetation standards and guidelines that limit vegetation management activities that have the potential to adversely affect important components of lynx and snowshoe hare habitat. Further, **VEG S1** and **S2** limit early stand initiation stages, created by vegetation management such as timber harvest. **VEG S1**, limits young regenerating stands to 30 percent of the LAU in order to sustain a mosaic of age-classes across the landscape. This 30 percent limit is required unless a broad scale assessment is completed to demonstrate a need based on historic levels of early seral conditions. When applied across the landscape, even with six percent of the area exempted for fuels management, this measure and other vegetation standards would collectively result in sufficient lynx habitat being maintained over time to support recovery objectives. The wide-spread application of these measures would provide sufficient habitat to sustain lynx populations in the NRLA area. Although the exceptions and exemptions to vegetation guidance may result in adverse effects to individual lynx (as detailed earlier), vegetation objectives, standards and guidelines would contribute to creating and maintaining landscape patterns that sustain snowshoe hare and lynx populations in core areas and occupied secondary areas, thus on the whole would avoid an appreciable reductions in the reproduction, numbers, and distribution of lynx in the NRLA area.

Denning Habitat Denning habitat is used for parturition and rearing of young. The common component of denning habitat appears to be large amounts of coarse woody debris (Koehler 1990; Staples 1995). This structure is most valuable when distributed throughout the home range, in or near foraging habitat. Coarse woody debris is needed at den sites for cover and shelter for kittens at den sites. Vegetation management activities such as salvage harvesting and prescribed fire may remove existing coarse woody debris and/or affect its recruitment. The proposed action may result in localized effects to denning habitat, mostly through fuels management activities and salvage and timber harvest. These activities may remove existing coarse woody material, which can affect the quality and quantity of available lynx denning habitat.

Recent research in northwestern Montana and elsewhere has shown that lynx use a variety of conditions for dens sites (Squires et al. 2006; Merril and Shenk 2006; Merrill 2005; Mc Collough, pers. comm. 2007; BA). Most sites occurred in mature to older stands but younger stands were also used, all providing structure by large downed trees, smaller logs in wind-thrown tree piles, slash piles; even talus was used for den sites. In the northeast United States, lynx dens were found in a several stand types including softwood mid/late regeneration, mature forest mixed regeneration, mature softwood, other regeneration, and hardwood/softwood mid/late regeneration (M. McCullough, pers.comm. 2007). The structural components of lynx den sites are common features in managed (logged) and unmanaged (spruce budworm damaged areas, wind-throw) stands. Tip-up mounds (root wads) were the most common predictor of den sites in Maine. Across the range of lynx, information indicates that the key component for suitable lynx denning habitat appears to be horizontal structural.

On the whole, the best information suggests that Forest Service management conducted under current Plans has resulted in conditions that provide adequate denning habitat. Since publication of the 2000 LCAS, lynx studied in the United States have been shown to use a variety of sites and conditions for denning. The common factor appears to be dense cover for kittens, typically provided by downed wood and/or debris. These habitat elements are generally found distributed across National Forests. Lynx denning sites are not believed to be a limiting factor in Montana and Maine study areas (J. Squires, pers. comm. *in* BA; M. McCollough, pers. comm. 2007). Further, earlier assessments also concluded that in most geographic areas, denning habitat was not likely limiting to lynx, and existing Plan direction would not result in adverse effects (Hickenbottom et al. 1999). Within nondevelopmental land allocations (e.g., wilderness, roadless, late successional reserves), denning habitat would likely be maintained at or above levels that occurred historically. Thus, only in exceptional circumstances would an LAU lack of denning habitat.

Similarly we do not anticipate that vegetation management under the proposed action would result in a lack of denning habitat within an LAU. The 2000 LCAS contained prescriptive and somewhat redundant standards and guidelines for denning habitat. The Forest Service proposes to minimize the potential for lack of adequate denning habitat through **VEG G11,** which condenses the direction found in two LCAS standards and three guidelines for retention of denning habitat into a less prescriptive guideline specific to denning habitat. **VEG G11,** which states that denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future. Further, **VEG G1** states that vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority should be given to stem-exclusion, closed-canopy structural stage stands for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat should be near denning habitat. This direction is similar to that recommended in the LCAS, but has changed from standards to guidelines. Objectives **VEG O1, O2, O3, and O4** and implementing standards **VEG S1, S2, and S6**, also indirectly promote the development and retention of the structure needed for denning habitat, distributed across the landscape, through vegetation management that promotes a mosaic of stand types across the landscape.

In most cases, denning habitat is not known to be limited within lynx habitat on federal lands within the NRLA area, and the vegetation management objectives, standards and guidelines either directly or indirectly promote the development and retention of adequate amounts of denning habitat. Therefore projects are unlikely to reduce denning structure to levels that result in adverse effects to lynx. In the infrequent cases where denning habitat is limited in an LAU, or projects would result in substantial reduction of denning structure, **VEG G11** would be followed in most cases. The number of projects leading to adverse effects on lynx due to lack of denning habitat is expected to be very few. The vegetation objectives, standards and guidelines would contribute to the generation and maintenance of adequate denning habitat within lynx habitat in core areas and areas occupied by lynx, sustaining lynx populations in core areas and occupied secondary areas, thus on the whole would avoid an appreciable reductions in the reproduction, numbers, and distribution of lynx in the NRLA area.

Habitat Conversions Forest management activities can result in conversion of vegetation types. For example, silvicultural prescriptions might be designed to change species composition to favor western larch, which has a high economic value, at the expense of lodgepole pine, which has low economic value but provides better winter habitat for snowshoe hare. This kind of type conversion could reduce lynx foraging habitat.

The proposed action includes objectives similar to those recommended in the LCAS to reduce the potential for adverse effects to lynx from type conversions of habitat. Vegetation management objectives **O1, O2, O3** and **O4** (described above) are all consistent with the intent of objectives in the LCAS to minimize habitat conversions. The LCAS did not contain standards or guidelines specific to habitat conversions. The LCAS objectives were to be attained through application of the vegetation management standards and guidelines, similar to the direction in the

proposed action. With the application of these measures, we do not anticipate that the proposed action would adversely affect lynx via habitat conversions within the NRLA area. Attainment of the vegetation management objectives through projects designed using vegetation management standards and guidelines would support lynx survival and recovery.

Forest Roads Lynx are known to have been killed by vehicle-collisions in Colorado (reintroduced lynx population; paved, high-speed highways), in Minnesota (paved, high-speed highways) and in Maine (high-speed, relatively straight gravel roads on flatter terrain). The best information suggests that the types of roads managed by the Forest Service in the NRLA area do not likely adversely affect lynx. Lynx mortality from vehicle strikes are unlikely, and to date have not been documented, on National Forest lands in the NRLA area given the relatively slow speeds at which vehicles on these roads travel (due to topography and road conditions) and generally low traffic volumes.

Unlike paved highways, Forest roads rarely receive motorized use at levels that create barriers or impediments to lynx movements. Lynx have been documented using less-traveled roadbeds for travel and foraging (Parker 1981; Koehler and Brittell 1990). 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. 2000b), except at high traffic volumes (Apps 2000). Lynx show no preference or avoidance of unpaved forest roads, and the existing road density does not appear to affect lynx habitat selection (McKelvey et al. 2000c). Most investigations indicate that lynx do not alter their behavior to avoid human activities (Staples 1995; Roe et al. 1999; Aubry et al. 2000; Mowat et al. 2000; J. Squires, pers. comm. 2006 *in* BA). Human access via Forest roads can increase the potential for mortality or injury of lynx captured incidentally in traps aimed at other species or through illegal shooting. Lynx harvest seasons closed due to listing in 2000. Some trapping incidental to other fur bearer seasons occurs (MDFWP in litt. 2006). Road densities may contribute to this factor. National Forests have road density standards for various resource objectives. For instance, within the grizzly bear recovery zones in Montana, Idaho and Wyoming, lynx would benefit from road limits for grizzly bear management or where roads are limited or closed for big game management. In roadless and wilderness areas, roads are not present.

The LCAS included several guidelines related to addressing potential impacts of forest roads, including upgrading, cutting and brushing and public use. These guidelines generally discourage improving road access for people or reduce the likelihood that people would see lynx near roads. Most of these LCAS guidelines have been retained in the amendment, **HU G7, G7, G8, G9**, with modifications of guideline **HU G6**. The guideline in LCAS directed to avoid upgrades to levels 4 or 5, while the amendment directs that methods to reduce effects to lynx should be used when upgrading.

At the time of the 2000 BO, forest roads were thought to potentially impact lynx due to the potential that snow compaction could allow lynx competitors into deep snow habitats. Thus, the one LCAS standard pertaining to forest roads focused on snow compaction. However, research has provided no conclusive evidence that snow compacted routes adversely affect lynx or their habitats, including research conducted within the NRLA area. This LCAS road standard was

changed to a guideline, and is included under winter dispersed recreation, discussed later under *Winter Dispersed Recreation.*

To reduce the potential effects of roads on lynx, the amendments retained the road management guidance recommended in the LCAS. The objectives and guidelines reduce or minimize the impacts of forest roads on lynx, which would avoid appreciable reductions in the reproduction, numbers, and distribution of lynx in core areas and all occupied habitat, and within the NRLA area.

Developed Recreation We anticipate that the proposed action related to developed recreation would limit adverse effects to lynx. Most investigations indicate that lynx do not alter their behavior to avoid human activities (Staples 1995; Roe et al. 1999; Aubry et al. 2000; Mowat et al. 2000). The exception may be activities that would cause abandonment of a den site, possibly affecting kitten survival (Ruggiero et al. 2000). However, lynx are known to move kittens from natal to rearing den sites, sometimes moving kittens several times during rearing. Further, if an area were disturbed to levels that impact lynx denning, it is unlikely lynx would select the site for denning in following years. Den sites are typically not re-used year to year and denning habitat does not appear limited in the action area (J. Squires, pers. comm. 2006 *in* BA).

Developed recreation can result in direct loss of lynx habitat and associated development of the surrounding area. Large developed sites, such as four-season resorts, alters lynx habitat, results in direct loss of lynx habitat on the footprint of the development itself, and may fragment the landscape depending upon size and location. Resort developments result in permanent loss of lynx habitat through the development of permanently groomed runs and resort infrastructure, such as lift termini, buildings and roads. Potential lynx habitat within resorts receive very high levels of use by people, which likely reduces use by lynx use. However, collectively, ski resorts currently impact only a small proportion of lynx habitat; a total of 24 downhill and cross-country ski areas affect about 17,459 acres of occupied lynx habitat within the NRLA area (Table 5, Appendix D). Eight of these have plans for expansion and one new ski area is being planned. Developed recreation sites such as ski areas and warming huts may encourage snow compaction in lynx habitat. Some loss of lynx habitat is unavoidable with development, but at Forest or larger scales, relatively small areas are affected.

The most serious impact of ski or four-season resort development is the associated private land development at the base, with resulting increases in highway traffic, speeds, and surrounding development. Such development can impact connectivity between areas of lynx habitat, typically valley bottoms between mountain ridges. Lynx may avoid areas with concentrated housing, roads, busy highways, and business parks. Higher traffic volumes and speed may impede or create barriers to lynx movement, and may somewhat increase the likelihood of lynx mortality through vehicle collision, although this impact is rarely documented outside of lynx re-introduction areas.

The direction and intent of the LCAS regarding developed recreation is well represented in the amendment. The proposed action retained LCAS objectives and standards that address the most serious consequence of development, requiring new or expanding permanent developments to maintain or where possible, promote habitat connectivity within LAUs and linkage areas (**All**

O1, All S1, LINK O1, and LINK S1). The proposed amendment retained LCAS guidelines to further promote connectivity (**All G1**). Further, the proposed amendment retained several guidelines that reduce impacts within the development itself, including: adequately sized inter-trail islands that support winter snowshoe hare habitat (**HU G1**), providing nocturnal foraging opportunities for lynx that are consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes (**HU G2**), and providing for lynx movement and maintenance of the effectiveness of lynx habitat (**HU G3**). These guidelines were not changed from those in the LCAS. Although the LCAS included a standard for maintaining and providing diurnal security habitat, there is no evidence that diurnal security habitat is required by or, where it occurs on ski areas, is used by lynx. The proposed action changed this LCAS standard to a guideline in the amendment (**HU G10**).

With the application of these objectives, standards and guidelines, we anticipate that many adverse effects of developed recreation on lynx would be minimized under the proposed action. Based on evidence suggesting lynx are fairly tolerant of human activity (e.g. Roe et al. 2000), some use of large ski areas, or immediately adjacent areas, by lynx may be possible. If lynx use is precluded by habitat alteration or excessively high levels of human activities, standard **ALL S1** addresses the most significant adverse effect of developed recreation on lynx populations. Neither the LCAS nor the proposed action prohibits the development of recreation sites on National Forest lands, therefore individual lynx may be adversely affected by developed recreation through habitat avoidance, alteration or loss. However, the total area affected by the existing 24 sites is currently 17459 acres. Some of these developments have expansions planned and only one new site is being planned (BA). Where expansions develop substantial amounts of habitat outside the existing footprint of development, adverse effects through habitat loss are expected. However, even with these expansions, the amount of habitat altered or lost is unlikely to impact the lynx population within the NRLA, given approximately 12.5 million acres of lynx habitat within the action area. Therefore, although individual lynx may be affected by adversely affected by recreation development actions, the Plans as a whole would have objectives, standards and guidelines to reduce potential project impacts and overall impacts at a landscape scale, and thus would avoid an appreciable reduction in the reproduction, numbers, and distribution of lynx in the NRLA area.

Non-winter Dispersed Recreation Due to the low susceptibility of lynx to displacement by humans, this activity presents low risk of adverse effects except possibly for disturbance near den sites. Because plans in the NRLA area generally already provide for adequate and widely distributed denning habitat (Hickenbottom et al. 1999), no adverse effects were identified related to non-winter dispersed recreation. Dispersed recreation often occurs along hiking trails through forested areas and well-used, if not designated camp sites. Human-created disturbance near such areas is fairly predictable and if disturbance occurred at levels affecting lynx or their dens, it is unlikely that lynx would den near such established sites at all. Further, lynx could move their kittens to an alternate site and/or would likely avoid denning in these areas in following years. Lynx den sites are not easily detected in forests and unlikely to be noticed by recreationists. Lynx are rare, as such are den sites are very rare. The likelihood that dispersed recreation on or off trails would occur in proximity of a den site, and/or that the dispersed recreation activities occurring would actually disturb a lynx den site or in other ways adversely affect lynx is so low as to be discountable and effects. Further, the intent of the LCAS standard to ensure landscape

connectivity in recreation projects is found in the proposed action in **All O1 and All S1.** Therefore, non-winter dispersed recreation activities are not likely to adversely impact lynx, nor result in adverse impacts to the lynx population in the NRLA area.

Winter Dispersed Recreation Dispersed recreational uses and activities, such as snowmobiling, cross-country skiing, and snowshoeing are increasing within higher elevation environments. These activities are unlikely to have direct adverse effects on lynx. Most investigations indicate that lynx do not alter their behavior to avoid human activities (Staples 1995; Roe et al. 1999; Aubry et al. 2000; Mowat et al. 2000).

Some researchers hypothesized that the presence of compacted snowmobile trails may allow coyotes to access lynx habitat from which they were previously excluded by deep, unconsolidated snow, which may negate the competitive advantages of lynx over coyotes and other predators during the winter (Buskirk et al. 2000, Murray and Boutin 1991, Bunnel et al. in press). Research documents that coyotes use compacted snow routes, or often select for shallow or more supportive snow conditions (Thibault and Oullet 2005), and scavenge for carrion, and/or prey on snowshoe hare and other small mammals during the winter (Kolbe and Squires in press; Shirley 2005; Staples 1995; O'Donoghue 2001).

The range of lynx and coyotes overlap in many regions of Canada and the United States. The range of lynx is restricted to forested areas with deep snow conditions during the winter. Lynx evolved in and are highly adapted to a boreal forest environment. Morphologically, lynx are well-adapted to hunting snowshoe hares in deep snow (Murray and Boutin 1991) in densely forested environments. Lynx have very large feet in relation to body mass, which prevents them from sinking deep into snow. This provides lynx with an inherent competitive advantage over many other mammalian carnivores in deep snow conditions. Their primary prey, snowshoe hare are also adapted to living in dense boreal forests in areas with abundant snow. Within the last century, coyotes have expanded their range from western and central prairie regions in North America to forests of the east and far north. Morphologically, coyotes are at a disadvantage hunting in high snow areas, as their feet are fairly small in relation to body mass and they therefore sink into soft snow (Murray and Boutin 1991).

Dietary and habitat-use overlap influences competition between predators. Much of what is known of lynx diet in the NRLA comes from recent studies in Montana. As in many areas across the range of lynx, lynx in Montana preyed almost exclusively on hares in the winter (Squires and Ruggiero in press) and so a significant depletion of hares by coyotes during winter could adversely affect lynx (Kolbe and Squires in press). Squires and Ruggeiro (in press) noted that the lynx use of alternate prey may increase as hares become scarce, but not at the hare densities they observed during 1998 to 2002. In areas of Canada where hares are abundant and hare populations cycle, lynx switched to red squirrels during cyclic hare lows (O'Donoghue et al. 2001). In the United States, snowshoe hare habitat becomes more fragmented as habitats becomes drier, and thus hare densities are significantly lower than in Canada. Hodges (2000) reports that hares may be cyclic in southern areas, although with peak and low densities lower than those in the north. Thus, snowshoe hare densities are relatively and consistently lower across lynx range in the United States, including the NRLA. Snowshoe hares are the primary prey of lynx and thus throughout their range in the United States, lynx occur at inherently low

densities compared to Canada. Coyotes are known as generalist predators, using a diverse selection of mostly small mammal prey, as well as carrion. Where hares are abundant, hares may also be a primary component of coyotes' diet (O'Donoghue et al. 2001). Coyotes are highly adaptable carnivores, although researchers have noted that in several studies, forests appear suboptimal habitat for coyotes (see Thibault and Quellet 2005 and O' Donoghue et al. 2001).

Bunnell et al. (in press) suggested that their results in indicated that snow compacted routes increased coyote presence in their study areas in Utah and Wyoming, thereby suggesting that compacted routes would increase coyotes' competition with lynx for snowshoe hare, if lynx were present. They also concluded that "restrictions placed on snowmobiles in lynx conservation areas by land management agencies because of the potential impacts of coyotes may be appropriate". However, in northwestern Montana (within the northern lynx core area) Kolbe and Squires (in press) concluded "little evidence that compacted snowmobile trails either facilitated coyote movements on our study area or that snowshoe hares provided a large proportion of the coyote's winter diet. It is unlikely that compacted snowmobile trails increased exploitation competition between coyotes and lynx during winter on our study area." Kolbe and Squires (in press) suggested that compacted snow routes did not appear to enhance coyotes' access to lynx and hare habitat, and so would not significantly affect competition for snowshoe hare. They found that coyotes used compacted snow routes for less than 8 percent of travel, suggesting normal winter snow conditions allowed access by coyotes, regardless of the presence or absence of compacted snow routes. Bunnell indicated that "circumstantial evidence" suggested the existence of competition. Kolbe was able to directly measure relationships between coyotes, compacted snow routes and snowshoe hare in an area that also supports a lynx population. Coyote diet was made up of large portions of carrion (over 60 percent) scavenged mostly along or near trails in the Uinta Mountains in Utah (Shirley et al. 2005), and similarly mostly ungulate carrion (over 60 percent) but not nearer to trails than expected in Montana (Kolbe and Squires in press). Analysis of coyote scat in each study area also revealed similar amounts of snowshoe hare (about 16 and 12 percent respectively). Advantages of Kolbe and Squires (in press) include a rigorous scientific methodology (e.g. a systematic random coyote sample, coyote population was sampled evenly across a large number of known individuals; radio-collared coyotes to locate individuals and begin backtracking in an unbiased manner; a rigorous quantification of coyote adjacency to all available packed snow routes; quantification of habitat use and daily availability of compacted snow routes; and GPS and GIS data to describe coyote use of and adjacency to trails).

The ecology of multi-species predator and prey relationships across the range of the boreal forest is complex. O'Donoghue et al. (2001) provide a comprehensive summary and integration of research from several study areas, and conclude they found in their findings "value as much in suggesting hypotheses as in providing answers," indicating there is much still to be known regarding the relationships and responses of these competing predators. They note that the question of how these two predators survive using a very limited resource base is "especially interesting." Even with high or complete overlap in resource use, recent models of competition have suggested that species may coexist for long periods of time (Hubbell and Foster 1986, MacNalley 1995 *in* O'Donoghue et al 2001). No research to date has documented a decline in lynx populations due to competition by coyotes. Further, the degree to which coyotes and lynx compete for snowshoe hares in the western United States is unknown (Kolbe and Squires in

press). The impact of competition by coyotes on lynx population is probably influenced by many variables including snowshoe hare abundance, alternate prey species, alternate prey abundance, availability of carrion, and several habitat variables including quality of snowshoe hare habitat, the extent of forest openings, and winter snow conditions over time.

To date, research has confirmed that lynx and coyote populations coexist, despite dietary overlap and competition for snowshoe hare, the primary prey of lynx, and alternate prey species. In some regions and studies, coyotes were found to use supportive snow conditions more than expected, but none confirm a resulting adverse impact on lynx populations in the area. The best scientific information from within the NRLA area in an area populated by both lynx and coyotes concludes that coyotes did not require compacted snow routes to access winter snowshoe hare habitat. In our final rule (March 24, 2000; 65 FR 16052), snow compaction created by human activities was not found to be a threat to the lynx DPS. In our 2000 and 2003 finding we concluded there is no evidence that any competition may exist between lynx and other species that exerts a population-level impact on lynx. We also have no evidence that packed snow trails facilitated competition to a level that negatively affects lynx or lynx populations. Neither factor is considered a threat to lynx populations, but may possibly have adverse effects on individual lynx depending upon the situation.

The proposed action includes an objective (**HU O1**) to maintain the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat. The proposed action changes an LCAS standard for no net increase in compacted snow routes, unless it consolidates use, to a guideline stating that "compacted-snow areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat" (**HU G11**). This measure directly addresses the hypothesis that the area impacted by coyotes (or other competitors) in deep-snow areas is related to the spatial arrangement of compacted snow routes. The guideline would reduce the potential for significant increases in the area influenced by compacted snow routes. Similar to the direction in the LCAS, the proposed action would continue to limit the expansion of winter dispersed recreation activities within lynx habitat. Further, guideline **HU G12** limits winter access for mineral and energy exploration and development to designated routes. Finally, the proposed action requires mapping and monitoring of snow compacting activities and designated and groomed routes at five-year intervals.

The Service concludes that the proposed guideline would be sufficient to maintain habitat effectiveness for lynx by limiting the expansion of compacted snow routes, and our conclusion would be tested through monitoring required in the Plans. The best information available has not indicated that compacted snow routes increase competition from other species to levels that adversely impact lynx populations, and under the proposed action, the amount of areas affected by snow compacted routes within the NRLA would not substantially increase. Thus the proposed action would allow projects that may adversely affect individual lynx in some specific cases, however the proposed action as a whole would avoid appreciable reductions in the reproduction, numbers, and distribution of lynx in core areas and all occupied habitat, and in the NRLA area.

Minerals and Energy Mining and energy development may directly impact habitat and can attract recreational activity (primarily snow compacting activities) into certain areas. As described earlier, the promotion of recreational activities is unlikely to adversely affect lynx. However, new development could result in small, localized losses of lynx and snowshoe hare habitat. The proposed action contains the following three guidelines that would minimize the potential impacts of mineral development on lynx by calling for management to reduce impacts on lynx and lynx habitat (**HU G5**), and encourage remote monitoring to reduce snow compaction (**HU G4**). These guidelines have not changed from the LCAS. An LCAS standard limiting winter access to designated routes was changed to a guideline in the amendment (**HU G12**). The direction and intent in the LCAS is well represented in the proposed action. With the application of these measures, the proposed action would result in no or only minor adverse effects to lynx depending upon the scale of development and potential loss of habitat. Therefore, the effects of minerals and energy development across the NRLA area would not appreciably reduce reproduction, numbers, and distribution of lynx.

Coordination/Connectivity Coordination among different land management agencies is important to recovery of lynx because lynx have large home ranges and may move long distances. Without coordination, the effects of highways and mixed land ownership patterns on lynx are likely to contribute to increased mortality on highways and reductions in habitat connectivity. Although the proposed action has measures to directly address coordination (coordination is already required under existing Forest management direction), the Forest Service is a lead member in the interagency Lynx Steering Committee and the Lynx Biology Team, and played a key coordination role for the Lynx Science Team.

Connected forest habitats allow lynx to move long distances to find food, cover, and mates. Because of the large amount of lynx habitat in the action area, the Forest Service has the ability to impact connectivity through the proposed action. The proposed action includes measures that would address the connectivity issue by requiring new or expanded permanent developments and vegetation management projects to maintain habitat connectivity in an LAUs and linkage areas through standard **All S1**, and by identifying potential highway crossings when highway or forest highway construction or reconstruction is proposed in linkage areas through standard **LINK S1**. This direction was found in the LCAS, and to that end the Forest Service led and completed an interagency effort that resulted in a map of potential lynx linkage areas for the NRLA area produced by a team of representatives of federal, state and tribal agencies (ftp://ftp2.fs.fed.us/incoming/r1/ro/lynx/lynxhab21x27bw.pdf).

Livestock Snowshoe hare densities and overwinter survival appear to be positively correlated with understory density (Adams 1959, Wolff 1980, Litvaitis et al. 1985). Livestock may compete with snowshoe hares for forage resources (Ruediger et al. 2000). Browsing or grazing also could impact plant communities that connect patches of lynx habitat within a home range. Conversely, appropriate grazing management can rejuvenate and increase forage and browse in key habitats such as riparian areas. We found no evidence that grazing was a factor threatening lynx, therefore, grazing was not addressed in the final listing rule (March 24, 2000; 65 FR 16052). There is no existing research that provides evidence of lynx being adversely affected by grazing within the NRLA or elsewhere, or of lynx movements within home ranges being impeded by grazing practices. Given the previous discussion of lynx dispersal movements, it is unlikely that grazing would impede lynx movements for dispersal or breeding. Accordingly, the proposed action changes LCAS grazing standards to guidelines. The proposed action would continue to reduce the potential for grazing to adversely affect lynx through guidelines for grazing management practices that provide for the regeneration of trees, shrubs and aspen clones in lynx habitat. These guidelines, formerly LCAS standards, should adequately minimize the potential for adverse effects of grazing to lynx, and may improve the habitat over baseline conditions: manage livestock grazing to allow regeneration in fire- and harvest-created openings (**GRAZ G1**); contribute to the long-term health and sustainability of aspen (**GRAZ G2**); maintain or achieve a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes in riparian areas and willow carrs (**GRAZ G3**); and contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes in shrub-steppe habitats (**GRAZ G4**). With the application of these measures in most cases, the proposed action would result in no effects or discountable effects to lynx as a result of grazing. Therefore, effects of grazing across the NRLA area would be minimal and would not appreciably reduce reproduction, numbers, and distribution of lynx in core areas or all occupied habitat, or in the NRLA area.

Effects of the Proposed Action in Relationship to Recovery

The action area includes all or part of the following areas identified in recovery outline for lynx (U.S. Fish and Wildlife Service 2005): the Northwestern Montana/Northeastern Idaho core area; the Greater Yellowstone core area; the southwestern Montana secondary area; and peripheral lynx habitat in Utah and Wyoming. Only the core areas currently have a clear role in recovery (lynx recovery outline); the secondary and peripheral areas may be important for periodic population expansion and connectivity.

The Forest Service proposes to amend the Plans of all 18 Forests in the NRLA, but require application of the amendment only in areas occupied by lynx. The direction in the amendment would be "considered" in areas with unoccupied lynx habitat, but would not be mandatory, until such time, if ever, the area becomes occupied by lynx.

Twelve Forests within the NRLA area are occupied (U.S. Forest Service and U.S. Fish and Wildlife Service 2006) by lynx (Appendix A). All core area is occupied by lynx, consisting of

nine Forests that are entirely or partially in core areas. Three Forests, within secondary areas only, are occupied as well-. For those Forests or portions of Forests that are occupied the amendment would be fully implemented.

Four Forests are in secondary areas only and are unoccupied by lynx (Appendix A). These Forests include the Beaverhead-Deerlodge, Bitterroot, Nez Perce, and Salmon-Challis. Additionally, the Lewis and Clark, Gallatin and Helena National Forests all manage portions of occupied lynx core area, but also manage disjunct mountain ranges in eastern Montana that occur in secondary or peripheral areas and are unoccupied. For these unoccupied Forests and disjunct mountain ranges, Plans would be amended but the provisions of the amendment would not be implemented until these areas become occupied by lynx.

Two Forests, the Ashley and Bighorn National Forests, are in peripheral areas only and are unoccupied.

Within these Forests (or portions thereof) that are unoccupied, we do not expect the proposed action would adversely affect individual lynx as lynx are not known to be present. However, there may be effects to lynx in the future if lynx use of the areas occurs, or to recovery if these areas are ultimately found to be essential to recovery by supporting resident lynx populations. The recovery plan suggests that secondary areas are important in providing connectivity between blocks of core area. Connectivity may be evaluated through an assessment of how habitat characteristics and management would facilitate lynx dispersal through an area, or even of how it might accommodate occupation of an area by low numbers of lynx.

The role of core, secondary and peripheral areas to recovery of the DPS is described in the recovery outline: "Focusing lynx conservation efforts on these core areas will ensure the continued persistence of lynx in the contiguous United States by addressing fundamental principles of conservation biology:

1) Representation by conserving the breadth of ecological settings of the distinct population segment;
2) Redundancy by retaining a sufficient number of populations to provide a margin of safety to withstand catastrophic events; and
3) Resiliency by maintaining sufficient numbers of animals in each population to withstand randomly occurring events and prey population dynamics."

As described in the recovery outline (Service 2005), the importance of core areas to lynx recovery is well established, however "the role of areas outside core in sustaining lynx populations in the contiguous United States unclear. The fluctuating nature of lynx population dynamics and the ability of lynx to disperse long distances have resulted in many *individual* occurrence records outside of core areas, without accompanying evidence of historic or current presence of lynx *populations* [emphasis added]. Areas classified as "secondary areas" are those with historical records of lynx presence but no record of reproduction; or areas with historical records and no recent surveys to document the presence of lynx and /or reproduction. If future surveys document presence and reproduction in a secondary area, the area could be considered for elevation to core. We hypothesize that secondary areas may contribute to lynx persistence by

providing habitat to support lynx during dispersal movements or other periods, allowing animals to then return to "core areas". In "peripheral areas" the majority of historical lynx records is sporadic and generally corresponds to periods following cyclic lynx population highs in Canada. There is no evidence of long-term presence or reproduction that might indicate colonization or sustained use of these areas by lynx. However some of these peripheral areas may provide habitat enabling the successful dispersal of lynx between populations or subpopulations. At this time, we simply do not have enough information to clearly define the relative importance of secondary or peripheral areas to the persistence of lynx in the contiguous United States."

The recovery outline is clear in its emphasis on the need to manage lynx habitat within core to support recovery of lynx in the DPS. Focusing lynx conservation efforts on core areas will ensure the continued persistence of lynx in the contiguous United States. The previous sections analyzed how the proposed action would conserve lynx and lynx habitat within core areas as well as within currently occupied secondary areas.

The recovery outlines indicates a need for "research to determine the role of secondary areas in ensuring the persistence of lynx in both the contiguous United States and individual core areas", and "based on results, adjust core and secondary area designations as appropriate" (recovery action 5.5.2). Secondary areas have fewer and more sporadic current and historic records of lynx than core areas, and no records of reproduction. This evidence suggests that historical lynx abundance was likely relatively low. The quality and quantity of lynx habitat in secondary areas is less clear, but habitat in secondary areas in the NRLA area generally becomes drier and patchier as it extends south, or lower in elevation. The recovery outline indicates that one hypothesis for the lack of lynx in unoccupied areas is that lynx were extirpated because of changes in vegetation structure resulting in poor prey populations, or due to past trapping, and the area has not been recolonized by lynx. On Forest Service land, the Service has reviewed no information related to habitat condition in LAUs in unoccupied secondary area that suggests that past vegetation alteration in lynx habitat was so severe as to reduce prey populations to levels that lynx would be extirpated. Further, lynx trapping in the NRLA area ended ten years ago or longer in Utah (1974), Wyoming (1973) and Idaho (1996), and was severely curtailed through a quota system in Montana beginning in the mid-1990s, ending altogether when lynx were listed in 2000. Further, our 2000 final rule (65 FR 16052) details how, in evaluating trapping harvests compared to anomalous cyclic highs in lynx populations in the 1960s and 1970s, overtrapping does not appear to have caused major declines in lynx populations in the contiguous United States.

As indicated earlier, National Forests mapped lynx habitat beginning in 1999, using the best available information on lynx and the best available mapping technology. The accuracy and precision of mapping methods varied among Forests. In some cases, lynx habitat may have been "overmapped". As projects are planned, these maps are typically ground-truthed by biologists, in some cases with assistance from the Lynx Biology Team and lynx scientists (J. Claar, pers. comm. 2007). In the past, several areas of previously mapped lynx habitat were found to lack lynx habitat of sufficient quality or quantity to sustain use by lynx. In such cases, some LAUs were dropped altogether and in others, lynx habitat was more accurately delineated, usually resulting in a reduction of mapped habitat. As further investigation informs our mapping efforts, it may be determined that some of the unoccupied secondary area has lynx habitat that is of

poorer quality or occurs in less abundance than originally believed, which is a reasonable explanation for the poor historic record of lynx in the area.

Peripheral areas were identified based on sporadic records of lynx presence that generally occurred following cyclic declines of peak lynx numbers in the northern (Canadian) lynx populations. There is no historical evidence of lynx "populations" in peripheral areas (e.g. no reproduction documented, nor long term presence of multiple animals in these areas). The NRLA area includes two larger blocks of peripheral area, the Bighorn and Ashley National Forests, and two small mountain ranges in eastern Montana (see Appendix B). Compared to areas within the contiguous United States with strong historical presence of lynx populations, these peripheral areas evidently played a relatively minor role in sustaining lynx a population over time, and likely primarily facilitated dispersal between areas of more suitable habitat. Lynx habitat in peripheral areas were also mapped during the same process as described above for secondary areas, and so the same limitations apply.

The recovery outline identifies four recovery objectives. Below, we analyze the extent to which the proposed action addresses the recovery objectives:

Objective 1: Retain adequate habitat of sufficient quality to support the long-term persistence of lynx populations within each of the identified core areas.

To summarize, we conclude that the proposed action fulfills this objective and adequately manages the two core areas within the NRLA to support lynx recovery. The proposed action would support the long-term persistence of lynx populations within the Northwestern Montana/Northeastern Idaho and Greater Yellowstone core areas, which constitutes one third of the core areas nationwide.

In support of Objective 1, the proposed amendment includes the following direction for all core area (and occupied secondary lynx area) within the NRLA:

1) The proposed action includes vegetation management objectives that support this recovery objective, as detailed earlier (**VEG O1, O2, O3, and O4**).
2) The proposed action would maintain a mosaic of early to late forest successional stages necessary to support snow shoe hare and lynx. No more than 30 percent of lynx habitat within an LAU would be in stand initiation structural phase, and no more than 15 percent of lynx habitat in any LAU could be changed (harvested) to this stage per decade (**VEG S1** and **S2**) (LAUs provide the basic scale within which to measure lynx habitat quality and moderate the impacts of Forest management.)
3) The proposed action would preclude a reduction in snowshoe hare winter forage habitat in either stand initiation structural stage (early successional stages) or in older, mature multistoried stands (**VEG S5** and **S6**) in at least 94 percent of core and occupied secondary area within the action area.
4) Where fuels treatment actions are planned, **VEG S1, S2, S5,** and **S6** will be considered in designing treatments to reduce adverse effects to lynx (**VEG G10**).
5) Exemptions to standards that avoid adverse effects to lynx habitat are limited to fuel reduction treatments within the WUI and would affect no more than six percent of lynx

habitat within the NRLA core areas. It is unlikely that all six percent would be treated, or that all treatments would adversely affect lynx.

6) Exceptions to standards that avoid adverse effects to lynx habitat are limited to only those circumstances listed under **VEG S5 and S6**. Collectively, these actions are not likely to occur on more than about 6400 acres per year, and more likely nearer to 2200 acres per year in core areas within the NRLA.
7) A number of vegetation management guidelines, as described earlier in this biological opinion, would further reduce potential for adverse effects.
8) A large proportion of all lynx habitat within the NRLA area (67 percent) is in non-developmental status, where natural ecological processes are expected to predominate.
9) Although not a part of this proposed action, the Forest Service is a lead agency in the multi-agency Lynx/Wolverine Steering Committee, and National Lynx Biology Team. These teams help develop relationships with non-Federal land owners, including the States, and provide a source for non-Federal land management options through the LCAS.

Objective 2: Ensure that sufficient habitat is available to accommodate the long-term persistence of immigration and emigration between each core area and adjacent populations in Canada or secondary areas in the United States.

To summarize, we conclude that the proposed action contributes to this recovery objective in part, although we have concerns related to continued connectivity across the secondary area between the Northwestern Montana/Northeastern Idaho and Greater Yellowstone core areas. Connectivity between the core areas Northern Rockies and Yellowstone is likely important to sustaining lynx at the periphery of its range in the contiguous United States. Connectivity between the United States and Canada appears intact thus far, as the Northwestern Montana/Northeastern Idaho core area is directly adjacent to Canada, and includes Glacier Park along its northeastern edge. Occupied secondary area in northern Idaho abuts the core area and international border in the far northwest region of the NLAA area. Thus, to the extent of Forest Service authority and management, the proposed action meets this objective in part by providing and conserving core area lynx habitat directly adjacent to and continuous with lynx habitat in Canada. Such habitat should accommodate both immigration of lynx from Canada, and emigration from core areas to secondary areas or Canada.

In all core area and occupied secondary area, the proposed action includes objectives to use federal jurisdiction to actively maintain or restore lynx habitat connectivity in and between linkage areas and LAUS, either through federal land management or conservation easements, land exchanges, or other cooperative efforts with private land owners (**All O1, Link O1**). The proposed action contains a standard that applies to all programs requiring new or expanded developments and vegetation management projects maintain habitat connectivity within LAUs and linkage areas (**ALL S1**). The proposed action also includes a standard that requires the Forest Service to identify potential linkage across highways proposed for construction or reconstruction (**LINK S1**). Because these measures would apply in both core and occupied secondary areas, it clearly meets the recovery objective of accommodated long-term connectivity across these broad areas these areas.

The proposed action is less clear in its effects in unoccupied secondary areas, largely situated between the Northwestern Montana/Northeastern Idaho and Greater Yellowstone core areas. The amendment would not be implemented in the secondary area between these two core areas until or unless the areas become occupied by lynx. In the meantime, existing Forest Plan direction would be implemented. Management actions that degrade lynx habitat quality could occur under this direction. It is reasonable to expect that at some point during the life of the proposed action, individual lynx would attempt dispersal across secondary area that is now unoccupied. Lynx are known to travel extensive distances traversing seemingly unsuitable terrain (Mech 1980; McKelvey et al. 2000b). Lynx have been documented as far south from lynx habitat as Iowa, south-central North Dakota, and South Dakota. Many of these occurrences are associated with mid-continent (Canada) irruptions of lynx populations in the 1960s, 1970s and 1980s (McKelvey et al. 2000b).

Information from the Forest Service indicates that the likely impact of projected vegetation management on connectivity in this area may not be excessive (U.S. Forest Service in litt. 2007) (Appendix D and E). Related to key habitat components such as horizontal structure, under existing Plan direction, fuels treatment projects in unoccupied habitat would likely occur in no more than about two to four percent of all lynx habitat (inside and outside the WUI) on any Forest in secondary areas (Appendix E), despite lack of mandatory direction in Plans, because areas within the WUI would likely be treated before other areas (BA). The Forest estimates that during the next ten years, precommercial thinning could occur on 66,870 acres (about 1 percent) with full funding, and more likely would occur on 22,750 acres (0.4 percent) or less with projected funding (see Appendix D, Table 1) of the lynx habitat in the unoccupied Forests in secondary areas. We did not receive projections of timber harvest for these Forests. Timber harvest could result in creating stand initiation phase openings in more than 30 percent of an LAU. However, given the baseline condition of LAUs across all of the NRLA area and recent timber harvest levels (R. Smith, pers. comm. 2007), it is unlikely that timber harvest would create stand initiation conditions in over 30 percent of many LAUs. Hillis et al. (2003) described effects of past timber harvest on the Northern Region of the Forest Service and indicated that no more than about 9.2 percent of National Forest lands were in early seral condition. Overall, Forest Service vegetation management, under existing Plan direction, would not preclude connectivity or opportunistic foraging conditions.

Development is another key factor that may impede lynx movement. On National Forest land, four ski areas occur in unoccupied secondary lynx habitat and affect 3800 acres (about .06 percent of unoccupied habitat in the NRLA); two of the four are planning expansions. As detailed earlier, existing ski areas in the entire NRLA area in general affect only minor amounts of lynx habitat (less than one percent of all lynx habitat) and none impede connectivity of lynx habitat at this time (U.S. Fish and Wildlife Service 2001).

Connectivity for lynx could be more seriously compromised by development such as highway expansions, for instance. Even with implementation of the amendment however, the role of the Forest Service in ameliorating the impacts of highway or private land development are limited. The amendment would however, if it were applicable, require the Forest Service consider land exchanges or acquisition, and coordinate with other agencies to lessen the impacts of development. As described previously, the Forest Service led and completed the effort to

identify key linkage zones across the range of lynx. These areas are identified in both core and secondary areas, and the map is available information for use by Forests and other agencies in secondary areas.

Under the proposed action, the Forests are to "consider" the provisions in the amendment in unoccupied lynx habitat. However, the Plans would allow actions that would degrade lynx habitat in currently unoccupied habitat and Forests' actions could to a limited extent, aggravate degradation of habitat connectivity because of development through its actions on adjacent Forest Service lands. Nonetheless, given lynx ability to move great distances through varied habitat and terrain, we expect Forest management actions in secondary areas that are currently unoccupied would not likely create total barriers to lynx movement or dispersal. As explained earlier in this opinion, dispersing lynx evidently use a variety of habitats and prey resources compared to lynx attempting to establish a home range and territory. A number of lynx from the reintroduced population in Colorado have dispersed to Idaho, Montana, and South Dakota (T. Shenk, pers. comm. 1007), traveling as far as 1220 kilometers, measured as a straight-line distance. Most of those lynx recaptured, or where carcasses were retrieved, were in good body condition. Some of these lynx evidently crossed the Red Desert region of Wyoming (Kurt Broderdorp, U.S. Fish and Wildlife Service, pers. comm. 2007). It is reasonable to predict that some of those eventually located in Montana or Idaho dispersed across unoccupied secondary areas. Individual lynx also would likely be able to occupy these secondary areas, but at low densities. If evidence of lynx on a Forest was determined to meet one or both of the criteria in the Conservation Agreement (U.S. Forest Service and U.S. Fish and Wildlife Service 2006), the Forest would be deemed occupied and the amendment would be fully implemented, and adverse effects to such lynx would be reduced.

Application of the amendment in secondary unoccupied habitat would ensure habitat conditions of higher quality throughout the unoccupied secondary area. However, given the estimates of projected impacts as described above and the best information available regarding lynx dispersal movements, we conclude that under existing Forest Plan direction, these secondary areas would reasonably be expected to provide adequate connectivity and opportunistic foraging habitat for lynx in unoccupied secondary area to allow dispersal.

Non-federal lands also contain lynx habitat. Although not a part of this proposed action, the Forest Service is a lead agency in the multi-agency Lynx/Wolverine Steering Committee, and National Lynx Biologist's Team. These efforts facilitate relationships with other Federal and non-Federal land owners, including the States and provide a source for non-Federal land management guidance, through products such as the LCAS and Forest Plans. The Steering Committee would also provide a forum to build and sustain cooperative efforts with Canada to maintain lynx habitat connectivity across the international border, if and when the need arises. Thus, we conclude that the proposed action contributes to this recovery objective, in part.

Objective 3: Ensure that habitat in secondary areas remains available for continued occupancy by lynx.

To summarize, we conclude that the proposed action contributes to this recovery objective in part, although we have concerns related to future lynx habitat conditions in currently unoccupied secondary areas between the Montana/Northeastern Idaho and Greater Yellowstone core areas.

The recovery outline discusses the relative importance of core and secondary areas to lynx recovery. The proposed action would fully implement the amendment in occupied lynx habitat occurring in the secondary area on three National Forests (see Appendix A). The proposed action supports this objective in part by applying the amendment equally in occupied core and secondary area within the NRLA. The proposed action would mandate that occupied lynx habitat in secondary areas in Montana and Idaho, including areas on the Targhee, Clearwater, and Idaho Panhandle National Forests, be managed by the same objectives, standards and guidelines as core areas. This measure would ensure that habitat in currently occupied secondary areas remains available for continued occupancy by lynx.

The Forest Service would "consider" the guidance in the amendment on the four Forests and disjunct mountain ranges in eastern Montana that are unoccupied, but it would not be mandatory. If and when occupancy by lynx is established on a Forest, either through reproduction or at least two verified reports since 1999, the amendment would be implemented in full. The Nez Perce, Salmon-Challis, Bitterroot, Beaverhead – Deerlodge National Forests occur in secondary areas where lynx habitat is unoccupied (Appendix B). Also the Lewis and Clark, Gallatin and Helena National Forests manage disjunct mountain ranges in secondary areas that are also unoccupied by lynx. The amendment would not apply in these areas until the areas are occupied by lynx. There is no assurance in the proposed amendment as to whether these secondary area Forest lands would remain available for continued occupancy by lynx.

In the meantime, management actions could degrade lynx habitat that is currently unoccupied. Appendix D and E (U.S. Forest Service in litt. 2007) contain tables of data pertaining to occupied and unoccupied lynx habitat. The tables identify and quantify, for unoccupied habitat, many of the potential risks to lynx habitat that are projected for the next decade. As described above under recovery objective 2, the information indicates that the likely adverse impacts of anticipated Forest vegetation management activities in these unoccupied areas may not be excessive. Most important in conservation of lynx habitat are key habitat components such as horizontal structure. Fuel treatment projects that reduce horizontal structure in unoccupied habitat would likely occur in no more than two to four percent of all unoccupied lynx habitat (inside and outside the WUI) on any Forest in secondary areas (Appendix E), despite lack of mandatory direction in Plans, because areas within the WUI would likely be treated before other areas (BA). Also, the Forest Service estimates that during the next ten years, precommercial thinning could occur in about one percent with full funding (56,160 of 3.3 million acres), and more likely less with projected funding, of the lynx habitat in each of the unoccupied Forests in secondary areas. Timber harvest could result in creating stand initiation phase openings in more than 30 percent of an LAU. However, the Service has not reviewed any information from these Forests to suggest that timber harvest levels would reasonably be expected to create stand initiation conditions in over 30 percent many LAUs. Vegetation management projects such as

precommercial thinning or timber harvest resulting in more than 30 percent of lynx habitat being in early seral conditions within an LAU, did not occur under the Conservation Agreements. Hillis et al. (2003) analyzed the effect that past timber harvest has historically had on creating these early seral stages, or stand initiation phases, within Forest Service and other lands in Region One. Based upon an analysis that approximated the a multiple LAU scale, a 4th code hydrologic unit, 9.2 percent of National Forest lands and 8.9 percent of lands of all ownerships were in a stand initiation or early seral phase. Only 2.5 percent of the 4th code hydrologic units were determined to have exceeded the LCAS standard that requires management actions change no more than 15 percent of lynx habitat in an LAU to stand initiation phase per decade. Fire was determined to be the dominant influence in creating early seral conditions in lynx habitat. The BA indicates that the analysis was conducted using data from 1986 through 2001, and included years when timber harvest was very extensive in some areas. This indicates that the overall baseline condition of lynx habitat at the regional scale, as related to VEG S1, is in good condition. It also suggests that even without guidance specific to lynx conservation, it is reasonable to expect that timber harvest in LAUs in unoccupied lynx habitat would not likely exceed the limits of vegetation standards VEG S1 and S2 in many cases.

About seventy percent of unoccupied secondary lynx area in the NRLA area is in roadless or wilderness (i.e.nondevelopmental) status where Forest management actions are minimal, and natural processes predominate (see Table 5). Also, as described previously, the Forest led the effort to identify key linkage zones across the range of lynx. These areas are identified in both core and secondary areas, and the map is available information for use by Forests in secondary areas.

Nonetheless, the Plans would allow actions that could adversely affect lynx habitat, and if and when lynx attempt to establish home ranges in secondary area, individual lynx may be affected. Such occupancy could occur if lynx populations in core areas were to expand, as periodically happens in lynx populations in Canada. However, given the estimates of projected impacts described above, nondevelopmental areas, and existing habitat conditions, we believe it is reasonable to expect that some lynx would occupy these secondary areas despite lack of mandatory direction in Plans, but at lower densities than in core. Further, if detected, once lynx occupy a previously unoccupied Forest, the amendment and all objectives, standards and guidelines would apply. In the meantime, Forest Service vegetation management actions may degrade lynx habitat, but the resulting conditions are typically temporary (i.e. not permanent). The risks of most vegetation management actions conducted by the Forest Service, such as timber harvest, precommercial thinning, and other modifications of habitat, are reversible as forests typically regenerate over time, with or without active restoration. We hope to gain more information into the quality, quantity and importance of secondary areas to lynx recovery. In the interim, lynx habitat on National Forests in secondary areas would likely remain available for recovery of lynx over the long-term.

The recovery outline recommends surveys at least every ten years to determine whether unsurveyed secondary areas support lynx populations and adjust secondary and core area designations as appropriate. The Forests have surveyed all unoccupied Forests through the National Lynx Survey, research or other verified records (U.S. Forest Service and U.S. Fish and Wildlife Service 2006), except the Nez Perce National Forest. The Nez Perce National Forest is

being surveyed this winter (2006-2007) to determine whether lynx are present (J. Claar, U.S. Forest Service, pers. comm. 2007). There has been no discussion to date, of adjusting the core designations to include occupied secondary habitat, as the quality of the habitat and the number of lynx that could be supported in those areas is less clear, and reproduction has not been documented thus far.

Ongoing lynx research in the NRLA area has developed a preliminary predictive lynx habitat map that "already appears to be a valuable tool in predicting lynx occurrence and suitable habitat at a broad-spatial scale" (Squires et al. 2006). Once this model is finalized, researchers will build a map of the quantity and distribution of lynx habitat in the region. Similar models have been useful in predicting grizzly bear habitat the NRLA area. Such models, and other information, may be available in the future to inform us of the nature and quantity of currently unoccupied lynx secondary (and peripheral) area, providing information we need to assess the potential value of secondary and peripheral lynx areas to lynx recovery.

The proposed action does not fulfill Objective 3 entirely, as it lacks requirements for further or continued monitoring or surveying of unoccupied secondary area for the amount and condition of lynx habitat and lynx presence, as recommended in the recovery outline. The recovery outline does not specify the agency or entity that should lead the effort for surveys or monitoring. The State, Forest Service, or other entity, or a combination of participants, could assume roles to fulfill the recommendation to survey for lynx presence. However, the Forest Service would be the obvious entity to monitor the amount and condition of habitat in secondary area on national forest lands. It is not clear, and probably unlikely, that the existing direction in Plans that would remain in place on unoccupied Forests, along with the amendment, would fulfill this recommendation.

Given the projected or estimated level of adverse impacts that could affect lynx habitat in unoccupied secondary areas, and the lesser importance of secondary area to lynx recovery (as compared to core area), we conclude that the Forest Service would contribute to this recovery objective, in part, through the proposed action.

Objective 4: Ensure that threats have been addressed so that lynx populations will persist in the contiguous United States for at least the next 100 years.

Although the plans do not apply for 100 years and thus cannot directly fulfill this objective, the proposed action would allow lynx populations to persist on lands within core areas in the action area within the foreseeable future. The proposed amendments address the threat to the DPS, inadequate regulatory measures, within core areas in the NRLA area by limiting, reducing or avoiding the major adverse impacts of federal land management on lynx, as well as several other potential impacts or influences that do not rise to the level of a threat to the DPS. Further, a large proportion of lynx habitat within the NRLA area (67 percent) remains in non-developmental status, where natural ecological processes predominate. Finally, as explained previously, on the whole, unoccupied lynx habitat within secondary and peripheral lynx areas is likely to retain habitat that provides opportunistic foraging habitat and connectivity adequate for dispersal of lynx, despite the lack of specific direction for lynx habitat management.

Summary of the effects of the proposed action

The Forest Service designed the proposed action to address those risk factors to lynx evaluated in the LCAS that were relevant in terms of Forest Plan direction. The LCAS incorporated a comprehensive amount of information, including information contained in the Science Report and other available information on lynx and forest management activities, in the development of risk factors and conservation measures. In the 2000 BO, we determined that if Plans were amended or revised to include the conservation measures in the LCAS, or an equivalent, Plans would provide substantive and measurable direction for the management of lynx habitat and would reduce or avoid the potential for adverse effects on lynx. At that time, the LCAS (along with the Science Report) represented the best information regarding Forest Plan direction and lynx. The BA and this biological opinion considered the information, objectives, standards and guidelines in the LCAS, but also new information relevant to assessing the proposed action's impacts on lynx and lynx habitat.

We have determined that the proposed Plan amendments would incorporate substantial and relevant conservation measures in the LCAS or the equivalent thereof, as modified with updated information or clarified for amendment purposes. The proposed amendment includes protective measures for lynx, where lynx occur, and as such is an improvement over the direction found in the existing Forest Plans. However, since 2000, the Forest Service has been managing its lands consistent with the Conservation Agreement (U.S. Forest Service and U.S. Fish and Wildlife Service 2005 and 2006), which required *deferring* most projects that adversely affect lynx until Plans were amended to conserve lynx overall. The proposed action amends the Plans to conserve lynx and lynx habitat overall, but would allow some projects with adverse effects to lynx to proceed. Therefore, the proposed action is likely to result in adverse effects to individual lynx at higher levels than what has occurred during the past six years under the Conservation Agreements, while providing for the overall conservation of the species at a landscape level.

The majority of adverse effects to lynx from the proposed action would come from fuels management projects within as much as six percent of lynx habitat in the action area (within the WUI) and to a much lesser extent (less than one percent of lynx habitat), from pre-commercial thinning for other resource benefits (Appendices D and E). A limited number of actions where third parties are involved, such as ski area expansions and development, may also have adverse effects on lynx under the proposed action. (The amendment would not affect the level of effects from these types of actions involving third parties during interim management over the past six years, because the Conservation Agreements did not require deferral of projects involving third parties.)

Overall, the proposed action would reduce or avoid the potential for adverse effects in occupied lynx habitat and core areas over the direction in the current Plans. The benefits of the proposed action to lynx come primarily from the incorporation of vegetation management objectives and implementing standards **ALL S1, VEG S1, S2, S5, S6**, and others into the Plans (refer to Appendix B for objectives, standards and guidelines). This suite of objectives and standards clearly conserve snowshoe hare and lynx habitat in all core area, and occupied secondary area in the NRLA area. Research confirms the dependence of lynx on their primary prey, snowshoe hare, and confirms the importance of early and late seral vegetation conditions for hares. Thus,

we consider proper vegetation management on federal lands of primary importance to lynx populations, especially considering that the preponderance of lynx habitat occurs on National Forest lands. Other than vegetation management, many activities authorized by Forests have relatively minor or less substantial impacts on lynx. Although a variety of activities that might seemingly result in disturbance to lynx are allowed under the Plans, such as road use or recreation, most investigations indicate that lynx do not significantly alter their behavior to avoid human activities (Staples 1995; Roe et al. 1999; Aubry et al. 2000; Mowat et al. 2000). The best information suggests that the main influence that Forest Service forest management has on lynx come from actions that impact snowshoe hare numbers through vegetation management and actions that impact lynx habitat connectivity.

Lynx are not known to occur in those areas determined to be unoccupied. However, lynx may occur in currently unoccupied secondary area at some point in the future. The importance of secondary area to lynx recovery is not yet known. The quantity and quality of lynx habitat within unoccupied secondary area varies considerably across the NRLA area, but is generally drier and more fragmented than lynx habitat in core areas. Much of the unoccupied secondary and peripheral area occurs in mountain ranges disjunct from larger blocks of core area. Therefore we expect that lynx would occupy these areas only at very low densities, or only intermittently through time, if at all. Lynx that attempt to establish home ranges may be adversely affected by Forest management actions, as none of the objectives, standards or guidelines would apply if lynx go undetected. The proposed action includes no requirement or direction for surveying currently unoccupied lynx habitat. Lynx that disperse through secondary habitat are not as apt to be adversely affected by Forest actions, as the best information suggests that existing Plan direction likely provides connectivity and opportunistic foraging habitats for dispersing lynx. In any case, relatively low numbers of individuals would be adversely affected by Forest Service actions in unoccupied habitat in the next decade. We base this conclusion on: 1) the naturally low density of lynx in the NRLA area, even in the best habitat (core areas); 2) in recent decades, the lack of an observed increase or expansion of lynx, such as that which occurred in the early 1960s and again in the 1970s (such large increases were an anomaly during the 20th century (March 24, 2000; 65 FR 16052); 3) lynx habitat tends to become more fragmented, drier and of lower quality in secondary area, and thus inherently would support fewer lynx; and 4) the best information regarding the baseline habitat conditions that currently exist in unoccupied areas suggest lynx habitat is in relatively good condition as affected by past timber harvest. Current Plan direction, without the amendment, applied in unoccupied lynx habitat would allow degradation of lynx habitat in some areas. However, in most cases, vegetation management actions conducted by the Forest Service do not result in permanent alterations of habitat. In roadless areas or wilderness, natural conditions would most often prevail. Given the mosaic of mixed aged stands required to sustain lynx populations, and the temporary nature of habitat alterations, lynx habitat in secondary area would remain available for long-term lynx recovery, if it is deemed necessary in the future.

Effects of Plans in areas outside of lynx habitat

The standards and guidelines in the proposed action designed to benefit lynx generally apply only in lynx habitat on Federal lands within LAUs, with exceptions such as recommendations pertaining to connectivity. However, the administrative units within the NRLA area typically

encompass lands that provide lynx habitat and also lands that are not considered lynx habitat. Thus, the Plans being analyzed here affect both lynx habitat and areas without lynx habitat.

Lynx are known to occur outside lynx habitat in anomalous habitats adjacent to as well as far from primary lynx habitat (McKelvey et al. 2000b). We fully expect that lynx will occasionally use habitats outside lynx habitat. Based on our examination of the risk factors to lynx, the analysis in the BA, the information in the LCAS and Science Report, as well as other information in our files, we conclude that the current direction in programmatic Forest Service Plans for lands outside of lynx habitat within LAUs is not likely to adversely affect lynx for the following reasons:

1. In the contiguous United States, the distribution of lynx is associated with southern boreal forests that receive deep snow conditions and support their primary prey, the snowshoe hare (Ruggiero et al. 2000b; 70 FR 68294, November 9, 2005). The proposed amendments focus on maintaining and improving prey populations within lynx habitat. Lynx habitat within the range of the DPS is typically comprised of those vegetation associations that support the highest numbers of snowshoe hares. Habitats outside lynx habitat generally do not have inherent potential to produce snowshoe hares at densities that would support lynx residency and reproduction. Alternate prey species are important to lynx in the southern periphery of their range. However, available evidence suggests that lynx populations are not likely to persist where snowshoe hares do not predominate in the diet (Ruggiero et al. 2000b).

2. Given the best information available, we are able to reasonably define and map lynx habitats, based on—(a) lynx research from Canada and Alaska (Mowat et al. 2000; O'Donoghue et al. 2001), (b) lynx research in Montana, Washington, and Wyoming (Kohler and Brittell 1990; McKelvey et al. 2000c, Squires and Laurion 2000; Squires et al. 2006), (c) relationships between lynx occurrence records and vegetation types in the contiguous United States (McKelvey et al. 2000b), (d) trapping data, (e) knowledge about prey species (Hodges 2000b; Squires et al. 2006), (f) knowledge about prey abundance and lynx population responses (Dolbeer and Clark 1975; McKelvey et al. 2000b, Ruggiero et al. 2000b; O'Donoghue et al. 2001), (g) knowledge regarding lynx response to human activities (Staples 1995; Aubry et al. 2000; Ruggiero et al. 2000b) and (h) local site-specific analyses. Extensive effort has been expended to accumulate and interpret existing knowledge of lynx and their habitats, culminating with publication of the Science Report and LCAS. Lynx occurrence records in the 20th century correspond with our current biological understanding of lynx habitat in the contiguous United States (McKelvey et al. 2000b).

3. We know and expect that lynx will occur outside of lynx habitat types. We conclude, based on but not limited to the research information detailed in (3) above, that these occurrences represent—(a) lynx that are dispersing to lynx habitat elsewhere, (b) lynx that are on relatively short exploratory movements near or adjacent to lynx habitat and will ultimately return to lynx habitat, or (c) individuals that have emigrated from lynx habitat due to prey species declines and ultimately will not successfully establish home ranges and reproduce, and may succumb to starvation for lack of prey.

4. We concur with the direction of the proposed action to focus habitat management efforts in lynx habitat, especially core area, which supports resident populations and contributes to the long-term conservation of lynx.

5. The proposed action also provides direction for additional important non-lynx habitats such as key linkage areas, which likely provide connectivity and opportunistic foraging habitats for lynx. Thus connectivity issues are addressed to the extent Federal land management has jurisdiction or authority.

Species Response to Proposed Action

Lynx populations occur at naturally low densities in the contiguous United States, largely due to inherently low densities of snowshoe hares, their primary prey (Aubrey et al. 2000). Low snowshoe hare densities are likely a result of the naturally fragmented boreal habitat at southern latitudes (including the NRLA area) that prevents hare populations from achieving densities similar to those in the extensive northern boreal forest of Canada.

Rarity of lynx does not necessarily mean that management actions have or will cause population reductions. At the same time, rarity and large home ranges makes it essential to develop and apply broad, landscape-level approaches that ensure the adequate and appropriate analyses of potential management impacts and the development of effective lynx conservation measures.

With the proposed lynx amendments, the Plans will provide this big-picture approach to lynx management. The incorporation of the proposed management direction over the large geographic area in the NRLA area in occupied lynx habitat within 12 of 18 National Forests (12,150,00 acres), contributes to the landscape level direction necessary for the survival and recovery of lynx in the northern Rockies ecosystem. The proposed action would provide for the conservation of lynx and lynx habitat in two of six essential core areas within the range of the United States lynx DPS that were identified for lynx recovery. Further if and when lynx occupy Forests managing unoccupied lynx habitat, the amendment would be applied, which could affect as many as 6,320,000 acres of additional lynx habitat. Until lynx occur on these areas, the proposed action would not affect lynx in these areas. Although lynx habitat may be adversely affect in these areas, the most likely adverse effects from the proposed action would be to vegetation, which would be able to recover and regenerate over time. At the present time, the importance of the lynx habitat within unoccupied areas to lynx recovery is uncertain. The Service's recovery outline emphasizes the importance of core areas in supporting lynx recovery.

Federal land management assumes the largest single role in the conservation of the lynx in the contiguous United States because of the preponderance of lynx habitat types on Federal lands, particularly in the western United States. Because the Forest Service manages a substantial amount of lynx habitat types in the contiguous United States, particularly in the west, it is imperative that lynx habitat and habitat for lynx prey be maintained and conserved on Federal lands.

In the final rule, we concluded that at present time, the contiguous United States lynx DPS does not appear to be threatened by destruction, modification, or curtailment of its habitat or range.

However, under current Plans, a large proportion of Federal land remains subject to management under developmental allocations. Current land management Plans allow management activities that could result in substantial degradation of lynx habitat that could affect productivity, availability, juxtaposition, and connectivity of habitat components at a large scale. This proposed action addresses that risk by creating regulatory mechanisms that will reduce or eliminate those risks in core area within the NRLA area through vegetation and linkage/connectivity standards.

Past analyses (Hickenbottom et al. 1999; U.S. Fish and Wildlife Service 2000) demonstrated that the existing Plans would likely result in adverse effects to lynx, based on 15 different criteria related to the impacts of various Federal land management programs and activities on lynx. The proposed action ameliorates to a great extent the adverse effects of the Plans in lynx core areas by requiring that actions proposed by the Forest Service be designed considering lynx conservation, through application of objectives, standards and guidelines. Further, the proposed action mostly implements the intent and direction in the LCAS, modified with new information and review, which was designed to provide programmatic guidance and to guide project planning to avoid adverse effects to lynx (Ruediger et al. 2000). For all core area within the action area and occupied secondary area, the proposed action includes objectives and standards for appropriate design of or limits on projects that the best information and research indicate have the most serious consequences for lynx: management actions that reduce snow shoe hare numbers through habitat alteration.

Based on our review of the LCAS and new information, the Service concludes that most actions in lynx habitat that are in compliance with the proposed action would either have no effect on lynx or would not likely adversely affect lynx. The most significant exceptions to this include the fuels management and pre-commercial thinning under special circumstances exempted from the standards, which are limited to no more than six percent of occupied habitat. The proposed action also limits the level of adverse effects that are unavoidable with certain other actions, such as recreation developments. Further, we conclude that changes from the standards contained in the LCAS to guidelines does not necessarily increase the likelihood that actions would adversely affect lynx. Guidelines would be implemented in most cases (BA) and adverse effects would not always occur where guidelines were not implemented. Effects would be based on site-specific conditions. Thus, we do not expect that adverse effects, as a result of changing LCAS standards to guidelines for this amendment, would reach levels that impact lynx populations. The Forest Service changed standards to guidelines mostly based on our finding that the actions did not pose threats to the DPS, and upon review of past and new research information. Our positions were based on the lack of conclusive or reliable information that supported that such actions or activities were exerting negative impacts on the DPS. Thus, changes from standards in the LCAS to guidelines in the amendment occurred when the best available information indicated that the action was not likely to adversely affect lynx, or not likely to adversely affect lynx in most cases (i.e. where no conclusive or reliable information supported the standard in the LCAS). Application of the proposed standards and for the most part, guidelines, in core and occupied secondary area would substantively reduce the potential for adverse effects on lynx over the existing Plans.

Lynx may occur in currently unoccupied secondary area at some point in the future. The importance of secondary area to lynx recovery is not yet known. However, it is reasonable at this point in our understanding of lynx ecology to expect that lynx may occupy portions of secondary area in the future, either for dispersal movements or perhaps to establish home ranges, if and when lynx populations in core area expand. The quantity and quality of lynx habitat within unoccupied secondary area varies considerably across the NRLA area, but is generally drier and more fragmented than lynx habitat in core areas. Much of the unoccupied secondary and peripheral area occurs in mountain ranges disjunct from larger blocks of core area. Therefore we expect that lynx would occupy these areas only at very low densities, or only intermittently through time, if at all. It is difficult to predict if, when or where lynx would most likely occur within these areas. Lynx that attempt to establish home ranges may be adversely affected by Forest management actions, as none of the objectives, standards or guidelines would apply if lynx go undetected. The proposed action includes no requirement or direction for surveying currently unoccupied lynx habitat. Lynx that disperse through secondary habitat are not as likely to be adversely affected by Forest actions, as existing Plan direction likely provides connectivity and opportunistic foraging habitats for lynx that provide for dispersal. The best information related to dispersal movements and recent evidence of dispersal of lynx from Colorado to Wyoming, Montana and Idaho support this premise. In any case, relatively low numbers of individuals would be adversely affected in the next decade. We base this conclusion on: 1) the naturally low density of lynx in the NRLA area, even in the best habitat (core areas); 2) in recent decades, the lack of an observed increase or expansion of lynx, such as that which occurred in the early 1960s and again in the 1970s (such large increases were an anomaly during the 20th century (March 24, 2000; 65 FR 16052); and 3) lynx habitat tends to become more fragmented, drier and of lower quality in secondary area, and thus inherently would support fewer lynx. Current Plan direction, without the amendment, applied in unoccupied lynx habitat would allow degradation of lynx habitat in some areas. However, in most cases, vegetation management actions conducted by the Forest Service do not result in permanent alterations of habitat. In roadless areas or wilderness, natural conditions would most often prevail. Glacier and Yellowstone National Parks occur within or adjacent to the NRLA area and also provide contiguous expanses of lynx habitat where natural condition are expected to predominate. Given the mosaic of mixed aged stands required to sustain lynx populations, and the temporary nature of habitat alterations, lynx habitat in secondary area would remain available for long-term lynx recovery, if it is deemed necessary in the future.

We conclude, based on our entire analysis, that the proposed action would support lynx populations in core areas, and would not appreciably reduce the reproduction, numbers or distribution of lynx in the NRLA. The recovery outline for lynx (U.S. Fish and Wildlife Service 2005) presents our current understanding of historical and current lynx distribution, ecology, population dynamics, and the relative importance of different areas to the persistence of lynx in the contiguous United States. We have determined that the proposed action is compatible with our understanding of recovery needs for lynx in the contiguous United States DPS. As analyzed in this opinion, the proposed action addresses, in whole or in part, each of the objectives in the recovery outline for lynx.

CUMULATIVE EFFECTS

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

In the NRLA action area, seven percent of the area occurs on private, State or tribal lands, encompassing over three million acres (Table 17, BA). Portions of private lands, especially those above 4000 feet in elevation, are likely in potential lynx habitat. Due to the forested nature of lynx habitat, large portions of this habitat occur on private, State, and corporate timber lands where timber harvest and thinning occurs. The tribes, States and several corporate timber companies own property in the NRLA area.

The Confederated Salish and Kootenai Tribes (CSKT) manage the Flathead Indian Reservation in Montana. Their Forest Management Plan incorporates the provisions of the LCAS (Confederated Salish and Kootenai Tribes 2000). The CSKT manage lynx habitat in the Mission Mountains, where the plan will continue to reduce the potential for land management actions to adversely affect lynx or lynx habitat. The Montana Department of Natural Resources and Conservation (MTDNRC) has had a lynx habitat management plan in place since 1998, prior to lynx being listed. In 2003, the department developed a mapping protocol for State lands and adopted administrative rules to conserve lynx.

Plum Creek Timber company is a major land owner in the NRLA area, with over 450,000 acres of lynx habitat. The company participates in the Sustainable Forest Initiative (SFI) program, which is a comprehensive system of principles, objectives and performance measures developed by foresters, conservationists and scientists, which combines the growth and harvest of trees and protection of wildlife, plants, soils and water quality (American Forest and Paper Association 2006). Plum Creek lands in western Montana are also managed under its Native Fish Habitat Conservation Plan. Both of these programs moderate to an extent, the potential adverse impacts of forestry practices on lynx.

Other smaller parcels of private lands will be primarily used for residential areas, or may be used for small scale forestry, or will developed for business uses in the future. Also, corporate timber lands are being divided into smaller parcels and offered for sale to private landowners. For example, in the Seeley Lake/Swan Valley area of northwest Montana, Plum Creek Timber Company is selling some corporate timber land for (primarily) residential development. Some corporate timber land is being acquired by conservation organizations or State agencies (Jim Williams, Montana Fish, Wildlife and Parks pers. comm. 2006). Plum Creek is a partner in a conservation agreement for grizzly bears in the Swan River Valley of Montana, along with the Flathead National Forest, MTDNRC and the Service, and is proposing to sell important sections of their holdings to conservation buyers or the Forest Service.

In addition to timber management, activities on non-Federal lands may include mineral extraction, oil and gas exploration, urban and rural development, recreation site construction and use, road construction, and utility corridors. Habitat loss or degradation and direct mortality of

lynx are possible adverse impacts on lynx. Cumulatively, urbanization and highway development may impact connectivity in lynx habitat. To date, lynx are known to have dispersed long distances, from Canada to northwest Montana and from Colorado to northwest Montana (T. Shenk, pers. comm. 2007). Past highway development has evidently not created a total barrier to lynx movements and highway projects would be reviewed under section 7(a)2 of the Endangered Species Act. However, ensuing private land development is likely to continue.

While not an action that will result in cumulative effects, the Service acknowledges that the MTDNRC is in process of completing a Habitat Conservation Plan (HCP) with the Service; MTDNRC entered into an agreement with the Service committing to developing an HCP using Congressional appropriated funding. Although not yet final, the plan has undergone technical and public review, scoping for an Environmental Impact Statement (EIS) is complete and the EIS is in preparation (April 28, 2003, 81 FR 22412). We therefore consider the completion of the HCP as a reasonably foreseeable action that will reduce the potential for negative effects to lynx from State forestry practices. The HCP will also go through review under section 7(a)2 of the Endangered Species Act.

There is potential and a reasonable likelihood for future management of many private lands within the NRLA area to have negative impacts on lynx habitat. Some snowshoe hare habitat would likely be permanently lost to development, and some would be reduced in quality through thinning or timber harvest. Not all lands would be developed or used in ways that have negative impacts on lynx habitat. Combined, private lands developed or used in ways that would have negative impacts on lynx habitat would constitute a fairly small proportion of lynx habitat within the NRLA area. With the exception of State or corporate timber lands, private land parcels are fairly small in size relative to the large landscape required by an individual lynx to support its home range and are scattered throughout the NRLA area. Many are and would be adjacent to or interspersed with Forest Service or other Federal land, and therefore some of the potential negative effects on the private parcels would be moderated by federal land management.

The final rule did not find that present conditions on private lands threaten the DPS. Within the action area, 93 percent of lynx habitat would be managed by the Forest Service or other federal agencies into the future. As stated previously, the Forest Service manages the preponderance of lynx habitat within the NRLA area. Within the core areas in the NRLA area, the proposed action substantively reduces the primary threat to lynx (inadequate regulatory mechanisms) by addressing the major adverse impacts of Federal land management on lynx, as well as several other potential impacts or influences that do not rise to the level of a threat to lynx. Further, the proposed action would alleviate some of the adverse actions on private land, where lands are adjacent to Forest lands or within the same LAU. The Forest Service considers the condition of lynx habitat on private lands within LAUs, to the extent possible, in its assessment of baseline conditions during the development of projects for Forest lands, and adjusts its action to reduce negative effects in the LAU.

CONCLUSION

After reviewing the current status of Canada lynx, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of lynx within the contiguous United States DPS. No critical habitat has been designated for this species on Federal lands within the NRLA area, therefore none will be affected.

The proposed action incorporated much of the information in the LCAS and Science Report, part of the best commercial and scientific information available with which to analyze the effects of Federal land management on lynx. The LCAS incorporated a comprehensive amount of information available in 2000, including information contained in the Science Report and other information on lynx and forest management activities. The LCAS is currently being updated and clarified with new information, information from recent publications, investigations in progress, and improved knowledge of the distribution of lynx (J. Claar, pers. comm. 2006). However new information supports that primary conservation measures that conserve horizontal structure and vegetation mosaics are essential components of lynx habitat. We conclude that the programmatic and project-level objectives, standards, and guidelines in proposed action provide comprehensive conservation direction adequate to reduce adverse effects to lynx from Forest management and to preclude jeopardy to the lynx DPS.

As stated in the final rule, we believe Plan amendments for those administrative units with lynx habitat are necessary for long-term conservation of habitat for lynx and its prey on Federal lands. Without programmatic guidance and planning to conserve lynx, assessment of land management effects to lynx and development of appropriate conservation strategies are left to project-specific analyses without consideration for larger landscape patterns.

The Service concludes that continued implementation of the Plans incorporating the amendments for lynx conservation may result in some level of adverse effects to lynx. However, the level of adverse effects to lynx are not reasonably expected to, directly or indirectly, reduce appreciably the likelihood of both the survival and recovery of the lynx DPS in the wild by reducing the reproduction, numbers, or distribution of lynx. Factors important in our assessment of jeopardy include, but are not limited to the following:

- Considering the environmental baseline for lynx, the final rule indicated that although several factors may be impacting lynx at smaller scales, only one factor was currently threatening the lynx DPS--inadequate Plans that reflect inadequate regulatory mechanisms. The proposed action addresses that threat through Forest management adequate to ensure long-term persistence of lynx in two of the six areas within the range of the United States lynx DPS determined to be lynx "core" area (Service 2005).

- The proposed amendments considered information in the Science Report, LCAS, final listing rule, remanded determination of listing, recent research information, and the recovery outline for lynx. These documents outline the best available information concerning threats to lynx and means to address the threats.

- The recovery outline for lynx (U.S. Fish and Wildlife Service 2005) presents our current understanding of historical and current lynx distribution, ecology, population dynamics, and the relative importance of different areas to the persistence of lynx in the contiguous United States. We have determined that the proposed action is compatible with our understanding of recovery needs for lynx. As analyzed in this opinion, the proposed action addresses, in whole or in part, each of the objectives in the recovery outline for lynx.

- The proposed action would immediately apply lynx management direction on nearly 12.2 million acres of occupied lynx habitat, including all lynx habitat in the two core areas in the action area, that were delineated in the recovery outline. The proposed action would apply direction that would substantially reduce or eliminate adverse effects to lynx from Forest Service land management activities on at least 94 percent of this area, and more likely nearer to 98 percent. This lynx management direction would apply to also to occupied lynx habitat in secondary areas as well.

- The best information indicates that existing Forest Plan direction would provide connectivity and opportunistic foraging habitats for dispersing lynx, and may provide for lynx home ranges at low densities, in unoccupied lynx habitat within secondary areas. The proposed action would amend the Forest Plans on approximately 3.3 million acres of unoccupied lynx habitat in secondary areas, and 1.1 million acres of unoccupied peripheral area, but would not require implementation of the amendment until evidence indicates that lynx occupy a Forest. If and when occupancy is established, the amendment would apply throughout the life of the proposed action. In the meantime, existing Forest Plan direction would apply, but the measures in the amendment could be considered in planning actions.

- Forest management actions conducted under existing Plan direction may negatively affect lynx habitat in secondary area in currently unoccupied Forests. However, the nature of most vegetation management alteration is temporary and reversible (i.e. forests regrow, or can be restored), and other types of Forest Service actions are unlikely to have severe or permanent impacts during the life of the proposed amendment. Thus, if additional information suggests or a final recovery plan determines that lynx habitat in secondary (or peripheral) areas is needed to sustain additional occupancy by lynx in the future, and as such warrants more protection, currently unoccupied lynx habitat in secondary areas on National Forest lands would be available for lynx recovery purposes over the long term.

- The lynx recovery outline is clear in its emphasis of concentrating lynx conservation measures in core area.

- One factor considered in this effects analysis was the uncertainty regarding the level and type of effects that land use management decisions at both project and programmatic levels may have on the contiguous United States lynx DPS. Researchers suggest that management plans should thus be conservative regarding retention of known important

lynx habitat components (McKelvey et al. 2000a). The proposed amendment meets this direction by addressing Forest land management actions that have the most potential to adversely affect key lynx habitat components. The Service considers the retention of high quality snowshoe hare habitat in core area as most essential to lynx conservation. The vegetation standards would be applied across at least 94 percent of lynx habitat in core area, and in any secondary area occupied by lynx. These standards directly address the major impacts identified in research: harvesting forests and creating early stand initiation stages, precommercial thinning, and altering multistoried stands. Managing and moderating the impacts of these actions will maximize snowshoe hare production, thus benefiting lynx populations.

- The Forest Service has demonstrated a commitment toward partnerships for the conservation of lynx and lynx habitat on a programmatic level. In March 1998, the Forest Service, BLM, and NPS began a collaborative process with the Service to collect and analyze existing information on lynx (the Science Report) and assess the conservation needs of lynx and develop a lynx conservation strategy (LCAS) applicable to Federal land management. From 1999 through 2002 the Forest Service conducted extensive surveys to detect lynx presence on Forests across the range of lynx DPS, and are surveying the remaining Forest this year (J. Claar, pers. comm. 2006). In 2006, the agencies have initiated an update and clarification of the LCAS in order to incorporate new science and other information regarding the impacts of forest management on lynx.

- A large proportion of lynx habitat on Forest Service lands in the NRLA area (67 percent) occurs in lands with nondevelopmental status where management focuses on the maintenance of natural ecological processes, or conservation of rare ecological settings or components. In unoccupied lynx habitat in secondary areas, about 70 percent is in nondevelopmental status.

- Negative effects on lynx may not be totally eliminated, but are significantly reduced by the proposed management direction compared to the direction in existing Forest Plans. In at least 94 percent of core area and occupied secondary areas, vegetation management projects on Forest Service lands would be designed under the management direction and guidance of the proposed action to the point that they are likely to avoid adverse effects on lynx. Further, in the remaining six percent of this areas, many fuels management projects can be designed in compliance or in partial compliance with the proposed standards and guidelines. Other projects types that are likely to adversely affect lynx, such as recreation development, are constrained by standards mandating maintenance of connectivity (the major adverse impact) and affect a relatively small proportion of lynx habitat within the NRLA area.

- The adverse effects of the action to lynx in core area due to the exemptions for fuels management and pre-commercial thinning constitute a small portion of the range of the species (less than six percent) and are offset by the beneficial effects of the proposed action in the balance of the core area and occupied secondary areas. Monitoring and recording of fuels treatment actions are required as decisions are signed to ensure that the

number of acres treated through exceptions stated in the vegetation management standards does not exceed six percent of lynx habitat.

- The proposed action is consistent with section 7(a)(1) of the Act through Forest Service commitments to undertake proactive management actions to benefit lynx.

INCIDENTAL TAKE

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

In general, an incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize the impacts of the take and sets forth terms and conditions which must be complied with in order to implement the reasonable and prudent measures.

Amount or Extent of Take Anticipated

Forest Plans are permissive, in that they allow, but do not authorize actions to occur. This biological opinion identifies management direction that allows for activities that adversely affect lynx. The proposed action reduces the potential for incidental take to occur as a result of actions implemented under the current Plans. However, at the broad scale of this consultation (18 National Forests), the Service is unable to anticipate all possible circumstances that may possibly involve the take of lynx that may be caused by the proposed action, with the exception of fuels and timber management (see below). The Service therefore conservatively anticipates that some low level of incidental take may occur in core and occupied secondary areas from activities other than fuels and timber management. The Service believes that the level of take would be low because the proposed action considers the known habitat and environmental factors influencing lynx, and includes standards and guidelines that avoid or minimize adverse effects, as detailed in this biological opinion. We also anticipate that there is a small risk that Forest management actions may result in take of lynx that could occupy what is currently unoccupied habitat, sometime in the future during the life of the proposed action. In unoccupied secondary areas, lynx may establish home ranges but the proposed measures to reduce or eliminate the potential for adverse effects would not be implemented unless lynx were detected, and there is no provision in the proposed amendment to survey for lynx in lynx habitat in currently unoccupied

secondary area. However, it is not possible at this time to estimate incidental take of lynx likely to occur from the proposed management direction, since site specific information related to the number, type, timing, location, and other such details of projects conducted under the amendment is unknown. Consequently, all consideration of incidental take and any reasonable and prudent measures required to minimize its effect on the species addressed in this consultation is deferred to further consultation on individual projects. Take that may occur due to trapping or shooting by private citizens within the action area is not exempted in this opinion.

The exception to this deferral is take from fuel and timber management projects in core and occupied secondary areas. We anticipate that that most of the take associated with implementation of the proposed action would occur in core area and occupied secondary areas when projects are conducted under the exceptions to the vegetation standards VEG S1, S2, S5 and S6. We anticipate this take in the form of harm, as the exceptions allow modification of lynx habitat that would result in decreased production and density of snow shoe hares, their primary prey. The Service anticipates such incidental take of lynx will be difficult to detect for the following reasons:

- Lynx are wide-ranging, not easily detected in the wild.
- Although we have a general understanding of where lynx population centers are within the action area, the distribution of individual lynx across the NRLA area or at smaller scales within the area is not known.
- Although we have a general understanding that snowshoe hares occur and are widely distributed in lynx habitat across the action area, snowshoe hare densities across the NRLA area or at smaller scales within the area are not known.
- We lack information to accurately predict the number of snowshoe hares and alternate prey needed for the survival of adult lynx or kittens.
- Snowshoe hare populations exhibit population cycles in Canada and although not well understood, populations likely fluctuate in the United States as well. This variation could cloud our ability to demonstrate a direct cause and effect relationship. It may be difficult in many cases to determine whether mortality or injury of lynx is attributable to incidental take of lynx as a result of the proposed action, or whether it was natural mortality or injury of lynx due to natural declines in snowshoe hares.
- We lack information to predict with precision the densities of hares in various habitat and forest stands, before and after specific treatments, especially in relationship to the host of naturally occurring environmental variables that may affect hare densities.
- Discovery or detection of lynx injury or mortality attributed to habitat alteration is very unlikely.

All of these variables are difficult to monitor or census. According to Service policy, as stated in the Endangered Species Consultation Handbook (March 1998) (Handbook), some detectable measure of effect should be provided, such as the relative occurrence of the species or a surrogate species in the local community, or amount of habitat used by the species, to serve as a measure for take. Take also may be expressed as a change in habitat characteristics affecting the species, such as water quality or flow (Handbook, p 4-47 to 4-48). Because of the difficulty of estimating the precise number of lynx that would experience take in the manner described above,

we have developed a surrogate measure to estimate the amount of anticipated take. The surrogate measure for the number of lynx harmed will be quantified using acres of occupied lynx habitat.

Because the Forest Service has provided explicit estimates on the number of acres that will be impacted by the proposed fire and timber management within occupied lynx habitat, we are able to accurately assess take from these activities. We have determined that many of the projects conducted under the exemptions from or exceptions to vegetation standards VEG S1, S2, S5 and S6 would result in take in the form of harm. Therefore, we are using the number of acres treated under these exceptions under the proposed action as a detectable surrogate for the number of lynx taken in the form of harm. This approach is consistent with Service policy, as stated in the Endangered Species Consultation Handbook, that some detectable measure of effect should be provided, such as the relative occurrence of the species or a surrogate species in the local community, or amount of habitat used by the species, to serve as a measure for take.

This biological opinion anticipates the following amounts of take in the form of harm (modification of habitat that reduce the snowshoe hare prey base for lynx): treatment of up six percent of occupied lynx habitat over ten years -- 729,000 acres (12,150,000 x 6 percent) due to fuels management, and no more than 64,320 acres of snowshoe hare foraging habitat due to pre-commercial thinning for vegetation management for other resource benefits (Appendix D, Table 1). Because the exemptions and exceptions are limited to a total of no more than about six percent of all lynx habitat, the decrease in prey base would translate to some low level of impairment of reproduction and feeding, during some years. Specifically, we anticipate that some adult female lynx within home ranges affected by such projects may fail to complete a pregnancy or would be less successful in finding adequate food resources needed to ensure maximum survival potential for kittens. Thus, we expect reproductive impairment and kitten survival to be impacted.

Effect of Take

To give perspective on what these losses mean to lynx, the average lynx territory in the NRLA area is 53,375 acres for males and 21,745 acres for females (Squires et al. 2004). While the proposed action limits adverse fuel treatments allowed in the WUI to total no more than six percent of lynx habitat per Forest, it does not prohibit fuels treatments that are exempt from VEG S1 to occur in adjacent or multiple LAUs. However, the impacts from fuels treatments and precommercial thinning would be distributed across the Forests encompassing 12,150,000 acres of occupied lynx habitat in the NRLA occupied area and occur within WUIs (Table 1, Appendix D and Appendix E), therefore the number of individual lynx home ranges that would be affected would be low. Further, the Forest Service estimates that based on past and anticipated funding levels, the acres of lynx habitat treated would in fact most likely be much less than six percent, more on the order of about 1.4 percent (Appendix C and D, Table 1). Also, even in areas treated through exemptions and exceptions and resulting in adverse effects, the level of reduction in snowshoe hare prey base will vary depending upon site conditions, and thus would not always result in take of lynx.

The take of lynx in the future in currently unoccupied secondary habitat would be low and of less impact to recovery than take of lynx in core area because a) lynx habitat in secondary areas is often of inherently lower quality, either drier or more naturally fragmented, or smaller in area than in core area and/or relatively isolated from other blocks of lynx habitat and thus supports corresponding lower densities of lynx, if any, in secondary area; and/or b) the expected numbers and densities of lynx in these secondary areas would be low for many years if lynx establish, thus intra-specific competition for available resources would also be low for many years.

In the accompanying biological opinion, the Service has determined that this level of anticipated take is not likely to result in jeopardy to the species.

Reasonable and Prudent Measures

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of lynx:

RPM #1: The Forest Service shall minimize harm of lynx from fuels management by ensuring that the acres impacted are not concentrated in a geographic area or several adjacent LAUs .

RPM #2: The Forest Service shall minimize harm of lynx from pre-commercial thinning and other vegetation management projects by ensuring that lynx home ranges, as represented by LAUs, either retain sufficient foraging habitat (when sufficient foraging habitat already exists in an LAU) or does not substantially reduce foraging habitat (when sufficient foraging habitat does not already exist in an LAU).

RPM #3: On those Forests with currently unoccupied lynx habitat, lynx detection is needed to assess whether further management direction is warranted (including application of the amendment) to minimize or avoid adverse affects to lynx. The Forest Service shall minimize harm to lynx attempting to establish or maintain home ranges in currently unoccupied secondary habitat at some point in the future, during the life of the proposed action.

Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary.

The following terms and conditions implement reasonable and prudent measure #1:

> The Forest Service shall ensure that fuels management projects conducted under the exemptions from standards VEG S1, S2, S5 and S6 in occupied habitat:
>
> 1. Do not occur in greater than six percent of lynx habitat on any Forest.
> 2. Do not result in more than 3 adjacent LAUs not meeting the VEG S1 standard of no more than 30 percent of an LAU be in stand initiation structural stage.

The following term and conditions implement reasonable and prudent measure #2:

3. In occupied lynx habitat, precommercial thinning and vegetation management projects allowed per the exceptions listed under VEG S5 and S6, shall not occur in any LAU exceeding VEG S1, except for protection of structures.

The following term and condition implements reasonable and prudent measure #3:

4. The Forest Service shall work with the Service to develop and complete an acceptable protocol to survey currently unoccupied lynx habitat in secondary area within 18 months of the date of Forest Service's Record of Decision for the amendments. An acceptable protocol may include any or none of the following, and is not limited to the following: surveying each Forest with unoccupied lynx habitat at some regular interval; ground-truthing and refining lynx habitat maps to more accurately identify lynx habitat in secondary area; relying on survey data generated by other cooperating agencies; removing some portions of secondary area from survey requirements (based on for instance, the best mapping information, most recent information, habitat quality and quantity, advice and recommendations from lynx experts, and juxtaposition between core areas). The Forest Service shall provide a written rationale for the protocol.

Monitoring and Reporting Requirement

The Forest Service Northern Region (Region 1) Office in Missoula, shall provide a written annual report to the Service each year this biological opinion is in effect. The report will include a summary of the reporting requirements listed below. The report shall be submitted to the Service by April 1 of each year, or other date through mutual agreement.

The report shall document the following information related to fuel treatment and vegetation management projects occurring in occupied lynx habitat:

1) To ensure that term and condition 1 has not been exceeded in any administrative unit, report the acres per Forest and LAU, of lynx habitat treated through fuel treatment projects, within and outside the WUI (as defined by HFRA). Report whether or not fuel treatment project met the vegetation standards and guidelines. If standards or guidelines were not met, report which were not met and include which exemptions were used, how many acres were affected, and why the standards could not be met.
2) To ensure that term and condition 2 is met, report any two, adjacent LAUs that have more than 30 percent of lynx habitat in stand initiation structural stages, either because of natural events, vegetation management or fuel treatment projects, or any combination of these or other causes.
3) To ensure that term and condition 3 is met, report the acres per Forest and LAU, of lynx habitat treated through precommercial thinning or other vegetation management projects as allowed in VEG S5 and S6; record the type of activity, acres, location and whether or not standard VEG S1 was within the allowance.

4) Monitoring requirements **shall be reported by Forests at the time the project decision is signed**. The report shall be sent to the designated Forest Service office with responsibility for maintaining an accurate accounting of reports. This requirement ensures that projects do not treat more than six percent of lynx habitat under exceptions to the vegetation standards, as described in the proposed action and term and condition 1. of this incidental take statement. This reporting requirement is found, in part, in the proposed action and is also a requirement of this biological opinion.

The following monitoring requirement is partially required by the proposed action, and would allow us to gauge the validity of our assumptions and those in the BA that suggest guidelines would be implemented in most cases:

5) In occupied lynx habitat, the Forest Service shall document, in the annual report, the rationale for deviations from guidelines established in the proposed action. The draft Environmental Impact Statement defines a "guideline" as follows: A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations ***may be*** documented [emphasis added], but amending the plan is not required. Application of specific guidelines in some cases may further minimize the impact of or potential for take. This monitoring requirement requires the Forest Service to document the rationale in all cases.

The annual report should be submitted to Service Field Offices responsible for tracking the requirements of the proposed action and the monitoring requirements. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The anticipated level of incidental take exempted in this incidental take statement is quantified through the use of the surrogate measures of up to 729,000 acres treated through exemptions to vegetation standards for fuels management, and no more than 62,260 acres of lynx habitat treated through exceptions to VEG S5 for precommercial thinning projects. If, during the course of this action, these limits on acres treated are exceeded on any Forest, the Service will determine if the level of anticipated incidental take has been exceeded. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

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

1. The Forest Service should ensure to the extent possible, that unoccupied habitat continues to facilitate and allow dispersal of lynx into the future. Therefore in linkage zones in unoccupied lynx habitat or for projects that may affect such linkage zones, apply the following direction from the proposed action:

- Maintain or restore lynx habitat connectivity in linkage areas **(All O1).**
- New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in linkage areas **(All S1).**
- Methods to avoid or reduce effects on lynx should be used when constructing of reconstructing highways or forest highways across federal lands **(All G1).**
- In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat **(LINK O1).**
- When highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings (**LINK S1**).
- National Forest Service lands should be retained in public ownership (**LINK G1**).

2. The Forest Service should coordinate with the Service to develop, within 18 months, a method to monitor the amount and condition of lynx habitat in unoccupied secondary habitat, as recommended in the lynx recovery outline. This information would be useful in future assessments of the value of secondary area to lynx.

3. The Service commends the Forest Service for initiating important efforts to increase our understanding of lynx and lynx habitat with completion of the Science Report, lynx habitat mapping, and linkage zone identification, and assuming leadership roles on both the Lynx Biology Team and Lynx Steering Committee. We recommend that you continue to be a leader in these arenas, and to the extent possible, alone and/or in coordination/cooperation with other federal, State, or private entities, work to fulfill the following key items identified in the lynx recovery outline to gain additional information could be useful in managing lynx.: 5.5.2, 5.5.4, 5.5.5, 6.6.1, 6.6.2, 6.6.3, 6.6.5

REINITIATION REQUIREMENT

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

We appreciate your continued cooperation in meeting our joint responsibilities under the Endangered Species Act. If you have questions or comments regarding this biological opinion, please Anne Vandehey of my staff at (406) 449-5225 extension 212.

Sincerely,

R. Mark Wilson

R. Mark Wilson
Field Supervisor

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APPENDIX A

List of National Forests

Table 1. National Forests included in the NRLA area with Land and Resource Management Plans being amended and considered in this consultation, identified as being core, secondary or peripheral areas and whether occupied by lynx or not (U.S. Forest Service in litt. 2007)

National Forest	Core (C), Secondary (S), Peripheral (P)	Acres	Acres of Lynx Habitat	% of National Forest that is Lynx Habitat
Occupied Lynx Habitat				
Bridger-Teton NF	C	3,437,527	2,000,000	58.2%
Clearwater NF	S	1,825,397	930,000	50.9%
Custer NF	C & S	1,187,621	230,000	19.4%
Flathead NF	C	2,355,592	1,730,000	73.4%
Gallatin NF	C & S	1,806,565	870,000	48.2%
Helena NF [1]	C , S & P	975,387	440,000	45.1%
Idaho Panhandle NF [2]	C & S	2,498,234	1,170,000	46.8%
Kootenai NF	C	2,242,468	1,010,000	45.0%
Lewis & Clark NF [1]	C, S & P	1,862,289	970,000	52.1%
Lolo NF	C	2,082,784	1,110,000	53.3%
Shoshone NF	C	2,436,850	640,000	26.3%
Targhee NF	C & S	1,810,854	1,050,000	58.0%
Total		**24,521,568**	**12,150,000**	**48.06%**
Unoccupied Lynx Habitat				
Ashley NF	P	1,384,136	700,000	50.6%
Beaverhead-Deerlodge NF	S	3,360,825	2,060,000	61.3%
Bighorn NF	P	1,107,671	310,000	28.0%
Bitterroot NF	S	1,580,948	640,000	40.5%
Salmon-Challis NF	S	4,350,827	1,800,000	41.4%
Nez Perce NF	S	2,224,230	810,000	36.4%
Total		**14,008,637**	**6,320,000**	**43.03%**

[1] Isolated mountain ranges are designated as peripheral habitat and are not subject to management direction outlined in the Northern Rockies Lynx Amendment (NRLA).
[2] Only the NE corner of the Idaho Panhandle NF is identified as core habitat.

APPENDIX B

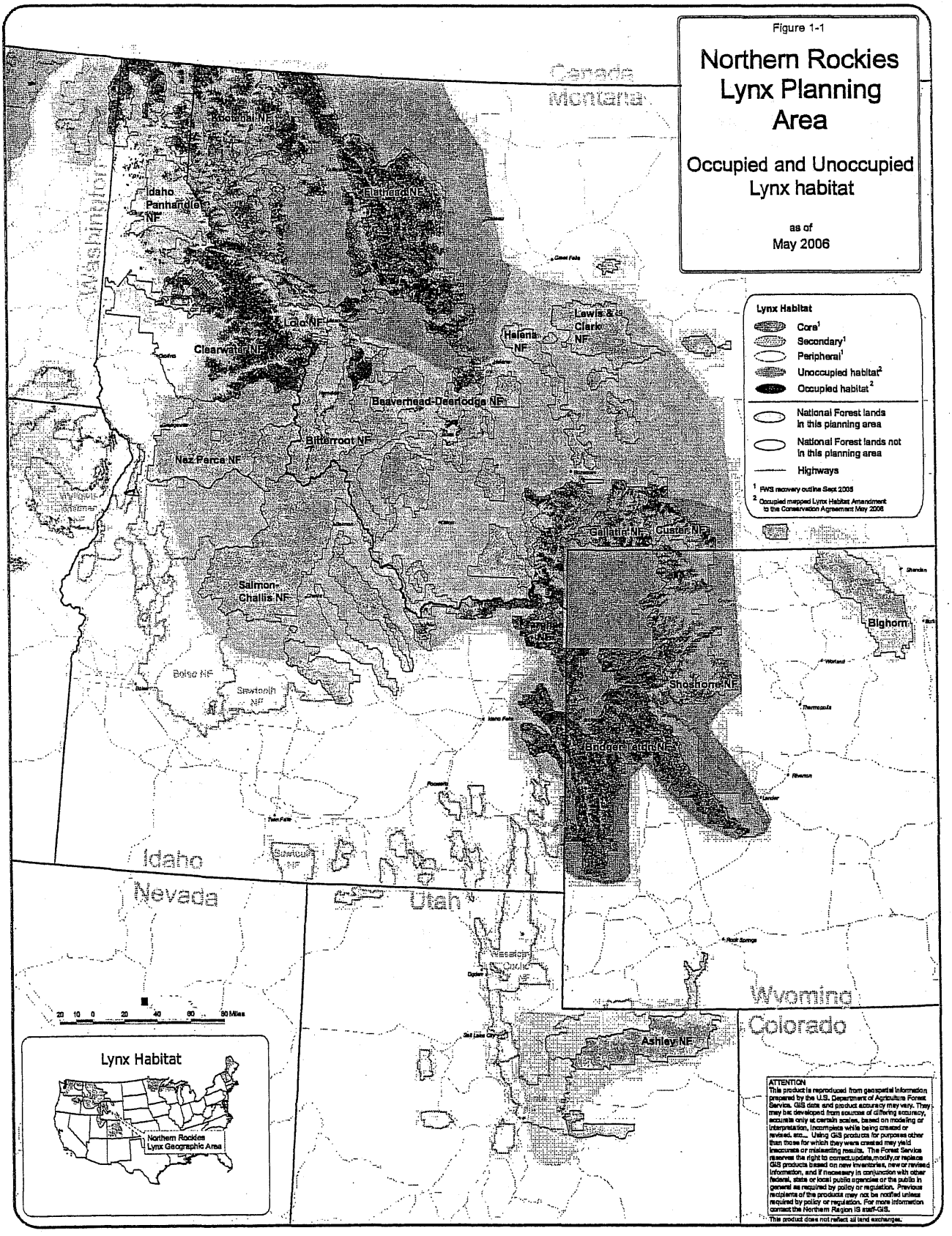
Figure 1-1
Northern Rockies Lynx Planning Area
Occupied and Unoccupied Lynx habitat
as of
May 2006
Canada
Montana
Idaho
Nevada
Utah
Wyoming
Colorado
Washington
Kootenai NF
Idaho Panhandle NF
Flathead NF
Lolo NF
Clearwater NF
Helena NF
Lewis & Clark NF
Beaverhead-Deerlodge NF
Bitterroot NF
Nez Perce NF
Salmon-Challis NF
Boise NF
Sawtooth NF
Caribou NF
Gallatin NF
Custer NF
Bighorn
Shoshone NF
Bridger-Teton NF
Ashley NF
Lynx Habitat
Core[1]
Secondary[1]
Peripheral[1]
Unoccupied habitat[2]
Occupied habitat[2]
National Forest lands in this planning area
National Forest lands not in this planning area
Highways
[1] FWS recovery outline Sept 2005
[2] Occupied mapped Lynx Habitat Amendment to the Conservation Agreement May 2006
20 10 0 20 40 60 80 Miles
Lynx Habitat
Northern Rockies Lynx Geographic Area
ATTENTION
This product is reproduced from geospatial information prepared by the U.S. Department of Agriculture Forest Service. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc... Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results. The Forest Service reserves the right to correct,update,modify,or replace GIS products based on new inventories, new or revised information, and if necessary in conjunction with other federal, state or local public agencies or the public in general as required by policy or regulation. Previous recipients of the products may not be notified unless required by policy or regulation. For more information contact the Northern Region IS staff-GIS.
This product does not reflect all land exchanges.

APPENDIX C
Alternative F – proposed action in occupied lynx habitat (excerpted from from U.S. Forest Service 2007)

Notes: **(1) Both *beneficial* and *detrimental* effects to all species except lynx are believed to be minimal due to the potentially small amount of acreage affected in relation to the entire NRLA area.**
(2) For those areas identified as **occupied** lynx habitat in the *Occupied Mapped Lynx Habitat Amendment to the Canada Lynx Conservation Agreement* (USDA Forest Service et al. 2006), management direction would be the objectives, standards, guidelines and monitoring identified under Alternative F in Appendix E. Areas identified as **unoccupied** lynx habitat would not have any specific management direction for lynx until such time as those areas are occupied. See section II.F. for more details.

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
Goal[14] Conserve Canada lynx.	Same as Alt B	No change.
ALL MANAGEMENT PRACTICES AND ACTIVITIES (ALL). *The following objectives, standards and guidelines apply to management projects in lynx habitat in lynx analysis units (LAU) and in linkage areas, subject to valid existing rights. They do not apply to wildfire suppression, or to wildland fire use*		
Objective[30] ALL O1 Maintain[26] or restore[39] lynx habitat[23] connectivity[16] in and between LAUs[21], and in linkage areas[22].	Same as Alt B	No change.
Standard[43] ALL S1 New or expanded permanent developments[33] and vegetation management projects[48] must maintain[26] habitat connectivity[16].	Standard[43] ALL S1 New or expanded permanent developments[33] and vegetation management projects[48] must maintain[26] habitat connectivity[16] *in an LAU[21] and/or linkage area[22].*	
Guideline[15] ALL G1 Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways[18] or forest highways[12] across federal land. Methods could include fencing, underpasses or overpasses.	Same as Alt B	No change.
Standard[43] LAU S1 LAU[21] boundaries will not be adjusted except through agreement with the FWS, based on new information about lynx habitat[23].	Standard[43] LAU S1 *Changes in LAU[21] boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.*	Clarified standard and added a higher level review to provide for consistency.
VEGETATION MANAGEMENT PROJETS (VEG): *The following objectives, standards and guidelines apply to vegetation management projects in lynx habitat in lynx analysis units (LAU). With the exception of Objective VEG O3 that specifically concerns wildland fire use, the objectives, standards and guidelines do not apply to wildfire suppression, wildland fire use, or removal of vegetation for permanent developments like mineral operations, ski runs, roads and the like. None of the objectives, standards, or guidelines apply to linkage areas.*		
Objective[30] VEG O1 Manage vegetation to be more similar to historic succession and disturbance processes while maintaining habitat components necessary for the	Objective [30] VEG O1 Manage vegetation[48] to *mimic or approximate natural* succession and disturbance processes while maintaining habitat components necessary for the	Clarified language.

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
conservation of lynx.	conservation of lynx.	
Objective VEG O2 Maintain or improve lynx habitat[23], emphasizing high-quality winter snowshoe hare habitat[50] near denning habitat[6].	Objective VEG O2 Provide a mosaic of habitat conditions through time that support dense horizontal cover[19], and high densities of snowshoe hare. Provide winter snowshoe hare habitat[50] in both the stand initiation structural stage and in mature, multi-story conifer vegetation.	Changed to more specific language which provides needed detail to aid project planning.
Objective VEG O3 Conduct fire use[11] activities to restore[39] ecological processes and maintain or improve lynx habitat.	Same as Alt B	No change.
Objective VEG O4 Design regeneration harvest, reforestation, and thinning to develop characteristics suitable for winter snowshoe hare habitat.	Objective VEG O4 *Focus vegetation management[48] in areas that have potential to improve winter snowshoe hare habitat[50] but presently have poorly developed understories that lack dense horizontal cover.*	Changed to more specific language which provides needed detail to aid project planning.
Standard[43] VEG S1 Unless a broad scale assessment[2] has been completed that substantiates different historic levels of unsuitable habitat[24], limit disturbance in each LAU[21] as follows: If more than 30 percent of the lynx habitat[23] in an LAU is currently in unsuitable condition, no additional habitat may be made unsuitable by vegetation management projects[48].	Standard[43] VEG S1 Standard VEG S1 applies to all vegetation management[48] projects that regenerate[37] timber, except for fuel treatment[13] projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10. **The Standard:** Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages[44] limit disturbance in each LAU as follows: If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects.	Changed to provide some flexibility for fuels reduction projects.
Standard VEG S2	Standard VEG S2	Changed to provide some flexibility for fuels reduction

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
Timber management projects[46] shall not change more than 15 percent of the lynx habitat on NFS lands in an LAU to an unsuitable condition in a ten-year period.	Standard VEG S2 applies to all vegetation management[48] projects that regenerate[37] timber, except for fuel treatment[13] projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10. **The Standard:** Timber management projects shall not regenerate[37] more than 15 percent of lynx habitat on NFS lands in an LAU in a ten-year period.	projects.
Standard VEG S3 Maintain[26] at least ten percent of the lynx habitat in an LAU as denning habitat[6] in patches generally larger than five acres. Where less than ten percent denning habitat is present in an LAU, defer vegetation management projects in stands that have the highest potential to develop denning habitat.	*Guideline VEG G11* *Denning habitat[6] should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris[4], piles, or residual trees to provide denning habitat[6] in the future.*	Changed because the current consensus by lynx researchers is that denning habitat, in most cases, is not limiting.
Standard VEG S4 After a disturbance kills trees in areas five acres or smaller that could contribute to lynx denning habitat, salvage harvest[41] may occur only in: 1) Developed recreation[9] sites, administrative sites, or authorized special use structures or improvements; or 2) Designated road or trail corridors where public safety or access has been or may be compromised; or 3) LAUs where denning habitat has been mapped and field-validated, provided at least ten percent is retained and well distributed.	*This number is not included in Alt F. This item is included as part of Guideline VEG G11).*	Changed because the current consensus by lynx researchers is that denning habitat, in most cases, is not limiting.
Standard VEG S5 Precommercial thinning[35] projects that reduce winter	Standard VEG S5 Standard VEG S5 applies to all precommercial	Changed to provide some flexibility for fuels reduction projects.

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
snowshoe hare habitat[50] during the stand initiation structural stage[44] may occur only: 1) Within 200 feet of administrative sites, dwellings or outbuildings. NOTE: Some thinning projects, such as white pine pruning or Christmas tree harvest, may occur if winter snowshoe hare habitat is not reduced.	thinning[35] projects, except for fuel treatment[13] projects that use precommercial thinning as a tool within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10. **The Standard:** Precommercial thinning projects that reduce snowshoe hare habitat, may occur from the stand initiation structural stage[44] until the stands no longer provide winter snowshoe hare habitat only: 1. Within 200 feet of administrative sites, dwellings, or outbuildings; or 2. For research studies[38] or genetic tree tests evaluating genetically improved reforestation stock; or 3. Based on new information that is peer reviewed and accepted by the regional levels of the Forest Serviceand FWS, where a written determination states: a. that a project is not likely to adversely affect lynx; or b. that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat; or 4. For conifer removal in aspen, or daylight thinning[5] around individual aspen trees, where aspen is in decline; or 5. For daylight thinning of planted rust-	

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
	resistant white pine where 80 % of the winter snowshoe hare habitat[50] is retained; or 6. To restore whitebark pine.	

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
Standard VEG S6 Precommercial thinning projects that reduce winter snowshoe hare habitat during the understory-reinitiation[47] or old-multistory structural stages[31] may occur only: 1) Within 200 feet of administrative sites, dwellings or outbuildings.	Standard VEG S6 Standard VEG S6 applies to all vegetation management[48] projects that regenerate[37] timber, except for fuel treatment[13] projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10. **The Standard:** Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests[29] may occur only: 1. Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or 2. For research studies[38] or genetic tree tests evaluating genetically improved reforestation stock; or 3. For incidental removal during salvage harvest[41] (e.g. removal due to location of skid trails). (NOTE: Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover [e.g. uneven age management systems could be used to create openings where there is little understory so that new forage can grow]).	Changed to provide some flexibility for fuels reduction projects and to provide for limited flexibility in situations where the standard is not operationally practical to implement.
Guideline[15] VEG G1 Vegetation management projects[47] should be planned to recruit a high density of conifers, hardwoods and shrubs where such habitat is scarce or not available.	Guideline VEG G1 Vegetation management[48] projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available.	Changed to more specific language which provides needed detail to aid project planning.

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
Winter snowshoe hare habitat [50] should be near denning habitat[6]. Vegetation management projects should be planned to extend the production of winter snowshoe hare habitat when forage quality and quantity is declining.	Priority should be given to stem-exclusion, closed-canopy structural stage[44] *stands for lynx or their prey (e.g. mesic, monotypic lodgepole stands).* Winter snowshoe hare habitat[50] should be near denning habitat[6].	
Guideline VEG G2 Where more denning habitat is desired, leave standing trees and coarse woody debris in amounts similar to what would be there naturally. Denning habitat should be near winter snowshoe hare habitat.	Guideline VEG G2 *This number is not included in Alt F. This item is included as part of Guideline VEG G11.*	Changed because the current consensus by lynx researchers is that denning habitat, in most cases, is not limiting.
Guideline VEG G3 Vegetation management projects designed to retain or restore[39] denning habitat should be located where there is a low probability of stand-replacing fire.	Guideline VEG G3 *This number is not included in Alt F. This item is included as part of Guideline VEG G11.*	Changed because the current consensus by lynx researchers is that denning habitat, in most cases, is not limiting.
Guideline VEG G4 Fire use[11] activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.	Guideline VEG G4 *Prescribed fire*[34] activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.	Changed language to address specific issue with prescribed fire.
Guideline VEG G5 Habitat for alternate prey species, primarily red squirrel[36], should be provided in each LAU.	Same as Alt B	No change.
Not included	Guideline VEG G10 *Fuel treatment projects in the WUI as defined by HFRA[17, 48] should be designed considering standards VEG S1, S2, S5, and S6 to promote lynx conservation.*	Added to provide direction to consider lynx habitat needs when planning fuel treatment projects.
LIVESTOCK MANAGEMENT (GRAZ): *The following objectives and guidelines apply to grazing projects in lynx habitat in lynx analysis units (LAU). They do not apply to linkage areas.*		
Objective[30] GRAZ O1 Manage livestock grazing to be compatible with improving or maintaining[26] lynx habitat[23].	Same as Alt B	No change.
Standard[43] GRAZ S1 In fire- and harvest-created openings, manage livestock grazing to make sure impacts do not prevent shrubs and trees from regenerating.	*This number is not included in Alt F. This item is included as Guideline GRAZ G1.*	Changed to Guideline because the USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not identify grazing practices as a threat to lynx.

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
Standard GRAZ S2 In aspen stands, manage livestock grazing to contribute to their long-term health and sustainability.	*This number is not included in Alt F. This item is included as* Guideline GRAZ G2.	Changed to Guideline because the USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not identify grazing practices as a threat to lynx.
Standard GRAZ S3 In riparian areas[40] and willow carrs[3], manage livestock grazing to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.	*This number is not included in Alt F. This item is included as Guideline GRAZ G3.*	Changed to Guideline because the USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not identify grazing practices as a threat to lynx.
Standard GRAZ S4 In shrub-steppe habitats[42], manage livestock grazing in the elevation ranges of forested lynx habitat[23] in LAUs[21], to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.	*This number is not included in Alt F. This item is included as Guideline GRAZ G4.*	Changed to Guideline because the USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not identify grazing practices as a threat to lynx.
This number is not included in Alt B. This item is included as Standard GRAZ S1.	Guideline[15] GRAZ G1 *In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.*	Standard was changed to Guideline because the USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not identify grazing practices as a threat to lynx.
This number is not included in Alt B. This item is included as Standard GRAZ S2.	Guideline GRAZ G2 *In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.*	Standard was changed to Guideline because the USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not identify grazing practices as a threat to lynx.
This number is not included in Alt B. This item is included as Standard GRAZ S3.	Guideline GRAZ G3 *In riparian areas[40] and willow carrs[3], livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.*	Standard was changed to Guideline because the USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not identify grazing practices as a threat to lynx.
This number is not included in Alt B. This item is included as Standard GRAZ S4.	Guideline GRAZ G4 *In shrub-steppe habitats[42], livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs[21], to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.*	Standard was changed to Guideline because the USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not identify grazing practices as a threat to lynx.

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
HUMAN USE PROJETS (HU): The following objectives and guidelines apply to *human use projects, such as special uses (other than grazing), recreation management, roads, highways, mineral and energy development, in lynx habitat in lynx analysis units (LAU),* subject to valid existing rights. *They do not apply to vegetation management projects or grazing projects directly. They do not apply to linkage areas.*		
Objective[30] HU O1 Maintain[26] the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat[23].	Same as Alt B.	No change.
Objective HU O2 Manage recreational activities to maintain lynx habitat and connectivity[16].	Same as Alt B.	No change.
Objective HU O3 Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat.	Same as Alt B.	No change.
Objective HU O4 Provide for lynx habitat needs and connectivity when developing new or expanding existing developed recreation[9] sites or ski areas.	Same as Alt B.	No change.
Objective HU O5 Manage human activities – such as exploring and developing minerals and oil and gas, placing utility corridors and permitting special uses – to reduce impacts on lynx and lynx habitat.	Objective HU O5 Manage human activities, *such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors*, to reduce impacts on lynx and lynx habitat.	Clarified language.
Objective HU O6 Reduce adverse highway[18] effects on lynx by working cooperatively with other agencies to provide for lynx movement and habitat connectivity[16], and to reduce the potential of lynx mortality.	Same as Alt B.	No change.
Standard[43] HU S1 Allow no net increase in designated over-the-snow routes[7] or play areas by LAU[21], unless designation serves to consolidate use and improve lynx habitat[23]. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private in holdings or where regulated by HU S3.	*This number is not included in Alt F. This item is included as Guideline HU G11.*	USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not consider packed snowtrails to be a threat to lynx at this time. Recent published research in western Montana has provided evidence to support this contention (Kolbe 2005). Other unpublished research in Utah arrived at differing conclusions (Bunnell 2005). Both studies used different methodology.

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
Standard HU S2 When developing or expanding ski areas, locate trails, access roads and lift termini to maintain[26] and provide lynx security habitat[10] if it's been identified as a need.	*This number is not included in Alt F. This item is included as Guideline HU G10.*	No clear evidence to indicate this is limiting lynx use.
Standard HU S3 Winter access for non-recreation special uses and mineral and energy exploration and development, shall be limited to designated routes[8] or designated over-the-snow routes[7].	*This number is not included in Alt F. This item is included as Guideline HU G12.*	USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not consider packed snowtrails to be a threat to lynx at this time. Recent published research in western Montana has provided evidence to support this contention (Kolbe 2005). Other unpublished research in Utah arrived at differing conclusions (Bunnell 2005). Both studies used different methodology.
Guideline[15] HU G1 When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris[4], so winter snowshoe hare habitat[49] is maintained.	Same as Alt B	No change.
Guideline HU G2 When developing or expanding ski areas, foraging should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.	Same as Alt B	No change.
Guideline HU G3 Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effective- ness of lynx habitat[23].	Same as Alt B	No change.
Guideline HU G4 For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction.	Same as Alt B	No change.
Guideline HU G5 For mineral and energy development sites and facilities that are closed, a reclamation plan that restores[39] lynx habitat should be developed.	Same as Alt B	No change.
Guideline HU G6 Upgrading unpaved roads to maintenance levels[27] 4	*Methods to avoid or reduce effects to lynx should be used in lynx habitat when* upgrading unpaved roads to	Clarified language.

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
and 5 should be avoided in lynx habitat, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.	maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.	
Guideline HU G7 New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity[16]. New permanent roads and trails should be situated away from forested stringers.	Same as Alt B	No change.
Guideline HU G8 Cutting brush along low-speed[25], low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.	Same as Alt B	No change.
Guideline HU G9 On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.	Same as Alt B	No change.
This number is not included in Alt B. This item is included as Standard HU S2.	*Guideline HU G10* *When developing or expanding ski areas and trails, access roads and lift termini to maintain and provide lynx security[10] habitat.*	Changed from Standard to Guideline because no clear evidence to indicate this is limiting lynx use.
This number is not included in Alt B. This item is included as Standard HU S1.	Guideline HU G11 ***Designated over-the-snow routes, or designated play areas, should not expand outside baseline areas of consistent snow compaction[1], unless designation serves to consolidate use and improve lynx habitat. This is calculated on an LAU basis, or on a combination of immediately adjacent LAUs.*** *This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.* *Use the same analysis boundaries for all actions subject to this guideline.*	Changed from Standard to Guideline. USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not consider packed snowtrails to be a threat to lynx at this time. Recent published research in western Montana has provided evidence to support this contention (Kolbe 2005). Other unpublished research in Utah arrived at differing conclusions (Bunnell 2005). Both studies used different methodology.

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
This number is not included in Alt B. This item is included as Standard HU S3.	Guideline HU G12 *Winter access for non-recreation special uses, and mineral and energy exploration and development, should be limited to designated routes[8] or designated over-the-snow routes[7].*	Changed from Standard to Guideline. USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not consider packed snowtrails to be a threat to lynx at this time. Recent published research in western Montana has provided evidence to support this contention (Kolbe 2005). Other unpublished research in Utah arrived at differing conclusions (Bunnell 2005). Both studies used different methodology.
LINKAGE AREAS (LINK): The following objective, standard and guidelines apply to *all projects within linkage areas,* subject to valid existing rights.		
Objective[30] LINK O1 In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat.	Same as Alt B	No change.
Standard[43] LINK S1 When highway[18] or forest highway[12] construction or reconstruction is proposed in linkage areas[22], identify potential highway crossings.	Same as Alt B	No change.
Standard LINK S2 Manage livestock grazing in shrub- steppe habitats[42] to contribute to maintaining[26] or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.	*This number is not included in Alt F. This item is included as* Guideline LINK G2.	Standard was changed to Guideline because the USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not identify grazing practices as a threat to lynx.
Guideline[15] LINK G1 NFS lands should be retained in public ownership.	Same as Alt B	No change.
This number is not included in Alt B. This item is included as Standard LINK S2.	Guideline LINK G2 *Livestock grazing in shrub-steppe habitats[42] should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.*	Standard was changed to Guideline because the USFWS Remand Notice (Federal Register Vol. 69, No. 128, July 3, 2003) did not identify grazing practices as a threat to lynx.
REQUIRED MONITORING		
Map the location and amount of snow-compacting use that coincided with lynx habitat[23] in LAUs[21] during the	*Map the location and intensity of snow compacting activities, and designated and groomed routes that occurred inside LAUs during the period of 1998 to*	Clarified language.

NRLA Baseline - Alternative B	NRLA Alternative F	Rationale for Change
1998-2000 seasons for designated over-the-snow[7] and groomed routes and areas, and areas of consistent snow compaction[1]. Such activities include snowmobiling, snowshoeing, cross-country skiing, dog sledding, etc.	*2000. The mapping is to be completed within one year of this decision and changes in activities and routes are to be monitored every five years after the decision.*	
None	Annually report the number of acres where any of the exemptions 1 through 6 listed in Standard VEG S5 were applied. Report the type of activity, the number of acres, and the location (by unit, and LAU[21]).	Additional monitoring item needed.
None	Report the acres of fuel treatment in lynx habitat within the wildland urban interface[49] as defined by HFRA[17] when the project decision is approved. Report whether or not the fuel treatment met the vegetation standard. If standard(s) are not met, report, which standard(s) are not, met, why they were not met, and how many acres were affected. Units will report to their respective USFS Regional Office. Region 1 of the USFS will consolidate all reports.	Additional monitoring item needed.

Glossary

[1] *Areas of consistent snow compaction* – An area of consistent snow compaction is an area of land or water that during winter is generally covered with snow and gets enough human use that individual tracks are indistinguishable. In such places, compacted snow is evident most of the time, except immediately after (within 48 hours) snowfall. These can be areas or linear routes, and are generally found in near snowmobile or cross-country ski routes, in adjacent openings, parks and meadows, near ski huts or plowed roads, or in winter parking areas. Areas of consistent snow compaction will be determined based on the area or miles used in 1998 to 2000.

[2] *Broad scale assessment* – A broad scale assessment is a synthesis of current scientific knowledge, including a description of uncertainties and assumptions, to provide an understanding of past and present conditions and future trends, and a characterization of the ecological, social and economic components of an area. (LCAS)

[3] *Carr* – Deciduous woodland or shrub land occurring on permanently wet, organic soil. (LCAS)

[4] *Course woody debris* – Any piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses on the ground or in streams. (LCAS)

[5] *Daylight thinning* – Daylight thinning is a form of precommercial thinning that removes the trees and brush inside a given radius around a tree.

[6] *Denning habitat (lynx)* – Denning habitat is the environment lynx use when giving birth and rearing kittens until they are mobile. The most common component is large amounts of coarse woody debris to provide escape and thermal cover for kittens. Denning habitat must be within daily travel distance of winter snowshoe hare habitat – the typical maximum daily distance for females is about three to six miles. Denning habitat includes mature and old growth[24] forests with plenty of coarse woody debris. It can also include young regenerating forests with piles of coarse woody debris, or areas where down trees are jack-strawed.

[7] *Designated over-the-snow routes* – Designated over-the-snow routes are routes managed under permit or agreement or by the agency, where use is encouraged, either by on-the-ground marking or by publication in brochures, recreation opportunity guides or maps (other than travel maps) or in electronic media produced or approved by the

agency. The routes identified in outfitter and guide permits are designated by definition; groomed routes also are designated by definition. The determination of baseline snow compaction will be based on the miles of designated over-the-snow routes authorized, promoted or encouraged in 1998 to 2000.

[8] *Designated route* – A designated route is a road or trail that has been identified as open for specified travel use.

[9] *Developed recreation* – Developed recreation requires facilities that result in concentrated use. For example, skiing requires lifts, parking lots, buildings and roads; campgrounds require roads, picnic tables and toilet facilities.

[10] *Security habitat (lynx)* – Security habitat amounts to places in lynx habitat that provide secure winter bedding sites for lynx in highly disturbed landscapes like ski areas. Security habitat gives lynx the ability to retreat from human disturbance. Forest structures that make human access difficult generally discourage human activity in security habitats. Security habitats are most effective if big enough to provide visual and acoustic insulation and to let lynx easily move away from any intrusion. They must be close to winter snowshoe hare habitat. (LCAS)

[11] *Fire use* – Fire use is the combination of wildland fire use and using prescribed fire to meet resource objectives. (NIFC) Wildland fire use is the management of naturally ignited wildland fires to accomplish resource management objectives in areas that have a fire management plan. The use of the term wildland fire use replaces the term prescribed natural fire. (Wildland and Prescribed Fire Management Policy, August 1998)

[12] *Forest highway* – A forest highway is a forest road under the jurisdiction of, and maintained by, a public authority and open to public travel (USC: Title 23, Section 101(a)), designated by an agreement with the FS, state transportation agency and Federal Highway Administration.

[13] *Fuel treatment* – A fuel treatment is a management action that reduces the threat of ignition and fire intensity or rate of spread, or is used to restore fire-adapted ecosystems.

[14] *Goal* – A goal is a broad description of what an agency is trying to achieve, found in a land management plan. (LCAS)

[15] *Guideline* – A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations may be documented, but amending the plan is not required. (LCAS modified)

[16] *Habitat connectivity (lynx)* – Habitat connectivity consists of an adequate amount of vegetation cover arranged in a way that allows lynx to move around. Narrow forested mountain ridges or shrub-steppe plateaus may serve as a link between more extensive areas of lynx habitat; wooded riparian areas may provide travel cover across open valley floors. (LCAS)

[17] *HFRA (Healthy Forests Restoration Act)* - Public Law 108-148, passed in December 2003. The HFRA provides statutory processes for hazardous fuel reduction projects on certain types of at-risk National Forest System and Bureau of Land Management lands. It also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships. (Modified from Forest Service HFRA web site.)

[18] *Highway* – The word highway includes all roads that are part of the National Highway System. (23 CFR 470.107(b))

[19] *Horizontal cover* – Horizontal cover is the visual obscurity or cover provided by habitat structures that extend to the ground or snow surface primarily provided by tree stems and tree boughs, but also includes herbaceous vegetation, snow, and landscape topography. Horizontal cover was measured by John Squires et al. (pers. com.) in Northwestern Montana according to the following methodology:
"A canvas cover-board (2 m x 0.5 m) was erected 10 m from plot center in 4 directions (forward track, back track, and at 2, 90° angles) was read to directly measure horizontal cover. The cover board was divided into 4, 0.5 meter blocks and each block was further dividend into quarters. At each reading, technicians estimated horizontal cover by 10% class at each of the 4 heights; these 4 estimates were then averaged for an overall estimate of that reading." (According to Squires via pers. com., cover measured during the summer period averaged approximately 65% while at den sites it was measured at roughly 85%. During the winter period cover was measured at 45% while at winter kill sites it was slightly greater than 50%.)

[20] *Isolated mountain range* – Isolated mountain ranges are small mountains cut off from other mountains and surrounded by flatlands. On the east side of the Rockies, they are used for analysis instead of sub-basins. Examples are the Little Belts in Montana and the Bighorns in Wyoming.

[21] *LAU (Lynx Analysis Unit)* – An LAU is an area of at least the size used by an individual lynx, from about 25 to 50 square miles (LCAS). An LAU is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

[22] *Linkage area* – A linkage area provides connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas, where basins, valleys or agricultural lands separate blocks of lynx habitat, or where lynx habitat naturally narrows between blocks. (LCAS updated definition approved by the Steering Committee 10/23/01)

[23] *Lynx habitat* – Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat is generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat. (LCAS)

[24] *Lynx habitat in an unsuitable condition* –Lynx habitat in an unsuitable condition consists of lynx habitat in the stand initiation structural stage where the trees are generally less than ten to 30 years old and have not grown tall enough to protrude above the snow during winter. Stand replacing fire or certain vegetation management projects can create unsuitable conditions. Vegetation management projects that can result in unsuitable habitat include clearcuts and seed tree harvest, and sometimes shelterwood cuts and commercial thinning depending on the resulting stand composition and structure. (LCAS)

[25] *Low-speed, low-traffic-volume road* – Low speed is less than 20 miles per hour; low volume is a seasonal average daily traffic load of less than 100 vehicles per day.

[26] *Maintain* – In the context of this amendment, maintain means to provide enough lynx habitat to conserve lynx. It does not mean to keep the status quo.

[27] *Maintenance level* – Maintenance levels define the level of service provided by and maintenance required for a road. (FSH 7709.58, Sec 12.3) Maintenance level 4 is assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most level 4 roads have double lanes and aggregate surfaced. Some may be single lane; some may be paved or have dust abated. Maintenance level 5 is assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-lane and paved, but some may be aggregate surfaced with the dust abated.

[28] *Mid-seral or later* – Mid-seral is the successional stage in a plant community that's the midpoint as it moves from bare ground to climax. For riparian areas, it means willows or other shrubs have become established. For shrub-steppe areas, it means shrubs associated with climax are present and increasing in density.

[29] *Multi-story mature or late successional forest* – This stage is similar to the *old multistory structural stage (see below)*. However, trees are generally not as old and decaying trees may be somewhat less abundant.

[30] *Objective* – An objective is a statement in a land management plan describing desired resource conditions and intended to promote achieving programmatic goals. (LCAS)

[31] *Old multistory structural stage* – Many age classes and vegetation layers mark the old forest, multistoried stage. It usually contains large old trees. Decaying fallen trees may be present that leave a discontinuous overstory canopy. On cold or moist sites without frequent fires or other disturbance, multi-layer stands with large trees in the uppermost layer develop. (Oliver and Larson, 1996)

[32] *Old growth* – Old growth forests generally contain trees that are large for their species and site, and are sometimes decadent with broken tops. Old growth often contains a variety of tree sizes, large snags and logs, and a developed and often patchy understory.

[33] *Permanent development* – A permanent development is any development that results in a loss of lynx habitat for at least 15 years. Ski trails, parking lots, new permanent roads, structures, campgrounds and many special use developments would be considered permanent developments.

[34] *Prescribed fire* – A prescribed fire is any fire ignited as a management action to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements met, before ignition. The term replaces management ignited prescribed fire. (NWCG)

[35] *Precommercial thinning* – Precommercial thinning is mechanically removing trees to reduce stocking and concentrate growth on the remaining trees, and not resulting in immediate financial return. (Dictionary of Forestry)

[36] *Red squirrel habitat* – Red squirrel habitat consists of coniferous forests of seed and cone-producing age that usually contain snags and downed woody debris, generally associated with mature or older forests.

[37] *Regeneration harvest* – The cutting of trees and creating an entire new age class; an even-age harvest. The major methods are clearcutting, seed tree, shelterwood, and group selective cuts (Helms 1998).

[38] *Research* – Research consists of studies conducted to increase scientific knowledge or technology. For the purposes of Standards VEG S5 and VEG S6, research applies to studies financed from the forest research budget (FSM 4040) and administrative studies financed from the NF budget.

[39] *Restore, restoration* – To restore is to return or re-establish ecosystems or habitats to their original structure and species composition. (Dictionary of Forestry)

[40] *Riparian area* – An area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation. (LCAS)

[41] *Salvage harvest* – Salvage harvest is a commercial timber sale of dead, damaged or dying trees. It recovers economic value that would otherwise be lost. Collecting firewood for personal use is not considered salvage harvest.

[42] *Shrub steppe habitat* – Shrub steppe habitat consists of dry sites with shrubs and grasslands intermingled.

[43] *Standard* – A standard is a required action in a land management plan specifying how to achieve an objective or under what circumstances to refrain from taking action. A plan must be amended to deviate from a standard.

[44] *Stand initiation structural stage* – The stand initiation stage generally develops after a stand-replacing disturbance by fire or regeneration timber harvest. A new single-story layer of shrubs, tree seedlings and saplings establish and develop, reoccupying the site. Trees that need full sun are likely to dominate these even-aged stands. (Oliver and Larson, 1996)

[45] *Stem exclusion structural stage* – In the stem exclusion stage, trees initially grow fast and quickly occupy all of the growing space, creating a closed canopy. Because the trees are tall, little light reaches the forest floor so understory plants (including smaller trees) are shaded and grow more slowly. Species that need full sunlight usually die; shrubs and herbs may become dormant. New trees are precluded by a lack of sunlight or moisture. (Oliver and Larson, 1996)

[46] *Timber management* – Timber management consists of growing, tending, commercially harvesting and regenerating crops of trees.

[47] *Understory re-initiation structural stage* – In the understory re-initiation stage, a new age class of trees gets established after overstory trees begin to die, are removed or no longer fully occupy their growing space after tall trees abrade each other in the wind. Understory seedlings then re-grow and the trees begin to stratify into vertical layers. A low to moderately dense uneven-aged overstory develops, with some small shade-tolerant trees in the understory. (Oliver and Larson, 1996)

[48] *Vegetation management projects* – Vegetation management projects change the composition and structure of vegetation to meet specific objectives, using such means as prescribed fire and timber harvest. For the purposes of this amendment, the term does not include removing vegetation for permanent developments like mineral operations, ski runs, roads and the like, and does not apply to fire suppression or to wildland fire use.

[49] *Wildland urban interface (WUI)* - The area adjacent to an at-risk community that is identified in the community wildfire protection plan. If there is no community wildfire protection plan in place, the WUI is the area 0.5 mile from the boundary of an at-risk community or within 1.5 miles of the boundary of an at-risk community. The WUI could also include areas if the terrain is steep, or there is a nearby road or ridge top that could be incorporated into a fuel break, or the land is in condition class 3, or the area contains an emergency exit route needed for safe evacuations. (Condensed from HFRA. For full text see HFRA § 101.)

[50] *Winter snowshoe hare habitat* – Winter snowshoe hare habitat consists of places where young trees or shrubs grow dense – thousands of woody stems per acre – and tall enough to protrude above the snow during winter, so hares can browse on the bark and small twigs (Ruediger et al. 2000). Winter snowshoe hare habitat develops primarily in the stand initiation, understory reinitiation and old forest multistoried structural stage.

APPENDIX D (US Forest Service 2007)

Table 1. Acres* of precommercial thinning during in lynx habitat next decade for Alternative F, Scenario 2

(Management direction would apply to occupied habitat, but not unoccupied (would follow no action – Alternative A)) full funding compared to historic average funding

	Alternative A		Alternative F	
	Full funding	*Historic average	Full funding	*Historic average
Occupied units				
Bridger-Teton-R4			1,000	340
Clearwater			1,930	670
Custer			1,000	340
Flathead			1,460	500
Idaho Panhandle			**40,280	13,670
Kootenai			**13,520	4,600
Lolo			2,200	750
Shoshone			0	0
Targhee -R4			870	300
Total occupied			**62,260**	**21,170**
Mix of occupied/unoccupied ***				
Gallatin	26,300	8,940	1,310	445
Helena	3,830	1,300	730	250
Lewis & Clark	7,410	2,520	20	5
Total mixed	**37,540**	**12,760**	**2,060**	**700**
Unoccupied units				
Beaverhead-Deerlodge	21,280	7,240		
Bitterroot	510	180		
Nez Perce	12,370	4,210		
Salmon-Challis - R4	22,000	7,480		
Ashley –R4	7,710	2,620		
Bighorn-R2	3,000	1,020		
Total unoccupied	**66,870**	**22,750**		
TOTAL				

Acres are estimates rounded to the nearest ten, and could change based on changing needs.

*Historically about 34% of precommercial thinning has been funded.

About **36,400 acres on the Idaho Panhandle and 11,720 acres on the Kootenai of precommercial thinning allowed under Alternative F is for daylight thinning of planted rust-resistant western white pine, where 80% of the cover would be retained.

***The Gallatin is 89% occupied; the Helena is 75% occupied; and the Lewis and Clark is 39% occupied

Table 2. Grazing allotments in occupied and unoccupied lynx habitat

				Active allotments with lynx habitat:			
	Number of allotments	With lynx habitat	Active with lynx habitat	Less than 25 percent	From 25 to 50 percent	More than 50 percent	With similar direction‡
Occupied units							
Bridger-Teton	278	278	236	0	236	0	236
Clearwater	17	0	0	0	0	0	0
Custer	133	24	24	13	4	7	24
Flathead	20	19	11	0	3	8	11
Idaho Panhandle	11	9	8	1	2	5	6
Kootenai	44	27	17	7	3	7	17
Lolo	36	18	13	2	5	6	13
Shoshone	84	47	45	21	14	10	10
Targhee	145	100	86	8	24	54	86
Total Occupied	**768**	**522**	**440**	**52**	**291**	**97**	**403**
Mixed of occupied/unoccupied							
Gallatin	98	98	94	20	36	38	0
Helena	88	88	75	27	30	18	25
Lewis and Clark	269	146	143	21	11	111	73
Total mixed	**455**	**332**	**312**	**68**	**77**	**167**	**98**
Unoccupied units							
Beaverhead-Deerlodge	318	318	315	91	80	144	315
Bitterroot	20	19	15	9	2	4	15
Nez Perce	29	15	12	3	3	6	12
Salmon-Challis	114	85	85	49	27	9	85
Ashley	68	68	51	6	19	26	51
Bighorn	106	61	59	13	23	23	59
Total unoccupied	**655**	**566**	**537**	**171**	**154**	**212**	**537**
TOTAL	1,878	1,420	1,289	291	522	476	1,045

‡ *Similar direction* includes plan standards for riparian habitat protection or other management direction for grazing.

Table 3. Miles of designated or groomed winter routes and acres of designated play areas in occupied and unoccupied lynx habitat

	All groomed or designated routes, in miles	Inside lynx habitat			
		Groomed or designated routes, in miles	Average designated routes groomed/year, in miles	Designated routes that could be groomed, in miles	Designated play areas (Number) & acres
Occupied units					
Bridger-Teton	850	850	750	100	0
Clearwater	1,025	500	425	75	0
Custer	50	25	0	25	0
Flathead	175	175	175	0	0
Idaho Panhandle	1,450	975	475	500	0
Kootenai	425	250	175	75	0
Lolo	700	375	300	75	0
Shoshone	500	150	100	50	0
Targhee	1,000	400	400	0	0
Total occupied	**6,175**	**3700**	**2800**	**900**	**0**
Mix of occupied and unoccupied					
Gallatin	425	350	305	50	0
Helena	375	275	200	75	(2) for 3,750
Lewis & Clark	825	600	225	400	(2) for 300
Total mixed	1625	1225	730	525	**(4) for 4,050**
Unoccupied units					
Beaverhead-Deerlodge	1,000	575	275	300	0
Bitterroot	250	100	25	75	0
Nez Perce	2,275	1,075	275	775	0
Salmon-Challis	1,500	1,125	225	900	0
Ashley	125	125	120	0	0
Bighorn	425	50	25	25	0
Total unoccupied	**5,575**	**3,050**	**945**	**2,075**	**0**
TOTAL	13,375	7,975	4,475 (56%)	3,500 (44%)	(4) for 4,050

The table contains estimated miles for each unit rounded to the nearest 25, as of January 2004. The baseline miles need to be established by each unit once a decision is made. The lynx amendment is not setting these as the baseline figures. These data may be updated as each unit conducts further site specific analysis to map the baseline, and for travel planning.

Table 4. Recreation special use permits (SUPs) and agreements in occupied and unoccupied lynx habitat

	Recreation SUPs and agreements	Winter recreation SUPs and agreements	Winter recreation SUPs and agreements in lynx habitat
Occupied units			
Bridger-Teton	227	39	39
Clearwater	37	6	3
Custer	17	0	0
Flathead	201	8	8
Idaho Panhandle	195	25	24
Kootenai	61	19	19
Lolo	141	24	20
Shoshone	279	25	20
Targhee	325	24	21
Total occupied	**1483**	**170**	**154**
Mix of occupied and unoccupied habitat			
Gallatin	376	30	30
Helena	58	8	6
Lewis and Clark	21	21	21
	455	59	57
Unoccupied units			
Beaverhead-Deerlodge	28	4	4
Bitterroot	211	7	7
Nez Perce	64	17	15
Salmon-Challis	114	14	14
Ashley	24	2	2
Bighorn	343	86	85
Total unoccupied	**784**	**130**	**127**
TOTAL	2,722	359	338

Table 5. Cross-country and downhill ski areas operating under special use permit In occupied and unoccupied lynx habitat

		Inside lynx habitat			
	Ski areas	Number	Acres	Planning expansion	New areas planned
Occupied units					
Bridger-Teton	5	5	4,620	0	0
Clearwater	0	0	0	0	0
Custer	1	1	1,288	1	0
Flathead	6	5	3,749	1	0
Idaho Panhandle †	2	0	0	1	0
Kootenai	3	1	2,640	1	1
Lolo †	3	2	1,412	1	0
Shoshone	10	1	2	0	0
Targhee	2	2	974	1	0
Total occupied	**32**	**17**	**14,685**	**6**	**1**
Mix of occupied and unoccupied habitat					
Gallatin	2	2	956	1	0
Helena	3	2	320	0	0
Lewis & Clark	3	3	1,498	1	0
Total mixed	8	7	2,774	2	0
Unoccupied units					
Beaverhead-Deerlodge	2	2	1,999	1	0
Bitterroot ‡	0	0	0	0	0
Nez Perce	1	0	0	0	0
Ashley	0	0	0	0	0
Salmon-Challis ‡	1	1	1,401	1	0
Bighorn	6	1	400	0	0
Total unoccupied	**10**	**4**	**3800**	**2**	**0**
TOTAL	50	28	21,259	10	1

† The Idaho Panhandle and Lolo National Forests both have parts of the Lookout Pass ski area within their administrative boundaries. On this table it is listed under the Lolo in Montana.

‡ The Salmon-Challis and Bitterroot National Forests both have parts of the Lost Trail ski area within their administrative boundaries. On this table it is listed under the Salmon-Challis NF in Idaho.

Table 6. Mining operations and wells in occupied and unoccupied lynx habitat

	Wells in last 10 years		Foreseeable wells or pads*	Minerals operations	
	Drilled	Outside habitat		Number	Name of major operations
Occupied units					
Bridger-Teton	0	Several	24	0	-
Clearwater	0	0	0	0	-
Custer	2*	0	2	1	Stillwater
Flathead	0	0	0	0	-
Idaho Panhandle	0	0	0	0	-
Kootenai	0	0	0	1	Troy
Lolo	0	0	0	1 to 5	-
Shoshone	0	1	1	0	-
Targhee	0	0	0	0	-
Total occupied	**2**	**several**	**27**	**3 to 5**	
Mix of occupied and unoccupied habitat					
Gallatin	0	0	0	1	East Boulder
Helena	1*	0	2	2 to 3	-
Lewis and Clark	0	0	2	0	-
Total mixed	1	1	4	3 to 4	
Unoccupied units					
Beaverhead-Deerlodge	0	0	4	2	Beal & Golden Jubilee
Bitterroot	0	0	0	0	-
Nez Perce	0	0	0	0	-
Salmon-Challis	0	0	0	0	-
Ashley	0	0	3	1	-
Bighorn	0	0	1	0	-
Total unoccupied	**0**	**0**	**8**	**3**	
TOTAL	1	3+	39	9 to 14	-

*Pads with multiple wells on the same location are counted as "1 well or pad" since the disturbance is comparable to a single well.

**One well on the Helena NFis on private land within the National Forest boundary has been plugged and abandoned. The two wells on the Custer NF are also plugged and abandoned.

Table 7. Miles of forest roads in occupied and unoccupied lynx habitat, part 1

			Paved 2 or more lanes		Environmental paving	
	Maintenance level 2	Maintenance levels 3 to 5	Paved last 10 years	Planned next 10 years	Paved last 5 years	Planned next 5 years
Occupied units						
Bridger-Teton	848	624	0	0	1	1
Clearwater	299	184	0	0	0	0
Custer	95	50	0	6.6	0	0
Flathead	500	795	0	0	0	1
Idaho Panhandle	1,166	830	0	0	0	0
Kootenai	400	450	0	0	1	0
Lolo	704	621	0	7.1	0	0
Shoshone	197	58	2	0	0	0
Targhee	138	557	2.2	5	0	0
Total occupied	**4,347**	**4169**	**4.2**	**18.7**	**2**	**2**
Mix of occupied and unoccupied habitat						
Gallatin	981	202	0.5	8	0	0
Helena	447	168	0	5	0	0
Lewis and Clark	327	323	0	0	0	0
Mixed total	**1755**	**693**	**0.5**	**13**	**0**	**0**
Unoccupied habitat						
Beaverhead-Deerlodge	1,050	741	10	5	0	0
Bitterroot	120	130	0	0	0	0
Nez Perce	386	372	0	7	0	0
Salmon-Challis	670	420	0	0	0	0
Ashley	211	353	0	1.7	0	0
Bighorn	125	51	0	0	0	0
Total unoccupied	**2,.562**	**2,067**	**10**	**13.7**	**0**	**0**
TOTAL	8,664	6,929	14.7	45.4	2	2

Table 8. Forest roads in occupied and unoccupied lynx habitat, part 2

	New open last 5 years	New open planned next 5 years	Upgrades planned next 5 years	On ridge-top planned next 10 years
Occupied habitat				
Bridger-Teton	10	0	100	2
Clearwater	0.4	0	7.2	2.8
Custer	0	0	14	0
Flathead	2	0	0	0
Idaho Panhandle	0.7	0	0	0
Kootenai	0	0	4	0
Lolo	0	0	63.4	0
Shoshone	0	0	3.6	0
Targhee	0.8	2.5	5	0.2
Total occupied	**13.9**	**2.5**	**197.2**	**5**
Mix of occupied and unoccupied habitat				
Gallatin	0	0	5	2
Helena	0	0	20	0
Lewis and Clark	0	0	0	0
Total mixed	**0**	**0**	**25**	**0**
Unoccupied habitat				
Beaverhead-Deerlodge	0.3	2.4	1.5	0
Bitterroot	0	0	0	0
Nez Perce	0	0	0	0
Salmon-Challis	0	0	12	0
Ashley	0	0	1.7	0
Bighorn	0.2	0	0	0
Total unoccupied	**.5**	**2.4**	**15.2**	**0**
TOTAL	14.4	4.9	237.4	7

APPENDIX E (adapted from U.S. Forest Service 2007)

Unit	Unit Acres	Acres of lynx habitat	% of lynx habitat	Acres within WUI*	Acres of lynx habitat within WUI*	% of acres within WUI* that are lynx habitat	% of all lynx habitat within WUI*	Lynx habitat treated in WUI* over a 10 year period				Total		Total 10 yr fuel treatment program
								Inside WUI*		Outside WUI*				
								Acres of lynx habitat	% of lynx habitat	Acres of lynx habitat	% of lynx habitat	Total acres of lynx habitat	% of lynx habitat	
Occupied Lynx Habitat														
Bridger-Teton NF	3,437,527	2,000,000	58.2%	70,700	43,900	62.1%	2.2%	22,320	1.1%	71,920	3.6%	94,240	4.7%	160,000
Clearwater NF	1,825,397	930,000	50.9%	50,900	90	0.2%	0.0%	0	0.0%	63,750	6.9%	63,750	6.9%	144,000
Custer NF	1,187,621	230,000	19.4%	79,200	22,800	28.8%	9.9%	1,450	0.6%	20,330	8.8%	21,780	9.5%	112,000
Flathead NF	2,355,592	1,730,000	73.4%	247,000	131,800	53.4%	7.6%	32,330	1.9%	34,310	2.0%	66,640	3.9%	108,000
Gallatin NF	1,806,565	870,000	48.2%	252,400	94,400	37.4%	10.9%	16,650	1.9%	2,400	0.3%	19,050	2.2%	50,000
Helena NF	975,387	440,000	45.1%	180,300	69,300	38.4%	15.8%	19,000	4.3%	12,150	2.8%	31,150	7.1%	77,000
Idaho Pan NF	2,498,234	1,170,000	46.8%	667,600	72,300	10.8%	6.2%	4,290	0.4%	39,010	3.3%	43,300	3.7%	122,000
Kootenai NF	2,242,468	1,010,000	45.0%	651,600	52,000	8.0%	5.1%	6,960	0.7%	36,000	3.6%	42,960	4.3%	167,000

Lewis & Clark NF	1,862,289	970,000	52.1%	69,100	35,800	51.8%	3.7%	17,160	1.8%	17,680	1.8%	34,840	3.6%	67,000
Lolo NF	2,082,784	1,110,000	53.3%	556,800	71,200	12.8%	6.4%	16,900	1.5%	32,330	2.9%	49,230	4.4%	130,000
Shoshone NF	2,436,850	640,000	26.3%	24,300	7,600	31.3%	1.2%	18,910	3.0%	17,160	2.7%	36,070	5.6%	127,000
Targhee NF	1,810,854	1,050,000	58.0%	100,000	55,400	55.4%	5.3%	14,300	1.4%	45,820	4.4%	60,120	5.7%	105,000
Total	**24,521,568**	**12,150,000**	**49.5%**	**2,949,900**	**656,590**	**22.3%**	**5.4%**	**170,270**	**1.4%**	**392,860**	**3.2%**	**563,130**	**4.6%**	**1,369,000**
Unoccupied Lynx Habitat														
Ashley NF	1,384,136	700,000	50.6%	56,000	27,200	48.6%	3.9%	31,360	4.5%	101,490	14.5%	132,850	19.0%	263,000
B-D NF	3,360,825	2,060,000	61.3%	211,700	154,400	72.9%	7.5%	36,500	1.8%	13,420	0.7%	49,920	2.4%	72,000
Bighorn NF	1,107,671	310,000	28.0%	43,400	7,800	18.0%	2.5%	13,640	4.4%	18,760	6.1%	32,400	10.5%	89,000
Bitterroot NF	1,580,948	640,000	40.5%	202,300	17,600	8.7%	2.8%	4,680	0.7%	16,400	2.6%	21,080	3.3%	93,000
Nez Perce NF	2,224,230	810,000	36.4%	119,800	15,800	13.2%	2.0%	5,200	0.6%	27,360	3.4%	32,560	4.0%	116,000
Salmon-Challis NF	4,350,827	1,800,000	41.4%	163,800	83,200	50.8%	4.6%	22,440	1.2%	27,060	1.5%	49,500	2.8%	110,000
Total	**14,008,637**	**6,320,000**	**45.1%**	**797,000**	**306,000**	**38.4%**	**4.8%**	**113,820**	**1.8%**	**204,490**	**3.2%**	**318,310**	**5.0%**	**743,000**

*** WUI= Within 1 mile of communities with >28 people/sq. mi.**

APPENDIX F (U.S. Forest Service 2007)

Non-developmental = GIS Categories 1-3

1. Natural, unmodified environments

In *natural, unmodified environments*, ecological processes such as fire, insects, and disease operate relatively free from human intervention. Diversity resulting from natural succession and disturbance predominate and non-native vegetation is rare.

Users must be self-reliant and expect little contact with others. Few if any structural improvements exist; travel is usually non-motorized.

Natural, unmodified environments are usually Designated Wilderness, Wilderness Study Areas, Research Natural Areas, backcountry lands, or rivers that are designated, suitable, or eligible for classification as Wild Rivers.

2. Special natural areas

In *special natural areas*, representative or rare, narrowly distributed ecological settings or components are conserved, helping to make sure the pieces and functions are saved to provide for the overall sustainability of larger landscapes.

The influences of humans on the ecosystem are sometimes evident. Human uses vary but generally are non-intensive. Travel is generally non-motorized.

Some of these areas serve as a "natural" reference for areas that are heavily managed for particular objectives. Special natural areas are often formally designated. They include some Research Natural Areas, most Areas of Critical Environmental Concern, many old growth reserves, rivers that are designated, suitable, or eligible for classification as Scenic Rivers outside of Wilderness, and some other areas.

3. Essentially unmodified forested and grassland ecosystems

In *essentially unmodified forested and grassland ecosystems*, although characterized by natural appearing landscapes, an array of management tools may be used to restore or maintain ecological processes, resulting in some evidence of human activities. Normally, natural processes and patterns predominate.

Ecological values are in balance with human occupancy, and consideration is given to both. Users may expect to experience some challenge and risk. Restrictions on motorized travel vary from area to area and season to season. Essentially unmodified forested and grassland ecosystems include lands unsuitable for timber production that have no planned harvest, special-status species habitat areas, and areas designated for and occupied by wild horses or burros.

Developmental = Categories 4-8

4. Natural appearing, but modified for human use and occupancy

In areas that are *natural appearing, but modified for human use and occupancy,* ecological values are managed to provide recreational use, but maintained well within levels necessary to maintain ecological systems. Resource use is not emphasized and has little impact.

Sights and sounds of humans can be expected. Motorized transportation is common.

Such lands include environmental education sites, rivers that are designated, suitable or eligible for classification as recreational, non-linear recreation sites and areas, and all other Areas of Critical Environmental Concern not included in special natural areas.

5. Modified forest ecosystems

Modified forest ecosystems are primarily forested ecosystems managed to meet a variety of needs. Ecologic conditions will be maintained with an emphasis on selected structures and compositions within the range of natural variability.

These lands often display high levels of forest management investment, use or activity, evidence of vegetative manipulation, and many facilities.

Users expect to see other humans and the evidence of human activities. Motorized transportation is common.

6. Modified grassland

Modified grasslands are grasslands but include many woodland ecosystems, managed to meet a variety of needs. Ecologic objectives are likely to emphasize selected structures and compositions within the range of natural variability.

These lands often display high levels of forest management investment, use or activity, evidence of vegetative manipulation, and many facilities. A wide variety of structure and composition is present.

Users expect to see other humans and the evidence of human activities. Motorized transportation is common.

7. Areas modified by human occupation and activities

In *areas modified by human occupation and activities,* public lands are intermingled with private lands to the point that public landowners cannot effectively manage for ecological values without the support and cooperation of the private sector.

Human activities have altered the natural appearances in most of these areas. The sight and sound of humans predominates. Private land use is often intensive agriculture, industrial, or residential.

Resource use may not be planned on a sustainable basis but may occur in concert with surrounding private land values. Motorized transportation is common.

8. Modified non-sustainable areas

In *modified non-sustainable areas,* ecological conditions and processes likely are or have been permanently altered by humans beyond the point where natural appearing landscapes and ecological processes can be maintained. The areas are generally small; they may include mines or other concentrated uses.

Ecological values are protected where they affect the heath and welfare of humans. Human activities are generally commercial, directly or indirectly providing jobs and income. Motorized transportation is common.