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50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Notice of Remanded Determination of Status for the Contiguous United States Distinct Population Segment of the Canada Lynx; Clarification of Findings; Final Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018–AF03

Endangered and Threatened Wildlife and Plants; Notice of Remanded Determination of Status for the Contiguous United States Distinct Population Segment of the Canada Lynx

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Clarification of findings.

SUMMARY: The Fish and Wildlife Service (Service), in response to the December 26, 2002, memorandum opinion and order of the United States District Court for the District of Columbia, in the case of *Defenders of Wildlife* v. *Norton* (Civil Action No. 00–2996 (GK)) and pursuant to the Endangered Species Act of 1973, as amended (ESA or Act), provides a clarification to the findings we made in support of the final rule that listed Canada lynx (*Lynx canadensis*) (lynx) as threatened. The lynx is currently listed as threatened in the contiguous United States as a Distinct Population Segment (DPS) that includes the States of Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming. As a result of our reanalysis of the basis for that final rule, which was directed by the Court, we find that the lynx is not endangered throughout a significant portion of its range. This finding does not affect the status of the lynx as currently set forth in 50 CFR 17.11; the lynx continues to be listed as threatened in the States listed above. This finding also does not affect the special rule pursuant to section 4(d) of the Act for the Canada lynx set forth in 50 CFR 17.40(k).

ADDRESSES: The complete file for this rule is available for inspection, by appointment, during normal business hours at the Montana Field Office, U.S. Fish and Wildlife Service, 100 N. Park Avenue, Suite 320, Helena, Montana 59601.

FOR FURTHER INFORMATION CONTACT: Mark Wilson, Field Supervisor, Montana Field Office (see **ADDRESSES**), telephone 406–449–5225; facsimile 406–449–5339.

SUPPLEMENTARY INFORMATION:

Background

The Service listed the Canada lynx, hereafter referred to as lynx, as threatened on March 24, 2000 (65 FR 16052). After listing the lynx as threatened, plaintiffs in the case of *Defenders of Wildlife* v. *Norton* (Civil Action No. 00–2996 (GK)) initiated action in Federal District Court, challenging the listing of the lynx as threatened and alleging violations of the Act and the Administrative Procedure Act (5 U.S.C. 551 *et seq.*). Plaintiffs argued that the Service acted arbitrarily and capriciously when it (1) did not treat the four lynx regions as separate DPSs, (2) determined that the lack of guidance for conservation of lynx in National Forest Land and Resource Management Plans and Bureau of Land Management (BLM) Resource Area Management Plans is the single factor threatening the contiguous United States DPS of lynx, (3) did not designate critical habitat for the lynx, and (4) determined that ''[c]ollectively, the Northeast, Great Lakes and Southern Rockies do not constitute a significant portion of the range of the DPS.''

On December 26, 2002, the Court issued its memorandum opinion and order, deciding that the Service's determination that ''[c]ollectively, the Northeast, Great Lakes and Southern Rockies do not constitute a significant portion of the range of the DPS'' must be set aside and remanded to the Service for further consideration of the lynx's status under the ESA consistent with the Court's memorandum opinion. The Court explained that the Service's determination about the four regions was counterintuitive and contrary to the plain meaning of the ESA phrase ''significant portion of its range.'' The Court did not address the issues concerning the threats and the DPSs. The Court also ordered the Service to ''undertake prompt rulemaking'' in order to designate critical habitat for lynx, and ordered injunctive relief directed at section 7 consultation.

The Court ordered the determination concerning a ''significant portion of its range'' be remanded to the Service and completed within 180 days of the date of the order consistent with the Court's memorandum opinion. With this document, the Service is providing its consideration of this issue. This document does not address critical habitat for the lynx, since our listing budget is currently insufficient to begin work on a rule for critical habitat. The Service will seek public comment in the future when it proposes critical habitat. This document also does not address the special rule for Canada lynx established in the March 24, 2000, final listing rule. That rule, which is found in 50 CFR 17.40(k), remains in effect.

As noted above, plaintiffs contend that our determination that ''[c]ollectively, the Northeast, Great Lakes, and Southern Rockies do not constitute a significant portion of the range of the DPS,'' was critical to our decision not to list the lynx as endangered. Plaintiffs maintain that, if those three regions are considered collectively to be a significant portion of the DPS, ''then the Lynx's highly imperilled status in those three areas would necessitate listing of the entire DPS as endangered.'' Pls. Mot. for Summ. J. at 30 (emphasis in original). However, the Service would need to find that the lynx is endangered in these areas and that they were significant in order to list the entire DPS. Therefore, we first reviewed all of the threats to the lynx in these areas to determine whether it is in danger of extinction in each area. We identified two areas or parts of areas in which the lynx might be in danger of extinction. We then determined whether either of those areas (or parts of areas) constitutes a significant portion of the range of the lynx.

The remainder of this section describes some important concepts used throughout the following analysis. Later sections include background information on the natural history and range of the lynx, responses to public comments, an analysis of the quantity and quality of habitat throughout the range of the DPS, an analysis of the threats facing the species in the areas addressed by the remand, a finding as to the areas in which the lynx currently are in danger of extirpation, and a finding that those areas do not constitute a significant portion of the range of the lynx.

As a preliminary matter, we note that the Court suggested, but did not decide, that ''significant'' is appropriately defined in this context as ''a noticeably or measurably large amount,'' citing a dictionary definition. However, there are other definitions of significance that pertain to importance. Moreover, we believe this is more consistent with the intent of the Act in the context of the provision at issue. Otherwise, a severe threat to a small area within the range of a species would always require the species to be listed as endangered, no matter how inconsequential that area might be given the biology of the species. For example, building a large dam may make the area covered by the resulting artificial lake unsuitable for an aquatic species currently resident in the river to be dammed. The area covered by the lake would be a ''measurably large'' area, and therefore a measurably large portion of the range of the species.

However, if the species is sufficiently widespread and healthy, the area subject to the threat would not be biologically important, and we believe it was not the intent of Congress that all such circumstances lead to the listing of all affected species.

Understanding ''significant'' to mean ''important,'' the following analysis concentrates on applying our understanding of the ecology of the lynx to the geography of its habitat. This allows us to determine whether a given area is a significant portion of the range of lynx.

With the help of new information available as a result of ongoing research, we continue to improve our understanding of lynx ecology in the contiguous United States. In delineating the range of the lynx in the contiguous United States, we must take into account lynx life history requirements, population dynamics, and the natural features of the vegetation communities that make up lynx habitat. The following list summarizes fundamental elements that determine the range of the lynx in the contiguous United States. We describe these elements in further detail later in this notice.

(1) Lynx in the contiguous United States are at the southern margins of a widely-distributed lynx population whose center is in north-central Canada and Alaska. Lynx populations in the contiguous United States are sustained by cyclic influx from lynx populations in Canada.

(2) Lynx are specialized predators of snowshoe hare (*Lepus americanus*). Lynx populations track hare cycles. Abundant hares are necessary to support survival of lynx kittens and recruitment into and maintenance of the lynx population. As a result, depending on habitat quality, local lynx populations naturally may not be able to survive through a cyclic low in the hare cycle.

(3) Lynx and snowshoe hare habitat is boreal forest where there are cold winters with deep snow.

(4) In the contiguous United States, the boreal forest is at its southernmost extent, transitions into other vegetation communities, and is naturally patchy. These natural patches may not be big enough or of high enough quality to support a resident lynx population.

(5) The habitat within these patches changes over time and location, naturally becoming suitable or unsuitable for lynx with forest succession or changes in local climate conditions.

(6) Lynx disperse long distances when hare populations decline. As a result, they can colonize suitable but unoccupied habitats, augment existing resident populations, or disperse to habitats where they cannot survive.

As a result of the factors described above, the range of the lynx in the contiguous United States is comprised of areas supporting resident, breeding populations and areas supporting occasional dispersers:

(1) Resident population—Resident, breeding populations exist in areas of abundant, higher-quality habitat. These areas are ''core'' areas essential to maintaining lynx in the contiguous United States. During cyclic population lows, resident lynx populations are naturally reduced to extremely low numbers of individuals. Throughout this document, we use the term ''resident population'' to refer to a group of lynx that has exhibited long-term persistence in an area as determined by a variety of factors, such as evidence of reproduction, successful recruitment into the breeding cohort, and maintenance of home ranges.

(2) Dispersers—Lynx records in many parts of the contiguous United States are of dispersing animals. Lynx occur as dispersers where boreal forest is isolated, patchy, or of marginal quality such that it cannot sustain a resident, breeding lynx population. We include areas of the contiguous United States that contain boreal forest as potential lynx range. Although dispersing lynx may periodically occupy some of this range, there is a low probability that habitat quality and quantity are sufficient to support a breeding population. It is possible that some of the large outlying patches of boreal forest may periodically support some breeding lynx; however, evidence of this is minimal and our best information indicates that these areas are likely to contribute little to the persistence of the species in the contiguous United States.

Some dispersing lynx are found in completely unsuitable habitats, such as prairie or deciduous forest, where they are unable to survive in the long term. We do not include such areas within the range of lynx because such occurrences are unpredictable and because, to the best of our knowledge, such areas have not contained conditions capable of supporting lynx since at least the time of European settlement.

We use the word ''dispersers'' to refer to lynx that have left the area they originally occupied for various reasons, most often when snowshoe hare populations decline. To successfully disperse, lynx must find suitable habitat and a mate and must successfully reproduce (McKelvey *et al.* 2000a). Successful dispersals can result in the colonization of unoccupied habitats and contribute to the persistence of the metapopulation (as described in the next paragraph). Unsuccessful dispersal is a natural phenomenon that occurs when lynx move to habitats that are unable to sustain lynx. These individuals are unable to survive and are lost from the metapopulation. Unsuccessful dispersal is demonstrated by records of lynx in areas such as North Dakota, Nebraska, and Iowa, which cannot support lynx populations in the long term (Adams 1963; Gunderson 1978; W. Jobman, U.S. Fish and Wildlife Service, in litt. 1997).

Another word we use is ''metapopulation.'' According to McKelvey *et al.* (2000a), a metapopulation is a number of discrete subpopulations within habitat patches, connected by dispersal. Through time, subpopulations may go extinct (no longer existing or living) and be recolonized, but the larger metapopulation persists. We believe lynx in the contiguous United States are part of a larger metapopulation with lynx populations in Canada.

The range of the lynx must be considered differently from the range of other species that are less mobile and have more stable population dynamics. Because the lynx is highly mobile and has cyclic population dynamics that are tied to its primary prey, the snowshoe hare, numbers of lynx naturally fluctuate and become extremely low at times during a cycle. Additionally, where snowshoe hare populations are not adequate, resident lynx populations cannot be sustained. Because of this, resident lynx populations never occurred everywhere boreal forest existed in the contiguous United States. Where the boreal forest was naturally more patchy and marginal the habitat was incapable of supporting an adequate snowshoe hare population that in turn was able to support a resident lynx population over time. As a result, only a few areas in the contiguous United States historically supported adequate quantity and quality of habitat to support resident lynx populations over time. Many historical lynx occurrences across a large area of the contiguous United States were likely dispersers. The occurrence of dispersing lynx is unpredictable, and dispersing lynx will continue to periodically move into areas that are not lynx habitat. This historic, natural condition continues to exist today, as will be discussed in this document.

Natural History

In the following section we describe in more detail than we did in the final rule the natural history, population

dynamics, and habitat of lynx in the contiguous United States, information necessary to delineate lynx range. 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 lynx's long legs and large feet make it highly adapted for hunting in deep snow.

Lynx are highly specialized predators of snowshoe hare. The North American distribution of the lynx is nearly the same as that of the snowshoe hare, both of which are strongly associated with boreal forest (Bittner and Rongstad 1982; McCord and Cardoza 1982; Quinn and Parker 1987; Agee 2000; Aubry *et al.* 2000; McKelvey *et al.* 2000b). Boreal forests are cold and moist with conifer trees, the predominant type of trees being species of spruce and fir (Elliot-Fisk 1988). Lynx habitat can be generally described as boreal forests that have cold winters with deep snow and that provide a snowshoe hare prey base (Quinn and Parker 1987, McKelvey *et al.* 2000b, Mowat *et al.* 2000). For example, in the Northeast, lynx were most likely to occur in areas with greater than 268 centimeters (cm) (105 inches (in)) of annual snowfall (Hoving 2001). Boreal forests are naturally dynamic and, therefore, are known as ''disturbance forests'' (Elliot-Fisk 1988, Agee 2000). The landscape changes over time and location as the forest undergoes natural succession following natural or human-caused disturbances such as fire, insect epidemics, wind, ice, disease, and logging. Large-scale disturbance is necessary to create the mosaic of different successional forest stages that provide suitable foraging and denning habitat for lynx. Lynx in the contiguous United States are at the southern margins of a widely distributed lynx population that is most abundant in northern Canada and Alaska.

To understand habitat relationships of lynx one must first understand the habitat relationships of snowshoe hares, their primary prey. Snowshoe hares use spruce and fir forests with dense understories that provide forage, cover to escape from predators, and protection during extreme weather (Wolfe *et al.* 1982; Monthey 1986; Hodges 2000a, 2000b). Generally, earlier successional (younger) forest stages have greater understory structure than do mature forests and, therefore, support higher hare densities (Fuller 1999, Hodges 2000a, 2000b). Lynx generally concentrate their hunting activities in areas where hare populations are high (Koehler *et al.* 1979; Parker 1981; Ward and Krebs 1985; Major 1989; Murray *et al.* 1994; O'Donoghue *et al.* 1997, 1998a). In Maine, snowshoe hare abundance and lynx occurrence are positively associated with late regeneration forests (forest stands that are growing back 12 to 30 years after being clear-cut and have greater than 50 percent canopy closure), evidence that lynx are selecting habitat primarily on the abundance of primary prey (Hoving 2001).

Lynx numbers and snowshoe hare densities in the contiguous United States generally do not get as high as in the center of their range in Canada, and there is no evidence they ever did so in the past (Hodges 2000a, 2000b; McKelvey *et al.* 2000b). It appears that northern and southern hare populations have similar cyclic dynamics but that in southern areas both peak and low densities are lower than in the north (Hodges 2000b). However, it is unclear whether hare populations cycle everywhere in the contiguous United States. Relatively low snowshoe hare densities at southern latitudes are likely a result of the naturally patchy, transitional boreal habitat at southern latitudes that prevents hare populations from achieving densities similar to those of the expansive northern boreal forest (Wolff 1980; Buehler and Keith 1982; Koehler 1990; Koehler and Aubry 1994). Additionally, the presence of more predators and competitors of hares at southern latitudes may inhibit the potential for high-density hare populations with extreme cyclic fluctuations (Wolff 1980). As a result of naturally lower snowshoe hare densities, lynx densities at the southern part of the range rarely achieve the high densities that occur in the northern boreal forest (Aubry *et al.* 2000).

The association between lynx and snowshoe hare is considered a classic predator-prey relationship (Saunders 1963; van Zyll de Jong 1966; Quinn and Parker 1987, Krebs *et al.* 2001). In northern Canada and Alaska, lynx populations fluctuate on approximately 10-year cycles that follow the cycles of hare populations (Elton and Nicholson 1942; Hodges 2000a, 2000b; McKelvey *et al.* 2000b). Generally, researchers believe that when hare populations are at their cyclic high, the interaction of predation and food supply causes hare populations to decline drastically (Buehler and Keith 1982; Krebs *et al.* 1995; O'Donoghue *et al.* 1997, Krebs *et al.* 2001). There is little evidence of regular snowshoe hare cycles in the Northeast and southern Quebec (Hoving 2001), but hare populations do fluctuate widely in this region. Hare fluctuations in this region may be more influenced by forest practices, weather, and other ecological factors. Snowshoe hare provide the quality prey necessary to support high-density lynx populations (Brand and Keith 1979). Lynx also prey opportunistically on other small mammals and birds, particularly when hare populations decline (Nellis *et al.* 1972; Brand *et al.* 1976; McCord and Cardoza 1982; O'Donoghue *et al.* 1997, 1998a). Red squirrels (*Tamiasciurus hudsonicus*) are an important alternate prey (O'Donoghue *et al.* 1997; 1998a; Apps 2000; Aubry *et al.* 2000). However, a shift to alternate food sources may not sufficiently compensate for the decrease in hares consumed to be adequate for lynx reproduction and kitten survival (Brand and Keith 1979, Koehler 1990, Koehler and Aubry 1994). When snowshoe hare densities decline, the lower quality diet causes sudden decreases in the productivity of adult female lynx and decreased survival of kittens, if any are born during this time; as a result, recruitment of young into the population nearly ceases during cyclic lows of snowshoe hare populations (Nellis *et al.* 1972; Brand *et al.* 1976; Brand and Keith 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue *et al.* 1997, Mowat *et al.* 2000).

Lynx den sites are found where coarse woody debris, such as downed logs and windfalls, provides denning sites with security and thermal cover for lynx kittens (McCord and Cardoza 1982; Koehler 1990; Koehler and Brittell 1990; Slough 1999; Squires and Laurion 2000; J. Organ, U.S. Fish and Wildlife Service, in litt. 1999). The integral component for all lynx den sites appears to be the amount of downed, woody debris present, not the age of the forest stand (Mowat *et al.* 2000). In Maine, 17 den sites have been located in a variety of stand types, including 10- to 20-year-old clear-cut and adjacent residual stands (J. Organ, U.S. Fish and Wildlife Service, in litt. 1999; G. Matula, Maine Department Inland Fisheries and Wildlife in litt. 2003). Maine den sites are characterized by regenerating hardwoods and softwoods, dense understory, and abundant coarse woody debris (J. Organ, in litt. 1999, 2003). In Washington, lynx denned in lodgepole pine (*Pinus contorta*), spruce (*Picea* spp.), and subalpine fir (*Abies lasiocarpa*) forests older than 200 years with an abundance of downed woody debris (Koehler 1990). A den site in Wyoming was located in a mature subalpine fir/lodgepole pine forest with abundant downed logs and dense understory (Squires and Laurion 2000).

Lynx require very large areas containing boreal forest habitat. In the Northeast, lynx were most likely to occur in areas containing suitable

habitat that were greater than 100 square kilometers (km ^{2}) (40 square miles (mi ^{2})) (Hoving 2001). The requirement for large areas also is demonstrated by home ranges that encompass many square miles. The size of lynx home ranges varies by the animal's gender and age, abundance of prey, season, and the density of lynx populations (Hatler 1988; Koehler 1990; Poole 1994; Slough and Mowat 1996; Aubry *et al.* 2000; Mowat *et al.* 2000). Based on a limited number of studies in southern boreal forest, the average home range for males is 151 km ^{2} (58 mi ^{2}), for females it is 72 km ^{2} (28 mi ^{2}) (Aubry *et al.* 2000). Recent home range estimates from Maine are 70 km ^{2} (27 mi ^{2}) for males and 52 km ^{2} (20 mi ^{2}) for females (G. Matula, in litt. 2003). However, documented home ranges in both the southern and northern boreal forest vary widely from 8 to 800 km ^{2} (3 to 300 mi ^{2}) (Saunders 1963; Brand *et al.* 1976; Mech 1980; Parker *et al.* 1983; Koehler and Aubry 1994; Apps 2000; Mowat *et al.* 2000; Squires and Laurion 2000; Squires *et al.* 2001; G. Matula, in litt. 2003). Generally, it is believed that larger home ranges, such as have been documented in some areas in the southern extent of the species' range in the West, are a response to lower-density snowshoe hare populations (Koehler and Aubry 1994; Apps 2000; Squires and Laurion 2000).

Lynx are highly mobile and have a propensity to disperse. Long-distance movements (greater than 100 kilometers (km) (60 miles (mi))) are characteristic (Mowat *et al.* 2000). Lynx disperse primarily when snowshoe hare populations decline (Ward and Krebs 1985; Koehler and Aubry 1994; O'Donoghue *et al.* 1997; Poole 1997). Subadult lynx also disperse even when prey is abundant (Poole 1997), presumably as an innate response to establish home ranges. Lynx also make exploratory movements outside their home ranges (Squires *et al.* 2001). Lynx are capable of moving extremely long distances (greater than 500 km (300 mi)) (Mech 1977; Brainerd 1985; Washington Department of Wildlife 1993; Poole 1997; Mowat *et al.* 2000; Squires *et al.* 2001); for example, a male was documented traveling 620 km (380 mi) (Brainerd 1985). A male lynx in Wyoming made an exploratory movement of 730 km (450 mi) round trip from its home range (Squires *et al.* 2001). While it is assumed lynx would prefer to travel where there is forested cover, the literature contains many examples of lynx crossing large, unforested openings (Roe *et al.* 2000). The ability of both male and female lynx to disperse long distances, crossing unsuitable habitats, indicates they are capable of colonizing suitable habitats and finding potential mates in areas that are isolated from source lynx populations.

Range of Lynx in the Contiguous United States

Within the contiguous United States, the lynx's range coincides with that of the southern margins of the boreal forest along the Appalachian Mountains in the Northeast, the western Great Lakes and the Rocky Mountains and Cascade Mountains in the West. In these areas, the boreal forest is at its southern limits, becoming naturally fragmented into patches of varying size as it transitions into subalpine forest in the West and deciduous temperate forest in the east (Agee 2000, Wisconsin Department Natural Resources, in litt. 2003). Because the boreal forest transitions into other forest types to the south, scientists have difficulty mapping its exact boundaries (Elliot-Fisk 1988). Therefore, precisely identifying and describing the distribution of lynx habitat also is difficult because there are several vegetation and landform classifications and descriptions that have been published for various parts of North America (U.S. Forest Service and Bureau of Land Management 1999). However, the term ''boreal forest'' broadly encompasses most of the vegetative descriptions of this transitional forest type that makes up lynx habitat in the contiguous U.S. (Agee 2000).

In addition to appropriate vegetation type, delineation of the range of the lynx within the contiguous United States must consider snow conditions. Lynx are at a competitive advantage over other carnivores (*e.g.*, bobcats (*Lynx rufus*) or coyotes (*Canis latrans*)) in areas that have cold winters with deep snow because of the lynx's morphological adaptations for hunting and surviving in such environments. Therefore, lynx populations may not be able to successfully compete and persist in areas with insufficient snow even if suitable forest conditions otherwise appear to be present (Ruediger *et al.* 2000; Ruggiero *et al.* 2000b; Hoving 2001; S. Hassett, Wisconsin Department Natural Resources, in litt. 2003). A consistent winter presence of bobcats indicates such areas are not of high quality for lynx.

Lynx in the contiguous United States are part of a larger metapopulation whose center is located in the northern boreal forest of central Canada; lynx populations emanate from this area (Buskirk *et al.* 2000b; McKelvey 2000a, 2000b). It appears hare populations and, as a result, lynx populations in the southern part of the range are cyclic, although the amplitude of the fluctuations in this portion of the range is not as extreme as in the center of the range (Aubry *et al.* 2000; Hodges 2000a, 2000b; Malloy 2000; McKelvey 2000b). When there is a high in the lynx population in central Canada, it acts like a wave radiating out to the margins of the lynx range (McKelvey *et al.* 2000a, 2000b). We know from historic data that the magnitude of the lynx population high emanating from the central Canadian boreal forest varies for each cycle (McKelvey *et al.* 2000a, 2000b). This wave can be produced by local populations reacting to environmental conditions, dispersers, or a combination of these (McKelvey *et al.* 2000b). Schwartz *et al.* (2002) concluded this wave is driven by dispersers, based on findings of a high level of gene flow between lynx in Alaska, Canada, and the western United States.

Lynx populations in the northeastern United States and southeastern Canada are separated from those in north-central Canada by the St. Lawrence River. There is little evidence of regular hare or lynx population cycles in this area (Hoving 2001), but wide fluctuations in lynx and snowshoe hare populations do occur. On a smaller scale, fluctuating populations in the core of this area (Quebec's Gaspé Peninsula, western New Brunswick, and northern Maine) can potentially influence lynx distribution up to several hundred miles distant.

We believe lynx dispersing during periods of population highs will occupy many patches of boreal habitat at the periphery of their range. Some patches will be suitable to maintain a long-term population and some will not. Where the boreal forest habitat patches within the contiguous United States are large, with suitable habitat, prey, and snow conditions, resident populations of lynx are able to survive throughout the low period of the approximately 10-year cycle. Most likely the influx of lynx from populations in Canada at the high point of the cycle augments these resident populations. It is likely that some of these habitat patches within the contiguous United States are able to act as sources of lynx (where recruitment is greater than mortality) that are able to disperse and potentially colonize other patches (McKelvey *et al.* 2000a).

In other areas, the lynx that remain in an area after a cyclic population high may be so few or in naturally marginal habitat that they are not able to persist or establish local populations, although some reproduction may occur. Such

areas naturally act as ''sinks,'' where lynx mortality is greater than recruitment and lynx are lost from the overall population (McKelvey *et al.* 2000a). Sink habitats are most likely those places on the periphery of the southern boreal forest where habitat naturally becomes more patchy and more distant from larger lynx populations. We consider lynx found in these sink habitats to be dispersers but we include these areas within the range of the lynx. Changes in the habitat conditions or cyclic fluctuations in the prey populations may cause some habitat patches to change from being sinks to sources and vice versa. Through this natural process, local lynx populations in the contiguous United States may ''blink'' in and out as the metapopulation goes through the 10-year cycle. We conclude that where habitat is of high enough quality and quantity, resident lynx populations are able to become established or existing populations are augmented, aiding in their long-term persistence.

We include areas that contain boreal forest but that support only dispersers within the range of the lynx because of the possibility lynx could establish a small, local population and contribute to the persistence of the metapopulation. However, evidence of this is minimal.

An example of the cyclic population ''wave'' occurred in the 1960s and 1970s, when numerous lynx were reported in the contiguous United States far from source lynx populations. These records of dispersing lynx correlate to unprecedented cyclic lynx highs in Canada (Adams 1963; Harger 1965; Mech 1973; Gunderson 1978; Thiel 1987; McKelvey *et al.* 2000b; Mowat *et al.* 2000). These dispersers frequently were documented in areas such as Wisconsin, that are close to source populations of lynx in Canada or possibly northeastern Minnesota and that contain some boreal forest. But there also have been a number of occurrences of dispersers in unsuitable habitats far from source populations, such as North Dakota prairie (Adams 1963; Gunderson 1978; Thiel 1987; McKelvey *et al.* 2000b; Verts and Carraway 2001).

Rather than recognizing that the cyclic peaks of the early 1960s and 1970s were anomalous highs for the 20th century, as explained in the final rule, some wildlife managers expected subsequent cycles to be equally high. Managers became concerned when harvest returns in the 1980s and 1990s indicated comparatively low cycles. However, as thoroughly described in the final rule, lynx harvest returns in the 1980s and early 1990s were not unusual nor appreciably lower than those recorded prior to the 1960s.

Some maps (*e.g.*, Hall and Kelson 1959, Tanimoto and Garton 1993) incorrectly portray the range of the lynx by encompassing peripheral records from areas that are not within boreal forest or do not have cold winters with deep snow, such as prairie or deciduous forest. Such maps have led to a misperception that the historic range of the lynx in the contiguous United States was once much more extensive than ecologically possible. Records of lynx outside of southern boreal forest in peripheral habitats that are unable to support lynx represent long-distance dispersers that are lost from the metapopulation unless they return to boreal forest and contribute to the persistence of a population. These unpredictable and temporary occurrences are not included within either the historic or current range of lynx because they are well outside of lynx habitat. This includes records from Connecticut, Indiana, Iowa, Massachusetts, Nebraska, Nevada, North Dakota, Ohio, Pennsylvania, South Dakota, and Virginia (Hall and Kelson 1959; Burt 1954 in Brocke 1982; Gunderson 1978; McKelvey *et al.* 2000b; J. Belfonti, The Nature Conservancy, in litt. 1994; S. Johnson, Indiana Department of Natural Resources, in litt. 1994; P. Jones, Ohio Department of Natural Resources, in litt. 1994; South Dakota Natural Heritage Program, in litt. 1994; W. Jobman, U.S. Fish and Wildlife Service, in litt. 1997; Smithsonian Institute, in litt. 1998). In the proposed rule to list the lynx, we included Massachusetts and Pennsylvania in the historic range of the lynx but removed those areas from the range in the final rule because of better information that historically habitat in these States was not capable of supporting lynx. We consider both the historic and current range to consist of Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming because these States support some boreal forest and have more frequent records of lynx.

Previous Federal Action

The final rule that listed lynx as threatened in the contiguous United States described the history of the Service's actions concerning the listing of the lynx. That discussion is incorporated herein by reference. Since publication of the final rule and as a result of the litigation that requires us to reconsider our determination about the significant portion of the range of lynx, we reopened the comment period for 30 days to acquire information to assist us during our reconsideration (March 17, 2003, 68 FR 12611). This comment period closed on April 16, 2003.

Summary of Comments and Recommendations

As a result of the reopened comment period in March and April 2003, the Service received 118 comments and recommendations. Of these comments, 2 were from Congressional or Legislative officials, 6 were from Federal agencies; 6 from States; 2 from County Commissioners, 17 from environmental organizations, 3 from businesses, 9 from Industry Trade Associations, 1 from a University, and 70 from individuals. Some commenters provided information relevant to our determination regarding the significant portion of the range of lynx. Comments of a similar nature are grouped into general issues. These issues and our responses are discussed below.

We received numerous comments covering a broad spectrum of lynx-related issues that are not the subject of this notice or are beyond the scope of the court's remand. We are not addressing these comments in this document. These comments covered such subjects as: designation of critical habitat for lynx; the existence of various DPSs of lynx; general support for or opposition to protection of lynx under the Act; support for or opposition to lynx re-introduction efforts; classifying the lynx re-introduction in the Southern Rocky Mountains as an experimental, non-essential population; concern that the Service was prioritizing the listing and protection of charismatic mega-fauna ahead of other flora and fauna; the competency and intent of the Service; an internet retail vendor of lynx pelts; recovery planning; and streamlining section 7 consultations. In particular, we received a number of comments as to the status of the lynx throughout the U.S. DPS (*i.e.*, endangered, threatened, or neither). However, the only portion of our March 24, 2000 final listing determination that the court remanded for further consideration was our determination that ''[c]ollectively, the Northeast, Great Lakes and Southern Rockies do not constitute a significant portion of the range of the DPS.'' Our finding on this limited remand is discussed below. To the extent that the information we received since the final listing determination, or that we receive in the future, causes us to reevaluate the listing of the lynx, we will issue an appropriate proposed rule when resources allow.

We conducted peer review of the proposed rule to list the contiguous United States population of lynx during the open public comment period in 1998. For this court-ordered reanalysis of the 2000 final rule listing the lynx, we did not have time to conduct additional peer review.

Issue 1: Technical information was provided based on recent research on lynx and snowshoe hares in Maine and Montana. Additional technical information on lynx populations and lynx habitat quality and quantity was provided by the State of Maine, the State of Vermont, the State of Colorado, the State of Wisconsin, the State of Wyoming, the State of Minnesota, research by the University of Maine and the University of Montana, the U.S. Forest Service, the BLM, the National Park Service, a number of environmental and industry groups, and individuals.

Response: We incorporated this information into this document.

Issue 2: Several commenters expressed support or concern for the Service's determination considering the significant portion of the range of the lynx. Specifically, commenters explained their concerns about whether or not the Northeast, Great Lakes, or the Southern Rockies constitute a significant portion of the range of the lynx.

Response: The Act defines ''endangered species'' as any species which is in danger of extinction throughout all or a significant portion of its range. A ''threatened species'' is any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The District Court found our determination that the Northeast, Great Lakes, and the Southern Rockies do not constitute a significant portion of the range of the lynx was arbitrary and capricious, and as a result of that finding, directed us to reevaluate it. Based on our reanalysis, we have determined that lynx is not in danger of extinction throughout a significant portion of its range in the contiguous United States DPS.

Issue 3: Several commenters opposed combining the Cascades in general, or specific locations within Washington, with the Northern Rocky Mountain region for our analysis.

Response: We combine the Cascades with the Northern Rocky Mountain region for our analysis and for convenience only because the issues in both regions are similar and frequently the best information available addressed both regions. The two areas are separated by the Okanogan River valley in northern Washington, which lynx can cross, although we believe most movement of lynx to be north-south within contiguous habitat with Canada and less likely that lynx would move between habitat patches within Washington. Furthermore, the Cascades alone supports the smallest amount of lynx habitat of any region within the contiguous United States. The relative size and close proximity of the lynx habitat in the Cascades to that in the Northern Rocky Mountains further supports considering both areas as one. Combining these two regions has not in any way diminished or obscured our analysis of the status of lynx or the threats to the species.

Issue 4: Several commenters suggested the Cascades, the Cascades/Northern Rocky Mountains, the Southern Rockies, the Great Lakes, and the Northeast Lynx populations should each be designated as individual DPSs. Other commenters believed the contiguous United States as a whole does not fulfill the criteria to be a DPS for lynx.

Response: Reevaluation of DPS issues is outside of the scope of the remand in this case. However, because the plaintiffs' claims regarding application of the Service's authority to list DPSs have not yet been addressed by the court, we are responding to these comments to update and elaborate on our analysis in the final rule. The Act gives us the authority to list fish, wildlife and plants by species, subspecies, or by DPS of any species of vertebrate fish or wildlife which interbreeds when mature. However, Congress directed that we use our authority to list by DPS sparingly (see Senate Report 151, 96th Congress, 1st Session). The Service and National Marine Fisheries Service DPS policy (61 FR 4721) identifies criteria that must be met for a vertebrate group to qualify as a DPS, but it does not require that we designate a DPS in all cases where a vertebrate group meets the DPS criteria. The Service lists, reclassifies, or delists at the level we believe to be most appropriate to carry out the conservation provisions of the Act.

In this document we reaffirm our determination in the final rule to list the lynx in the contiguous United States as a single DPS. There has been no new information since the final rule was published in 2000 that compels us to change our original determination. Subsequent to issuing the proposal to list the lynx in 1998, we evaluated whether any of the four regions individually fulfilled the criteria to be listed as a DPS. As described in the final rule, we recognize that within the contiguous United States the lynx occurs in four regions—the Northeast, Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades. As described elsewhere in this document, we combine the Northern Rocky Mountains and Cascades in our analysis because the two regions are only separated by the Okanogan River valley, which lynx can cross, and forest types and land ownership are similar. Furthermore, the Cascades alone support the least amount of lynx habitat of any region in the contiguous United States. In evaluating whether a region qualified as a separate DPS, we analyzed whether lynx in each region were both discrete and significant, as required by our DPS policy. We concluded that within the contiguous United States these regions are geographically isolated from each other and, therefore, are discrete. Since the final rule, we are less certain that the Southern Rocky Mountains regions were historically as isolated as described by some authors. We believe it is likely that lynx in the Southern Rocky Mountains region may have been dispersers that arrived during extremely high population cycles, as indicated by the fact that the last verified record of lynx in the region is from 1973, which correlates to an extreme cyclic population high documented throughout the contiguous United States and in Canada. As a result, our original conclusion that the Southern Rocky Mountains supported an isolated resident lynx population may not be correct, and the region should perhaps be considered connected to the Northern Rocky Mountains/Cascades region.

When evaluating the status of a potential DPS, the DPS policy requires that we evaluate the significance of the population segment in relation to the taxon. A taxon is the taxonomic group of animals to which the population belongs—in this case the species *Lynx canadensis.* The DPS policy identifies elements that may be considered in determining the discrete population segment's importance to the taxon to which it belongs. These include: (1) Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon, (2) evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon, (3) evidence that the discrete population segment represents the only surviving natural occurrence of a taxon, and (4) evidence that the discrete population segment differs markedly from other populations

of the species in its genetic characteristics.

Lynx canadensis has an extensive distribution in North America, existing in the boreal forest from Alaska throughout Canada from the Yukon and Northwest Territories south across the United States border and east to the Maritime Provinces and the Island of Newfoundland. Of the entire North American range of the lynx, only a small portion extends into the contiguous United States. Individually, the Northeast, Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades account for an extremely small fraction of the entire range of the taxon, the loss of which would not result in a significant gap in the range of the taxon. Within all four regions of the contiguous United States the distribution of lynx is associated with the southern extensions of the boreal forest, where the predominant vegetation in each region is spruce and fir types, although the individual species of vegetation varies. As is true throughout the range of *Lynx canadensis,* within these boreal forests in each region within the contiguous United States, the important element for lynx is forest structure that provides food and cover for snowshoe hares. Lynx cannot sustain breeding populations without an adequate snowshoe hare population. Additionally, the forest must provide cover for lynx dens. Such habitat conditions occur in each of the four regions. As a result, we determined that none of the regions individually constitute significantly unique or unusual ecological settings. The only genetic analysis of lynx populations shows that there is a high level of gene flow between lynx populations in Alaska, western Canada and the western contiguous United States (Schwartz *et al.* 2002). Genetic analysis comparing lynx populations within the contiguous United States has not been done. Finally, lynx in the different regions of the contiguous United States clearly are not the only surviving natural occurrence of lynx. Therefore, the individual regions do not fulfill the significance criteria under our DPS policy and, as a result, do not constitute separate DPSs. The DPS policy allows us to use the international boundary with Canada to delineate a discrete DPS in the contiguous United States. As described in the final rule, lynx in the contiguous United States may be considered ecologically significant because lynx habitat in the contiguous United States is a transitional type of southern boreal forest rather than the classic boreal forest of northern latitudes in Canada and Alaska, which is the center of lynx range. Within this transitional boreal forest within the contiguous United States there are core areas in Maine, Minnesota, Montana, Washington and likely Idaho that support resident, breeding lynx populations, the loss of which would result in a significant gap in the range of lynx. Therefore, we once again conclude the listable entity is the contiguous United States DPS of the lynx, consisting of the Northeast, Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades.

Issue 5: Several commenters raised concerns about threats that were beyond the control of Federal land management practices, particularly in the Northeast where much of the forested lynx habitat is primarily in private ownership.

Response: We recognize that lynx habitat occurs on non-Federal lands, particularly in the Northeast. We do not have specific information on the amount of lynx habitat on non-Federal lands nor precise information on the type of activities that occur on such lands. Non-Federal landowners are under no obligation to identify lynx habitat on their lands nor do they have to supply any information to the Service regarding these lands. We solicited information about non-Federal lands during the reopened comment period. To the extent possible, we attempted to better understand and assess the activities on non-Federal lands that could affect lynx. Our analysis is described in the ''Summary of Factors Affecting the Species'' section.

Issue 6: Several other comments noted the reduced threat on Federal lands, particularly National Forest lands, resulting from lynx habitat management plans.

Response: We agree that threats to lynx as a result of a lack of Federal land management plan guidance to conserve lynx, as identified in the final rule, have been somewhat alleviated. As described in ''Factor D,'' Conservation Agreements the U.S. Forest Service and BLM have with the Service, and the biological opinion on National Forest and BLM land management plans committed the U.S. Forest Service and BLM to use the Lynx Conservation Assessment and Strategy (LCAS) in determining the effects of actions on lynx. The U.S. Forest Service further committed to deferring any actions that both would adversely affect lynx and do not involve third parties until such time as the Forest Plans are amended to adequately conserve lynx. The ongoing adherence to the Conservation Agreements and programmatic biological opinion and use of the LCAS in assessing the impacts of Federal actions has been effective in removing most threats to the species on these Federal lands. However, amendment or revision of National Forest and BLM land management plans to conserve lynx is still the strongest mechanism needed to ensure lynx and lynx habitat are conserved on National Forest and BLM lands for the long term (see Factor D).

Issue 7: Several commenters suggested that habitat features (such as snow depth, forest composition, prey abundance, elevation, connectivity with lynx populations in Canada) that vary among regions and affect habitat quality may not exist in peripheral areas. Other commenters suggested that generalizations about western lynx populations cannot be applied to the East. Other commenters made recommendations as to how lynx habitat should or should not be defined according to certain vegetation types or descriptions.

Response: Our understanding of lynx habitat requirements is continually refined with ongoing research. We have a better understanding of the habitat conditions based on information from areas where there have been numerous records of lynx over many years and, especially, where resident, breeding populations of lynx have existed over time. Based on the best available information, the key to the presence of lynx populations is adequate snowshoe hare populations. Therefore, habitat conditions and vegetation types that support adequate densities and distribution of snowshoe hares and deep snows are what we consider to be lynx habitat. In general, lynx and snowshoe hare habitats are described as moist boreal forest types that receive deep snow and cold winters (Bittner and Rongstad 1982; McCord and Cardoza 1982; Quinn and Parker 1987; Elliot-Fisk 1988; Agee 2000; Aubry *et al.* 2000; McKelvey *et al.* 2000b; Ruediger *et al.* 2000). It is well established that lynx are highly mobile and are frequently found in marginal forest types or completely unsuitable habitats that cannot sustain lynx. The fact that individual lynx have been found in such areas does not mean that those areas can support a lynx population or should be considered or managed as ''lynx habitat'' (J. Claar *et al.*, in litt. 2001). To be considered lynx habitat, an area must have the potential to sustain a lynx population over a period of time, which includes supporting the appropriate vegetation composition and structure to support adequate snowshoe hare densities and deep snow where lynx are at a competitive advantage. We recognize

that the specific vegetation composition of the boreal forest type varies among the regions. Additionally, we recognize that boreal forest types on the periphery of the boreal forest range are found in smaller patches and are only marginally able to support adequate snowshoe hare populations. We conclude records of lynx in these marginal areas or in other areas without lynx habitat are of dispersers. Although there is no evidence that such habitats are able to sustain a resident lynx population, we include all areas with lynx occurrences and lynx habitat, however marginal, within the range of lynx.

Issue 8: One comment suggested lynx historically inhabited the Black Hills of South Dakota as a permanent resident. Another comment suggested northern mountain ranges in New Mexico should be included within the range of lynx.

Response: The scientific literature definitively demonstrates that lynx are specialist predators of snowshoe hares and do not successfully reproduce without an adequate diet of snowshoe hares (Brand and Keith 1979). Snowshoe hares are not indigenous to South Dakota (American Society of Mammalogists Web site). Therefore, we conclude South Dakota naturally could not support a lynx population. We recognize that dispersing lynx have occurred in unsuitable habitats such as in South Dakota; however, we do not include areas of unsuitable habitat within the range of lynx. We do not include New Mexico within the range of lynx because we have no reliable records of native lynx occurring in New Mexico. Lynx are not included on the list of Mammals of New Mexico (American Society of Mammalogists Web site). We do not consider lynx recently released into Colorado that strayed into New Mexico as sufficient reason to include New Mexico within the range of native lynx because there is no evidence habitat in New Mexico historically supported lynx.

Issue 9: A number of comments reported lynx sightings or lynx tracks in New York, New Hampshire, Washington, and Wyoming.

Response: Because lynx are difficult to identify and are often confused with bobcats, we must consider the majority of these reports anecdotal. Nonetheless, because of the existence of reliable lynx records from these States, in addition to the presence of lynx habitat, we include all these States within the range of lynx.

Issue 10: Some comments voiced concern that evidence of lynx in some areas was a result of a survey that was subsequently found to have been contaminated.

Response: In this reanalysis of the basis for our final rule, we did not use any information from that particular survey, the results of which have been rescinded by the author because of the contamination of samples. The majority of the evidence of lynx in the contiguous United States is from trapping records, research, and sightings or track surveys by qualified individuals. Results of positive identification of lynx by DNA acquired during the National Lynx Survey (K. McKelvey, Rocky Mountain Research Station, in litt. 2003) provide additional evidence of lynx. The integrity of the National Lynx Survey has been maintained because of the survey method, DNA analyses, and measures used to ensure quality and reliability.

Issue 11: We received a number of comments suggesting that certain land use activities, particularly timber management practices, adversely impact lynx habitat and are incompatible with lynx survival. Alternatively, one comment suggested that pre-commercial thinning can be compatible with objectives for high-quality lynx habitat.

Response: Timber harvesting can be beneficial, benign, or detrimental to lynx depending on harvest methods, spatial and temporal specifications, and the inherent vegetation potential of the site. Forest practices in lynx habitat that result in or retain a dense understory provide good snowshoe hare habitat that in turn provides good foraging habitat for lynx. In Maine, extensive clear cutting over the past 25 years has resulted in a large amount of the forest currently in a stage of regeneration that is optimal for snowshoe hares and lynx. However, research in Maine has shown that snowshoe hare densities are low in forest stands that have been partially harvested such that there is little understory to provide snowshoe hare habitat. The effects of forest practices on lynx are described and analyzed under Factor A.

Issue 12: Several comments raised concerns about the impacts of various activities on lynx habitat. Activities identified by commenters include roads and trails; agricultural and urban development; off-road-vehicle and snowmobile use; ski resort expansion; mining; fire suppression; and grazing.

Response: We address the potential threats to lynx under the ''Summary of Factors Affecting the Species'' section. As a result of our analysis, we found the threat to lynx by some of these activities, such as fire suppression, is low. We found no evidence that some activities, such as forest roads, pose a threat to lynx. Some of the activities suggested, such as mining and grazing, were not specifically addressed because we have no information to indicate they pose threats to lynx.

In considering threats to lynx, one must consider that lynx have evolved to adapt to an ever-changing boreal forest and require a mosaic within the boreal forest of appropriate species composition, varying stand ages, and structure to support abundant snowshoe hares and lynx denning habitat. Additionally, one must consider scale. Lynx are highly mobile, moving long distances to find abundant prey, and use a large area on a landscape as demonstrated by the large size of an average lynx home range. To significantly impact a local lynx population, an activity would likely have to occur across a very large area (presumably at least the size of several home ranges), create a homogeneous forest that does not provide the various stand ages, species composition, and structure that are good snowshoe hare and lynx habitat, or result in a barrier that effectively precludes dispersal (see Summary of Factors Affecting the Species section).

Issue 13: One comment suggested that climate change posed a threat to southern lynx populations.

Response: This comment is based on a model that predicted that if average annual snow depths decrease for a long period of time in the Northeast, appropriate lynx habitat would be diminished and could be completely eliminated if appropriate climate conditions did not return, as the author theorized could happen as a result of global warming (Hoving 2001). We conclude the potential for long-term reductions in snow depth because of climate change is speculative at this time and is not a threat to lynx within the foreseeable future (see Factor E).

Issue 14: One comment suggested a State-sanctioned coyote snaring program threatens the lynx population in Maine.

Response: As addressed under Factor D, we recognize that legal trapping, snaring, and hunting for bobcat, coyote, wolverine, and other furbearers create a potential for incidental capture or shooting of lynx. We acknowledge that no reliable recordkeeping exists to determine how frequently such take occurs. Mortality of captured individuals likely has differing impacts on the ability of local populations to persist, depending on the size of the local population and when the take occurs in the population cycle. Lynx still persist throughout their range despite the fact that incidental catch occurred historically, in all likelihood at higher levels than presently occur. Although we are concerned about the

mortality of lynx that are incidentally captured, we have no information to indicate that the loss of these individuals negatively affects the overall ability of lynx populations to persist.

Introduction to Remand Analysis

In the final rule, we found that ''[c]ollectively, the Northeast, Great Lakes and Southern Rockies do not constitute a significant portion of the range of the DPS.'' The following reanalysis of that finding is based on the administrative record, information obtained by the Service during the comment period opened to address the issues on remand, and the Court's opinion in the litigation. As discussed above, we address first whether there were any areas in the range of the lynx outside of the Northern Rockies in which the lynx is in danger of extirpation. Our analysis of whether extirpation will occur is based on the five factors listed in section 4(a)(1) of the Act. For any such areas, we then determine whether they constitute a significant portion of the range of the lynx, based largely on the quantity and quality of the habitat in the portion of the range in question.

Summary of Factors Affecting the Species

Section 4 of the Act and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act set forth the procedures for adding species to the Federal lists. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to the Canada lynx (*Lynx canadensis*) were discussed in the final rule. Highlighted below are the key points raised in the final rule and the conclusions we made about whether certain activities or conditions threaten Canada lynx to the extent that those points are relevant to the three areas at issue in this remand. If new information changes a statement or conclusion made in the final rule, this point will be made in this analysis. Also discussed below is any new information we received about the five listing factors and their application to lynx during the reopened comment period initiated as a result of the remanded decision. Finally, in this document, we assess the magnitude of the threats to lynx to assist us in determining the status of the species in the areas at issue.

In considering threats to lynx and whether those threats are low, medium, or high, one must consider that lynx have evolved to adapt to an ever-changing boreal forest and require a mosaic within the boreal forest of appropriate species composition, varying stand ages, and structure to support abundant snowshoe hares and lynx denning habitat. Additionally, one must consider scale. Lynx are naturally highly mobile, moving long distances to find abundant prey, and use a large area on a landscape; the average home range for a male lynx is 151 km^2 (58 mi^2) (Aubry *et al.* 2000). In order to affect the suitability of lynx habitat and, in particular, a local lynx population to the extent of putting the population at risk of extinction, an activity would likely have to occur across a very large area (at a minimum the size of several home ranges) and (1) cumulatively result in the conversion of lynx habitat into non-lynx habitat, (2) result in a homogeneous forest that does not provide the various stand ages, species composition, and structure that are good snowshoe hare and lynx habitat, or (3) effectively preclude dispersal.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Habitat Quantity and Quality

In assessing habitat quality for lynx, we examine a variety of elements, such as primary prey (snowshoe hare) abundance, forest type, forest structure, snow conditions, denning habitat, inherent habitat patchiness, and connectivity with larger lynx populations and habitat in Canada. We use lynx reproduction and recruitment into the population as additional indicators of habitat quality.

In the following discussions, we describe available information on lynx occurrence, habitat quantity, habitat quality, and other elements that frame our understanding of lynx in the contiguous United States. The complexities of lynx population dynamics and our incomplete understanding of the limited lynx occurrence data, combined with a naturally dynamic and transitional habitat, make it difficult to precisely delineate the historic or current extent of the range of lynx in the contiguous United States. While recognizing these limitations, we use our best professional judgement of the best scientific and commercial data available to make conclusions about the range of the lynx for the purposes of this remand.

Important to understanding the range of lynx in the contiguous United States is the status of the lynx in any given area as a member of a resident, breeding population or as a disperser. While we recognize and agree with McKelvey *et al.*'s (2000b) caution that lynx occurrence data are too incomplete to infer much beyond simple occurrence, for the purposes of this reevaluation, we feel it necessary to make conclusions about the condition of lynx using our professional assessment of the best scientific and commercial data available. We partially base our conclusions regarding whether lynx in a particular area are resident or dispersers on the record of reliable reports of lynx. We discuss the reliability of records below.

Historic lynx data in the contiguous United States are scarce and exist primarily in the form of trapping records. Many States did not differentiate between bobcats and lynx in trapping records. Therefore, long-term lynx trapping data are not available for most States. Long-term trapping data have been used to understand population trends for various species; however, because trapper effort can change across years, trapping returns may not accurately reflect population trends. Data showing few lynx trapped may be the result of low pelt prices or reduced trapper effort, not necessarily a decreased population. However, despite these difficulties, trapping data are the best information available on historic lynx presence throughout much of its range in the contiguous United States.

In the past, surveys designed specifically for lynx were rarely conducted, and many reports (*e.g.*, visual observations, snow tracks) of lynx were collected incidental to other activities. The reliability of many of these records is unknown. Trapping records may have errors, track identification is extremely difficult, and observations may be wrong because lynx look very similar to bobcat. Data from recent research in Maine and Montana (Hoving 2001; Squires and Ruggiero 2001; Squires *et al.* 2001; Squires *et al.* 2002; Homyack 2003; Maine Department of Inland Fisheries and Wildlife 2003; G. Matula, in litt. 2003; L.S. Mills and P. Griffin, in litt. 2003); recent confirmed records of lynx in Minnesota (Minnesota Department Natural Resources, in litt. 2003); results from the National Lynx Survey (K. McKelvey, Rocky Mountain Research Station, in litt. 2003); and mapping of lynx habitat on Federal lands (E. Johnston, U.S. Forest Service, in litt. 2003; J. Whitney, Bureau of Land Management, in litt. 2003) provide some of the best current information for our analysis.

Numerous reliable lynx records over a period of years (particularly across a cyclic population low) and reliable evidence of reproduction are considered strong evidence of a resident

population. For example, Washington has had numerous verified lynx records since the 1800s (McKelvey *et al.* 2000b). These records exist in the form of museum specimens (78 specimens), snow tracks, radio-collared study animals, harvest records, remote-camera photographs, and DNA samples. During the period that lynx harvest data were kept (1961–1990) the annual harvest ranged from highs of 39 and 31 animals to lows of 0 in some years. Finally, lynx reproduction has been and continues to be documented numerous times in Washington. As a result of this information, we conclude that Washington has a resident lynx population.

Few and sporadic records, many of which correlate to timeframes when there were cyclic population highs, and no evidence of reproduction are considered evidence of dispersers, rather than resident populations. For example, in Wisconsin only 11 verified records exist from 1870–1961 (McKelvey *et al.* 2000b). There are 16 verified records of lynx from the early 1960s and 1970s that correspond to the extreme cyclic population highs of that period, exceeding the number known for the previous century. Two records from 1992 are the only verified records in the State since the early 1970s, and also correspond to the time period for a cyclic population high. Lynx reproduction has never been documented in Wisconsin. We conclude that Wisconsin has never had a resident lynx population but rather occasional dispersers. We still consider Wisconsin to be in the range of lynx, as discussed in more detail below.

The range of the lynx in the contiguous United States is broadly delineated by the distribution of the southern extensions of boreal forest, which occur in: (1) The Northeast (portions of Maine, New Hampshire, Vermont, New York); (2) the western Great Lakes (portions of Minnesota, Wisconsin, Michigan); (3) the Northern Rocky Mountains/Cascades (portions of Washington, Oregon, Idaho, Montana, northwestern Wyoming, Utah); and (4) the Southern Rocky Mountains (portions of Colorado, southeastern Wyoming) (Agee 2000, Aubry 2000, McKelvey *et al.* 2000). Differences in local climate, primarily precipitation, and effects of elevation have resulted in boreal forest vegetation that differs in the western regions compared to the east (Buskirk *et al.* 2000b); however, spruce and fir are the predominant tree species in both the east and west. Within the borders of the contiguous United States, these regions are separated from each other by vegetation types that do not support lynx (*e.g.*, prairie, deciduous forest). With the exception of the Southern Rocky Mountain region, each of the regions where lynx are found in the contiguous United States are directly connected to lynx populations in Canada.

As described above, maps that accurately display the distribution of boreal forest (and therefore lynx habitat) are not readily available across the contiguous United States The only attempt to portray the range of lynx across the contiguous United States with some degree of precision is that of McKelvey *et al.* (2000b). McKelvey *et al.* (2000b) overlayed lynx occurrence records across the contiguous United States with broad vegetation classifications and topography to determine which vegetative cover types and elevations contain most of the lynx occurrences. In the East (Northeast and Great Lakes), Bailey's (1998) ecoregion classification was used to describe vegetation at the broader scale and in the West (Northern Rocky Mountains/Cascades and Southern Rocky Mountains) Küchler's (1964) classification was used (McKelvey *et al.* 2000b). Broad-scale vegetative mapping at a continental scale, such as Bailey (1998) or Küchler (1964), results in generalized descriptions that are expected to have some inconsistencies with vegetation maps at a finer scale (T.B. Wigley, National Council on Air and Stream Improvement, Inc., in litt. 2003). However, these broad-scale maps are useful in generally delimiting and describing vegetation types. McKelvey *et al.* (2000b) put some outer bounds on what can reasonably be delineated as the range of lynx. In this analysis, we rely on McKelvey *et al.* (2000b) as our starting point in more precisely defining the range of the lynx.

In the following we summarize key information from the final rule, new information available since the final rule, and the best scientific information provided during the recent comment period to arrive at our analysis of the range of the lynx.

The amount of boreal forest habitat in the contiguous United States has not changed substantially in the past 100 years. In some local areas there has been encroachment by human development but for the most part these habitats are predominantly still forested. In these forests the changes primarily have been the natural and human-caused disturbance processes (fire, insect infestations, wind, ice, timber harvesting) that alter the successional patterns and, sometimes dominant tree species, within a forest.

In the western United States, boreal forests are located at higher elevations and are predominantly under Federal ownership (U.S. Geological Survey 1998). As a consequence, in the west (Northern Rocky Mountains/Cascades and Southern Rocky Mountains) lynx habitat occurs primarily on a Federally-owned land base. The proportion of Federal land base decreases as one progresses eastward. However, in the Great Lakes region most of the lynx records are from northeast Minnesota where the majority of the boreal forest is federally-owned (Minnesota Department Natural Resources in litt. 2003). In the Northeast, nearly all the lynx habitat is privately-owned, most of which is commercial forest in Maine.

Unfortunately, accurate estimates of the amount of lynx habitat on all land ownerships are not available for all regions. In most cases, private landowners have not mapped lynx habitat on their lands, and private landowners have not shared information about their lands with the Service. In the final rule, we cited estimates of the amount of lynx habitat on all ownerships based on coarse maps of vegetation types provided in a biological assessment (U.S. Forest Service and Bureau of Land Management 1999). We recognized that these calculations overestimated the amount of lynx habitat in many areas and possibly underestimated it in other areas, but they provided a perspective on the amount of lynx habitat overall and in the individual regions (T.B. Wigley, in litt. 2003). The biological assessment estimates the following area of lynx habitat: Northeast—65,337 km^2 (25,227 mi^2); Great Lakes—96,247 km^2 (37,161 mi^2); Southern Rockies—26,673 km^2 (10,298 mi^2); Northern Rockies—138,929 km^2 (53,641 mi^2); Cascades—16,964 km^2 (6,550 mi^2) (U.S. Forest Service and Bureau of Land Management 1999). (These calculations were cited in the final rule but were presented as acres, which we have converted into square kilometers and square miles for this rule.) During the most recent public comment period we were provided approximate estimates of the amount of lynx habitat currently mapped on U.S. Forest Service, BLM, and some National Park Service lands (S. Gniadek, National Park Service, in litt. 2003; E. Johnston, USDA Forest Service, in litt. 2003; J. Whitney, BLM, in litt. 2003). This information also is included in Table 1. These estimates for Federal lands will continue to be refined to reflect data obtained through site-specific analysis, field verification, and new information from research that

allows a better understanding and description of lynx habitat (E. Johnston, in litt. 2003). Finally, rough estimates of the amount of lynx habitat on all ownerships in the Northeast based on models of the probability of lynx occurrence also are included in Table 1 (Hoving 2001, Hoving, University of Maine, pers. comm. 2003).

TABLE 1.—ESTIMATES OF LYNX HABITAT [1] WITHIN THE CONTIGUOUS UNITED STATES USED BY THE FISH AND WILDLIFE SERVICE IN THIS ANALYSIS

Land ownership	Northeast	Great Lakes	Southern Rockies	Northern Rockies/Cascades
Federal Lands				
U.S. Forest Service [2]	2,104 km^2 (813 mi^2)	17,685 km^2 (6,828 mi^2).	30,311 km^2 (11,703 mi^2).	N. Rockies: 89,841 km^2 (34,688 mi^2) Cascades: 5,949 km^2 (2,297 mi^2).
Bureau of Land Management [3].	No BLM lands	No BLM lands	716 km^2 (277 mi^2)	1,236 km^2 (477 mi^2).
National Park Service [4].	No NPS lands	Not available	Not available	Yellowstone: 2,784 km^2 (1,075 mi^2) Glacier: 1,103 km^2 (426 mi^2).
Non-Federal Lands				
	Not available	Not available	Not available	Not available.
All Ownerships Combined				
Hoving, pers. comm. 2003 [5].	13,511 km^2 (5,217 mi^2) Maine: 12,300 km^2 (4,700 mi^2) New Hampshire: 1,000 km^2 (400 mi^2) Vermont: 12 km^2 (4 mi^2) New York: 190 km^2 (73 mi^2)	Not included in study	Not included in study	Not included in study.

[1] Each of these estimates is qualified (*e.g.*, Yellowstone is likely an overestimate because vegetation mapping has not been refined; therefore, this estimate broadly includes all areas of potential habitat).
[2] E. Johnston (in litt. 2003).
[3] BLM acreages provided by management unit (J. Whitney, BLM, in litt. 2003); therefore, Northern Rocky Mountains and Cascades are not individually identified. BLM acreages not available for Wyoming.
[4] Not all NPS units provided lynx habitat estimates. Acreages from Murphy *et al.* (2003) and S. Gniadek (in litt. 2003).
[5] Fifty percent or greater probability of lynx occurrence in this area based on Hoving (2001).

Northeast

Northeastern United States lynx and snowshoe hare habitat and populations are directly contiguous with those of Canada, south of the St. Lawrence River, in southeastern Quebec and western New Brunswick. Movement of lynx across the St. Lawrence River between populations in northern Quebec and those south of the St. Lawrence is believed to occur infrequently (R. Lafond, Quebec Ministry of the Environment, pers. comm. 1999). However, a substantial lynx population resides south of the St. Lawrence River on Quebec's Gaspé Peninsula, where lynx densities are estimated to be 10 lynx per 100 km^2 (26 per 100 mi^2) during periods of high hare populations (C. Fortin, unpubl. data, in Ray *et al.* 2002). Lynx probably encounter little difficulty moving between southeastern Quebec and northern Maine because habitat is continuous.

Based on an analysis of cover types 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 broadly described ''Mixed Forest-Coniferous Forest-Tundra'' cover type. This habitat type 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 fragmented and begins to diminish to the south and west, with a disjunct segment running north-south through Vermont, and a patch of habitat in the Adirondacks of northern New York (McKelvey *et al.* 2000b).

Hoving (2001) modeled lynx habitat across all ownerships for the Northeast region, including Canada south of the St. Lawrence River. Hoving (2001) found that lynx are most likely to occur in areas with deep snow (greater than 268 cm (105 in) mean annual snowfall) and relatively little deciduous cover. Based on this model, potential lynx habitat is concentrated on Quebec's Gaspé Peninsula and northwestern New Brunswick extending into northern Maine. The majority of lynx habitat in this region is found in Canada; only sixteen percent of this area is in the United States. Based on this analysis, there is little lynx habitat in the northeastern United States outside of Maine (Hoving 2001). In the United States, the amount of potential lynx habitat where there is a 50 percent or greater probability of lynx occurrence in this region is roughly 13,501 km^2 (5,177 mi^2) (Table 1) (C. Hoving, University of Maine, pers. comm. 2003). Maine has approximately 12,300 km^2 (4,700 mi^2) of potential lynx habitat, New Hampshire has 1,000 km^2 (400 mi^2), Vermont has 11 km^2 (4 mi^2), and New York has 190 km^2 (73 mi^2) (C. Hoving, pers. comm. 2003).

Maine-Lynx have been documented in Maine since the 1800s, although accounts are irregular and anecdotal for some time periods (Hoving 2001; R. Joseph, U.S. Fish and Wildlife Service, in litt. 1999). Lynx occurrences have been fairly consistent since the 1950s (Hoving 2001; R. Joseph, in litt. 1999). Historical accounts provide evidence of the reproduction and persistence of lynx in several northern and western townships (Hoving 2001; R. Joseph, in litt. 1999). Since 1999, intensive lynx research in northern Maine has resulted in 30 different lynx radio-collared, and

17 litters with 37 kittens, documented in the 300-km² (100-mi²) study area (Maine Department of Inland Fisheries and Wildlife 2003; G. Matula, in litt. 2003), demonstrating the current existence of a resident population.

Lynx habitat in Maine is considered to be of high quality at this time. The quantity of boreal forest that can potentially support lynx in Maine has not changed substantially in the past 100 years (G. Matula, in litt. 2003). Extensive clear cutting to salvage diseased trees in the 1970s and 1980s resulted in large amounts of the forest presently in a stage of regeneration that is optimal for snowshoe hares (Hoving 2001; Homyack 2003, Krohn 2003; G. Matula, in litt. 2003). Snowshoe hare densities are high (1.6–2.4 hares per hectare (ha) (4.0–5.9 per acre (ac))) in these regenerating stands (Homyack 2003; G. Matula, in litt. 2003). As a result, lynx numbers have increased in response to improved habitat conditions and increased snowshoe hare populations. In a 300-km² (100-mi²) study area in northern Maine, the preliminary estimate of lynx density in fall 2002 was 4.4 lynx per 100 km² (11.4 per 100 mi²) (G. Matula, in litt. 2003). Based on preliminary analyses, lynx home ranges in this study area average 52 km² (20 mi²) for females and 70 km² (27 mi²) for males (G. Matula, in litt. 2003); these relatively small home ranges are likely an indication of high habitat quality with abundant snowshoe hares. Coincidentally, these optimal habitat conditions occur during a period when hares and lynx should be at a cyclic high, although evidence of hare population cycles are less clear in this region. Maine's lynx numbers are expected to fluctuate in concert with hare population fluctuations.

New Hampshire—Although habitat in New Hampshire is contiguous with that in Maine, the amount of current or historical lynx habitat in New Hampshire is much less than in Maine. Recent modeling predicted approximately 1,000 km² (400 mi²) (Hoving 2001; C. Hoving, pers. comm. 2003). Most of the lynx records are from harvest that occurred in the 1930s, ranging from 1 to 20 per year (Brocke *et al.* 1993, McKelvey *et al.* 2000b). Between 1940 and 1964, lynx harvests were lower, ranging from 0 to 3 lynx trapped per year. For 11 of these 24 years, the harvest was zero (McKelvey *et al.* 2000b). The trapping season was closed in 1964 in response to apparent declines in lynx abundance reflected in harvest returns (Siegler 1971; Silver 1974; Litvaitis *et al.* 1991). Since the 1960s, reports of lynx in New Hampshire have been rare; only two reports exist from the 1990s (M. Amaral, U.S. Fish and Wildlife Service, in litt. 1999). Although there are no records of lynx breeding in New Hampshire, based on regular harvest reports from the past and connectivity with habitats in Maine where resident lynx occur, we believe that a small resident lynx population historically occurred in New Hampshire but no longer exists. However, dispersers likely still occur in New Hampshire because of its connectivity with Maine; lynx have recently been documented in Maine near the New Hampshire border (M. McCollough, pers. comm. 2003).

Vermont—Little boreal forest exists currently or historically in Vermont and what habitat exists is isolated from that in New Hampshire (W. Laroche, Vermont Department of Fish and Wildlife, in litt. 2003). Only four verified records of lynx exist for Vermont (McKelvey *et al.* 2000b; W. Laroche, in litt. 2003). There is no evidence lynx reproduction ever occurred in Vermont. In the Green Mountain National Forest, all potential lynx habitat occurs in small patches that are not large enough to support a lynx; bobcats are present throughout these areas (P. Brewster, Green Mountain and Finger Lakes National Forests, in litt. 2000), evidence that these areas are not suitable for lynx. Hoving's (2001) model predicts only approximately 11 km² (4 mi²) of potential lynx habitat in Vermont (C. Hoving, pers. comm. 2003). Based upon the limited amount and dispersed nature of suitable habitat, we conclude lynx have occurred in Vermont as dispersers that have never established resident populations. It is still possible for lynx to disperse to Vermont.

New York—An ''island'' of boreal forest exists both historically and currently in the Adirondack Mountains of New York. A resident lynx population reportedly occurred in the northern region of New York, particularly in the Adirondack Mountains, but it was considered extirpated by 1900 (Brocke 1982, McKelvey *et al.* 2000b). However, there are 23 verified lynx occurrences since 1900, primarily from the Adirondack Mountains (McKelvey *et al.* 2000b). The most recent verified record was from 1973 (McKelvey *et al.* 2000b), which correlates to an extreme cyclic population high. Habitat and prey conditions were deemed suitable for a lynx reintroduction in 1989–1991 (Brocke 1982). The reintroduction was unsuccessful in establishing a population. Hoving's 2001 model predicted approximately 190 km² (73 mi²) of potential lynx habitat in New York (C. Hoving, pers. comm. 2003), an area only slightly larger than the average home range of a single male lynx. The boreal forest in New York is protected as Adirondack State Park and much of the forest is mature without the understory necessary to support a snowshoe hare population capable of sustaining lynx (G. Batcheller, New York State Division of Fish, Wildlife and Marine Resources, pers. comm. 2003). It appears habitat quality is marginal. We conclude that a resident population may have existed in New York prior to 1900; however, records of lynx since 1900 are of dispersers.

Northeast Summary—As it did historically, the boreal forest of the Northeast continues to exist primarily in Maine where habitat is currently optimal and a resident, breeding population of lynx continues to exist. Maine's lynx population is currently much larger than we knew at the time of the final rule in 2000 and habitat is directly connected to substantive lynx populations and habitat in southeastern Quebec and New Brunswick. The potential exists for lynx to occur in New Hampshire because of its direct connectivity with Maine and we presume they currently occur there. Lynx in Vermont have always existed solely as dispersers. Lynx occurring in New York since 1900 have been dispersers.

Great Lakes

At the time of the final listing rule for lynx, the coarse-scale vegetation description, ''mixed deciduous-coniferous forest'' was used to characterize potential lynx habitat in the Great Lakes Region because it encompassed 88 percent of lynx occurrence records in this region (McKelvey *et al.* 2000b). As mapped (Bailey 1998, McKelvey *et al.* 2000b), the mixed deciduous-coniferous forest covers an extensive area in the western Great Lakes region, primarily in northeastern Minnesota, northern Wisconsin, and the western portion of Michigan's upper peninsula, giving the appearance of a large expanse of continuous boreal forest and creating the expectation of resident lynx populations throughout this large area.

However, this broad vegetation description encompasses large areas that are not lynx habitat, particularly in Wisconsin (Wisconsin Department Natural Resources, in litt. 2003). As can be seen in maps of Early Settlement Vegetation, historically spruce and fir (the predominant type of trees in the boreal forest) were most abundant in northeastern Minnesota, which is contiguous with boreal forest in Ontario,

Canada, whereas in Michigan and especially Wisconsin, spruce and fir were limited to scattered patches (Great Lakes Ecological Assessment no date, Mladenoff no date, Wisconsin Department Natural Resources, in litt. 2003). Therefore, within the Great Lakes region, potential lynx habitat has always been most abundant in northeastern Minnesota.

An accurate estimate of the amount of potential lynx habitat for all ownerships in the Great Lakes region was not available to us. The majority of potential lynx habitat in this region is in northeastern Minnesota under Federal ownership, although we cannot say precisely how much because we do not have acreages of lynx habitat on non-Federal lands. In the Great Lakes region, as currently mapped there are approximately 18,000 km^2 (7,000 mi^2) of potential lynx habitat on National Forest lands (Table 1). This estimate includes National Forest lands in Minnesota and Michigan's Upper Peninsula. There is no potential lynx habitat on National Forest lands in Wisconsin (Weiland 2002).

Minnesota—As was true historically, northeastern Minnesota continues to support a substantial amount of transitional boreal forest (roughly estimated at 12,500 km^2 (4,800 mi^2)) in a more evenly distributed pattern rather than in small patches (Great Lakes Ecological Assessment no date, Wisconsin Department Natural Resources, in litt. 2003). In Minnesota, the deepest snows occur in the northeast corner of the State (Minnesota Department Natural Resources in litt. 1998). Most of northeastern Minnesota is under Federal ownership, primarily in the Superior National Forest (Minnesota Department Natural Resources, in litt. 2003).

Minnesota provides a good example of the problems in assessing the status of lynx because of the complexity of lynx cycles and the difficulty in interpreting historical lynx occurrence data. As a result, scientists have debated whether lynx in Minnesota are members of a long-term resident population or dispersers from Canada that do not establish a resident population in the State (McKelvey *et al.* 2000b; R. Sando, Minnesota Department of Natural Resources, in litt. 1998). Minnesota has a substantial number of historic lynx reports, primarily trapping records (McKelvey *et al.* 2000b), as expected because of the direct connectivity of the boreal forest in northeastern Minnesota with that of Ontario, Canada, where lynx occur. Harvest and bounty records for Minnesota are available since 1930. Approximate 10-year cycles are apparent in the data, with highs in the lynx cycle in 1940, 1952, 1962, and 1973 (Henderson 1978; McKelvey *et al.* 2000b). During a 47-year period (1930–1976), the Minnesota lynx harvest was substantial, ranging from 0 to 400 per year (Henderson 1978). These harvest returns for Minnesota are believed to be driven by immigration from Canada (Henderson 1978; Mech 1980; McKelvey *et al.* 2000b; M. DonCarlos, Minnesota Department of Natural Resources in litt. 1994). Outside of harvest data, 76 additional verified lynx records exist for Minnesota before 2001 (McKelvey *et al.* 2000b).

Reproduction and maintenance of home ranges by lynx were documented in the early 1970s (Mech 1973, 1980), potential evidence of the presence of a resident population. But this may have been an artifact of the early 1970s being a period of an extreme peak in the population cycle in Canada. Records of lynx in Minnesota have been rare in the past 2 decades; there were only 3 verified records of lynx in Minnesota in the 1990s (M. DonCarlos, in litt. 1994).

Individuals knowledgeable about lynx and snowshoe hares suggest that fires and logging created early successional forests that were conducive to abundant hare populations in northern Minnesota in the first half of the 20th century (S. Loch, in litt. 2003), resulting in the high numbers of lynx recorded during that time. In contrast, snowshoe hare numbers were exceptionally low in the 1980s through the 1990s (S. Loch, in litt. 2003), likely explaining the scarcity of lynx. Based on surveys in northern Minnesota, snowshoe hare numbers are currently high (J. Erb, Minnesota Department of Natural Resources, in litt. 2003).

In the past 3 years there have been 62 verified reports of lynx in northeastern Minnesota, 6 of which provided evidence of reproduction (usually visual observations of kittens accompanying an adult) (Minnesota Department of Natural Resources, in litt. 2003; S. Loch, in litt. 2003); it is assumed some of these reports are of the same animal or family group so the actual number of animals is likely lower. This dramatic increase in reports corresponds with a cyclic population high directly adjacent in Ontario (S. Loch, in litt. 2003). Research has been initiated that will help determine whether these animals are members of an established resident population in Minnesota or if these animals fail to persist when the cyclic population high recedes (University of Minnesota, in litt. 2002).

Lynx presence in Minnesota is an artifact of the international border between Canada and the United States artificially splitting the lynx range in this area into two pieces of a whole that exists primarily in adjacent Ontario, highlighting a phenomenon that occurs with differing magnitude all along the international border where lynx habitat occurs on both sides of the border. It appears the Ontario lynx population sometimes expands and occupies northeastern Minnesota and sometimes it contracts and lynx recede from Minnesota. As a result, northeastern Minnesota may not always support lynx. However, we conclude that northeastern Minnesota often supports a resident lynx population because there is ample boreal forest habitat directly connected with that in Ontario, there is a high number of historic lynx records, evidence of lynx reproduction and cyclically abundant snowshoe hares.

Wisconsin—The mapping of Wisconsin shows the discrepancy that can occur between broad-scale vegetation mapping and more precise vegetation maps. Maps of the early vegetation of Wisconsin delineate only small patches of boreal forest primarily along the shore of Lake Superior in extreme northern Wisconsin (Mladenoff no date; Wisconsin Department Natural Resources, in litt. 2003; S. Hassett, in litt. 2003) compared to one third of the State being mapped as mixed deciduous-coniferous forest as broadly classified by Bailey (1998) (McKelvey *et al.* 2000b). Therefore, it is clear that historically in Wisconsin there actually was very little boreal forest and, as a result, little potential lynx habitat (Mladenoff no date; S. Hassett, in litt. 2003; Wisconsin Department Natural Resources, in litt. 2003). Where appropriate lynx forest types do occur in Wisconsin, historic snow conditions have not been optimal for lynx (Weiland 2002). This habitat is more appropriate for bobcats, which are common and well-distributed in northern Wisconsin (S. Hassett, in litt. 2003). As a result, no lynx habitat was mapped on U.S. Forest Service lands in Wisconsin because of a lack of appropriate habitat and snow depth to support lynx (Weiland 2002).

Verified reports of lynx in Wisconsin are limited (29 records from 1870 to 1992) (McKelvey *et al.* 2000b); 16 of these reports are associated with unprecedented cyclic highs that occurred throughout Canada in the early 1960s and 1970s. In 1992, two lynx mortalities were reported (Wydeven 1993; C. Pils, in litt. 1994). No sign of lynx has been found during extensive snow track surveys in potential lynx habitat in northern Wisconsin over the past 4 years (S. Hassett, in litt. 2003). There are no records of lynx breeding in Wisconsin.

Because Wisconsin always has had a limited amount of boreal forest habitat, marginal snow conditions for lynx, and no evidence of reproduction, we concur with Thiel (1987) that, historically, Wisconsin has not supported a permanent, self-sustaining lynx population; rather, lynx presence is associated with cyclic lynx population fluctuations in Canada. We conclude that any lynx found in Wisconsin are dispersers, not residents.

Michigan—Michigan's Upper Peninsula supports boreal forest, and lynx habitat has been mapped on U.S. Forest Service lands in the Upper Peninsula (Great Lakes Ecological Assessment no date; J. Trick, U.S. Fish and Wildlife Service, pers. comm. 2003). Beyer *et al.* (2001) suggested habitat in the Upper Peninsula is limited. Additionally, Lake Superior nearly isolates the Upper Peninsula from source lynx populations in Canada, limiting the number of animals available to successfully establish a population. The majority of occurrences are on the eastern part of the Upper Peninsula where the largest patch of boreal forest historically occurs (Great Lakes Ecological Assessment no date) and which is the shortest distance (lynx can cross the St. Mary's River) from lynx populations in Ontario, Canada. Beyer *et al.* (2001) documented 39 verified records of lynx from Michigan's Upper Peninsula between 1940 and 1997. Twenty-seven of these records correlate with an extreme cyclic high in Canada in the early 1960s (Beyer *et al.* 2001). McKelvey *et al.* (2000b) found 44 verified records Statewide from the mid 1800s until 1983 (Harger 1965; McKelvey *et al.* 2000b). The Lower Peninsula naturally had very little boreal habitat (Great Lakes Ecological Assessment no date) and was even more isolated from source lynx populations in Canada by Lakes Huron and Michigan. Six records exist for Michigan's lower peninsula, all from 1917 or earlier (Harger 1965; McKelvey *et al.* 2000b). There is no evidence of lynx reproduction in Michigan (Beyer *et al.* 2001). Beyer *et al.* (2001) concluded a resident lynx population does not occur in the Upper Peninsula and that dispersers occur only occasionally.

We include Michigan's Upper Peninsula within the range of lynx because it supports some boreal forest and periodically lynx have been present but we conclude that limited number of lynx occurrences did not constitute a resident population but were dispersers. We do not include Michigan's Lower Peninsula because the few historic reports of lynx were in non-lynx habitat.

Great Lakes Summary—We conclude that northeastern Minnesota has historically supported and currently supports a resident lynx population, based on the number of lynx records, evidence of reproduction, and the presence of boreal forest contiguous with occupied habitat in Ontario. Currently, there are many more lynx in northeastern Minnesota than we knew of at the time of the final rule in 2000. We conclude records of lynx in Wisconsin and Michigan constitute dispersing animals, rather than individuals from resident populations, based on the lack of evidence of reproduction, lack of connectivity with suitable habitat, and limited amount of habitat.

Northern Rocky Mountains/Cascades

In this region, the majority of lynx occurrences are associated with the ''Rocky Mountain Conifer Forest'' in the Rocky Mountains of Montana, Idaho, eastern Washington, and Utah, and the Cascade Mountains in Washington and Oregon. The boreal forest of northern Washington, northern Montana, and northern Idaho is directly contiguous with that in adjacent British Columbia and Alberta, Canada. In this mountainous area, lynx habitat occurs at higher elevations and, therefore, is naturally fragmented by topography into island-like patches (McKelvey *et al.* 2000b). Lynx cross intervening landscapes, made up of shrub-steppe, grassland, low-elevation forested or unforested valleys, and in some cases, desert, to reach these habitat ''islands.'' We combine the Northern Rocky Mountains and Cascades together for our analysis because the Cascades and Northern Rocky Mountains regions are only separated by the Okanogan River Valley in northern Washington and because of similar conditions in both regions. Additionally, the Cascades alone supports the smallest amount of lynx habitat in the contiguous United States. Approximately 99 percent of the lynx habitat in the Cascades was estimated to occur on National Forest lands (U.S. Forest Service and Bureau of Land Management 1999); based on current mapping there are nearly 6,000 km² (2,300 mi²) of lynx habitat on National Forest lands in the Cascades (Table 1). By contrast, the Northern Rocky Mountains alone support the largest amount of lynx habitat in the contiguous United States. Approximately 67 percent of the lynx habitat in the Northern Rocky Mountains was estimated to occur on National Forest lands (U.S. Forest Service and Bureau of Land Management 1999), and based on current mapping there are nearly 96,000 km² (37,000 mi²) of lynx habitat just on National Forest lands in the Northern Rocky Mountains (Table 1). The relatively small size and close proximity of the lynx habitat in the Cascades to that in the Northern Rocky Mountains further supports considering both areas as one.

The majority of lands within the mountain ranges in this region are under Federal ownership, predominantly as National Forest lands. As a result, within this region a large amount of lynx habitat is found on Federal lands; as currently mapped, there are approximately 89,841 km² (34,688 mi²) of lynx habitat on National Forest land in the Northern Rockies and 5,949 km² (2,297 mi²) of lynx habitat on National Forest lands in the Cascades; approximately 1,300 km² (490 mi²) on BLM lands; approximately 2,900 km² (1,100 mi²) in Yellowstone National Park; and approximately 1,100 km² (430 mi²) in Glacier National Park (Table 1). Estimates of the quantity of lynx habitat were not available for all National Park Service units in this region.

Washington—Washington has a long record of verified lynx occurrences over the past century. Resident lynx populations were historically found in the northeast and north-central regions and along the east slope of the Cascade Mountains (McKelvey *et al.* 2000b, Stinson 2001). There are a few historic records of lynx in the southern part of the Cascades in Washington near Mt. Adams (Stinson 2001). Trapping data kept since 1961 reflect cyclic patterns (McKelvey *et al.* 2000b). The largest harvests were taken in 1969–1970 (31 lynx) and 1976–1977 (39 lynx) (Washington Department of Wildlife 1993). Results of snow track surveys, remote cameras, and DNA surveys show that lynx continue to occupy north-central and northeast Washington (Base and Zender 2001; Stinson 2001; Aubry *et al.* 2002; B. Maletzke, Okanagon National Forest, in litt. 2003; K. McKelvey, in litt. 2003). Recent records of lynx reproduction also exist for Washington (Stinson 2001; B. Maletzke, in litt. 2003). We conclude resident lynx populations continue to exist in Washington.

Oregon—There is no evidence that a resident lynx population ever occurred in Oregon (Verts and Carraway 1998; K. McKelvey and K. Aubry, Rocky Mountain Research Station, in litt. 2001). Only 12 verified records of lynx exist for Oregon for the past century (Verts and Carraway 1998, McKelvey *et al.* 2000b). The majority of these records are from marginal or non-lynx habitats and correlate with cyclic highs in

northern lynx populations (Verts and Carraway 1998; K. McKelvey and K. Aubry, Rocky Mountain Research Station, in litt. 2001). We do not consider compilations of anecdotal reports of lynx in Oregon reliable for the reasons described by McKelvey and Aubry (Rocky Mountain Research Station, in litt. 2001). Habitats in Oregon that are potentially suitable for lynx are naturally isolated from occupied habitats in Washington and Idaho. There are no records of lynx reproduction in Oregon. Based on the limited verified records of lynx, lack of evidence of lynx reproduction, frequency of occurrences in atypical habitat, and the correlations of such occurrences with cyclic highs, we believe that lynx occur in Oregon as dispersers that have never maintained resident populations.

Idaho—According to Rust (1946), lynx were not abundant but were distributed throughout northern Idaho in the early 1940s, occurring in 8 of the 10 northern and north-central counties. McKelvey *et al.* (2000b) located a number of lynx specimen records from Idaho collected during the early 1900s. Between 1960 and 1991, 35 verified records exist for Idaho, with 13 of these from 1982 to 1991 (McKelvey *et al.* 2000b). Lynx reports in Idaho have been few in the past 20 years. The Idaho Conservation Data Center (2003) has four reports since 2000, and a lynx was confirmed by DNA evidence on the Boise National Forest (K. McKelvey, in litt. 2003). Because past records of lynx in northern and north-central Idaho are common and boreal forest in Idaho is contiguous with boreal forest in Washington, Montana, and British Columbia, Canada, where resident lynx populations are known to exist, we conclude that lynx continue to be present in northern and north-central Idaho, which have the capacity to support a resident population.

Montana—In Montana, numerous historic and current lynx records exist throughout the Rocky Mountain Conifer Forest in the western part of the State (McKelvey *et al.* 2000b; P. Graham, Montana Department of Fish, Wildlife, and Parks, in litt. 1998). Montana's harvest records since the 1950s reflect cyclic lynx populations (McKelvey *et al.* 2000b). Since Montana started accurately recording lynx harvest in 1977, Montana's largest lynx harvests occurred in both 1979 and 1984 when 62 lynx were taken each season (McKelvey *et al.* 2000b; B. Giddings, Montana Department of Fish, Wildlife, and Parks, in litt. 1994). Harvest records, winter track surveys conducted since 1990/1991, and trapper logbooks, led Montana Department of Fish, Wildlife, and Parks to conclude that the State's lynx population is distributed throughout what it determined to be ''predicted lynx habitat'' (P. Graham, Montana Fish, Wildlife and Parks, in litt. 1998). Snow track surveys have documented lynx tracks throughout the range in western Montana (P. Graham, in litt. 1998). Reproduction is documented; 14 dens were located between 1999 and 2001 in a study area in northwestern Montana (Brainerd 1985, Squires and Ruggiero 2001). In some mountain ranges in southwest Montana, lynx are present but in apparently low numbers, based on recent surveys (Gehman and Robinson 2000, Squires *et al.* 2002). We conclude that a resident population of lynx is distributed throughout suitable habitat in the northern and central mountain ranges in western Montana, whereas in the mountains in southwestern Montana, habitat naturally becomes more marginal (more patchy and drier forest types) and supports dispersers more often than resident populations.

Wyoming—Most historical and recent records of lynx in Wyoming are from the northwestern mountain ranges (Reeve *et al.* 1986; McKelvey *et al.* 2000b; B. Wichers, Wyoming Game and Fish, in litt. 2003). McKelvey *et al.* (2000b) found only 30 verified records Statewide since 1856. Lynx reports from Yellowstone National Park have always been rare; since 2001, lynx survey efforts in the Park have detected one lynx (Murphy *et al.* 2003). In west-central Wyoming, a female lynx with kittens was documented in 1998 (Squires and Laurion 2000). However, the female died of starvation and it is presumed the kittens also died, perhaps indicating inadequate habitat and prey base (Squires *et al.* 2001). A male lynx was radio-tracked moving long distances from its home range in west-central Wyoming and into Yellowstone National Park as recently as 2001 (Squires *et al.* 2001). It is possible, based on recent evidence of reproduction, that in the past a resident lynx population occurred in northwestern Wyoming. However, few lynx have been found during several recent surveys. We believe this is because the habitat is naturally marginal (more patchy and drier forest types) and less capable of supporting snowshoe hares (B. Wichers, in litt. 2003), and is farther from source populations. Therefore, we believe lynx currently in Wyoming are dispersers and that the habitat may not be able to support resident populations.

Utah—There are only 10 verified records of lynx in Utah since 1916 (McKay 1991; McKelvey *et al.* 2000b). Nearly all the reliable lynx reports are from the Uinta Mountain Range along the Wyoming border (McKay 1991). Four of the records correlate to the cyclic highs of the 1960s and 1970s. Recent DNA results documented the presence of a lynx in Utah (McKelvey in litt. 2003). There is no evidence of lynx reproduction in Utah. We conclude that lynx that occur in Utah are dispersers rather than residents, because most of the few existing records correspond to cyclic population highs, there is no evidence of reproduction, and boreal forest habitat in Utah is remote and far from source lynx populations.

Northern Rocky Mountains/Cascades Summary—In summary, we conclude that the Northern Rocky Mountains/Cascades Region continues to support resident lynx populations in north-central and northeastern Washington, western Montana and likely northern Idaho. We conclude that lynx have always occurred as dispersers in Oregon and Utah. In northern Wyoming it appears habitat is less suitable to support resident populations and, therefore, we conclude animals in this area are most likely dispersers.

Southern Rocky Mountains

This area represents the extreme southern edge of the range of the lynx. 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). These habitats reduce opportunities for emigration from the Northern Rocky Mountains/Cascades Region and Canada, and may isolate lynx in the Southern Rocky Mountains in Colorado and southeastern Wyoming (Halfpenny 1982; Koehler and Aubry 1994). However, the potential still exists for lynx to immigrate to the southern Rocky Mountains, particularly during extreme cyclic population highs.

As in the Northern Rocky Mountains/Cascades region, lynx habitat in the Southern Rocky Mountain region occurs at high elevations and, therefore, is naturally fragmented by topography and drier south- and west-facing slopes into island-like patches rather than expansive, contiguous blocks (Ruediger *et al.* 2000). Accurate estimates of the amount of lynx habitat on all land ownerships in the Southern Rocky Mountain region are not available. The only estimate of lynx habitat on all ownerships was based on coarse maps of vegetation types that contained the majority of lynx occurrences; based on this type of mapping, it was roughly

estimated that there were 27,000 km^2 (10,300 mi^2) of potential lynx habitat across all ownerships in this region (U.S. Forest Service and Bureau of Land Management 1999). All of this habitat is found in the mountains, which are primarily under Federal ownership (U.S. Geological Survey 1998). In the Southern Rocky Mountains region, as currently mapped there are approximately 30,000 km^2 (12,000 mi^2) of lynx habitat on U.S. Forest Service lands and approximately 700 km^2 (280 mi^2) on BLM lands (Table 1) (E. Johnston, in litt. 2003; J. Whitney, in litt. 2003).

Colorado—The montane and subalpine forest ecosystems in Colorado are naturally highly fragmented (Thompson 1994), which we believe has always limited the potential for lynx. Most historic records are distributed among the northern and central mountain ranges in Colorado (McKelvey *et al.* 2000, Meaney 2002). There is a great deal of inconsistency among historic lynx reports for Colorado (Meaney 2002); as a result, it is difficult to interpret historic records and we question some of the numbers reported. However, based on available information, Thompson and Halfpenny's (1989) description seems accurate: ''it is unlikely lynx were ever very common and have probably existed as discontinuous, remnant populations,'' a conclusion that is supported by the State of Colorado (T. Blickensderfer, in litt. 2003). A total of 22 positive lynx reports exist in State records since the late 1800s (J. Mumma, Colorado Division of Wildlife, in litt. 1998); although McKelvey *et al.* (2000b) considered only 17 of these records ''verified.'' The last verified lynx specimens were taken in 1973–1974 (Halfpenny *et al.* 1982; T. Blickensderfer, in litt. 2003); which coincided with extreme cyclic population highs that occurred throughout the west and Canada. No verified records of lynx exist since 1974; however, extensive survey efforts have resulted in periodic reports of lynx tracks (Halfpenny and Miller 1981; Thompson and Halfpenny 1989; Anderson 1990; Thompson and Halfpenny 1991; Andrews 1992; Carney 1993; Fitzgerald 1994; Colorado Division of Wildlife *et al.* 1997; T. Blickensderfer, in litt. 2003). Based on historic lynx records, we are uncertain whether Colorado supported a small resident lynx population that may have been extirpated or whether historic records were of dispersers that arrived during extremely high population cycles. If these historic records did represent resident populations rather than solely dispersing animals that emigrated from the Northern Rocky Mountains/Cascades or Canada that were unable to sustain persistent populations, we believe a viable native resident lynx population no longer exists in Colorado. We believe the most likely cause for the loss of resident lynx populations in Colorado was a natural process because lynx in this region are isolated from source lynx populations and habitats. Immigration appears necessary to augment and maintain local lynx populations, especially in transitional habitats at the southern margins of lynx range. The distance and isolation of this region from source populations outside of the Southern Rocky Mountains severely reduced, if not entirely precluded, the immigration that was likely necessary for the lynx population of this region to sustain itself. If these historic records were of dispersers that arrived when there were extremely high population cycles, it would be inappropriate to conclude these populations were extirpated because dispersers can continue to arrive in these areas in the future.

In 1997, the Colorado Division of Wildlife in cooperation with numerous government and private entities began a program to introduce lynx from Canada and Alaska into Colorado in an effort to reestablish a resident lynx population. In 1999 and 2000, 96 lynx were released into in Colorado with the intention of releasing an additional 186 lynx between 2003 and 2009 (T. Blickensderfer, in litt. 2003). It is too early to determine whether this effort will be successful (T. Blickensderfer, in litt. 2003), although reproduction has been recently documented (T. Malmsbury, in litt., 2003).

Southeastern Wyoming—Habitat in southeastern Wyoming is contiguous with that in Colorado. Records from southeastern Wyoming are scarce (Reeves 1986, McKelvey 2000b). The most recent record is from the Laramie Range in 1963, a time when the lynx population cycle was at an unprecedented high. The core of lynx range in this region was in Colorado. Because habitat in this area is naturally marginal, patchy, and less suitable for snowshoe hares (B. Wichers, in litt. 2003) and there are extremely few historic records of lynx in southeastern Wyoming with no evidence of breeding, we conclude a resident population never existed in southeast Wyoming and that reports of lynx were of dispersers.

Southern Rocky Mountains Summary—We are uncertain whether lynx in this region historically occurred as a resident population or if historic records were of periodic dispersers. We conclude that if a resident lynx population historically occurred in the Southern Rocky Mountains, then this native population has been lost. We surmise the primary cause for the loss of this population was its natural isolation from potential source populations. 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 extreme highs in the population cycle. It remains to be seen if the State of Colorado's reintroduction program will reestablish a resident lynx population.

Habitat-Related Threats Analysis

The final rule discussed the factors affecting lynx habitat, which included human alteration of the distribution and abundance, species composition, successional stages, and connectivity of forests, and the resulting changes in the forest's capacity to sustain lynx populations. The final rule noted that two important human influences on snowshoe hare habitat are timber harvest and fire suppression; however, the final rule acknowledged that information about how lynx populations respond to these specific impacts is limited. Studies of lynx and snowshoe hare have documented lynx presence and reproduction and snowshoe hare abundance in a variety of managed landscapes (Apps 2000; Squires and Laurion 2000; Squires and Ruggiero 2001; Stinson 2001; Homyack 2003; Maine Department of Inland Fisheries and Wildlife 2003; Minnesota Department of Natural Resources, in litt. 2003; G. Matula, in litt. 2003; Mills and Griffin, in litt. 2003).

In the final rule we cited calculations of the extent of lynx habitat encompassed in certain regions, land ownerships, and land management designations. These calculations were provided to us in a biological assessment (U.S. Forest Service and Bureau of Land Management 1999). Because these calculations were based on coarse mapping of vegetation types, they overestimated the amount of lynx habitat in many areas (particularly in the Great Lakes, as described above) and possibly underestimated it in other areas, but they nonetheless provided a perspective on the amount of lynx habitat overall and the proportions in various ownerships and land management designations. Since the final rule, lynx habitat has been mapped on Federal lands in order to conduct analyses under section 7 of the Act. As a result, estimates of the amount of lynx habitat on some Federal lands are more

accurate than in the 1999 biological assessment (U.S. Forest Service and Bureau of Land Management 1999; S. Gniadek, in litt. 2003; E. Johnston, in litt. 2003; J. Whitney, Bureau of Land Management, in litt. 2003). Refined calculations for all ownerships were not provided; therefore it was not possible to recalculate the information in the biological assessment for the purposes of this remanded decision. Nonetheless, for the Southern Rocky Mountains and Northern Rocky Mountains/Cascades, we believe the proportions of lynx habitat provided in the biological assessment are still fairly accurate and useful because if the same refinements and mapping that occurred on National Forest and BLM lands were applied to non-Federal lands it would presumably result in similar adjustments. Therefore, in this analysis we will use the proportions of Federal and non-Federal lands in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains, and the proportions in either developmental or non-developmental management designations for the Northern Rocky Mountains/Cascades, Southern Rocky Mountains, and Great Lakes provided in the biological assessment and used in the final rule.

In all regions where the lynx range in the contiguous United States, timber harvest and its related activities are the predominant land use affecting lynx habitat. The final rule stated that timber harvest and associated forest management can be benign, beneficial, or detrimental to lynx depending on harvest methods, spatial and temporal specifications, and the inherent vegetation potential of the site. Some timber harvest regimes can result in reduced cover, unusable forest openings, and large monotypic stands with sparse understories that are unfavorable for lynx and snowshoe hare (de Vos and Matel 1952; Harger 1965; Hatler 1988; Brittell *et al.* 1989; Koehler 1990; Hoving 2001; Homyack 2003; Mills and Griffin, in litt. 2003). Mechanical thinning (pre-commercial thinning) of densely stocked young stands to promote vigorous growth of fewer trees can reduce the stem densities required to support high numbers of snowshoe hare (U.S. Forest Service *et al.* 1999a; Homyack 2003; Mills and Griffin, in litt. 2003).

The final rule explained that forestry practices can be beneficial when the resulting understory stem densities and structure meet the forage and cover needs of snowshoe hare (Keith and Surrendi 1971; Fox 1978; Conroy *et al.* 1979; Wolff 1980; Parker *et al.* 1983; Litvaitis *et al.* 1985; Monthey 1986; Bailey *et al.* 1986; Koehler 1990; McKelvey *et al.* 2000d). Snowshoe hare densities tend to be highest in regenerating stands with very high stem densities (Hodges 2000a, 2000b, Griffin and Mills in press, Homyack 2003). Although large openings initially may not be used by snowshoe hare and lynx, regeneration harvest units (*e.g.*, clear-cut) in appropriate habitat types eventually (in 10 years or more depending on the type of forest) achieve early successional stages with dense understories as preferred by snowshoe hares (Monthey 1986; Quinn and Parker 1987; Koehler 1990; Koehler and Brittell 1990; Washington Department of Wildlife 1993; McKelvey *et al.* 2000c; Hoving 2001; Homyack 2003). Lynx can readily move across landscapes fragmented by commercial forestry (Squires and Laurion 2000).

The final rule suggested that large clear-cut may be detrimental to lynx because they might eliminate the mosaic forest ages and structure needed by lynx. We have learned since publication of the final rule that, in northern Maine, optimal forest conditions for lynx and snowshoe hares have been created as a result of large-scale clear cutting in the 1970s and 1980s to salvage spruce and fir stands damaged by insects. A large proportion of Maine's northern forest is currently in a stage of regeneration that provides dense understories where snowshoe hares are most abundant (Hoving 2001; Homyack 2003; Krohn 2003; G. Matula, in litt. 2003). Despite extensive clear cutting, the forests of northern Maine continue to provide a mosaic of forest ages and structure, such as required for lynx denning. As a result, Maine lynx populations are high (see ''Maine'' discussion above). Larger openings, such as created by clear-cut, can often more closely resemble vegetative patterns that follow natural disturbance events (*e.g.*, fire, windthrow, and insect outbreaks) and decrease amounts of edge favorable to generalist predators (McKelvey *et al.* 2000c, Krohn 2003). We anticipate that where good snowshoe hare and lynx habitat occurs within the contiguous United States, regenerating stands that result after large clear-cut can be managed to allow regrowth of a dense understory, so that they too will provide good conditions for snowshoe hares and lynx.

Recent research in Maine and Montana measured the effects of some timber harvest regimes on snowshoe hare populations, which has implications for lynx. In Maine in 2000–2002, snowshoe hare densities were highest in unthinned, 12- to 20-year old clear-cut (1.77 hares per ha (0.72 hares per ac)) (Homyack 2003). Pre-commercially thinned stands averaged about half the hare density (0.98 hares per ha (0.40 hares per ac)) as unthinned stands. Hare densities in mature conifer forests with sparse understories were low (0.23 hares per ha (0.09 hares per ac)). Lowest hare densities were in partial-harvest cuts (0.15 hares per ha (0.06 hares per ac)). In Montana, preliminary results of research since 1998 found that in winter snowshoe hare densities were high in mature forests with abundant understories and lowest in stands that had been pre-commercially thinned or in sparsely-regenerating clear-cut; in this study standard pre-commercial thinning had a negative effect on snowshoe hare densities in most places and times (Mills and Griffin, in litt. 2003). Furthermore, preliminary findings in Montana substantiate what scientists have generally presumed—snowshoe hares are exposed to higher predation and suffer higher mortality rates in forest stands with open understories (Mills and Griffin, in litt. 2003).

The final rule also explained that fire has an important role in forest ecology in some forest types in the United States. During the early 20th century, Federal and State agencies in the contiguous United States enacted a policy of suppressing forest fires. The effects of fire suppression, as well as timber harvest, on lynx habitat vary among the geographic regions (Agee 2000) and will be discussed separately below.

Except in the Northeast, a substantial amount of lynx habitat in the contiguous United States occurs on Federal lands, primarily National Forests and BLM lands (see Table 1). Since the listing of the lynx in 2000, Conservation Agreements the U.S. Forest Service and BLM have signed with the Service (Bureau of Land Management and U.S. Fish and Wildlife Service in litt. 2000; U.S. Forest Service and U.S. Fish and Wildlife Service in litt. 2000), and the programmatic biological opinion on National Forest and BLM land management plans (U.S. Fish and Wildlife Service 2000) committed the U.S. Forest Service and BLM to use the LCAS in determining the effects of actions on lynx (Ruediger *et al.* 2000). The final rule explained that the LCAS was developed to provide a consistent and effective approach to conserve lynx and lynx habitat on Federal lands across its range in the contiguous United States (Ruediger *et al.* 2000). The U.S. Forest Service further committed to deferring any actions not involving third parties that would adversely affect lynx until such

time as the Forest Plans were amended or revised to adequately conserve lynx. Adherence to the Conservation Agreements, the biological opinion, and the LCAS in assessing the impacts of Federal actions on lynx alleviates the affects of National Forest and BLM land management plans and the activities they allow on lynx, such as timber harvest or fire management, that were identified in the final rule and the 1999 biological assessment (U.S. Forest Service and Bureau of Land Management 1999) (see Factor D).

Northern Rocky Mountains/Cascades and Southern Rocky Mountains

In the final rule, we recognized that the Northern Rocky Mountains encompass more privately-owned lynx habitat than elsewhere in the west (U.S. Forest Service and Bureau of Land Management 1999). In the final rule, we stated that almost one-third of lynx habitat is in private ownership (U.S. Forest Service and Bureau of Land Management 1999). Although we lacked specific information when we published the final rule, we recognized that large portions of this habitat likely occur on privately-owned corporate timber lands where timber harvest and thinning occurs. Data regarding private lands is generally not as available as data pertaining to Federal lands; as a result, few data are available concerning the quality of lynx and snowshoe hare habitat on private lands. However, preliminary results of research conducted on privately-owned corporate timber lands in northwestern Montana show that such lands provide varying levels of snowshoe hare densities (abundant to low), depending on the timber harvest regime (Mills and Griffin, in litt. 2003).

The final rule identified that the majority of lynx habitat in the west occurs on Federal lands. According to assessments in 1999, in the Northern Rocky Mountains, 72 percent of lynx habitat is on National Forest or BLM lands, 99 percent in the Cascades, and 82 percent in the Southern Rocky Mountains (U.S. Forest Service and Bureau of Land Management 1999). As currently mapped, in the Northern Rocky Mountains/Cascades region there are approximately 96,000 km^2 (37,000 mi^2) of lynx habitat on National Forest Lands and approximately 1,236 km^2 (477 mi^2) on BLM lands (see ''Table 1'') (E. Johnston, in litt. 2003; J. Whitney, in litt. 2003). In the Southern Rocky Mountain region there are approximately 30,000 km^2 (12,000 mi^2) of lynx habitat on National Forest Lands and approximately 700 km^2 (280 mi^2) on BLM lands (see Table 1) (E. Johnston, in litt.2003; J. Whitney, in litt. 2003).

Federal lands are managed as either ''developmental'' or ''non-developmental'' allocations. Lands in developmental allocations are managed for multiple uses, such as recreation and timber harvest, some of which may conflict with conservation of lynx. Lands within non-developmental allocations are managed for the most part to allow natural ecological processes to dominate and contain large portions of wilderness or other natural areas (U.S. Forest Service and Bureau of Land Management 1999; D. Prevedal, U.S. Forest Service, in litt. 1999). Timber harvest and construction of roads or fire suppression typically do not occur or are very limited in lands managed in non-developmental allocations. Lynx (including introduced lynx in Colorado) continue to be broadly distributed throughout lynx habitat in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains (McKelvey *et al.* 2000b; T. Blickensderfer, in litt. 2003), both inside and outside of non-developmental allocation areas (U.S. Forest Service and Bureau of Land Management 1999).

Non-developmental allocations are beneficial for lynx because they are managed for the most part to allow natural ecological processes to dominate. This is significant, because in the Northern Rocky Mountains, 41 percent of lynx habitat is in non-developmental allocations; in the Cascades, 85 percent of lynx habitat is in non-developmental allocations; and in the Southern Rocky Mountains, 23 percent is in non-developmental status (U.S. Forest Service and Bureau of Land Management 1999).

The final rule described the amount of lynx habitat managed in developmental allocations for multiple uses in the Northern Rocky Mountains/Cascades, and Southern Rocky Mountains. In the Northern Rocky Mountains, 59 percent of lynx habitat is in developmental allocations, in the Cascades 15 percent, and in the Southern Rocky Mountains 77 percent (U.S. Forest Service and Bureau of Land Management 1999). Activities that may be detrimental to lynx or lynx habitat, such as some timber harvest regimes and fire suppression, can occur in developmental allocations.

Timber harvest levels on Federal land in the West have declined consistently and dramatically (approximately 80 percent) over the past decade or longer (R. Gay, U.S. Forest Service, in litt. 1999). Timber harvest in specific lynx forest types also has declined in the Northern Rocky Mountains (B. Ballenbacher, U.S. Forest Service, in litt. 1999; B. Ferguson, U.S. Forest Service, pers. comm. 1999), Cascades (F. Zenson, U.S. Forest Service, pers. comm. 1999), and the Southern Rocky Mountains (B. Short, U.S. Forest, in litt. 1999).

On National Forest lands, with a few exceptions for projects involving third parties (applicants), activities that may affect lynx on developmental allocations are addressed by adherence to the LCAS and its conservation measures for lynx. For example, the Forest Service has curtailed its precommercial thinning on Forest Service land since the signing of its Conservation Agreement with the Service and the programmatic biological opinion on Forest and BLM land management plans, both of which abide by the LCAS (see Factor D). Risks to lynx or lynx habitat on BLM lands also are being addressed through adherence to the Conservation Agreement. Most Federal land management plans have yet to be amended to provide long-term conservation for lynx.

Timber harvest activities on non-Federal lands are guided by State or Tribal forest practice rules whose requirements vary (*e.g.*, Idaho Department of Lands 1996, Washington Administrative Code 2001, Montana State Forest Practices Rules 2003). Under Washington Forest Practices Board regulations, three major non-Federal landowners have adopted and implemented lynx habitat management plans on their lands in Washington (see Factor D).

We conclude that some timber harvest activities, such as pre-commercial thinning, may reduce the quality of snowshoe hare habitat in local areas on non-Federal lands in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains, and thus may negatively affect lynx or lynx habitat at local scales. Alternatively, timber harvest regimes in lynx habitat that create a dense understory provide good snowshoe hare and lynx conditions. A significant proportion of lynx habitat is managed in non-developmental status, which is beneficial for lynx. Furthermore, lynx habitat on National Forest and BLM lands is managed to conserve lynx. As a result, we conclude the current threats from timber harvest and thinning on both non-Federal and Federal lands to lynx in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains are low.

The final rule explained that natural fire plays a significant role in creating the mosaic of vegetation patterns, forest stand ages and structure that provide good lynx and snowshoe hare habitat in the western mountain ranges of the

United States. The final rule also explained that fire suppression in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains during the past 50 years has likely had little impact on lynx, because most forests where lynx habitat occurs have natural fire return intervals that are longer than the period of time of human fire suppression or because fires that do occur in lynx habitat are large, high-intensity fires that are difficult to suppress. Where fire suppression does occur in lynx habitat, it can reduce the quality of habitat by reducing the amount of younger forests or by changing the species composition and structure of forests.

Because of the many large forest fires in the West since 2000, there is increased national interest in reducing the risk of fire by reducing fuel loads on both Federal and non-Federal lands (U.S. Department of Agriculture and U.S. Department of the Interior 2001). Such efforts can affect lynx habitat if they reduce the amount of understory vegetation. Understory removal may affect the capability of stands to support snowshoe hares. At this time, few of these fire suppression efforts have been implemented, so it is impossible to analyze their effects on lynx. The LCAS recommends that on Federal lands fire be restored as an ecological process. The U.S. Forest Service and BLM use the LCAS in determining the effects of their actions on lynx (see Factor D).

As in the final rule, we conclude that past fire suppression has had limited impact in lynx habitat in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains; however, it may affect lynx habitat quality at some local scales, particularly on non-Federal lands. Although increased interest in fire suppression and reduction of heavy fuels has the potential to affect snowshoe hare habitat, we conclude the threat to lynx in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains as a result of the current effects of fire suppression is currently low.

Northeast

In the Northeast, lynx habitat is supported almost entirely on a non-Federal land base (private, State, or county), predominantly commercial forest lands, as was recognized in the final rule. The final rule discussed activities that may affect lynx in the Northeast Region. It described the history of logging and forest management through the 1800s and 1900s and the effects on lynx habitat in this region.

Since the final rule, our understanding of forest conditions in Maine, which is the core of the lynx range in the Northeast, has improved. Historically, large-scale natural disturbances (wind, ice, and insect epidemics) and traditional forestry practices (including some level of clear-cutting) created the early successional forest stages where snowshoe hares generally are most abundant. In response to insect outbreaks in the 1970s and 1980s, extensive clear-cutting to salvage diseased trees and subsequent herbicide use to promote regrowth of conifers created the current forest conditions that are optimal for snowshoe hares and lynx (Hoving 2001; Homyack 2003, Krohn 2003; G. Matula, in litt. 2003). Currently, large amounts of the forest are in a stage of regeneration that supports high snowshoe hare densities (Homyack 2003). As a result, lynx numbers also are high (see ''Maine'' discussion, above).

At its peak in the late 1990s, 20 to 25 percent of the Maine forest was in an early regeneration stage (Gadzik *et al.* 1998), which is unnaturally high and out of proportion to historic conditions when only 3 to 7 percent of the forest was in this stage of regeneration (Krohn 2003). Nonetheless, this created exceptional snowshoe hare and lynx habitat.

Passage of the Maine Forest Practices Act has in 1989 limited the amount of clear cutting. As a result, forest landowners have changed their harvest practices to extensive use of pre-commercial thinning and partial harvesting rather than clear cutting (Gadzik *et al.* 1998, Homyack 2003; Krohn 2003). These techniques result in forest stands with sparse understories that support low snowshoe hare densities (Homyack 2003). If harvest practices cease to provide early successional forest with dense understories or stand-replacing disturbances (such as provided by large clear-cut) in proportions similar to historic conditions, habitat conditions for snowshoe hare and lynx will be diminished.

The quantity of lynx habitat in Maine is expected to decline as stands in late regeneration created by clear cutting in the 1970s and 1980s succeed to mature forest. Snowshoe hare populations begin to decline in stands about 30 years after clear cutting when the forest canopy closes, shading increases at ground level, and the dense understory that supports high populations of snowshoe hares is greatly reduced. Over 95 percent of cutting that occurs now is partial harvesting (selective cutting, patch cuts). This new cutting regime supports lower populations of snowshoe hares (Fuller 1999, Homyack 2003) and will not provide the large patches of regenerating forest that support the more numerous lynx populations observed at the present time.

As explained in the final rule, in Northeast forests fire return intervals are very long as a result of the moist maritime influence. Thus, fire did not historically play a significant role in creating early successional habitats. While current fire suppression may have localized minor effects, it is not likely affecting lynx habitat overall in the Northeast.

As recognized in the final rule, timber harvest and associated activities on non-Federal lands exert the most influence on lynx habitat in the Northeast and have created the optimal conditions that currently exist for lynx and snowshoe hares in northern Maine. At this time, we do not know if future timber harvest practices will continue to provide forest conditions that are capable of supporting snowshoe hare densities that can, in turn, support a resident lynx population. We conclude the threat to lynx in the Northeast because of timber harvest and associated activities is moderate, although it may have more severe impacts if a natural mosaic of forest stand ages and structure that can support snowshoe hares and lynx is not maintained.

Great Lakes

The final rule described habitat conditions for lynx in the Great Lake Region. It described the history of logging and forest management through the 1800s and 1900s that was similar to the history in the Northeast.

We know that the estimate of lynx habitat provided in 1999 (U.S. Forest Service and Bureau of Land Management 1999) substantially overestimated the amount of lynx habitat in the Great Lakes because of the coarse-scale vegetation map on which the estimate for the Great Lakes was based (see ''Great Lakes'' discussion above). By using more accurate maps we now know that the majority of lynx habitat in the Great Lakes is on Federal lands, primarily National Forest lands, contrary to the information used in the final rule that incorrectly portrayed a high proportion of lynx habitat on non-Federal lands (Great Lakes Ecological Assessment no date, Mladenoff no date; Minnesota Department Natural Resources, in litt. 2003; Wisconsin Department Natural Resources, in litt. 2003). In the Great Lakes Region, approximately 18,000 km^2 (7,000 mi^2) of lynx habitat are currently mapped on National Forest lands (Table 1).

Unfortunately, an accurate estimate of the amount of lynx habitat across all land ownerships in the Great Lakes is still not available.

A large amount of the boreal forest in northeastern Minnesota where lynx are found is managed as the Boundary Waters Canoe Area Wilderness (4,160 km^2 (1,600 mi^2)) (Superior National Forest website). Wilderness is managed to let natural ecological processes dominate, which is beneficial to lynx.

The final rule recognized that timber harvest is the predominant use of the forests where lynx habitat occurs in the Great Lakes region; the final rule also explained that timber harvest levels on National Forest lands in the Great Lakes have declined by approximately 20 percent over the past decade (R. Gay, U.S. Forest Service, in litt. 1999). As described in the final rule, mixed conifer/hardwood stands are often replaced and maintained in pure deciduous stands because of the importance of aspen as a crop tree (Agee 2000). On managed timber lands in all ownerships, the maintenance of aspen to produce pulpwood precludes the establishment of coniferous forest types, which in turn likely diminishes snowshoe hare habitat quality.

The final rule described natural fire regimes and the history of fire suppression in the Great Lakes. Fire suppression policies across all land ownerships in the Great Lakes are such that fire is unlikely to assume its natural role in creating a mosaic of vegetation communities and age classes across the landscape. However, the final rule established that on some Federal lands in northeastern Minnesota, where the region's highest quality and quantity of lynx habitat is found, and where numerous lynx have been documented in the past 3 years (Minnesota Department of Natural Resources in litt. 2003), fires are allowed to burn. The LCAS recommends that on Federal lands fire be restored as an ecological process. Locally, fire suppression may reduce the quality of lynx habitat in the Great Lakes.

Since the listing of the lynx in 2000, activities that may affect lynx on National Forest lands are addressed by the U.S. Forest Service's adherence to the LCAS in alleviating the impacts of actions on lynx (see Factor D). However, at this time, most Federal land management plans have not been amended or revised to provide long-term conservation of lynx.

We conclude that timber harvest and fire suppression on non-Federal lands may cause local impacts to lynx and snowshoe hare habitat in the Great Lakes Region. Since the lynx was listed, lynx habitat on National Forest lands is managed to conserve lynx. As a result, we conclude the threat to lynx in the Great Lakes because of timber harvest and fire suppression is low.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Education Purposes

The final rule explained that one of the primary reasons we proposed to list lynx, based on available information at the time, was our conclusion that the low numbers of lynx in the contiguous United States and southern Canada were the residual effects of over-trapping believed to have occurred in the 1970s and 1980s, in response to unprecedented high pelt prices, a concern that was widely shared (Brand and Keith 1979; Todd 1985; Bailey *et al.* 1986; Hatler 1988; Washington Department of Wildlife 1993).

The final rule explained the variables that influence trapping records and the use of such records as indicators of historic lynx population changes. The final rule recognized that trapping mortality can either compensate for natural mortality or be in addition to natural mortality, depending on when it occurs in the population cycle. The final rule described trends in lynx pelt prices, and we will not restate them here.

The final rule explained that based on information obtained after public review and comment of the proposed rule in 1998, we now recognize that the cyclic peak harvest returns of the early 1960s and 1970s were unprecedented highs for the 20th century (McKelvey *et al.* 2000b; Mowat *et al.* 2000). Wildlife managers may have expected harvest returns during the 1980s and 1990s to be comparable to the anomalous cyclic peaks of the 1960s and 1970s. When harvest returns failed to be as high as anticipated, managers interpreted the lower returns to be caused by overtrapping when pelt prices were high (Bailey *et al.* 1986; Hatler 1988; Hash 1990; Washington Department of Wildlife 1993). We compared the lynx harvest returns in the 1980s and early 1990s to harvest data dating back over a longer period of time (*i.e.*, prior to 1960) and found that lynx harvest returns were not unusual nor appreciably lower than those recorded prior to the 1960s.

To demonstrate that lynx harvest returns in the 1980s and 1990s were not substantially different from returns prior to the 1960s and that wildlife managers were inappropriately using returns from the 1960s and 1970s as the standard on which to compare subsequent returns and set seasons, the final rule thoroughly described historic trapping data for Minnesota, Montana, and Washington, which will not be restated here.

The final rule explained that Mowat *et al.* (2000) suspected that over-trapping may deplete local lynx populations, particularly at the southern part of the lynx's North American range, but that dispersal of lynx from healthy populations has led to the repopulation of such areas. States and Tribes closed lynx trapping seasons prior to the listing of the lynx, which, in addition to the listing of lynx under the Act, eliminated the mortality of lynx through legal lynx-targeted trapping and we have no information suggesting that illegal lynx-targeted trapping occurs in the contiguous United States. We continue to believe that precautions taken by States and Provinces to restrict lynx trapping since the 1980s likely have prevented and continue to prevent the over-harvest of resident lynx. Most Canadian provinces control for potential over-trapping by closing the lynx trapping seasons during the lows in the lynx population cycle (*e.g.*, Environment et faune Quebec 1995). However, some theorize that lynx harvest in Canada reduces the numbers of lynx that could potentially disperse to the contiguous United States. In the final rule we explained that low numbers of lynx in the contiguous United States compared to Canada occur not as a result of over-trapping, but because the prey of lynx is limited by naturally fragmented habitat, topography, and climate.

As we emphasized in the final rule, legal trapping, snaring, and hunting for bobcat, coyote, wolverine, and other furbearers create a potential for incidental capture or shooting of lynx. We know that incidental capture and shooting occurs (Wydeven 1998; M. DonCarlos in litt. 1994; Colorado Department of Wildlife 2003; R. Naney, U.S. Forest Service, pers. comm. 1999, B. Giddings, Montana Fish, Wildlife and Parks, pers. comm. 2001; C. McLaughlin, Maine Department of Inland Fisheries and Wildlife, pers. comm. 2001; J. Cochrane, U.S. Fish and Wildlife Service, pers. comm. 2003; M. McCollough pers. comm. 2003); no reliable recordkeeping exists to determine how frequently such taking occurs. The effect on the individual lynx captured has varied, usually depending on the type of trap or the set and whether the trap was checked in time to successfully release or rehabilitate the animal. These captures have sometimes caused no injuries and the animal was immediately released back into the wild, sometimes lynx were injured but were rehabilitated and then

released into the wild, and sometimes the captures have resulted in mortality. Mortality of captured individuals likely has differing impacts on the ability of local populations to persist depending on the size of the local population and when the trapping occurs in the population cycle. Lynx persist throughout their range despite the incidental catch that presumably has occurred throughout the past, probably at higher levels than presently. Although we are concerned about the mortality of lynx that are incidentally captured, we have no information to indicate that the loss of these individuals has negatively affected the overall ability of lynx in the contiguous United States to persist. We recognize that individuals may be lost, which could affect small, local populations.

Based on the information described in this section, we conclude that legal, lynx-targeted harvesting does not occur and therefore is not a factor threatening the contiguous United States lynx population. The threat to lynx populations from illegal harvesting, if any, and incidental catch by trapping, snaring, or hunting is low.

Factor C. Disease or Predation

Mountain lions (*Puma concolor*) and fisher (*Martes pennanti*) have been documented to prey on lynx (Squires and Ruggiero 2001, G. Matula, in litt. 2003) but there is no information to suggest that these natural events are threatening lynx populations. Plague has been documented in the Colorado reintroduced population, but its overall impact is unknown at this time (T. Shenk, Colorado Division of Wildlife, pers. comm 2003). As in the final rule, we conclude that disease and predation are not factors threatening lynx.

Factor D. Inadequacy of Existing Regulatory Mechanisms

The final rule (1) outlined regulatory protections that States and Tribes within the range of the lynx have in place to provide protection to the species, (2) described how lynx is protected under the Convention on International Trade in Endangered Species (CITES), and (3) identified efforts on private lands to provide for the conservation of the species. These protections and efforts will not be reiterated here.

Timber harvest activities on non-Federal lands are guided by State or Tribal forest practice rules whose requirements vary (*e.g.*, Maine Forest Practices Act 1989); however, not all States or Tribes have forest practice rules.

The final rule discussed the fact that a substantial amount of lynx habitat in the contiguous United States is found on Federal lands, primarily National Forest and BLM lands. The final rule thoroughly described the purposes and analyses of the LCAS and the biological assessment of National Forest and BLM Land Management Plans (U.S. Forest Service and Bureau of Land Management 1999, Ruediger *et al.* 2000). At that time, we found that Federal land management plans did not adequately address risks to lynx and, as identified in the LCAS, that plans allowed actions that cumulatively could result in significant detrimental effects to lynx in the contiguous United States. As a result, we concluded in the final rule that the lack of Federal Land Management Plan guidance for conservation of lynx, and the potential for Plans to allow or direct actions that adversely affect lynx, were a significant threat to the contiguous United States lynx population.

As described in the final rule, the LCAS was developed to provide a consistent and effective approach to conserving lynx on Federal lands in the contiguous United States (Ruediger *et al.* 2000). The overall goals of the LCAS were to recommend lynx conservation measures, provide a basis for reviewing the adequacy with regard to lynx conservation of Forest Service and BLM land and resource management plans, and facilitate conferencing and consultation under section 7 of the Act, should the lynx be listed. The LCAS identifies an inclusive list of 17 potential risk factors for lynx or lynx habitat that may be addressed under programs, practices, and activities within the authority and jurisdiction of Federal land management agencies. For example, these risk factors include programs or practices that result in habitat conversion, habitat fragmentation, or obstruction to lynx movement; roads or winter recreation trails that facilitate access to historical lynx habitat by competitors; and fire suppression, which changes the vegetation mosaic maintained by natural disturbance processes. The risks identified in the LCAS are based on effects to either individual lynx, populations, both, or lynx habitat. Therefore, not all of the risks identified in the LCAS threaten lynx populations in the United States. For example, one risk factor identified for the Southern Rockies Region is accidental death from vehicle collisions. While this may result in the death of individual lynx, it is not considered to be a threat to lynx populations.

With the listing of the lynx in 2000, Federal agencies across the contiguous United States range of the lynx were required to consult with the Service on actions that may affect lynx. The LCAS assists Federal agencies in planning activities and projects in ways that benefit lynx or avoid adverse impacts to lynx or lynx habitat (Ruediger *et al.* 2000). The LCAS addresses potential risks including timber harvest and fire management. The LCAS ensures the appropriate mosaic of habitat is provided for lynx on Federal lands. For instance, both early successional forests and older forests with understory are important for lynx foraging habitat. The LCAS recommends that while timber harvest can result in early successional forests, harvest be limited to provide adequate amounts of older timber stands. Also, the LCAS recommends that no pre-commercial thinning occur in lynx habitat and no increase in designated or groomed snowmobile routes in lynx habitat. If projects are designed that fail to meet these or other recommendations, the biologists using the LCAS would arrive at an adverse effects determination for lynx. On National Forest lands such projects then would be deferred until Forest Plans are amended to conserve lynx.

A Conservation Agreement between the U.S. Forest Service and the Service (U.S. Forest Service and U.S. Fish and Wildlife Service in litt. 2000) and a similar Agreement between the BLM and the Service (Bureau of Land Management and U.S. Fish and Wildlife Service in litt. 2000) committed the U.S. Forest Service and BLM to use the LCAS in determining the effects of actions on lynx. The U.S. Forest Service further committed to deferring any actions not involving third parties that would adversely affect lynx, until such time as the Forest Plans were amended or revised to adequately conserve lynx. A programmatic biological opinion analyzed and confirmed the adequacy of the LCAS and its conservation measures to conserve lynx and concluded that Forest and BLM land management plans as implemented in accordance with the Conservation Agreements would not jeopardize the continued existence of lynx (U.S. Fish and Wildlife Service 2000). Currently, the ongoing adherence to the Conservation Agreements, the LCAS, and the programmatic biological opinion alleviates the effects of Federal land management activities identified in the final rule. However, amendment of National Forest and BLM land management plans to conserve lynx will be the strongest mechanism in ensuring lynx and lynx habitat are conserved on

National Forest and BLM lands for the long term.

As a result of Federal, State, and Tribal regulations and plans that conserve lynx, the threats to lynx from the inadequacy of existing regulatory mechanisms have been reduced. However, until Federal land management plans are amended to address lynx, we conclude that the threat to lynx because of the inadequacy of existing regulatory mechanisms continues to be moderate, albeit at a lower level than that described in the final rule.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Since the lynx was listed, our understanding of the vital role immigration of lynx from Canada plays in sustaining lynx in the contiguous United States has improved (Ray *et al.* 2002, Schwartz *et al.* 2002). In the final rule, we explained that connectivity of appropriate habitat types and cover provide travel corridors between habitat patches, thereby increasing the likelihood of successful lynx dispersal. It is essential that landscape connectivity between lynx habitats and populations in Canada and the contiguous United States be maintained. The final rule described the reduced ability for lynx from northern populations in Canada to cross the St. Lawrence River in southern Quebec and the St. Mary's River between Ontario and Michigan. At this time, we know of no natural or human-caused barriers that effectively prohibit movement of lynx between Canada and the directly adjacent regions of the contiguous United States (Northeast, Great Lakes, and Northern Rocky Mountains/Cascades) that support lynx habitats and populations. The threat to lynx because of the lack of a cohesive international strategy to maintain connectivity between habitats in Canada and the United States is low.

The final rule also noted that for most areas of the contiguous United States, we have no evidence that human-caused changes have significantly reduced the ability of lynx to disperse or have resulted in the loss of genetic interchange. The final rule explained that high traffic volume on roads that bisect suitable lynx habitat and associated suburban developments (such as from ski area expansion) may inhibit lynx movement and dispersal and may contribute to loss of habitat connectivity. Such situations occur in the Southern Rocky Mountains Region connecting cities, towns, and ski areas. The final rule explained that roads do not appear to be a significant direct cause of mortality of resident lynx, but that the majority of records of lynx mortalities from vehicle accidents are of recently translocated animals. No information currently exists to determine the level at which traffic volume or roadway design may influence or create an impediment to lynx movements. In local areas, lynx may be negatively influenced by high traffic volume on roads that bisect suitable lynx habitat and associated suburban developments that contribute to loss of habitat connectivity; however, we conclude the overall threat to lynx populations from high traffic volume on roads that bisect suitable lynx habitat and associated suburban developments is low, although locally in Colorado the risk is higher.

Isolated, small resident lynx populations, such as may have existed in the Southern Rocky Mountains and New York, are susceptible to genetic or demographic problems or random environmental events (such as a series of years when snow conditions are poor such that lynx cannot out-compete other predators). As described in ''Background'' above, we surmise that immigration is necessary to augment and maintain local lynx populations, especially in transitional habitats at the southern margins of lynx range. The natural distance and isolation of the Southern Rocky Mountain region and New York from source lynx populations may have severely reduced, if not entirely precluded the immigration that was likely necessary for potential resident lynx populations in these areas to sustain themselves. This same analysis does not apply to dispersers because we consider dispersers to be transient individual animals that are not a part of a population; they contribute little to the persistence of the metapopulation unless they augment or colonize resident lynx populations. We recognize that individual lynx may be affected by random environmental events. We expect that many dispersing lynx naturally do not survive because they are unable to find adequate food resources and because of the risks naturally inherent in long-distance movements.

The final rule describes that lynx show no evidence of being displaced by or avoidance of unpaved forest roads. We find no information demonstrating that forest roads negatively impact lynx (Roe *et al.* 2001) and, therefore do not consider forest roads to be a threat to lynx.

The final rule discussed the theory that suggested that increasing ease of human access into forests increased the vulnerability of lynx to intentional or unintentional shooting and trapping. We are concerned about the mortality of lynx through legal or illegal trapping and shooting; however, we have no information to indicate that the loss of these individuals negatively affects the overall ability of lynx populations to persist. We conclude the threat to the threat to lynx populations from incidental catch by trapping, snaring, or hunting is low (see Factor B above).

There continues to be no data on the role of competition between lynx and other species; therefore, we have only information on behavior and morphological adaptations of lynx and of potential competitors during both winter and snow-free seasons from which to gain some inferences about competition and whether it has an impact on lynx, as was thoroughly described in the final rule. Bobcats, mountain lions, and fishers are natural potential competitors or predators that coevolved with lynx. As described in the final rule, the coyote expanded its range into that of the lynx within the past century so any potential for competition between these two species may be considered unnatural. Deep snow provides lynx its competitive advantage. The final rule explained that human alteration of forests may create habitats that may be more suitable to potential lynx competitors. At this time there is no evidence that, if competition exists between lynx and any of these species, it exerts a population-level impact on lynx; therefore, we do not consider competition to be a threat to lynx.

Research scientists in the Missoula Wildlife Ecology unit of the Forest Service Rocky Mountain Research Station, in cooperation with the Northern Region of the Forest Service and the Superior National Forest in Minnesota, recently discovered evidence of hybridization between bobcats and Canada lynx. This is the first time hybridization has been reported in wild populations of these species. As a result of this finding, the Forest Service has conducted a DNA analysis of most of the lynx hair samples collected as part of the National Lynx Survey to help determine if hybridization has occurred elsewhere. So far, no additional instances of hybridization have been detected. This phenomenon may have implications for lynx conservation, but additional sampling and analysis are required before biologists will be able to fully understand the significance of the hybridization (D. Tippetts, U.S. Forest Service, in litt., 2003).

Despite the lack of evidence that competition with any species is negatively affecting lynx, the final rule explained the theory that ski and snowmobile trails and roads that are maintained for winter recreation and forest management create packed snow corridors that give other species, particularly coyotes, access to lynx winter habitat on all land ownerships. This theory has neither been proven or disproven at this time (Roe *et al.* 2000). On the basis of this theory, the LCAS provides that there be no net increase in groomed or designated over-the-snow routes and snowmobile play areas on Federal lands (Ruediger *et al.* 2000). The U.S. Forest Service and BLM are committed to adhering to their Conservation Agreements with the Service and the programmatic biological opinion on Forest and BLM land management plans that require the U.S. Forest Service and BLM to use the LCAS in determining the effects of actions on lynx (see Factor D). Because no evidence has been provided that packed snowtrails facilitate competition to a level that negatively affects lynx, we do not consider packed snowtrails to be a threat to lynx at this time.

During the public comment period on this remanded decision, we received information that predicted that if snow depths substantially decrease for a long period of time, lynx habitat will no longer exist in the Northeast (Hoving 2001). Hoving's (2001) model predicted that lynx were most likely to occur in areas with deep snow (greater than 268 cm (105 in) of mean annual snowfall). Hoving (2001) modeled possible consequences to the availability of lynx habitat in the Northeast as determined by snow depth. His predictions were only based on a comparison of average annual snow depths in the 1970s to those of the 1980s, not on models of future climate. Hoving (2001) acknowledged that the 1970s were unusually snowy whereas the 1980s was a period of relatively little snow. If average annual snow depth substantially decreases in the Northeast, as Hoving (2001) theorized could happen as a result of global warming, appropriate lynx habitat would be diminished and could be completely eliminated if appropriate climate conditions did not return. We conclude the potential for long-term reductions in snow depth because of climate change is speculative at this time and is not a threat to lynx.

TABLE 2

	Magnitude of threat			
	Northeast	Great Lakes	Southern Rockies	Northern Rockies/ Cascades
Factor A:				
Timber harvest regimes	Moderate	Low	Low	Low.
Fire suppression	Not a threat	Low	Low	Low.
Factor B:				
Legal lynx-targeted harvest	Not a threat	Not a threat	Not a threat	Not a threat.
Incidental harvest	Low	Low	Low	Low.
Factor C	Not a threat	Not a threat	Not a threat	Not a threat.
Factor D:				
Federal land management plan guidance.	Not a threat	Moderate	Moderate	Moderate.
Factor E:				
International strategy	Low	Low	Low	Low.
High volume traffic/development	Low	Low	Moderate	Low.
Forest roads	Not a threat	Not a threat	Not a threat	Not a threat.
Competition	Not a threat	Not a threat	Not a threat	Not a threat.
Global warming	Not a threat	Not a threat	Not a threat	Not a threat.

Finding

Based on the information provided in the final rule and the analysis provided above about the range of the lynx and the five factors contained in section 4(a)(1) of the ESA, we find that the lynx is not endangered because it is not in danger of extinction throughout a significant portion of its range. The way the lynx is affected varies across the range and there is not any particular activity that poses a threat consistently throughout the range of the species. Activities that may impact the lynx and its habitat are typically localized and even within a local area the impact an activity may have on lynx can vary depending on the quality and quantity of habitat in a local area or the size of the local resident population. In some portions of the range, lynx and its habitat face few or no threats (*e.g.*, in wilderness areas in the Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades).

Activities addressed in the factors contained in section 4(a)(1) are not of the magnitude or scope to require us to list the species as endangered. We base our finding that lynx is not endangered on the following factors:

(1) Lynx in the contiguous United States are, and historically have been, the southernmost segment of a larger metapopulation whose center is in Canada. Immigration from Canada is, and historically was, vital to sustaining lynx in the contiguous United States.

(2) In the contiguous United States, lynx habitat consists of the southern extensions of the boreal forest in the Northeast, Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades. The overall quantity and extent of boreal forest in these areas has not substantially changed in the past century because, for the most part, areas where lynx habitat occurs are still managed as forest lands, although there may have been a low level of encroachment in lynx habitat because of human development in some local areas. The quality of the boreal forest varies because it is a naturally dynamic ecosystem. To support lynx, the boreal forest must contain the mosaic of appropriate species composition, forest stand ages, and forest structure that provide snowshoe hare habitat for lynx foraging and lynx denning conditions.

(3) Lynx habitat occurs on lands owned and managed by Federal, Tribal, State, County, and private individuals and entities. Although we do not have information that allows us to accurately quantify how much habitat for lynx exists in the contiguous United States,

in the Northeast nearly all lynx habitat occurs on private lands. In the Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades, lynx habitat occurs primarily on Federal lands, although a portion does occur on State, Tribal, or private lands. Based on coarse vegetation maps, potential lynx habitat was roughly estimated to be 65,337 km^2 (25,227 mi^2) in the Northeast; 96,247 km^2 (37,161 mi^2) in the Great Lakes; 26,673 km^2 (10,298 mi^2) in the Southern Rocky Mountains; and 155,893 km^2 (60,191 mi^2) in the Northern Rocky Mountains/Cascades (U.S. Forest Service and Bureau of Land Management 1999).

(4) The current range of the lynx includes portions of Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming. The historic range of the lynx included these same States. The range of the lynx has not been dramatically reduced. We believe all historic habitat is still available to dispersing lynx except for very local areas where development has encroached on the boreal forest. A resident population does not exist in New York. We do not know if New York or the Southern Rockies ever supported resident lynx populations, but efforts at reintroduction of lynx in New York were unsuccessful and it would be premature to judge ongoing reintroduction efforts in Colorado (although reproduction has recently been documented).

(5) In the contiguous United States, the quality and quantity of the available habitat and its proximity to source populations influenced whether lynx historically were able to establish resident populations or occurred primarily as dispersers. The best scientific information suggests that historically only a few areas in the contiguous United States had lynx habitat of high enough quality and quantity to support resident populations and these are areas where resident populations currently continue to persist—northern Maine, northeastern Minnesota, western Montana, and north-central and northeastern Washington. Evidence of the continuing high quality habitat of these areas is indicated by the fact that currently there are many more lynx in these areas where resident populations exist (particularly in Maine and northeastern Minnesota) than we knew at the time we listed the species in 2000. Northern New Hampshire and northern Idaho currently have habitat conditions presumed capable of supporting lynx and are directly adjacent to resident populations; therefore we expect lynx occupy these areas.

The areas where resident populations occur are where habitat for lynx has consistently been of sufficient quality and quantity to support abundant snowshoe hare populations so that lynx are able to successfully produce kittens that are then recruited into the population. These habitats are of sufficient quality and quantity such that snowshoe hare populations at cyclic lows are still able to support a minimal number of lynx in the area, although we do not expect that lynx successfully reproduce when hare populations are low. Additionally, the habitat quality and quantity can support immigrants from Canada that colonize new areas or contribute to existing populations. In reality, in each region these areas are an artifact of the international border between Canada and the United States that artificially splits them into two pieces of a whole that exists primarily in Canada. This is most evident in Minnesota and Ontario—it appears sometimes the Ontario lynx population expands and occupies Minnesota and sometimes it contracts and lynx recede from Minnesota.

Historically, both Colorado and New York may have supported small resident lynx populations that may have been extirpated, although we are uncertain because historic records in these areas also may have been of dispersers that arrived during extremely high population cycles. In both Colorado and New York the last verified record of lynx was in 1973, a time that corresponds to an extreme cyclic population high. In both States there have been recent efforts to establish lynx populations. The attempt to establish a lynx population in New York in 1989–1991 was unsuccessful. The State of Colorado has undertaken an intensive effort to restore lynx in Colorado. Lynx have been released over the past 4 years into Colorado and reproduction was recently documented, but it is too early to determine if a population will be successfully established.

(6) In the remainder of the lynx range where some boreal forest exists in smaller patches, is of marginal quality, or is relatively isolated from source lynx populations, lynx occur as dispersers. We include boreal forest that supports only dispersers within the range of the lynx because of the possibility lynx could establish a local population and contribute to the persistence of the metapopulation. However, evidence of this is minimal. We consider these areas that only support dispersers within the range of the lynx—portions of Michigan, Oregon, Utah, Vermont, Wisconsin, and Wyoming.

(7) Areas that are outside of boreal forest types and that do not have cold winters with deep snow where dispersing lynx have sporadically been documented are not considered a part of the range of lynx because they do not contain the ecological conditions capable of supporting lynx. These areas include—Connecticut, Indiana, Iowa, Massachusetts, Nebraska, Nevada, North Dakota, Ohio, Pennsylvania, South Dakota, and Virginia.

(8) We conclude that large portions of range of the lynx in the Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades are managed as non-developmental, such as designated wilderness areas, which is beneficial to lynx because it is managed to let natural ecological processes dominate. While there is some risk to lynx in these areas, these risks do not threaten lynx.

(9) We conclude there is a low threat to the contiguous United States lynx population because of the lack of a cohesive international strategy to maintain connectivity between habitats in Canada and the United States.

(10) We conclude there is a threat to the contiguous United States lynx population because of current effects of timber harvest and thinning and fire suppression on both non-Federal and Federal lands in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains. We conclude that this threat is low. Although a majority of lynx habitat in these regions is on National Forest and BLM lands that are managed to conserve lynx, timber harvest regimes and fire suppression that may be locally detrimental to lynx and snowshoe hare habitat likely occurs on the limited amount of non-Federal lands that support lynx habitat in both the Northern Rocky Mountains/Cascades and Southern Rocky Mountains.

(11) We conclude that lynx habitat may be impacted because of changing timber harvest regimes on non-Federal lands in the Northeast. We conclude the threat of these activities is moderate, although there is the potential for more severe impacts if a natural mosaic of vegetation ages and forest structure that can support snowshoe hares and lynx is not maintained.

(12) We conclude that lynx may be impacted because of timber harvest and fire suppression on non-Federal and Federal lands in the Great Lakes. However, the impact of these activities is low because a majority of lynx habitat in this region is on National Forest lands, which are managed to conserve

lynx; however, on the non-Federal lands in this region timber harvest regimes and fire suppression could cause local impacts to lynx and snowshoe hare habitat.

(13) Until Federal land management plans are amended or revised to address lynx, we conclude that the threat to lynx because of the inadequacy of existing regulatory mechanisms is moderate, albeit at a lower level than that described in the final rule.

(14) We conclude there is a threat to the contiguous United States lynx population from incidental catch by trapping, snaring, or hunting. We conclude this threat is low, although there may be an increased risk to small, local populations from incidental catch depending on when it occurs in the population cycle; however, we have no information regarding how frequently incidental trapping, snaring, or hunting of lynx occurs.

(15) We conclude that existing regulatory mechanisms do not ameliorate all of the threats contained in Factors A, B, and E. However, some regulatory mechanisms do minimize the impact some activities may have on lynx, such as regulations that prohibit the trapping and hunting of lynx in most States. While Federal land management plans have yet to be amended to adequately address lynx, Federal land managers have taken significant steps to minimize the impacts projects may have on lynx and manage habitat to conserve lynx until land management plans are amended.

(16) We conclude lynx are impacted by high traffic volume on roads that bisect suitable lynx habitat and by associated suburban developments. However, we conclude this impact is low because this situation rarely occurs throughout the range of lynx except in the Southern Rocky Mountains; however there is currently no native lynx population in this area.

Lynx in the Northeast are not in danger of extinction. As it has historically, the boreal forest of the Northeast exists primarily in Maine. Lynx habitat in Maine is currently optimal and a resident, breeding population of lynx continues to exist. Maine's lynx population is currently much larger than we knew at the time of the final rule in 2000 and lynx habitat in Maine is directly connected to substantial lynx populations and habitat in southeastern Quebec and New Brunswick. Future timber harvest regimes in Maine have the potential to reduce the amount of snowshoe hare habitat, which in turn would reduce the size of the lynx population. There are no barriers to the movement of lynx across the Canada-U.S. border. Coyote snaring in Maine poses a risk of incidental mortality to local lynx populations. The potential exists for lynx to occur in New Hampshire because of its direct connectivity with Maine and we presume they currently occur there. Lynx in Vermont have always existed solely as dispersers because Vermont naturally supports very little lynx habitat.

Lynx in the Great Lakes are not in danger of extinction. Northeastern Minnesota has historically supported, and currently supports, a resident lynx population. Boreal forest in Minnesota is contiguous with occupied habitat in Ontario. Currently, there are many more lynx in northeastern Minnesota than we knew of at the time of the final rule in 2000. The majority of lynx habitat in the Great Lakes area is located in Minnesota and is managed as Federal lands. Threats to lynx on these lands are alleviated because these Federal agencies use the LCAS to guide activities in lynx habitat. Amendment or revision of Federal land management plans to adequately address lynx is necessary to provide long-term lynx conservation. On non-Federal lands there is a low threat to lynx because of the potential for certain forms of timber management and fire suppression to reduce snowshoe hare habitat. Wisconsin and Michigan naturally support only dispersing animals. We base this assessment on the lack of evidence of reproduction, lack of direct connectivity with suitable habitat, and limited amount of habitat in these States.

We conclude that the only portion of the range where the lynx faces possible extirpation includes the Southern Rocky Mountains (primarily Colorado) and New York, to the extent that either of these areas historically supported resident populations. We believe the loss of these resident populations was a natural process because these areas are naturally isolated from source lynx populations and habitats; therefore, the immigration necessary to augment and maintain local lynx populations was naturally precluded. However, the State of Colorado is currently undertaking an intense effort to restore lynx to Colorado. If lynx in these areas historically consisted only of dispersers that arrived during extremely high population cycles, we have no evidence that anything would prevent further such dispersal into these areas in the future. In addition, to use the words of another court quoted with approval of the court in this case, to the extent that these areas never supported a resident population (as opposed to dispersers), these areas are not ''areas in which [the lynx] is no longer viable but once was,'' because the lynx was never viable there. *Defenders of Wildlife* v. *Norton*, 258 F.3d 1136, 1145 (9th Cir. 2001) (quoted at 239 F.Supp.2d at 20). However, if we presume that both Colorado and New York historically supported resident populations, we find these areas do not constitute a significant portion of the range of lynx for the following reasons:

(1) Both areas constitute a comparatively small amount of the contiguous United States range of the lynx. Based on rough estimates, the Southern Rockies (primarily Colorado) supported only 8 percent of lynx habitat in the contiguous United States (U.S. Forest Service and Bureau of Land Management 1999); however, we know this proportion was somewhat underestimated because lynx habitat was overestimated in other regions. New York supports slightly more than 1 percent of lynx habitat just within the Northeast based on a current habitat model, and therefore only a small fraction of a percent of the habitat nationwide.

(2) The fact that historic records do not clearly demonstrate that these areas supported resident, breeding lynx populations indicates that these areas are of more marginal quality. Where habitat is abundant and of higher quality, there is evidence that resident, breeding lynx populations persist as indicated by high numbers of reliable lynx records over many years and evidence of reproduction. We do not have such information for either New York or the Southern Rocky Mountains. In fact, an effort to establish a lynx population in New York during 1989–1991 failed, potentially an indication that the habitat was not adequate to support a lynx population. Reproduction has recently been documented in an intensive lynx reestablishment effort currently underway in Colorado but it remains to be seen if the habitat is adequate to support a lynx population for the long-term without such intensive human intervention.

(3) Habitat appears marginal in the Southern Rocky Mountains and New York. In the Southern Rocky Mountains lynx habitat occurs at high elevations and, therefore, is naturally highly fragmented by topography and drier south- and west-facing slopes into island-like patches rather than expansive, contiguous blocks. The amount of potential lynx habitat in New York is estimated to be an area only slightly larger than the average home range of a single male lynx. Additionally, the boreal forest in New

York is protected as Adirondack State Park where much of the forest is mature and does not have the understory necessary to support a snowshoe hare population capable of sustaining lynx.

(4) Both of these areas are a relatively long distance and naturally more isolated from other lynx populations, substantially reducing the potential for lynx from northern populations to augment or colonize these areas or, alternatively, reducing the ability of lynx from these areas to have augmented or colonized other lynx habitats. Therefore the contribution of these areas to the persistence of lynx in the contiguous United States is presumably minimal.

We conclude that the contiguous United States DPS of the lynx is not in danger of extinction throughout a significant portion of its range within the Northeast, Great Lakes, or Southern Rockies and therefore does not warrant reclassification to ''endangered'' status in all or a significant portion of its range within these areas. As a result the Canada lynx will remain listed as threatened in Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming.

References Cited

A complete list of all references cited herein, as well as others, is available upon request from the Montana Field Office (see **ADDRESSES**).

Author

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Steve Williams,

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