At your request, I provided an unpaid peer-review of proposed critical habitat designation for Canada lynx dated 26 September 2013. As requested, I focused my comments on the scientific basis of the proposed critical habitat designation, but recognized that my comments must also discuss policy to a limited extent given the nature of the issue and questions. I am a Principle Investigator on long-running studies of lynx in Montana and Colorado, as well as in northwestern Wyoming from 2000 – 2006. The scope of my research includes many aspects of lynx ecology including distribution, den selection, habitat-use preferences, movement and population connectivity, response to winter recreation, and demography. Thus, I base my comments on the experience and knowledge gained from my research in the Northern Rockies and my understanding of the literature. As requested, I focused my peer-review comments on the following 9 questions:

1) Are our descriptions and analysis of the biology, habitat requirements, and historic and current distribution of lynx in the contiguous U.S. accurate as related to critical habitat designation?

The basic descriptions of lynx biology, habitat requirements, and historic and current distribution provided in the proposed rule were consistent with best scientific understandings. The proposed rule does adequately review the most pertinent scientific literature for the determination of critical habitat. In 2000, when lynx were listed and the original critical habitat documents were written, most scientific understanding of the species was based on studies of northern populations in Canada. It is unknown how well results from northern populations relate to populations in the contiguous U.S. However, there are now many new studies of lynx from the contiguous U.S. The description of lynx biology could have been presented more clearly if studies of lynx in the contiguous U.S. were stressed in the narrative rather than being combined with the northern literature.

The actual structure of the proposed rule was somewhat confusing because it accomplished 2 objectives that were unrelated: 1) established that lynx will be protected where they occur and not along state boundaries; and 2) redefined critical habitat for lynx in the contiguous U.S. I found it confusing that these separate objectives were combined in a single document. It would help readers understand the document’s structure if the revised rule led with a cogent paragraph that described these 2 independent goals.
Specific points of science:

1) Page 59433, column 3, paragraph 2 – persistent lynx populations: The term “persistent” population is difficult to define in the context of critical habitat. For example, is the population of lynx in Minnesota truly “persistent?” Mech (1973) reported lynx were present in Minnesota after being apparently absent from the state for some period. It then appeared that lynx in Minnesota failed to persist from about 1973 to 2003. However, in approximately 2003 to the present, a reproductive population of lynx has been routinely detected in northern Minnesota. So whether or not lynx are “persistent” in Minnesota depends on the definition. This is important because it relates to how lynx are viewed in Colorado. Lynx were introduced to Colorado between 1999 – 2006 by Colorado Parks and Wildlife. The introduced population of lynx in Colorado has persisted to the present, with kittens surviving long enough to produce kittens. The long-term persistence of the introduced Colorado population is truly unknown as is the case with lynx in Minnesota. Thus, the distinction of population persistence between Minnesota and Colorado as articulated in the proposed rule seems arbitrary, especially since there are probably many more lynx in Colorado than Minnesota.

2) Page 59434, column 1, paragraphs 1-3 – connections of southern populations with Canada: McKelvey et al. (2000) identified that lynx in the contiguous U.S. exhibit a lagged-population synchrony with those in Canada. Squires et al. (2013) stated, “thus, lynx conservation in the contiguous US hinges in part on maintaining population connectivity between Canada and the US.” There is scientific evidence that lynx populations in the contiguous U.S. are connected with those in Canada. However, it is unclear if the persistence of southern populations depends on their own productivity or if augmentation from Canada is truly needed. It is also unclear the role that connectivity among southern population plays in maintaining the overall metapopulation structure. The proposed rule implied a higher degree of certainty regarding population connectivity than may be the case. For example, the proposed rule states that lynx use habitat “stepping stones” to connect Montana to the Greater Yellowstone Area (GYA). It is unknown if this putative movement path is true scientifically. For example, it is also plausible to assume that lynx in the Garnet Range depend on connectivity from lynx in Seeley Lake, MT, only 40 km away. However, we have not documented in over 13 years of research a single lynx dispersal to the Garnet Range. It is possible that lynx in the GYA are maintained from pulses of lynx from populations in Canada rather than movements of animals from Montana populations. Recognizing this uncertainty is important as it relates to lynx in Colorado. The proposed rule downplayed the persistence of the Colorado population because it lacked habitat “stepping stones” from northern populations. However, several lynx from Colorado have dispersed to the GYA including males and females with overlapping home ranges. Thus, the lack of lynx
habitat or “steeping stones” did not prevent connectivity with the GYA. I suggest the proposed rule better communicate these uncertainties.

2) Page 59434, column 3, paragraphs 2 – transitional habitat: The proposed rule states that lynx habitat in the contiguous U. S. is patchy and transitional, and that this landscape pattern limits snowshoe hare density. The proposed rule implies that lynx habitat used by southern populations is almost “ephemeral.” It is true that lynx habitat in the contiguous U. S. is patchy compared to northern populations. However, the characterization that lynx habitat in the contiguous U. S. is transitional lacks support. Both northern and southern boreal forests are structured by natural disturbance processes (Agee 2000). Lynx habitat in the western U.S. consists of mature spruce-fir forests that may exceed 300 years in age. Using the word “transitional” is misleading.

3) Page 59434, column 3, paragraphs 2 – lynx habitat is limited and fragmented: The Berg and Inman (2010) citation that supports this statement is inappropriate. This is a non-peer reviewed publication that describes a small track survey in Utah. It has no basis for discussing lynx habitat in the contiguous U. S. as cited in the proposed rule.

4) Page 59435, column 1, paragraphs 2-3 – lynx habitat: It might be beyond the scope of the document, but seasonal and geographic differences in lynx habitat were poorly described. In the Northern Rockies, Squires et al. (2013) described type-2 resource selection (Johnson 1980) of home ranges, and Squires et al. (2010) described Type 3 and 4 levels of selection. The narrative would be most helpful for critical habitat understanding if it clearly articulated how lynx habitat differs across southern populations in cogent paragraphs. For example, winter habitat used by lynx in the Northern Rockies is almost opposite the forest structure used by lynx in Maine year-round. These relationships are difficult to determine with the current narrative. In the context of critical habitat, readers should understand that management actions in Maine may have actually created lynx habitat in the state. It is unclear if Maine could support lynx without extensive forest management with herbicide treatment. The role that herbicide treatment of forests in Maine played to create/promote the conifer infill that lynx depend on should be discussed.

5) Page 59435, column 2, paragraph 1 – den habitat: Den habitat in the Northern Rockies is poorly defined in the proposed rule. It was mentioned that 80% of dens in Montana are in mature forests, but the narrative does not clearly describe how lynx respond to environmental characteristics at dens at various spatial scales.

6) Page 59435, column 2, paragraph 2 – Lynx require large boreal landscapes: Lynx in the contiguous U. S. do have large home ranges that exceed 80 km². Lynx are also territorial so their large spatial-use areas constrain the number of individuals in any one mountain range. However, the phase “lynx populations in the DPS require large boreal
forest landscapes with high average snowshoe hare densities” is both important and
difficult to interpret in the context of critical habitat. What is a “large boreal
landscape”? Persistent lynx populations occur in the Garnet Mountains in Montana and
the Wyoming Range in Wyoming. Both these ranges support small lynx populations in
areas with a limited amount of boreal forest habitat. Thus, the inclusion of these
mountain ranges in critical habitat is inconsistent with the text as currently written. The
text should state that some mountain ranges with limited amounts of boreal forest have
supported persistent lynx populations.

7) Page 59437, column 1, paragraph 2 – critical habitat background: The proposed rule
clearly states that lynx habitat is equally protected both inside and outside critical
habitat on federal lands, including those administered by the BLM and Forest Service.
Therefore, the declaration of critical habitat apparently does little to alter federal
responsibilities for the species’ management. However, it was unclear how the
designation of critical habitat may affect lynx management and conservation on state
and tribal lands. Many state and federal biologists and county commissioners perceive
that a critical-habitat designation may impose added levels of species protection. This
perception is highlighted by the many lawsuits by non-government organizations
(NGO) over the specifics of critical-habitat delineation. Therefore, readers need to
fully understand what the inclusion or exclusion of a critical-habitat designation means
to lynx conservation and management on all lands. This is especially important for
state and tribal land holdings since these lands are proposed for exclusion in the final
rule.

2) Are you aware of any additional information concerning the historical and current
status, range, distribution, and population size of this distinct population segment
(DPS) including locations of any additional populations of lynx in contiguous U.S.?

The proposed rule correctly described the primary lynx populations in the contiguous U.S.
There is no additional information that I am aware of that would suggest missed populations that
warrant critical habitat designation. However, there is limited anecdotal evidence that lynx in the
GYA are declining. Attempts to trap lynx by RMRS in cooperation with the Wyoming Game
and Fish failed to find “native” lynx (all detected animals were believed to have traveled from
the Colorado introduction) in 2005-2006. The status of lynx in the GYA is an important
information need that has received little scientific attention; there is no available literature that
could be cited in the proposed rule.
3) Are you aware of any additional information on the biological or ecological requirements of lynx as it relates to the proposal to revise the critical habitat designation?

The biological or ecological requirements of lynx as they relate to the proposed rule are fairly well understood scientifically. These understandings were adequately described in this document.

4) Are you aware of any additional information on the amount, distribution and quality of lynx habitat in the contiguous United States as it relates to revised critical habitat for the DPS?

Boreal forests occupied by lynx are structured by natural and anthropogenic disturbance processes (Agee 2000). It appears that lynx habitat in the western U. S. has contracted significantly in the last decade from fire and insect outbreak, but these changes are fairly recent and not addressed in the lynx scientific literature. For example, in Colorado, approximately 400,000 acres of spruce-fir forests that support lynx in the San Juan Mountains (Rio Grande National Forest) experienced an almost complete die-off of Engelmann spruce from spruce-bud worm; this is some of the most important lynx habitat in Colorado. It is unknown the degree to which forests altered by harmful insects will continue to support local lynx populations in the San Juan Mountains. In addition, fire activity in the Northern Rockies has increased 60% since the mid-1980s at elevations between 5,500 ft and 8,800 ft (1,680 m to 2,690 m; Westerling et al 2006); this elevation zone largely overlaps lynx critical habitat. For example, wildfires in 2003 burned 37% of lynx habitat in Washington (Robert Naney, Resource Planner, USFS-R6, pers.com. 2007), while in 2007, the Jocko Lakes Fire on the Lolo National Forest (NF) and several large-scale fires throughout the Bob Marshall Wilderness Complex (Flathead and Lewis & Clark NF) burned tens of thousands of acres of high quality lynx habitat in Montana.

The proposed rule mentioned that forest management in Maine shifted from clearcuts to partial cuts, which resulted in a reduction of lynx habitat (page 59445, column 3, paragraph 2). As was stated, this change in forest practice could result in a >50% reduction of lynx habitat by 2032. It was unclear if this reduction in habitat was primarily due to partial cutting, or if herbicide-use was also greatly curtailed to maintain conifer plantations. The context of the reported 50% reduction was difficult to determine. Would the anticipated >50% decline represent “historical” lynx habitat in the state prior to the extensive habitat fragmentation from earlier clearcutting and herbicide treatment? It would be helpful if this relationship was better explained as the proposed critical habitat in Maine is assessed.
5) Are you aware of other information of the projected and likely impacts of climate change on lynx and its habitat, and if so, how will these impacts alter the quantity and distribution of landscapes capable of supporting lynx in the contiguous U. S.?

The USFWS was justified, in my opinion, to elevate climate change as an important factor that will affect the persistence and spatial arrangement of lynx habitat in the contiguous U.S. The proposed rule provided clear documentation of how climate change influences spring-melt dates, temperature, precipitation and snow depth. As the USFWS contends, it is plausible that climate change will cause lynx habitat to contract to higher elevations and will accordingly become smaller in extent and more fragmented. This could potentially greatly reduce population persistence across the continental U.S., and decrease connectivity within a greater metapopulation structure with Canada. It is also plausible that a reduced snow depth, increased habitat patchiness, and an earlier spring melt may alter exploitation and interference competition by generalist predators (Buskirk et al. 2000). Although currently being researched in the Northern Rockies, I am unaware of other information of projected climate impacts on lynx and its habitat.

Climate change alters the disturbance patterns associated with fires and insect outbreaks in boreal forests (Soja et al. 2007). These factors are already a major force in structuring the extent and composition of forests that support lynx in the western U.S. For example, insect outbreaks in lodgepole pine and spruce-fir forests have dramatically altered lynx habitat in Colorado. Wildfires have changed the amount and composition of lynx habitat in Washington and Montana. However, the influence of climate change on disturbance processes in lynx habitat is not described in the peer-reviewed literature. The USFWS is justified to highlight these climate-related effects based on the more general climate change literature and the observed recent declines of lynx habitat in Colorado, Washington, and Montana.

6) Are our assumptions and definitions of critical habitat logical and adequate?

The proposed rule correctly identified (page 59446, column 3, paragraph 2-3) that lynx exhibit a lagged-population synchrony with northern populations according to McKelvey et al. (2000). Thus, it follows that critical habitat should primarily include southern populations with direct connectivity to the north, which is the case in the proposed rule. However, there is an explicit assumption in the narrative that southern lynx populations require demographic rescue periodically from the north. This assumption was partially justified from documented genetic similarity between southern and northern lynx populations (Schwartz et al. 2002). However, it is unknown if augmentation from northern populations is sufficient for demographic rescue. This uncertainty was poorly articulated in the narrative. We also do not know if the lagged synchrony documented by McKelvey et al. (2000) resulted from the physical movement of animals from the north or if southern populations increased due to a related environmental factor (e.g. increased hare abundance). The former assumption seems most plausible, but this uncertainty was not communicated in the proposed rule. We have conducted lynx research in Montana since 1998
and have never documented a large incursion of lynx. In addition, the proposed rule assumes that peripheral southern populations (outside proposed critical habitat) failed to persist due to unsuitable habitat conditions. This may be true, but the proposed rule fails to mention that no large incursion of lynx has happened in the western U. S. without active persecution of peripheral populations. For example, approximately 20 lynx were harvested from both the Pioneer Mountains (Montana) and the Wyoming Range (Wyoming) immediately following the 1972-3 incursion. The abundance or distribution of lynx in these ranges may have been different today if the early emigrants were protected from excessive harvest.

As mentioned, the central assumption of proposed critical habitat is that connectivity with northern populations is the primary driver of persistent southern lynx populations. However, maintaining connectivity for lynx populations in the contiguous U. S. may become increasingly difficult in the future due to climate and anthropogenic change, as evidenced by reduced connectivity of other boreal species (van Oort et al. 2011). This added risk was not discussed in the proposed rule. Scientific evidence suggests that range contraction and decreased viability is prevalent in southern peripheral populations of boreal species (Wirsing et al. 2002, Schaefer 2003, Laliberte and Ripple 2004, Bayne et al. 2008, Koehler et al. 2008, DeCesare et al. 2011). Recent collapses of population cycles and synchrony have also been observed in southern populations of many boreal species due to changing climate and community dynamics (Ims et al. 2008). A dampened hare/lynx cycle in Canada may cause demographic and genetic impacts to southern populations that alter lynx critical habitat over time.

7) Are our conclusions logical and supported by the evidence we provide?

The most difficult issue addressed in the proposed rule is the inclusion or exclusion of western Colorado as critical habitat. Available science offers little guidance in how to address this issue. The proposed rule states that Colorado should be excluded from critical habitat because: 1) it is an introduced population that lacks the primary constituent elements (PCE) necessary to support persistent populations, 2) Colorado has a tenuous documentation of lynx presence prior to the introduction by Colorado Parks and Wildlife; 3) Colorado is disjoint from populations to the north that could provide population rescue; and 4) patchy habitat distribution results in low hare abundance (< 1.0 hares/ha) across much of the landscape. In conclusion, the proposed rule states, “the Service has determined that the Southern Rocky Mountains likely do not possess the physical and biological features essential to lynx in sufficient quantities, quality, and spatial arrangement to sustain lynx populations over time.”

The long-term persistence of the lynx in Colorado is unknown. The assumption that introduced populations may be more tenuous compared to natural populations is probably true in most cases. However, some assumptions used to exclude Colorado could also be used to exclude other “natural” populations from critical habitat. Thus, the decision to exclude the Southern Rockies as critical habitat seems to stem mostly from the fact that lynx were introduced to
Colorado as a management action in a region where the historical population status was unclear. Some of the logic to exclude Colorado in the proposed rule seems inconsistent when compared to native populations. For example, Colorado currently may support more lynx than northwest Wyoming or Minnesota. The kittens from introduced lynx in Colorado are now old enough to produce kittens of their own. In Wyoming, the montane forests that support lynx are much smaller than suitable lynx habitat in San Juan Range of Colorado. Although hare density can be high in small patches of habitat in Wyoming (Berg et al. 2012), the landscape-level density of hares in Wyoming may be similar to Colorado. The Service states that Colorado lacks connectivity with northern populations (page 59449, column 3, paragraph 1) for north to south movements. However, there are several documented movements (males and females from Colorado occupying historical home ranges in Wyoming) of lynx traveling south to north across that same landscape. Thus, Colorado lynx have demonstrated that connectivity is possible with native populations in the GYA. In Minnesota, the resident lynx population included in critical habitat may be just as ephemeral as the Colorado introduction (see question 1). These examples illustrate the potential problems in logic used to exclude Colorado from critical habitat as presented. It was also unclear to readers if defining critical habitat in Colorado would impose a management burden on state and federal agencies, given that lynx are equally protected on federal lands regardless of designation as stated (page 59437, column 1, paragraph 2).

USFWS proposed to exclude tribal and State of Montana Department of Natural Resources and Conservation (MDNRC) lands. MDNRC administers lands that are disjunctive in spatial arrangement across Montana. However, MDNRC holdings in the Garnet and Whitefish Ranges in western Montana are in lynx core habitat and these lands are important to the species’ conservation and management. It was also unclear from the narrative why tribal lands in the Mission Range west of Highway 93 were excluded from critical habitat. The proposed rule simply states (Page 59457, column 1, paragraph 2) that these lands were excluded in the 2009 critical habitat declaration relative to “government to government relationships with tribes.” The rationale for exclusion of tribal lands should be fully explained in the current proposed rule.

The rationale to exclude MDNRC lands in the proposed rule (Page 59457, column 1, paragraph 1) was the Habitat Conservation Plan (HCP). It was unclear if the HCP or if the critical habitat designation best facilitates lynx management and conservation. The basic rationale that a management plan (e.g. HCP) can be declared in lieu of critical habitat was applied inconsistently. For example, U. S. Forest Service lands that support lynx in the continental U.S. are managed under a Lynx Conservation Agreement and Strategy (LCAS), but these lands are still classified as critical habitat in the proposed rule. Although both the MDNRC’s HCP and the LCAS provide thoughtful approaches to lynx management and conservation, the use of a management guideline as a surrogate for formally defining critical habitat is questionable. It seems unlikely that an agencies’ management plan is comparable to formally identifying critical habitat under the Endangered Species Act. The justification for exclusion of MDNRC lands needs to be better articulated. Readers need to fully understand the true impact of a critical
habitat designation on habitat management and protection for lynx. Given that the MDNRC already manages their lands for lynx under the HCP, how does a critical habitat designation impose any added burdens to the agency?

8) Did we include all necessary and pertinent literature to support our assumptions and conclusions?

The included literature was sufficient to support the primary issues that relate to critical habitat designations. I did not notice the following literature that relates to lynx and hare management:


9) Are there any significant oversights, omissions or inconsistencies in the proposed rule?

The proposed rule was complete in the reported science that related to the designation of critical habitat; omissions and inconsistencies were discussed above.

Sincerely,

John R. Squires
Research Wildlife Biologist
Rocky Mountain Research Station
Room 263, Federal Building
200 E. Broadway
Missoula, MT 59802
References


