



May 4, 2013

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
MONTANA FIELD OFFICE
585 SHEPARD WAY, SUITE 1
HELENA, MONTANA 59601

Dear Brent Esmoil;

As per your request, I have provided comments and served as a peer reviewer on the proposed listing of a distinct population segment (DPS) of the North American wolverine. Comments on the nonessential experimental population in the southern Rocky Mountains will be coming shortly under a different cover letter.

Your letter requesting me to peer review the document suggested that I focus on the following issues:

- (1) Is our description and analysis of the biology, habitat, population trends, and historic and current distribution of the species accurate?
- (2) Do the Proposed Rules provide accurate and adequate review and analysis of the factors affecting the species?
- (3) Are there any significant oversights, omissions or inconsistencies in our proposed rules?
- (4) Are the conclusions we reach logical and supported by the evidence we provide?
- (5) Did we include all the necessary and pertinent literature to support our assumptions/arguments/conclusions?

I address each of questions individually below. However before discussing these points, I want to note that I found the document very well written, logical, and informative. I commend the Service on an excellent piece of work.

(1) Is our description and analysis of the biology, habitat, population trends, and historic and current distribution of the species accurate?

Overall the document does an excellent job on the analysis of the biology, habitat, population trends and distribution of the species. Below are some points that need some clarification:

- Taxonomy. Given the reference of two subspecies in the taxonomy section, it would be helpful to note which studies refer to the North American subspecies, and which are finding from Eurasia. For example, the statistic that the average age to reproduction was 3.4 years is from Scandinavia and should be noted.
- Natal Dens. The discussion of natal dens suggests slight differences in minimum elevation between Montana and Idaho. It needs to be clearer that the Idaho samples are from Central Idaho, not Northern Idaho, and this difference is a function of latitude.
- Food Habits. It is noted that wolverines primarily scavenge on carrion. It should be noted that there are many report of wolverine also killing ungulates.



- Abundance Estimates. More details are needed as to how the abundance estimate of wolverine in the United States was obtained. This is not a formal population estimate, but is a best guess based on extrapolating density from a small area across the entire distribution. This may be inflated as it could easily contain areas that have habitat, but are unoccupied. Currently there are no formal estimates of wolverine abundance except for in individual mountain ranges.
- Anecdotal Evidence. I applaud the Service for their caution on using anecdotal evidence, especially when trying to define historical range. Many listing decisions consider all evidence equally, which leads to errors. This decision considers the validity of the source and type of data before using it to make inferences.
- Distribution. The distribution lists 5 Rocky Mountain states with wolverine records. It should also note New Mexico. The proposed rule does an excellent job noting the disjunct nature of the Pacific Coast wolverines. Wolverine, like fishers, great grey owls, and several tree species have a population that persisted in a Southern Sierra Nevada refugia, as well as a population further north that is more consistent with the main boreal population. The proposed rule did a good job noting that there is not a wolverine population, nor evidence of female wolverines in the Sierra Nevada. This section could be strengthened by noting the substantial genetic difference between historical samples from the Sierra Nevada, samples from the U.S. Rocky Mountains, and the Cascades. Each region has its own geographically unique haplotype, suggesting disjunct populations.
- Discreteness of DPS. In the analysis of discreteness of the DPS, the wolverine is considered a DPS due to the International boundary. It can also be argued that the population is discrete due to the fact that it is markedly separated from other populations (see Schwartz et al. 2009). Later in the document it is noted that only a small subset of haplotypes are found in the U.S. Rocky Mountains compared to Canada, indicative of a barrier to movement. This suggests marked separation bolstering the argument for a discrete DPS.
- Climate Change. The Service does a good job with describing the general state of climate science and studies specific to climate change and wolverine (McKelvey et al. 2011). However, on page 7875 they note that “changes in temperature and rainfall patterns are expected to shift the distribution of ecosystems northward and up mountain slopes.” This is an oversimplification. Please see Crimmins et al. (2011; Science) and Dobrowski et al. (2013; Global Change Biology) to show how climate velocity and direction is not necessarily northward and up, but can be counterintuitive. Dobrowski et al. (2013) provides average climate velocities for regions within the wolverine DPS.
- Dispersal influenced by infrastructure development. There was a Ph.D. project conducted by N. Balkenhol (University of Idaho) that examined the influence of population density (Carroll et al. 2001) and its influence of wolverine gene flow. He showed that at the large scale (in a multi-scalar analysis), population density was significant in its limiting gene flow.

(2) Do the Proposed Rules provide accurate and adequate review and analysis of the factors affecting the species?

I think the proposed rule provides an accurate review of the factors affecting the species. It does a good job showing the multiple interacting dynamics that are influencing the wolverine’s geographic

range (decline from initial European settlement, recovery due to protection and elimination of large scale predator poisoning and trapping, current effects of trapping, and future predictions under climate change). It also clearly sets the bar for what is accepted as reliable scientific evidence.

One concern is the conclusion that targeted and incidental trapping are not a threat to the wolverine DPS. While this statement may be correct, it would be better supported by Population Viability Analyses (PVA), where this hypothesis could be directly tested. A simple sensitivity analysis based on the numbers presented in this proposed rule would show that adult survival is the most sensitive demographic parameter. Thus, it is possible that even a minimum amount of trapping of a population of such small size, targeted on the right age class could be important. A formal PVA would assess this. Similarly a PVA could be structured to consider the joint impact of climate change and trapping. Lastly, a PVA could examine the impact of increased or reduced incidental harvest from trapping of wolves, bobcats, and other species.

I am also concerned with the statement in “Summary of Factor E” that loss of genetic diversity due to small effective population sizes, by itself is not a threat to the wolverine DPS. With an effective population size of less than 50 this could be an issue without the additive consideration that the sub-populations in the wolverine meta-population is likely to become more isolated in the future.

(3) Are there any significant oversights, omissions or inconsistencies in our proposed rules?

No. As noted above, this is a thorough document that justifies its conclusions based on scientific data.

(4) Are the conclusions we reach logical and supported by the evidence we provide?

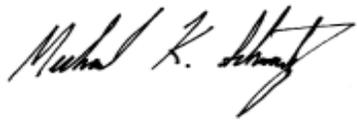
Yes.

(5) Did we include all the necessary and pertinent literature to support our assumptions/arguments/conclusions?

Yes. The review committee should be aware of two papers that are currently in the review process. The first, Ellis et al. is currently accepted in Conservation Biology. This manuscript details the power to detect trend in a wolverine monitoring program should one be initiated. The second, McKelvey et al. is currently in review and details the historical and contemporary haplotypes found in the DPS. This second manuscript has additional information concerning the historical range / distribution of wolverines and can provide information concerning historical connectivity among populations (of interest for the listing and special 4(d) rule). Both manuscripts have been shared with the Service.

If you have any questions regarding my review, please don't hesitate to contact me at mkschwartz@fs.fed.us or (406) 542-4161. In addition, the proposed rule asks about interest in participating in recovery efforts for this species. Please consider the services of myself and my genetics team.

Sincerely,

A handwritten signature in black ink, reading "Michael K. Schwartz". The signature is written in a cursive style with a large, stylized initial 'M'.

Michael K. Schwartz, Ph.D.
Conservation Genetics Team Leader / Research Ecologist