<u>Jeff Copeland Review</u>

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

[FWS–R6–ES–2012–0107]

[4500030113]

RIN 1018–AY26

Endangered and Threatened Wildlife and Plants; Threatened Status for the Distinct Population Segment of the North American Wolverine Occurring in the Contiguous United States

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service, propose to list the distinct population segment of the North American wolverine occurring in the contiguous United States, as a threatened species under the Endangered Species Act. If we finalize this rule

as proposed, it would extend the Act's protections to this species. The effect of this regulation is to add the distinct population segment of the North American wolverine occurring in the contiguous United States to the List of Endangered and Threatened Wildlife (50 CFR 17.11). We also propose a special rule under section 4(d) of the Act to apply the specific prohibitions of the Act necessary to protect the wolverine. We find that critical habitat is not determinable at this time. The Service seeks data and comments from the public on this proposed listing rule, the proposed special rule under section 4(d) of the Act, and our finding that the designation of critical habitat for the species is not determinable at this time.

DATES: We will accept comments received or postmarked on or before [INSERT DATE 90 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES** section, below) must be received by 11:59 p.m. Eastern Time on the closing date. We must receive requests for public hearings, in writing, at the address shown in the **ADDRESSES** section by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

Public Informational Sessions and Public Hearing: We will hold 3 public informational sessions and public hearings on this proposed rule. Public informational sessions will occur from 2:00 p.m. to 5:00 p.m. and public hearings will be held from 7:00 p.m. to 9:00 p.m. at each location. Public informational sessions and public hearings will occur in Boise, ID, on March 13, 2013, from 7:00 p.m. to 9:00 p.m.; in Lakewood, CO, on March

19, 2013, from 7:00 p.m. to 9:00 p.m.; and in Helena, MT, on March 27, 2013, from 7:00 p.m. to 9:00 p.m., all times local (see **ADDRESSES**). Registration for those providing testimony in the public hearings will begin at 6:00 p.m. at each location.

ADDRESSES: You may submit comments by one of the following methods:

(1) *Electronically*: Go to the Federal eRulemaking Portal: *http://www.regulations.gov*. In the Keyword box, enter Docket No. FWS–R6–ES–2012–0107, which is the docket number for this rulemaking. Then, in the Search panel on the left side of the screen, under the Document Type heading, click on the Proposed Rules link to locate this document. You may submit a comment by clicking on Comment Now!"

(2) *By hard copy*: Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R6–ES–2012–0107; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

(3) *At a public hearing*: We are holding three public hearings on this proposed rule (see **ADDRESSES** for location information). You may provide your comments at any of the three hearings.

We request that you send comments **only** by the methods described above. We will post all comments on *http://www.regulations.gov*. This generally means that we will post any personal information you provide us (see the **Public Comments** section below for more information).

Public Informational Sessions and Public Hearings: Public informational sessions and public hearings will be held on March 13, 2013, at the Boise Centre on the Grove, 850 West Front Street, Boise, ID 83702. The second is scheduled on March 19, 2013, at the Hampton Inn, 137 Union Boulevard, Lakewood, CO 80228. The third is scheduled on March 27, 2013, at the Red Lion Colonial Inn, 2301 Colonial Drive, Helena, MT 59601. At all three locations the public informational session will run from 2:00 p.m. to 5:00 p.m., followed by public speaker registration at 6:00 p.m., and then the public hearing for oral testimony from 7:00 p.m. to 9:00 p.m. People needing reasonable accommodations in order to attend and participate in the public hearing should contact Brent Esmoil, Montana Ecological Services Field Office, as soon as possible (see **FOR FURTHER INFORMATION CONTACT**).

Any additional tools or supporting information that we may develop for this rulemaking will be available at http://www.fws.gov/mountain-prairie/species/mammals/wolverine/, at http://www.regulations.gov at Docket No. FWS–R6–ES–2012–0107, and at the Montana Field Office (see **FOR FURTHER INFORMATION CONTACT**).

FOR FURTHER INFORMATION CONTACT: Brent Esmoil, Field Supervisor (Acting), U.S. Fish and Wildlife Service, Montana Field Office, 585 Shepard Way, Helena, Montana 59601, by telephone (406) 449-5225. Persons who use a

telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800-877-8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act or ESA), if a species is determined to be an endangered or threatened species throughout all or a significant portion of its range, we are required to promptly publish a proposal in the **Federal Register** and make a determination on our proposal within 1 year. Critical habitat shall be designated, to the maximum extent prudent and determinable, for any species determined to be an endangered or threatened species under the Act. Listing a species as an endangered or threatened species and designations and revisions of critical habitat can only be completed by issuing a rule.

This rule consists of:

- A proposed rule to list the distinct population segment (DPS) of the North American wolverine occurring in the contiguous United States as a threatened species; and
- A proposed special rule under section 4(d) of the Act that outlines the prohibitions necessary and advisable for the conservation of the wolverine.

A proposed rule under section 10(j) of the Act to establish an experimental non-essential population of wolverine in Colorado is published concurrently in this issue of the **Federal Register**. Also, a draft Recovery Outline for the wolverine DPS is available on our website at http://www.fws.gov/mountain-prairie/species/mammals/wolverine/ or on http://www.regulations.gov.

The basis for our action. Under the Act, we can determine that a species is an endangered or threatened species based on any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; or (E) Other natural or manmade factors affecting its continued existence.

We have determined that habitat loss due to increasing temperatures and reduced late spring snowpack due to climate change is likely to have a significant negative population-level impact on wolverine populations in the contiguous United States. In the future, wolverine habitat is likely to be reduced to the point that the wolverine in the contiguous United States is in danger of extinction.

We will seek peer review. We are seeking comments from knowledgeable individuals with scientific expertise to review our analysis of the best available science and application of that science and to provide any additional scientific information to improve this proposed rule. Because we will consider all comments and information received

during the comment period, our final determinations may differ from this proposal.

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from the public, other concerned governmental agencies, Native American tribes, the scientific community, industry, or any other interested parties concerning this proposed rule. We particularly seek comments concerning:

(1) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to this species and regulations that may be addressing those threats.

(2) Additional information concerning the historical and current status, range, distribution, and population size of this species, including the locations of any additional populations of this species.

(3) Any information on the biological or ecological requirements of the species, and ongoing conservation measures for the species and its habitat.

(4) Current or planned activities in the areas occupied by the species and possible impacts of these activities on this species.

(5) The reasons why we should or should not designate habitat as “critical habitat” under section 4 of the Act (16 U.S.C. 1531 *et seq*.) including whether and how the wolverine may benefit from such a designation; whether there are threats to the species from human activity, the degree to which it can be expected to increase due to a critical habitat designation, and whether that increase in threat outweighs the benefit of designation such that the designation of critical habitat may not be prudent;

(6) Specific information on the amount and distribution of wolverine habitat,

(7) Information on the projected and reasonably likely impacts of climate change on the wolverine and its habitat;

(8) Suitability of the proposed 4(d) rule for the conservation, recovery, and management of the DPS of the North American wolverine occurring in the contiguous United States.

(9) Additional information concerning whether it is appropriate to prohibit incidental take of wolverine in the course of legal trapping activities directed at other species in the proposed 4(d) rule, including any information about State management plans related to trapping regulations and any measures within those plans that may avoid or minimize the risk of wolverine mortality from incidental trapping for other species.

(10) Additional provisions the Service may wish to consider to conserve, recover, and manage the DPS of the North American wolverine occurring in the contiguous United States.

We will consider all comments and information received during the comment period on this proposed listing rule and special rule under section 4(d) of the Act during our preparation of a final determination. Accordingly, the final decision may differ from this proposal.

Please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or threatened species must be made "solely on the basis of the best scientific and commercial data available."

You may submit your comments and materials concerning this proposed rule by one of the methods listed in the **ADDRESSES** section. We request that you send comments **only** by the methods described in the **ADDRESSES** section.

If you submit information via *http://www.regulations.gov*, your entire submission—including any personal identifying information—will be posted on the website. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this

information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov*. Please include sufficient information with your comments to allow us to verify any scientific or commercial information you include.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov*, or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Montana Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Previous Federal Actions

On April 19, 1995, we published a finding (60 FR 19567) that a previous petition, dated August 3, 1994, submitted by the Predator Project (now named the Predator Conservation Alliance) and Biodiversity Legal Foundation to list the wolverine in the contiguous United States as an endangered or threatened species, did not provide substantial information indicating that listing the wolverine in the contiguous United States may be warranted.

On July 14, 2000, we received a petition dated July 11, 2000, submitted by the Biodiversity Legal Foundation, Predator Conservation Alliance, Defenders of Wildlife, Northwest Ecosystem Alliance, Friends of the Clearwater, and Superior Wilderness

Action Network, to list the wolverine within the contiguous United States as an endangered or threatened species and designate critical habitat for the species.

On October 21, 2003, we published a 90-day finding that the petition failed to present substantial scientific and commercial information indicating that listing may be warranted (68 FR 60112).

On September 29, 2006, as a result of a complaint filed June 8, 2005 by Defenders of Wildlife and others alleging we used the wrong standards to assess the July 11, 2000, wolverine petition, the U.S. District Court, Montana District, ruled that our 90-day petition finding (68 FR 60112) was in error and ordered us to submit to the **Federal Register** a 12-month finding for the wolverine by September 29, 2007. On April 6, 2007, the deadline for this 12-month finding was extended to February 28, 2008.

On March 11, 2008, we published a 12-month finding of "not warranted" for the wolverine in the contiguous United States (73 FR 12929). In that finding we determined that the wolverine in the contiguous United States did not constitute a distinct population segment or a significant portion of the range of a listable entity of the wolverine in North America and so was not a listable entity under the Act.

On July 8, 2008 we received a Notice of Intent to Sue from Earthjustice alleging violations of the Act in our March 11, 2008, 12-month finding. On September 30, 2008,

Earthjustice filed a complaint in the U.S. District Court, District of Montana, seeking to set aside and remand the 12-month finding back to the Service for reconsideration.

On March 6, 2009, the Service agreed to settle the case with Earthjustice by voluntarily remanding the 12-month finding and issuing a new 12-month finding by December 1, 2010. Following the settlement agreement, the court dismissed the case on June 15, 2009, and ordered the Service to comply with the settlement agreement.

On April 15, 2010, the Service published a Notice of Initiation of a 12-month finding for wolverines in the contiguous United States (75 FR 19591). That finding was published on December 14, 2010, and determined that the wolverine in the contiguous United States constituted a Distinct Population Segment and that the DPS warranted listing under the Act, but that listing was precluded by higher priority listing actions (75 FR 78030).

On September 9, 2011, we reached an agreement with plaintiffs in *Endangered Species Act Section 4 Deadline Litig.*, Misc. Action No. 10-377 (EGS), MDL Docket No. 2165 (D. D.C.) (known as the "MDL case") on a schedule to publish proposed rules or to withdraw warranted findings for the species on our list of candidate species. This agreement stipulated that we would submit for publication in the **Federal Register** a proposed listing rule for the wolverine, or withdraw the warranted 12-month finding, no later than the end of the 2013 Fiscal Year.

On April 13, 2012, several parties filed an action challenging the Service's December 14, 2010 warranted but precluded finding for wolverine. *Cottonwood Envtl. Law Ctr., et al. v. Salazar, et al.*, 9:12-cv-00057-DLC (D. Mont.) On September 20, 2012, the court granted the Service's motion to stay that litigation based on the Service's representation to the Court that it expected to submit this rule or withdraw the warranted finding to the **Federal Register** by January 18, 2013.

THREATENED STATUS FOR THE CONTIGUOUS UNITED STATES WOLVERINE DPS:

Background

It is our intent to discuss below only those topics directly relevant to the listing of the contiguous United States DPS of the North American wolverine as a threatened species in this section of the proposed rule.

Species Information

Taxonomy and Life History

The wolverine has a Holarctic (habitats found in the northern continents) distribution including northern portions of Europe, Asia, and North America. The currently accepted taxonomy classifies wolverines worldwide as a single species, *Gulo*

gulo, with two subspecies. Old World wolverines are found in the Nordic countries of Europe, Russia, and Siberia and are part of the subspecies *Gulo gulo gulo*. New World wolverines occur in North America. The wolverines in the contiguous United States are a part of the New World subspecies, *G. g. luscus*: the North American wolverine (Kurten and Rausch 1959 p. 19; Pasitschniak-Arts and Lariviere 1995, p. 1). The species is known by several common names, including mountain devil, glutton, caracajou, quickhatch, gulon, skunk bear, as well as wolverine.

The wolverine is the largest terrestrial member of the family Mustelidae. Adult males weigh 12 to 18 kilograms (kg) (26 to 40 pounds (lb)), and adult females weigh 8 to 12 kg (17 to 26 lb) (Banci 1994, p. 99). The wolverine resembles a small bear with a bushy tail. It has a broad, rounded head; short, rounded ears; and small eyes. Each foot has five toes with curved, semi-retractile claws used for digging and climbing (Banci 1994, p. 99).

Comment [JC1]: See comment 1

A large number of female wolverines (40 percent) are capable of giving birth at 2 years old, become pregnant most years, and produce average litter sizes of 1 to 2 kits. In one study of known-aged females, none reproduced at age 2; 3 of 10 first reproduced at age 3; and 2 did not reproduce until age 4. The average age at first reproduction was 3.4 years (Persson *et al*. 2006, pp. 76-77). Another study indicated that the average age at first reproduction is likely more than 3 years (Inman *et al*. 2007c, p. 70). Pregnant females commonly resorb or spontaneously abort litters prior to giving birth (Magoun 1985, pp. 30-31; Copeland 1996, p. 43; Persson *et al*. 2006, p. 77; Inman *et al*. 2007c, p.

70). This may in turn preserve resources to increase reproductive success in subsequent years (Persson 2005, p. 1456). By age 3, nearly all female wolverines become pregnant every year, but energetic constraints due to low food availability result in loss of pregnancy in about half of them each year. It is likely that, in many places in the range of wolverines, it takes 2 years of foraging for a female to store enough energy to successfully reproduce (Persson 2005, p. 1456). It is likely that, despite the high rate of initiation of pregnancy, due to the spontaneous abortion of litters resulting from resource limitation, actual rates of successful reproduction in wolverines are among the lowest known for mammals (Persson 2005, p. 1456).

Comment [JC2]: See Comment 2

Supplemental feeding of females increases reproductive potential (Persson 2005, p. 1456). Food-supplemented females were also more successful at raising kits to the time of weaning, suggesting that wolverine reproduction and ultimately population growth rates and viability are food-limited. Female wolverines appear to use a complex strategy of food accumulation and caching to attain enough resources to successfully raise a litter (Inman *et al*. 2012b, pp. 640-641).

Breeding generally occurs from late spring to early fall (Magoun and Valkenburg 1983, p. 175; Mead *et al*. 1991, pp. 808-811). Females undergo delayed implantation until the following winter or spring, when active gestation lasts from 30 to 40 days (Rausch and Pearson 1972, pp. 254-257). Litters are born from mid-February through March, containing one to five kits, with an average in North America of between one and

two kits (Magoun 1985, pp. 28-31; Copeland 1996, p. 36; Krebs and Lewis 1999, p. 698; Copeland and Yates 2006, pp. 32-36; Inman *et al*. 2007c, p. 68).

Female wolverines use natal (birthing) dens that are excavated in snow. Persistent, stable snow greater than 1.5 meters (m) (5 feet (ft)) deep appears to be a requirement for natal denning, because it provides security for offspring and buffers cold winter temperatures (Pulliainen 1968, p. 342; Copeland 1996, pp. 92-97; Magoun and Copeland 1998, pp. 1317-1318; Banci 1994, pp. 109-110; Inman *et al*. 2007c, pp. 71-72; Copeland *et al*. 2010, pp. 240-242). Female wolverines go to great lengths to find secure den sites, suggesting that predation is a concern (Banci 1994, p. 107). Natal dens consist of tunnels that contain well-used runways and bed sites and may naturally incorporate shrubs, rocks, and downed logs as part of their structure (Magoun and Copeland 1998, pp. 1315-1316; Inman *et al*. 2007c, pp. 71-72). In Idaho, natal den sites occur above 2,500 m (8,200 ft) on rocky sites, such as north-facing boulder talus or subalpine cirques (steep-walled semicircular basin carved by a glacier) in forest openings (Magoun and Copeland 1994, pp. 1315-1316). In Montana, natal dens occur above 2,400 m (7,874 ft) and are located on north aspects in avalanche debris, typically in alpine habitats near timberline (Inman *et al*. 2007c, pp. 71-72). Offspring are born from mid-February through March and the dens are typically used through late April or early May (Myrberget 1968, p. 115; Magoun and Copeland 1998, pp. 1314-1317; Inman *et al*. 2007b, pp. 55-59). Occupation of natal dens is variable, ranging from approximately 9 to 65 days (Magoun and Copeland 1998, pp. 1316-1317).

Females may move kits to multiple secondary (maternal) dens as they grow during the month of May (Pulliainen 1968, p. 343; Myrberget 1968, p. 115), although use of maternal dens may be minimal (Inman *et al*. 2007c, p. 69). Timing of den abandonment is related to accumulation of water in dens (due to snow melt), the maturation of offspring, disturbance, and geographic location (Myrberget 1968, p. 115; Magoun 1985, p. 73). After using natal and maternal dens, wolverines may also use rendezvous sites through early July. These sites are characterized by natural (unexcavated) cavities formed by large boulders, downed logs (avalanche debris), and snow (Inman *et al*. 2007c, pp. 55-56). Male wolverines likely mate with several females, and although they are not known to directly contribute to rearing young, they do tolerate subadult wolverines in their territories (usually their own offspring) until they reach maturity (Copeland 1996, p. 72).

Habitat, Space, and Food

In North America, wolverines occur within a wide variety of alpine, boreal, and arctic habitats, including boreal forests, tundra, and western mountains throughout Alaska and Canada. The southern portion of the species' range extends into the contiguous United States, including high-elevation alpine portions of Washington, Idaho, Montana, Wyoming, California, and Colorado (Wilson 1982, p. 644; Hash 1987, p. 576; Banci 1994, p. 102, Pasitschniak-Arts and Lariviere 1995, p. 499; Aubry *et al.* 2007, p. 2152; Moriarty *et al*. 2009, entire; Inman *et al*. 2009, pp. 22-25). Wolverines do not appear to specialize on specific vegetation or geological habitat aspects, but instead select areas

that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season (Copeland *et al*. 2010, entire). The requirement of cold, snowy conditions means that, in the southern portion of the species' range where ambient temperatures are warmest, wolverine distribution is restricted to high elevations, while at more northerly latitudes, wolverines are present at lower elevations and even at sea level in the far north (Copeland *et al*. 2010, Figure 1).

In the contiguous United States, wolverines likely exist as a metapopulation (Aubry *et al*. 2007, p. 2147, Figures 1, 3). A population is a group of interbreeding individuals of the same species. A metapopulation is a population composed of a network of semi-isolated subpopulations, each occupying a suitable patch of habitat in a landscape of otherwise unsuitable habitat (Pulliam and Dunning 1997, pp. 212-214). Metapopulations require some level of regular or intermittent migration and gene flow among subpopulations, in which individual subpopulations support one-another by providing genetic and demographic enrichment through mutual exchange of individuals (Meffe and Carroll 1997, p. 678). Individual subpopulations may go extinct or lose genetic viability, but are then "rescued" by immigration from other subpopulations, thus ensuring the persistence of the metapopulation as a whole. If metapopulation dynamics break down, either due to changes within subpopulations or loss of connectivity, then the entire metapopulation may be jeopardized due to subpopulations becoming unable to persist in the face of inbreeding or demographic and environmental stochasticity (Pulliam and Dunning 1997, pp. 221-222). The wolverine metapopulation in the DPS consists of a network of small subpopulations on mountain tops, some consisting of less than ten

individuals. Persistence of subpopulations under these conditions requires movement between subpopulations across both suitable and unsuitable wolverine habitat. Wolverines prefer to move across suitable habitat (as defined by persistent spring snow cover) rather than to cross unsuitable habitats during dispersal movements (Schwartz et al. 2009, p. 3230). Therefore, we would expect that changes resulting in reduction of suitable habitat conditions would result in reduced movement rates between habitat patches if distances between them became greater. This could affect the metapopulation as a whole if movement rates became too low to ensure subpopulation demographic or genetic health.

Wolverines are opportunistic feeders and consume a variety of foods depending on availability. They primarily scavenge carrion, but also prey on small animals and birds, and eat fruits, berries, and insects (Hornocker and Hash 1981, p. 1290; Hash 1987, p. 579; Banci 1994, pp. 111-113). Wolverines have an excellent sense of smell that enables them to find food beneath deep snow (Hornocker and Hash 1981, p. 1297).

Wolverines require a lot of space; the availability and distribution of food is likely the primary factor in determining female wolverine movements and home range size (Hornocker and Hash 1981, p. 1298; Banci 1994, pp. 117-118). Male wolverine home range size and location is likely tied to the presence of active female home ranges and breeding opportunities (Copeland 1996, p. 74). Female wolverines forage close to den sites in early summer, progressively ranging fa~~u~~rther from dens as kits become more independent (May *et al*. 2010, p. 941). Wolverines travel long distances over rough

terrain and deep snow, and adult males generally cover greater distances than females (Hornocker and Hash 1981, p. 1298; Banci 1994, pp. 117-118; Moriarty *et al*. 2009, entire; Inman *et al*. 2009, pp. 22-28; Brian 2010, p. 3; Copeland and Yates 2006, Figure 9). Home ranges of wolverines are large, and vary greatly in size depending on availability and distribution of food and gender and age of the animal. Home ranges of adult wolverines also vary in size depending on geographic location. Home ranges in Alaska were approximately 100 square kilometers (km^2) to over 900 km^2 (38.5 square miles (mi^2) to 348 mi^2) (Banci 1994, p. 117). Average home ranges of resident adult females in central Idaho were 384 km^2 (148 mi^2), and average home ranges of resident adult males were 1,522 km^2 (588 mi^2) (Copeland 1996, p. 50). Wolverines in Glacier National Park had average adult male home ranges of 496 km^2 (193 mi^2) and adult female home ranges of 141 km^2 (55 mi^2) (Copeland and Yates 2006, p. 25). Wolverines in the Greater Yellowstone Ecosystem had average adult male home ranges of 797 km^2 (311 mi^2), and average adult female home ranges of 329 km^2 (128 mi^2) (Inman *et al*. 2007a, p. 4). These home range sizes are large relative to the body size of wolverines, and may indicate that wolverines occupy a relatively unproductive niche in which they must forage over large areas to consume the amount of calories needed to meet their life-history requirements (Inman *et al*. 2007a, p. 11).

Comment [JC3]: Some of which probably also relates to sample size and method of home range calculation.

Comment [JC4]: See comment 3

Across their worldwide distribution, wolverines are dependent on persistent spring snow cover for successful reproduction (Pulliainen 1968, pp. 338-341; Myrberget 1968, p. 115; Copeland 1996, pp. 93-94; Magoun and Copeland 1998, pp. 1315-1319; Aubry *et al*. 2007, p. 2153; Inman *et al*. 2012a, p.785; Copeland *et al*. 2010, entire). No

records exist of wolverines denning anywhere but in snow, despite the wide availability of snow-free denning opportunities within the species' geographic range. The snow tunnels and complex structure associated with dens are likely required to protect young from interspecific and intraspecific predation (Persson *et al*. 2003, pp. 25-26; Magoun and Copeland 1998, p. 1318). A layer of deep snow may also add crucial insulation from cold temperatures and wind prevalent in wolverine habitat (Pulliainen 1968, p. 342; Bjärvall *et al*. 1978, p. 24-25; Copeland 1996, p. 100; Magoun and Copeland 1998, p. 1318).

Female wolverines have been observed to abandon reproductive dens when temperatures warm and snow conditions become wet (Magoun and Copeland 1998, p. 1316); this response indicates that the condition of the snow is also important to successful reproduction, and that the onset of spring snowmelt forces female wolverines to move kits into alternate denning sites with better snow conditions, if they are available. These movements may be energetically costly and subject females and kits to predation risk. The deep, persistent spring snow layer in the Copeland et al. (2010) model captures all known wolverine den sites in the DPS; however, on average, most denning occurs at higher elevations within the area defined by the model. Female wolverines establish reproductive dens at elevations higher than average elevations used by nonreproductive wolverines (Copeland 1996, p. 94; Magoun and Copeland 1998, pp. 1315-1316; Inman *et al*. 2007c, p. 71), suggesting that females find the conditions necessary for successful denning in the upper portion of their home range where snow is most persistent and occurs in the heaviest accumulations.

Wolverine year-round habitat use also takes place almost entirely within the area defined by deep persistent spring snow (Copeland et al. 2010, pp. 242-243). Within the DPS, this area is generally centered on the alpine tree line (the maximum elevation beyond which tree growth is precluded and only low-growing vegetation is found). In the contiguous United States, wolverine year-round habitat is found at high elevations centered near the tree line in conifer forests (below tree line) and rocky alpine habitat (above tree-line) and in cirque basins and avalanche chutes that have food sources such as marmots, voles, and carrion (Hornocker and Hash 1981, p. 1296; Copeland 1996, p. 124; Magoun and Copeland 1998, p. 1318; Copeland *et al*. 2007, p. 2211; Inman *et al*. 2007a, p. 11). In the southern portion of wolverine range in North America which includes the DPS, wolverines are constrained by their need for cold conditions and persistent spring snow to using only the coldest available landscapes (Copeland *et al*. 2010, Figure 6).

Mean seasonal elevations used by wolverines in the northern Rocky Mountains and North Cascades vary between 1,400 and 2,600 m (4,592 and 8,528 ft) depending on location, but are always relatively high on mountain slopes (Hornocker and Hash 1981, p. 1291; Copeland *et al*. 2007, p. 2207, Aubry *et al*. 2007, p. 2153; Inman et al. 2012, p.782). Elevation ranges used by historical wolverine populations in the Sierra Nevada and southern Rocky Mountains are unknown, but presumably wolverines used higher elevations, on average, than more northerly populations to compensate for the higher temperatures found at lower latitudes. In the contiguous United States, valley bottom habitat appears to be used only for dispersal movements and not for foraging or

reproduction (Inman *et al*. 2009, pp. 22-28). Wolverine reproductive dens have been located in alpine, subalpine, taiga, or tundra habitat (Myrberget 1968, p. 115; Pulliainen 1968, pp. 338-341; Bjärvall 1982, p. 318; Lee and Niptanatiak 1996, p. 349; Landa *et al*. 1998, pp. 451-452; Magoun and Copeland 1998, pp. 1317-1318). Wolverines rarely, or never, den in lower elevation forested habitats, although they may occupy these habitats occasionally (Magoun and Copeland 1998, p. 1317).

Wolverine Densities

Wolverines naturally occur in low densities with a reported range from one animal per 65 km^2 (25 mi^2), to one animal per 337 km^2 (130 mi^2) (Hornocker and Hash 1981, pp. 1292-1295; Hash 1987, p. 578; Copeland 1996, pp. 31-32; Copeland and Yates 2006, p. 27; Inman *et al*. 2007a, p. 10; Squires *et al*. 2007, p. 2218). No systematic population census exists over the entire current range of wolverines in the contiguous United States, so the current population level and trends are not known with certainty. However, based on our current knowledge of occupied wolverine habitat and wolverine densities in this habitat, it is reasonable to estimate that the wolverine population in the contiguous United States numbers approximately 250 to 300 individuals (Inman 2010b, pers. comm.). The bulk of the current population occurs in the northern Rocky Mountains, with a few individuals in the North Cascades and one known individual each in the Sierra Nevada and southern Rocky Mountains. Within the area known to currently have wolverine populations, relatively few wolverines can coexist due to their naturally low population densities, even if all areas were occupied at or near carrying capacity.

Given the natural limitations on wolverine population density, it is likely that historical wolverine population numbers were also low (Inman et al. 2007a, Table 6). Because of these natural limitations, it is possible that densities and population levels in the northern Rocky Mountains and North Cascades where populations currently exist may not be substantially lower than population densities were in these areas prior to European settlement. However, historically, the contiguous United States population would likely have been larger than it is today due to the larger area occupied by populations when the southern Rocky Mountains, Bighorn Mountains, Sierra Nevada, and possibly also the Oregon Cascades and mountains of Utah, were occupied at full capacity.

Comment [JC5]: See Comment 4

Wolverine Status in Canada and Alaska

The bulk of the range of North American wolverines is found in Canada and Alaska, where wolverines inhabit alpine tundra, boreal forest, and arctic habitats (Slough 2007, p. 78). Wolverines in Canada have been divided into two populations for management by the Canadian Government: an eastern population in Labrador and Quebec, and a western population that extends from Ontario to the Pacific coast, and north to the Arctic Ocean. The eastern population is currently listed as endangered under the Species At Risk Act in Canada, and the western population is designated as a species of special concern (COSEWIC 2003, p. 8).

The current status of wolverines in eastern Canada is uncertain. Wolverines have not been confirmed to occur in Quebec since 1978 (Fortin *et al*. 2005, p. 4). Historical

evidence of wolverine presence in eastern Canada is also suspect because no evidence exists to show that wolverine pelts attributed to Quebec or Labrador actually came from that region; animals were possibly trapped elsewhere and the pelts shipped through the eastern provinces (COSEWIC 2003, p. 20). Wolverines in eastern Canada may currently exist in an extremely low-density population, or may be extirpated. Wolverines in eastern Canada, both historically and currently, could represent migrants from western populations that never became resident animals (COSEWIC 2003, pp. 20-21). The Federal Government of Canada has completed a recovery plan for the eastern population with the goal of establishing a self-sustaining population through reintroduction and protection (Fortin *et al*. 2005, p. 16).

Wolverines in western Canada and Alaska inhabit a variety of habitats from sea level to high elevations (Slough 2007, pp. 77-78). They occur in Alaska, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, Yukon, Northwest Territories, and Nunavut (Slough 2007, pp. 77-78). Since European colonization, a generally recognized range contraction has taken place in boreal Ontario and the aspen parklands of Manitoba, Saskatchewan, and Alberta (COSEWIC 2003, pp. 20-21; Slough 2007, p. 77). This range contraction occurred concurrently with a reduction in wolverine records for the Great Lakes region in the contiguous United States (Aubry *et al*. 2007, pp. 2155-2156). Causes of these changes are uncertain, but may be related to increased harvest, habitat modification, or climate change (COSEWIC 2003, pp. 20-21; Aubry *et al*. 2007, pp. 2155-2156; Slough 2007, pp. 77-78). Analysis supports climate change as a factor contributing to population declines in southern Ontario, because snow conditions

necessary to support wolverines do not currently exist in the Great Lakes region of the contiguous United States, and are marginal in southern Ontario (Aubry *et al*. 2007, p. 2154). It is not known if these snow conditions existed historically in the Great Lakes of the contiguous United States; however, the small number of wolverine records from this area suggests that they did not. It is possible that suitable snow conditions did reach further south in eastern Canada in 1850 than they do today, making wolverine dispersal attempts from Canada to the Great Lakes region of the contiguous United States more likely than they are now. Wolverines occurred historically on Vancouver Island and have been given status as a separate subspecies by some (Hall 1981, p. 109). The Vancouver Island population is now regarded as possibly extirpated; no sightings have occurred since 1992 (COSEWIC 2003, p. 18).

Wolverines in western Canada and Alaska appear to persist everywhere that habitat and climate conditions are suitable (COSEWIC 2003, pp. 13-21; Aubry *et al*. 2007, pp. 2152-2155; Slough 2007, p. 79; Copeland *et al*. 2010, Figure 2). Throughout this area, wolverines are managed by regulated harvest at the Provincial and State level. Population estimates for Canada and Alaska are rough because no wolverine surveys have taken place at the State or Provincial scale. However, the population in western Canada is estimated to include approximately 15,089 to 18,967 individuals (COSEWIC 2003, p. 22). The number of wolverines in Alaska is unknown, but they appear to exist at naturally low densities in suitable habitats throughout the state (Alaska Department of Fish and Game 2004, pp. 1-359). We have no information to indicate that wolverine populations have been reduced in numbers or geographic range in Alaska.

The Complexity of Geographic Range Delineation

Information on the nature of historical and current locations of wolverine is lacking for several reasons. Wolverines tend to live in remote and inhospitable places away from human settlements, where they are seldom encountered, documented, or studied. Wolverines naturally occur at low population densities and are rarely and unpredictably encountered where they do occur. Wolverines often move long distances in short periods of time; for example, when dispersing from natal ranges, wolverines may transit through habitats that are unsuitable for long-term survival (Aubry *et al*. 2007, p. 2147; Moriarty *et al*. 2009, entire; Inman *et al*. 2009, pp. 22-28; Brian 2010, p. 3). Such movements make it difficult to distinguish with certainty between occurrence records that represent established populations in suitable habitats and records that represent short-term occupancy or exploratory movements without the potential for establishment of home ranges, reproduction, or populations. These natural attributes of wolverines make it difficult to precisely determine their present range, or trends in range expansion or contraction, that may have occurred in the past. Therefore, we are cautious and use multiple lines of evidence when trying to determine where past wolverine populations occurred.

Comment [JC6]: This doesn't really follow well with what is stated below in lines 658-660. See comment 5

Throughout the remainder of this proposed rule, we focus on the use of verifiable and documented wolverine occurrence records to define historical and present range as we have determined that these records constitute the best scientific information available

on the past and present distribution of wolverines (see Aubry *et al*. 2007, p. 2148; McKelvey *et al*. 2008, entire). Verifiable records are records supported by physical evidence such as museum specimens, harvested pelts, DNA samples, and diagnostic photographs. Documented records are those based on accounts of wolverines being killed or captured. Use of only verifiable and documented records avoids mistakes of misidentification often made in eyewitness accounts of visual encounters of unrestrained animals in the wild. Visual-encounter records often represent the majority of occurrence records for elusive forest carnivores, and they are subject to inherently high rates of misidentification of the species involved, including wolverines (McKelvey *et al*. 2008, pp. 551-552). These misidentifications can result in wildly inaccurate conclusions about species occurrence (McKelvey *et al*. 2008, pp. 550-553).

Aubry *et al*. (2007, entire) used only verifiable and documented records to investigate wolverine distribution through time. This paper is the only available comprehensive treatment of these distribution patterns that attempts to distinguish between records that represent resident animals versus animals that have dispersed outside of suitable habitat. For these reasons, we find that Aubry *et al.* (2007, entire) represents the best available summary of wolverine occurrence records in the contiguous United States at this time. Since the publication of Aubry *et al*. (2007, entire), verified records of wolverines have also been documented in Colorado and California, which we will describe in greater detail below.

Aubry *et al*. (2007, entire) used verifiable and documented records from museum collections, literature sources, and State and Federal institutions to trace changes in geographic distribution of wolverines in the historical record. They then used an overlay of suitable wolverine habitats to determine which records represent wolverines in habitats that may support residency, and, by extension, populations, and which records likely represent wolverines outside the range of suitable habitats, so called "extralimital" records. Aubry *et al*.'s (2007, entire) focus on verifiable and documented records corrected past overly broad approaches to wolverine range mapping (Nowak 1973, p. 22; Hall 1981, p. 1009; Wilson 1982, p. 644; Hash 1987, p. 576), which used a more inclusive but potentially misleading approach when dealing with occurrence records. Many of the extralimital records used in these publications represented individuals that dispersed from natal ranges but ended up in habitats that could not support wolverines. Use of these data to determine the historical geographic range of wolverines results in gross overestimation of the area that can actually be used successfully by wolverines for the establishment of populations. Subsequent to publication of Aubry *et al*. (2007, entire), two publications (Copeland *et al*. 2010, entire; Brock *et al*. 2007, entire) further refined our understanding of wolverine habitat needs and corroborated the approach of Aubry *et al*. (2007, entire). Thus, despite the paucity of verifiable records, we now have strong information on the areas that are currently suitable to be occupied by wolverine based on habitat and climate conditions.

Comment [JC7]: See Comment 5

We agree with Aubry *et al*. (2007, p. 2149) that the most appropriate method to determine the current and historical range of wolverines is to use a combination of

occurrence records and habitat suitability, along with other information, such as documented successful reproduction events, indicating where reproductive and potentially self-sustaining populations may occur. We also generally agree with their conclusions about the historical and current range of the species. We find that the species' range is the area that may support viable populations, and does not include extralimital occurrences outside of habitat that is likely to support wolverine life-history needs. Areas that can support wolverine populations may be referred to as potential "source" populations because they provide surplus individuals through reproduction beyond what is needed for replacement. Areas that have some of the habitat attributes of wolverine habitat but do not have enough habitat to support viable populations may be referred to as population "sinks" because wolverines may disperse to these areas and remain for some time, but will either die there without reproducing, leave the area in search of better habitat conditions, or may actually reproduce, but at a rate lower than that needed for replacement of individuals lost to mortality or emigration, leading to eventual population extinction.

Comment [JC8]: See Comment 5

For a widely dispersing species like the wolverine, we expect many locality records to represent dispersal attempts into sink habitats or nonhabitat. The value to the population (and thus the DPS) of dispersers in these areas is unclear; it is likely that most dispersers into sink habitats or nonhabitat will be lost to the population unless they are able to move back into source habitats. Therefore, it is our conclusion that population sink areas and areas of non-wolverine habitat, here defined as places where wolverines may be found but where habitat is not suitable for long-term occupancy and reproduction,

do not represent part of the species historical range and have little conservation value for the DPS, other than possibly serving as temporary stop-overs for attempted dispersers as they search for suitable habitats. Compared with broader approaches to defining historical geographic range, this focused approach (1) results in reducing the bias of extralimital dispersers and (2) concentrates conservation attention on areas capable of maintaining populations.

Comment [JC9]: See Comment 5

Aubry *et al*. (2007, pp. 2147-2148) divided records into "historical" (recorded prior to 1961), "recent" (recorded between 1961 and 1994), and "current" (recorded after 1994). Historical records occurred before systematic surveys. Historical records encompass the time during which wolverine numbers and distribution were hypothesized to be at their highest (prior to European settlement) and also at their lowest (early 20th century) (Wright and Thompson 1935; Grinnell *et al*. 1937; Allen 1942; Newby and Wright 1955, all as cited in Aubry *et al*. 2007, p. 2148). The recent time interval covers a hypothesized population expansion and rebound from the early 20th century low. Current records offer the most recent evidence available for wolverine occurrences and potential populations. All occurrence records must be individually analyzed in light of their context in terms of habitat conditions conducive to wolverine population establishment and whether or not they occur clustered with other records, which might indicate that populations have historically occurred in the area. The authors of Aubry *et al.* (2007) did such an analysis as they compiled their records.

Wolverine Distribution

We assessed the historical, recent, and current distribution data for each of the regions below to determine the likelihood of the presence of historical populations (rather than extralimital dispersers). Of 729 mappable records (those records with precise location information) compiled by Aubry *et al*. (2007, p. 2150), 188 were from the historical time interval (see Table 1). The discussion below draws heavily from both Aubry *et al*. (2007, entire) and Copeland *et al*. (2010, entire).

Table 1. Wolverine records from three time periods from Aubry *et al*. 2007. Numbers represent total documented and verifiable records with the subset of those records that were verifiable in parentheses.

	Historical (<1964)	Recent (1961-1994)	Current (>1994)
Northeast	13 (1)	0	0
Upper Midwest	4 (2)	0	0
Great Lakes	36 (4)	1	0
Central Great Plains	71* (2)	1	0
Rocky Mountains	147 (45)	332 (283)	215 (210)
Pacific Coast	89 (14)	23 (15)	7
TOTALS	362 (68)	357 (298)	222 (210)

* 35 records from a single source (the journals of Alexander Henry).

Northeast and Upper Midwest—The low number of records and scattered nature of their distribution combined with a lack of suitable habitat indicate that wolverines

were likely only occasional transients to the area and not present as a reproducing population after 1800.

Great Lakes—The lack of large numbers of verifiable records in this area of relatively high human population density and the lack of suitable habitat suggests that wolverines did not exist in this area as a viable population after 1900. Widely scattered records generally before 1900, along with occasional subsequent records suggest that if a reproducing population existed in the Great Lakes, it predated 1900, and that any post-1900 records represent dispersal from a receding Canadian population. Wolverine distribution in Ontario, Canada, appears to have receded north from the Great Lakes region since the 1800s, and currently wolverines occupy only the northern portion of the province, a distance of over 644 km (400 mi) from the United States border (COSEWIC 2003, p. 9). The distribution pattern of record illustrated in Aubry *et al.* (2007, p. 2152) is consistent with what would be expected if those records were of dispersing individuals from a Canadian population that receded progressively further north into Canada after 1800, possibly due to natural climate changes (COSEWIC 2003, p. 28).

Central Great Plains—The lack of precise locality records and suitable habitat from the Great Plains States leads us to conclude that reproducing populations of wolverines did not historically inhabit this area. Of thirty-six records from North Dakota, 35 are from the journals of a single fur trader (see Table 1), and it is not clear that the records represent actual collection localities or are localities where trades or shipments occurred (Aubry 2007, pers. comm.). Given the habitat relationships of wolverines (e.g.,

Copeland *et al*. 2010, Figure 1), it is unlikely that these records represent established wolverines or that this area served as wolverine habitat.

Rocky Mountains—Five Rocky Mountains States (Idaho, Montana, Wyoming, Colorado, and Utah) contained numerous wolverine records. Records with precise locality information appear to coalesce around several areas that may have been population centers, such as central Colorado, the greater Yellowstone region, and northern Idaho-northwestern Montana. The large number of verifiable and documented records for this region, along with the suggestion of population centers or strongholds, suggests that wolverines existed in reproducing populations throughout much of the Rocky Mountains during the historical time interval. The lack of records for Colorado and Utah after 1921 suggests that the southern Rocky Mountains population of wolverines was extirpated in the early 1900s, concurrent with widespread systematic predator control by government agencies and livestock interests. The northern Rocky Mountains population (north of Wyoming) was reduced to historical lows or possibly even extirpated during the early 1900s, and then increased dramatically in the second half of the 1900s (see Table 1) as predator control efforts subsided and trapping regulations became more restrictive (Aubry *et al*. 2007, p. 2151). This increase likely indicates a population rebound from historical lows in this period.

Wolverine records from 1995 to 2005 indicate that wolverine populations currently exist in the northern Rocky Mountains (see Table 1). Legal trapping in Montana in the recent past removed an average of 10.5 individuals from this population

each year (Montana Department of Fish, Wildlife, and Parks 2007, p. 2), but harvest mortality has been reduced due to regulatory changes in 2008 (Montana Department of Fish, Wildlife and Parks 2008, p. 8). Populations in British Columbia and Alberta, Canada, are extant (COSEWIC 2003, pp. 18-19), and may have been a source of surplus wolverines to the contiguous United States population during population lows. Recently, a male wolverine moved on its own from the southern Greater Yellowstone Area of Wyoming into the southern Rocky Mountains of Colorado, where it still persisted as of November 2012 (Inman *et al*. 2009, pp. 22-26; Odell 2012, pers. comm.). This attempted dispersal event is the first verified wolverine occurrence in Colorado since 1919 and may represent a continuation of the wolverine expansion in the Rocky Mountains detailed above. It is possible that other wolverines have traveled to the southern Rocky Mountains and have remained undetected. There is no evidence that Colorado currently hosts a wolverine population or that female wolverines have made, or are likely to make, similar movements. Female dispersal movements tend to be much shorter than males, usually occupying home ranges adjacent to their natal range, and dispersal is documented only for lesser distances than males routinely travel (Hornocker and Hash 1981, p. 1290; Copeland 1996, p. 91; Kyle and Strobeck 2001, p. 338; Tomasik and Cook 2005, p. 390; Cegelski *et al*. 2006, p. 206, Inman *et al*. 2011, p. 7). The largest documented female movement occurred in 2010 in the North Cascades of Washington (Aubry *et al*. 2011, pp. 21-22). In that instance, a radio-collared female wolverine moved an air-line distance of approximately 233 km (145 mi) over a 44-day period. During this movement, her course generally stayed within suitable wolverine habitat (as defined by Copeland *et al*. (2010, p. 242)) and was never more than about 19 km (12 mi) from suitable wolverine habitat.

Pacific Coast—Historical records show that wolverines occurred in two population centers in the North Cascades Range and the Sierra Nevada. However, records do not show occurrences between these centers from southern Oregon to northern California, indicating that the historical distribution of wolverines in this area is best represented by two disjunct populations rather than a continuous peninsular extension from Canada. This conclusion is supported by genetic data indicating that the Sierra Nevada and Cascades wolverines were separated for at least 2,000 years prior to extirpation of the Sierra Nevada population (Schwartz *et al*. 2007, p. 2174).

Only one Sierra Nevada record exists after 1930, indicating that this population was likely extirpated in the first half of the 1900s, concurrent with widespread systematic predator control programs. In 2008, a male wolverine was discovered in the Sierra Nevada Range of California, the first verified record from California since 1922 (Moriarty *et al*. 2009, entire). Genetic testing revealed that this wolverine was not a descendant of the endemic Sierra Nevada wolverine population, but was likely derived from wolverines in the Rocky Mountains (Moriarty *et al*. 2009, p. 159). This attempted dispersal event may represent a continuation of the wolverine expansion in the contiguous United States as detailed above. Other wolverines may have travelled to the Sierra Nevada and remain undetected. There is no evidence that California currently hosts a wolverine population or that female wolverines have made, or are likely to make, similar dispersal movements.

Wolverines were likely extirpated from the North Cascades in the early 20th century and then recently recolonized from Canada. Currently, a small population persists in this area (Aubrey *et al*. 2011, entire). In 2012, reproduction was documented for the first time in the North Cascades (Aubry *et al*. 2012, p. 2). Wolverines have also been documented in the southern portion of the North Cascades, near Mount Adams, since 2009 (Akins 2010, p. 4). The North Cascades population may be connected with, and is possibly dependent on, the larger Canadian population for future expansion and long-term persistence.

Summary of Wolverine Distribution

Historical wolverine records were found across the northern tier of the contiguous United States, with convincing evidence of wolverine populations in the northern and southern Rocky Mountains, Sierra Nevada Mountains, and North Cascades Mountains (Aubry *et al*. 2007, p. 2152).

Currently, wolverines appear to be distributed as functioning populations in two regions in the contiguous United States: the North Cascades in Washington, and the northern Rocky Mountains in Idaho, Montana, and Wyoming (this area also includes the Wallowa Range in Oregon). Wolverines were likely extirpated, or nearly so, from the entire contiguous United States in the first half of the 20th century (Aubry *et al*. 2007, Table 1). Although the reasons for this extirpation are not known with certainty, unregulated trapping and widespread indiscriminant predator control likely contributed to

population declines. The available evidence suggests that, in the second half of the 20th century and continuing into the present time, wolverine populations have expanded in the North Cascades and the northern Rocky Mountains from sources in Canada, but that populations have not been reestablished in the Sierra Nevada Range or the southern Rocky Mountains, despite the known movement of single individual males to each of these areas. We conclude that the current range of the species in the contiguous United States includes the North Cascades Mountains, the northern Rocky Mountains, the southern Rocky Mountains, and the Sierra Nevada Mountains, but that reestablishment of populations in the southern Rocky Mountains and Sierra Nevada Mountains has not yet occurred.

We also conclude that wolverines either did not exist as established populations, or were extirpated prior to settlement and the compilation of historical records, in the Great Lakes region, possibly due to climate changes that occurred through the 1800s and 1900s. The Great Lakes region lacks suitable wolverine habitat, and suitable habitat does not appear to exist in adjacent Canada (Copeland *et al*. 2010, Figure 1). The widely scattered records from this region are consistent with dispersing individuals from a Canadian population that receded north early in the 1800s. We cannot rule out the possibility that wolverines existed as established populations prior to the onset of trapping in this area, but we have no evidence of this.

No evidence in the historical records indicates that wolverines were ever present as established populations in the Great Plains, Midwest, or Northeast.

Habitat Relationships and Wolverine Distribution

~~Deep~~The area defined by the distribution of deep, persistent, and reliable spring snow cover (April 15 to May 14) is the best overall predictor of wolverine occurrence in the contiguous United States (Aubry *et al*. 2007, pp. 2152-2156; Copeland *et al.* 2010, entire). Deep, persistent snow correlates well with wolverine year-round habitat use across wolverine distribution in North America and Eurasia at both regional and local scales (Copeland *et al*. 2010, entire; Inman *et al*. 2012a, p. 785). It is uncertain why spring snow cover so accurately predicts wolverine habitat use; however, it is likely related to wolverines' need for deep snow during the denning period. In addition, wolverines appear to take advantage of a cold, low-productivity niche by using food caching in cold habitats to survive food-scarce winters that other carnivores cannot (Inman *et al*. 2012b, pp. 640-642). Wolverines' physiological requirement for year-round cold temperatures may also play a role in habitat use (Copeland *et al*. 2010, pp. 242-243). Snow cover during the denning period is essential for successful wolverine reproduction range-wide (Hatler 1989, p. iv; Magoun and Copeland 1998, p. 1317; Inman *et al*. 2007c, pp. 71-72; Persson 2007; Copeland *et al*. 2010, p. 244). Wolverine dens tend to be in areas of high structural diversity such as logs and boulders with deep snow (Magoun and Copeland 1998, p. 1317; Inman *et al*. 2007c, pp. 71-72; Persson 2007, entire). Reproductive females dig deep snow tunnels to reach the protective structure provided by logs and boulders. This behavior presumably protects the vulnerable kits from predation~~ by large carnivores~~, including other wolverines (Pulliainen 1968, p. 342;

Comment [JC10]: Organisms do not survive in a "low productivity," "food-scarce" environment. See Comment 6.

Comment [JC11]: A physiological requirement for cold temperatures has not been empirically demonstrated. Copeland et al. (2010) considered this as a contributing factor to wolverine year-around presence at high elevation. I think this is covered below in lines 888-889.

Zyryanov 1989, pp. 3-12), but may also have physiological benefits for kits by buffering them from extreme cold, wind, and desiccation (Pullianen 1968, p. 342, Bjärvall *et al*. 1978, p. 23). Wolverines live in low-temperature conditions and appear to select habitats in part to avoid high summer temperatures (Copeland *et al*. 2010, p. 242). Wolverine distribution is likely affected by climatic conditions at two different scales. Wolverines require deep persistent snow for denning, and this likely determines where wolverine populations can be found at the grossest range-wide scale (Copeland *et al*. 2010, p. 244). At smaller scales, wolverines likely select habitats to avoid high summer temperatures. These cool habitats also tend to retain snow late into spring, leading to wolverines' year-round association with areas of persistent spring snow (Copeland *et al*. 2010, p. 244).

All of the areas in the contiguous United States for which good evidence of persistent wolverine populations (either present or historical) exists (i.e., North Cascades, Sierra Nevada, northern and southern Rocky Mountains) contain large and well-distributed areas of deep snow cover that persists through the wolverine denning period (Inman *et al*. 2011, Fig. 3; Aubry *et al*. 2007, p. 2154; Copeland *et al*. 2010, Figure 1). The Great Plains, Great Lakes, Midwest, and Northeast lack the spring snow conditions and low summer temperatures thought to be required by wolverines for successful reproduction and year-round occupancy (Aubry *et al*. 2007, p. 2154; Copeland *et al.* 2010, Figure 1). The lack of persistent spring snow conditions in the Great Plains, Great Lakes, Midwest, and Northeast supports the exclusion of these areas from the current range of wolverines. Whether wolverines once existed as established populations in any of these regions ~~is uncertain~~appears unlikely (Aubry et al. 2007), but the current climate

Comment [JC12]: I think if we accept Aubry et al. as the best available science in this area of study, we can conclude that hsitorical wolverine presence in these area is at least unlikely.

appears to preclude their presence as reproducing populations, and the sparse historical record of wolverine presence in this area makes historical occupation of these areas by wolverine populations doubtful. It is our conclusion that the ecosystem that supports wolverines does not exist in these areas currently, and may not have existed at the time of European settlement of these areas.

Large areas of habitat with characteristics suitable for wolverines still occur in the southern Rocky Mountains and Sierra Nevada, despite the extirpation of wolverines from those areas (Aubry *et al*. 2007, p. 2154, Inman et al. 2011, Fig. 4; Copeland *et al*. 2010, Figure 1). Wolverine extirpations in these areas were coincident with unregulated trapping and systematic predator eradication efforts in the early 1900s, which have been discontinued for many years. Each of these areas has received at least one and possibly more migrants from adjacent populations in the northern Rocky Mountains; however, there is no evidence that females have migrated to these areas or that populations of wolverines currently exist there (Aubry *et al*. 2007, *Table 1*; Moriarty *et al*. 2009, entire; Inman *et al*. 2009, entire).

We conclude that areas of wolverine historical occurrence can be placed in one of three categories: (1) Areas where wolverines are extant as reproducing and potentially self-sustaining populations (North Cascades, northern Rocky Mountains); (2) areas where wolverines historically existed as reproducing and potentially self-sustaining populations prior to human-induced extirpation, and where reestablishment of those populations is possible given current habitat conditions and management (the Sierra Nevada Mountains

in California and southern Rocky Mountains in Colorado, New Mexico, Wyoming, Uinta Mountains and surrounding ranges in Utah, Bighorn Mountains in Wyoming, and possibly the Oregon Cascades Mountains); and (3) areas where historical presence of wolverines in reproducing and potentially self-sustaining populations is doubtful, and where the current habitat conditions preclude the establishment of populations (Great Plains, Midwest, Great Lakes, and Northeast). We, therefore, consider the current range of wolverines to include suitable habitat in the North Cascades of Washington, the northern Rocky Mountains of Idaho, Wyoming, Montana, and eastern Oregon, the southern Rocky Mountains of Colorado and Wyoming, and the Sierra Nevada of California. We here include the Sierra Nevada and southern Rocky Mountains in the current range of wolverines despite the probability that functional populations do not exist in these areas. They are included due to the known existence of one individual in each area and the possibility that more, as yet undetected, individuals inhabit these areas.

Comment [JC13]: Recent efforts to detect an extant population of wolverines in eastern Oregon (Wallowa Range) have not proved successful so I'm not sure that eastern Oregon shouldn't be considered the same as Utah, Calif, and Colorado. Surveys in the Wallowa Range have consistently documented the presence of at least one individual but no evidence of a reproducing population.

Comment [SSS14]: Issue: Wallowas should not be considered a population.

Distinct Population Segment

Pursuant to the Act, we must consider for listing any species, subspecies, or, for vertebrates, any Distinct Population Segment (DPS) of these taxa, if there is sufficient information to indicate that such action may be warranted. To interpret and implement the DPS provision of the Act and Congressional guidance, the Service and the National Marine Fisheries Service published, on February 7, 1996, an interagency Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Act (61 FR 4722). This policy addresses the recognition of DPSs for potential listing actions.

The policy allows for more refined application of the Act that better reflects the biological needs of the taxon being considered, and avoids the inclusion of entities that do not require its protective measures.

Under our DPS policy, three elements are considered in a decision regarding the status of a possible DPS as endangered or threatened under the Act. These are applied similarly for additions to the list of endangered and threatened species, reclassification, and removal from the list. They are: (1) Discreteness of the population segment in relation to the remainder of the taxon; (2) the biological or ecological significance of the population segment to the taxon to which it belongs; and (3) the population segment's conservation status in relation to the Act's standards for listing (i.e., whether the population segment is, when treated as if it were a species or subspecies, an endangered or threatened species). Discreteness refers to the degree of isolation of a population from other members of the species, and we evaluate this factor based on specific criteria. If a population segment is considered discrete, we must consider whether the discrete segment is "significant" to the taxon to which it belongs by using the best available scientific and commercial information. If we determine that a population segment is both discrete and significant, we then evaluate it for endangered or threatened species status based on the Act's standards. The DPS evaluation in this proposed rule concerns the segment of the wolverine species occurring within the contiguous 48 States, including the northern and southern Rocky Mountains, Sierra Nevada Range, and North Cascades Range.

Distinct Population Segment Analysis for Wolverine in the Contiguous United States

Analysis of Discreteness

Under our DPS Policy, a population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions: (1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors (quantitative measures of genetic or morphological discontinuity may provide evidence of this separation); or (2) it is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act (inadequacy of existing regulatory mechanisms). The wolverine within the contiguous United States meets the second DPS discreteness condition because of differences in conservation status as delimited by the Canadian-United States international governmental boundary.

In our 12-month finding for the North American wolverine DPS (75 FR 78030) we conducted a complete analysis of the discreteness of the wolverine DPS that we incorporate here by reference. In that analysis we concluded that the international boundary between Canada and the United States currently leads to division of the control of exploitation and conservation status of the wolverine. This division is significant because it allows for potential extirpation of the species within the contiguous United

States through loss of small populations and lack of demographic and genetic connectivity of the two populations. This difference in conservation status is likely to become more significant in light of threats discussed in the five factors analyzed below. Therefore, we find that the difference in the conservation statuses in Canada and the United States result in vulnerability to the significant threat (discussed below) in the U.S. wolverine population but not for the Canadian population. Existing regulatory mechanisms are inadequate to ensure the continued existence of wolverines in the contiguous United States in the face of these threats. Therefore, it is our determination that the difference in conservation status between the two populations is significant in light of section 4(a)(1)(D) of the Act, because existing regulatory mechanisms appear sufficient to maintain the robust conservation status of the Canadian population, while existing regulatory mechanisms in the contiguous United States are insufficient to protect the wolverine from threats due to its depleted conservation status. As a result, the contiguous United States population of the wolverine meets the discreteness criterion in our DPS Policy (61 FR 4725). Consequently, we use the international border between the United States and Canada to define the northern boundary of the contiguous United States wolverine DPS.

Analysis for Significance

If we determine a population segment is discrete, its biological and ecological significance will then be considered in light of Congressional guidance that the authority to list DPSs be used sparingly while encouraging the conservation of genetic diversity.

In carrying out this examination, we consider available scientific evidence of the population's importance to the taxon to which it belongs (i.e., the North American wolverine (*Gulo gulo luscus*)). Our DPS policy states that this consideration may include, but is not limited to: (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 the taxon; (3) evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range; or (4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

In our 12-month finding (75 FR 78030), we conducted an exhaustive analysis of the significance of the contiguous United States population of the North American wolverine that we incorporate here by reference. In that analysis we concluded that the wolverine population in the contiguous United States is significant because its loss would result in a significant gap in the range of the taxon.

Summary of the Distinct Population Segment Analysis

We conclude that the wolverine population in the contiguous United States is both discrete and significant under our DPS policy. The conservation status of wolverines in the contiguous United States is less secure than wolverines in adjacent Canada due to fragmented habitat, small population size, reduced genetic diversity, and their

vulnerability to threats analyzed in this finding. Loss of the contiguous United States wolverines would result in a significant gap in the range of the taxon. Therefore, we determine that the population of wolverines in the contiguous 48 States, as currently described, meets both the discreteness and significance criteria of our DPS policy, and is a listable entity under the Act as a DPS.

Summary of Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on any of the following five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination. Each of these factors is discussed below.

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

Under Factor A we will discuss a variety of impacts to wolverine habitat including: (1) Climate change, (2) human use and disturbance, (3) dispersed recreational activities, (4) infrastructure development, (5) transportation corridors, and (6) land management. Many of these impact categories overlap or act in concert with each other to affect wolverine habitat. Climate change is discussed under Factor A because although climate change may affect wolverines directly by creating physiological stress, the primary impact of climate change on wolverines is expected to be through changes to the availability and distribution of wolverine habitat.

Two efforts to map wolverine habitat in the contiguous United States have been completed (Inman et al. 2012, entire; Copeland *et al*. 2010, entire). Both of these habitat models rely on snow as a primary input. The Copeland *et al*. (2010) model defines wolverine habitat as simply the area continuously covered by snow from mid-winter until mid-May. The Inman *et al*. (2012) model is based on snowpack and also incorporates other habitat variables, such as terrain ruggedness and some aspects of human development. The two models result in estimates of wolverine habitat that are very similar across most of the range of wolverines in the contiguous United States. Areas of significant departure between the models are the California Sierras and Oregon Cascades where the Copeland *et al*. (2010) model predicts significantly greater habitat area than does the Inman *et al*. (2012) model. Given the general agreement between the two models, we combined the areas depicted by them into a composite wolverine habitat model that includes all areas described by one or both of these models. This composite model serves as the basis for our estimates of wolverine habitat below. Within the four

Comment [JC15]: The Inman et al (2012) paper provides model estimates for wolverine in the Yellowstone ecosystem, but not range wide?

Comment [JC16]: I cannot find any mention of other habitat variables such as terrain ruggedness and human development in this paper?

Comment [JC17]: Again, the Inman model in the 2012 paper is specific to the Yellowstone ecosystem. I don't see any mention of extrapolation to California in this paper? Should this, and the citations above, be referencing Inman's 2011 manuscript rather than their 2012 JWM paper? Has the 2011 ms been published – Bob's dissertation, perhaps? If so, you might want to update these citations.

States that currently harbor wolverines (Montana, Idaho, Oregon (Wallowas) and Wyoming), an estimated 124,014 km^2 (47,882 mi^2) of wolverine habitat exists. Habitat in the North Cascades and Eastern Washington (Kettle Range and associated habitat) add approximately 20,356 km^2 (7859 mi^2). Ninety-four percent (135,396 km^2; 52,277 mi^2) of total wolverine habitat is in Federal ownership with most of that managed by the U.S. Forest Service (Forest Service).

Reduction in Habitat due to Climate Change

Our analyses under the Act include consideration of ongoing and projected changes in climate. The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). "Climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19).

We recognize that there are scientific uncertainties on many aspects of climate change, including the role of natural variability in climate. In our analysis, we rely both on synthesis documents (e.g., IPCC 2007; Karl *et al*. 2009) that present the consensus view of a very large number of experts on climate change from around the world, and on five analyses that relate the effects of climate changes directly to wolverines (Gonzalez *et al*. 2008, entire; Brodie and Post 2009, entire; Peacock 2011, entire; McKelvey *et al*. 2011, entire, Johnston *et al*. 2012, entire). To date, McKelvey *et al*. (2011) is the most sophisticated analysis regarding climate change effects to wolverines. This report is based on data from global climate models including both temperature and precipitation, downscaled to reflect the regional climate patterns and topography found within the range of wolverines in the contiguous United States. For this reason we find that McKelvey *et al*. (2011, entire) represents the best scientific information available regarding the impacts of climate change to wolverine habitat.

Snowpack changes as well as concomitant changes to wolverine habitat suitability result from both changes in temperature (negative relationship) and changes in snowfall (positive relationship). Because many climate models predict higher precipitation levels associated with climate warming, the interaction between these two variables can be quite complex. Consequently, predictions about snow coverage that rely only on temperature projections are less reliable than those that rely on both temperature and precipitation. McKelvey *et al*. (2011, entire) report projections for wolverine habitat and dispersal routes through the time interval from 2070 to 2099.

Climate Effects to Wolverines

Due to dependence of wolverines on deep snow that persists into late spring ~~both~~ for successful reproduction ~~and for year-round habitat~~, and their restricted distribution to areas that maintain significant snow late into the spring season, we conclude that deep snow maintained through the denning period is required for wolverines to successfully live and reproduce. Reduction of this habitat feature would proportionally reduce wolverine habitat, or to an even greater extent if habitat reduction involved increasing fragmentation.

Comment [JC18]: This could be better worded. Wolverines don't depend on deep snow for year-around habitat.

Based on the information described above, we analyzed the effects of climate change on wolverines through three primary mechanisms: (1) Reduced snowpack and earlier spring runoff, which would reduce suitable habitat for wolverine denning; (2) increase in summer temperatures beyond the physiological tolerance of wolverines; and (3) ecosystem changes due to increased temperatures, which would move lower elevation ecosystems to higher elevations, thereby eliminating high-elevation ecosystems on which wolverines depend and increasing competitive interactions with species that currently inhabit lower elevations. These mechanisms would tend to push the narrow elevation band that wolverines use into higher elevation. Due to the conical structure of mountains, this upward shift would result in reduced overall suitable habitat for wolverines.

Reduced Snow Pack and Earlier Spring Runoff

Warmer winter temperatures are reducing snow pack in western North American mountains through a higher proportion of precipitation falling as rain and higher rates of snowmelt during winter (Hamlet and Lettenmaier 1999, p. 1609; Brown 2000, p. 2347; Mote 2003, p. 3-1; Christensen *et al*. 2004, p. 347; Knowles *et al*. 2006, pp. 4548-4549). This trend is expected to continue with future warming (Hamlet and Lettenmaier 1999, p. 1611; Christensen *et al*. 2004, p. 347; Mote *et al*. 2005, p. 48). Shifts in the initiation of spring runoff toward earlier dates are also well documented (Hamlet and Lettenmaier 1999, p. 1609; Brown 2000, p. 2347; Cayan *et al*. 2001, pp. 409-410; Christensen *et al*. 2004, p. 347; Mote *et al*. 2005, p. 41; Knowles *et al*. 2006, p. 4554). Earlier spring runoff leads to lack of snow or degraded snow conditions during April and May, the critical time period for wolverine reproductive denning. In addition, a feedback effect hastens the loss of snow cover due to the reflective nature of snow and the relative heat-absorbing properties of non-snow-covered ground. This effect leads to the highest magnitude of warming occurring at the interface of snow-covered and exposed areas, increasing the rate at which melting occurs in spring (Groisman *et al*. 1994a, pp. 1637-1648; Groisman *et al*. 1994b, pp. 198-200). Due to the importance of deep snow cover in spring for wolverine reproduction, currently suitable habitat that loses this feature would be rendered unsuitable for wolverines.

Ecosystem Changes Associated with Climate Change

Changes in temperature and rainfall patterns are expected to shift the distribution of ecosystems northward (IPCC 2007c, p. 230) and up mountain slopes (McDonald and

Brown 1992, pp. 411-412; Danby and Hik 2007, pp. 358-359; IPCC 2007c, p. 232). As climate changes over a landscape, the ecosystems that support wolverines are likely to move according to the change of temperature, but with a time lag depending on the ability of individual plant species to migrate (McDonald and Brown 1992, pp. 413-414; Hall and Fagre 2003, p. 138; Peterson 2003, p. 652). Wolverines are not dependent on any particular ecosystem in the sense that they do not appear to depend on a certain vegetative component or other biological ecosystem attribute; however, it is likely that wolverines would respond to similar climatic cues as other members of the alpine ecosystem such that changes in tree-line location up or down slope would predict a similar change in wolverine distribution. Because of their reliance on mountainous habitat, wolverines in the contiguous United States will most likely adjust to climate changes by using higher elevations on mountain slopes, not by shifting their latitudinal distribution. Along a latitudinal gradient through the historical distribution of wolverines, records tend to be found at higher elevations in southern latitudes (Aubry *et al*. 2007, p. 2153), suggesting that wolverines compensate for increased temperature at low latitudes by selecting higher elevations. Therefore, the regional availability of suitable habitat is not likely to significantly change (i.e., at least some wolverine habitat will continue to be available in all regions where wolverines currently occur), but within these landscapes, smaller areas will remain suitable for wolverines. Mountain ranges with maximum elevations within the elevation band that wolverines currently use, such as much of the wolverine habitat in central Idaho, may become entirely unsuitable for wolverines with the projected level of warming reported in McKelvey *et al*. (2011, Figure 3; see below for discussion).

Timing of Climate Effects

Unlike snow conditions, which respond directly to temperature change without a time lag, ecosystem responses to temperature change do lag, with the magnitude of the lag depending on constituent species' individual migratory abilities. Wolverines are described as a "tree-line" species because they are most often found in an elevation band that is approximately centered on the alpine tree-line at any given locality within their range (Inman *et al*. 2012a, p. 785). Alpine tree lines are maintained by a complex set of climactic and biotic factors, of which temperature is significantly important (Cogbill and White 1991, p. 169; Hättenschwiler and Körner 1995, p. 367; Jobbágy and Jackson 2000, p. 259; Pellat *et al*. 2000, pp. 80-81). However, the conditions that favor tree establishment and lead to elevation advance in the tree line may exist only sporadically, increasing time lags associated with tree line response to warming beyond the species-specific generation time of the trees involved (Hessl and Baker 1997, p. 181; Klasner and Fagre 2002, p. 54). Within wolverine habitats, tree lines have advanced up mountain slopes since 1850, due to climate warming, and this trend is expected to continue into the future (Hessl and Baker 1997, p. 176; Hall and Fagre 2003, p. 138). We expect that species reliant on resources associated with this biome, such as wolverines, will need to shift accordingly, not necessarily due to their dependence on the specific vegetation conditions, but due to wolverines likely being keyed into similar climatic variables. Since wolverine association with tree-line location is likely coincident with their dependence on climatic conditions, and the fact that wolverines can move about in

response to climate changes, it is not likely that wolverines would respond to climate changes with a similar time lag. More likely, wolverines would respond to climate changes in real time, shifting habitat use more rapidly than tree-line shifts would occur. Given the irregular nature of tree-line response to warming, tree-line migration is likely to lag behind the climate warming that causes it.

Magnitude of Climate Effects on Wolverine

Several studies relating the effects of climate changes on wolverines in the past, present, and future are now available (Brock and Inman Personal Communication 2007, entire; Gonzales *et al*. 2008, pp. 1-5; Brodie and Post 2010, entire; McKelvey *et al*. 2011, entire; Peacock 2011, entire; Johnston *et al*. 2012, entire). The Gonzalez *et al*. report and the report by Brock and Inman (Personal Communication 2007) were both preliminary attempts to analyze climate change impacts to wolverines, but are not currently considered the best available science because they did not consider the effects of both changes in temperature and precipitation that may affect the distribution of persistent spring snow cover (McKelvey 2011, entire). The analysis by Peacock (2011) is a sophisticated look at climate change impacts to wolverines, but suffers from the large-scale data presentation used. This large scale makes relating specific impacts to wolverines difficult, because the montane habitat inhabited by wolverines is climatologically complex on a small scale, and without significant downscaling of climate results, it is not possible to determine how much habitat may be left after climate change impacts have occurred. Both Brock and Inman (Personal Communication 2007)

and Gonzalez *et al.* (2008) have been superseded by a more sophisticated analysis provided by McKelvey *et al.* (2011, entire). The course-grain scale of the analysis in Peacock (2011, entire) limits its use to that of supporting the conclusion that wolverine habitat is likely to decline. Likewise, the limited area analyzed by Johnston *et al*. (2012) also limits its use for this wide-ranging species. The McKelvey *et al.* (2011, entire) analysis includes climate projections at a local scale for wolverine habitats and analyzes the effects of both temperature changes and changes to precipitation patterns. Lack of accounting for changes in precipitation was a weakness of their own work cited by the authors of both Brock and Inman (Personal Communication 2007) and Gonzalez *et al.* (2008).

Brodie and Post (2010, entire) correlate the decline in wolverine populations in Canada over the past century with declining snowpack due to climate change over the same period. However, correlation does not infer causation; other factors could have caused the decline. The Brodie and Post (2010, entire) analysis used harvest data to infer population trends in addition to its reliance on correlation to infer causation (McKelvey *et al*. 2010a, entire); in this case, historic climate changes are inferred to have caused the declines in harvest returns, which are thought by the authors to reflect actual population declines. Due to the above-stated concerns, we view the analysis of Brodie and Post (2010, entire) with caution, although we do agree that the posited mechanism, of loss of snowpack affecting wolverine populations and distribution, likely has merit.

McKelvey *et al*. (2011, entire) used downscaled global climate models to project the impacts of changes in temperature and precipitation to wolverine habitat as modeled by Copeland *et al*. (2010, entire). The authors also present an alternative method for evaluating climate impacts on wolverine habitat, by merely projecting onset of spring snowmelt to occur 2 weeks earlier than it currently does. Based on this information, wolverine habitat in the contiguous United States, which supports approximately 250 to 300 wolverines, is shrinking and is likely to continue to shrink with increased climate warming (McKelvey *et al*. 2011, Figure 4). Habitat losses are likely to occur throughout the range of the DPS and are projected to be most severe in central Idaho. However, large areas of snow cover are likely to remain in the North Cascades, Greater Yellowstone Area (GYA), and the Glacier Park-Bob Marshall Wilderness of Montana (McKelvey *et al*. 2011 Figures 4, 13). The southern Rocky Mountains of Colorado retained significant high-elevation snow in some models but not others, and so may be another area that could support wolverine populations in the face of climate changes (McKelvey *et al*. 2011, p. 2889).

Overall, wolverine habitat in the contiguous United States is expected to get smaller and more highly fragmented as individual habitat islands become smaller and the intervening areas between wolverine habitats become larger (McKelvey *et al*. 2011, Figures 4, 13). McKelvey et al. (2011) predict that 31 percent of current wolverine habitat in the contiguous United States will be lost due to climate warming by the time interval centered on 2045 (2030-2059) (McKelvey *et al*. 2011, pp. 2887-2888). That loss expands to 63 percent of wolverine habitat by the time interval centered on 2085 (2070 to

2099). Estimates for the northern Rocky Mountain States (Montana, Idaho, and Wyoming) are similar, with an estimated 32 percent and 63 percent of persistent spring snow lost for the 2045 and 2085 intervals respectively. Central Idaho is predicted to be especially sensitive to climate change effects losing 43 percent and 78 percent of wolverine habitat for the 2045 and 2085 intervals respectively. Conversely, the mountains of Colorado appear to be slightly less sensitive to climate changes in their analysis losing 31 percent and 57 percent of habitat over the same intervals. Given the spatial needs of wolverines and the limited availability of suitable wolverine habitat in the contiguous United States, this projected gross loss of habitat area is likely to result in a loss of wolverine numbers that is greater than the overall loss of habitat area.

We expect wolverine populations to be negatively affected by changes in the spatial distribution of habitat patches as remaining habitat islands become progressively more isolated from each other due to climate changes (McKelvey *et al*. 2011, Figure 8). Currently, wolverine habitat in the contiguous United States can be described as a series of habitat islands. Some of these groups of islands are large and clumped closely together, such as in the North Cascades, Glacier Park-Bob Marshall Wilderness complex in Montana, and the GYA. Other islands are smaller and more isolated, such as the island mountain ranges of central and southwestern Montana. Inbreeding and consequent loss of genetic diversity have occurred in the past within these smaller islands of habitat (Cegelski *et al*. 2006, p. 208), and genetic exchange between subpopulations is difficult to achieve (Schwartz *et al*. 2009, Figure 4). Climate change projections indicate that, as warming continues, large contiguous blocks of habitat will decrease in size and become

isolated to the extent that their ability to support robust populations becomes questionable (McKelvey *et al*. 2010b, Figure 8). Under the moderate climate change scenarios analyzed by McKelvey *et al*. (2011, entire), the current wolverine stronghold in central Idaho begins to look similar to the current situation in the more isolated mountain ranges of southwestern Montana (McKelvey *et al.* 2011, Figure 4) where wolverines persist, but subpopulations are small. These subpopulations are essentially family groups, which require connectivity with other groups for genetic and possibly demographic enrichment. This habitat alteration would result in a high likelihood of reduced genetic diversity due to inbreeding within a few generations (Cegelski *et al*. 2006, p. 209). Further isolation of wolverines on small habitat islands with reduced connectivity to other subpopulations would also increase the likelihood of subpopulations loss due to demographic stochasticity, impairing the functionality of the wolverine metapopulation in the contiguous United States.

We find that McKelvey *et al*. (2011, entire) represents the best available science for projecting the future impacts of climate change on wolverine habitat for four primary reasons. First, their habitat projections are based on global climate models that are thought to be the most reliable predictors of future climate available (IPCC 2007a, p. 12). Second, they conducted downscaling analyses to infer geographic climate variation at a scale relevant to wolverine habitat. Third, they used a hydrologic model to predict snow coverage during the spring denning period (the strongest correlate with wolverine reproductive success). Fourth, they used the habitat model developed by Copeland *et al.* (2010, entire), to relate projected climate changes to wolverine habitat. Based on our

analysis of the methods and analysis used by the authors, we conclude it constitutes the best available information on the likely impact of climate change on wolverine distribution in the contiguous United States. Other analyses of climate change discussed above (Brock and Inman Personal Communication 2007, entire; Gonzales *et al.* 2008, entire; Brodie and Post 2010, entire; Peacock 2011, entire) all support the conclusion that climate changes caused by warming are likely to negatively affect wolverine habitat in the future. Based on the analysis presented, we conclude that climate changes are likely to result in permanent loss of a significant portion of wolverine habitat in the future. Additional impacts of climate change will be increased habitat fragmentation as habitat islands become smaller and intervening habitat disappears. Eventually, habitat fragmentation will likely lead to a breakdown of wolverine metapopulation dynamics, as subpopulations are no longer able to rescue each other after local extinctions due to a lack of connectivity. It is also likely that loss of genetic diversity resulting in lower fitness will occur as population isolation increases.

Summary of Impacts of Climate Changes

Wolverine habitat is projected to decrease in area and become more fragmented in the future as a result of climate changes that result in increasing temperatures, earlier spring snowmelt, and loss of deep, persistent, spring snowpack. These climate change impacts are expected to have direct and indirect effects to wolverine populations in the contiguous United States including reducing the number of wolverines that can be supported by available habitat and reducing the ability of wolverines to travel between

patches of suitable habitat. This reduction in population size and connectivity is likely to affect metapopulation dynamics, making it more difficult for subpopulations to recolonize areas where wolverines have been extirpated and to bolster the genetics or demographics of adjacent subpopulations.

Habitat Impacts Due to Human Use and Disturbance

Because wolverine habitat is generally inhospitable to human use and occupation and most wolverine habitat is also federally managed in ways that must consider environmental impacts, wolverines are somewhat insulated from impacts of human disturbances from industry, agriculture, infrastructure development, or recreation. Human disturbance in wolverine habitat in the contiguous United States has likely resulted in the loss of some minor amount of wolverine habitat, although this loss has not yet been quantified. Sources of human disturbance to wolverines has been speculated to include winter and summer recreation, housing and industrial development, road corridors, and extractive industry, such as logging or mining. In the contiguous United States, these human activities and developments sometimes occur within or immediately adjacent to wolverine home ranges, such as in alpine or boreal forest environments at high elevations on mountain slopes. They can also occur in a broader range of habitats that are occasionally used by wolverines during dispersal or exploratory movements—habitats that are not suitable for the establishment of home ranges and reproduction.

Comment [JC19]: See Comment 7

Comment [JC20]: I would question whether recreation belongs here as an example of humans avoiding inhospitable habitat. It is, to a large degree, the inhospitability of wolverine habitat that attracts winter recreation, which has increased dramatically within wolverine habitat over the past 40 years.

Comment [SSS21]: Issue: wolverine habitat inaccessablity does not provide protection to wolverines. While true that some people are attracted by the remote and inhospitable nature of wolverine habitat and that this has increased use of these areas, it also remains true that most people avoid it compared to more accessible areas.

Comment [JC22]: Wiinter recreation has been shown to directly result in disturbance to wolverines (Krebs et al. 2007, Copeland 1996), as has housing (May et al. 2006). Disturbance from roads and extractive industries is more speculative in nature.

Comment [SSS23]: Yes. What's missing in these papers is whether there is a measurable effect to the animal from these. Wolverines certainly perceive these things in their environment and may take some evasive actions, but whether that is significant to the individual, much less to the population is speculative without knowing the severity of the effect to the individual, the frequency of the effect, the extent of the effect on the landscape, etc.

Little is known about the behavioral responses of individual wolverines to human presence, or about the species' ability to tolerate and adapt to repeated human disturbance. Some speculate that disturbance may reduce the wolverine's ability to complete essential life-history activities, such as foraging, breeding, maternal care, routine travel, and dispersal (Packila *et al*. 2007, pp. 105-110). However, wolverines have been documented to persist and reproduce in areas with high levels of human use and disturbance including developed alpine ski areas and areas with motorized use of snowmobiles (Heinenmeyer 2012, entire). This suggests that wolverines can survive and reproduce in areas that experience human use and disturbance. How or whether effects of disturbance extend from individuals to characteristics of subpopulations and populations, such as vital rates (e.g., reproduction, survival, emigration, and immigration) and gene flow, and ultimately to wolverine population or metapopulation persistence, remains unknown at this time.

Wolverine habitat is characterized primarily by spring snowpack, but also by the absence of human presence and development (Hornocker and Hash 1981 p. 1299; Banci 1994, p. 114; Landa *et al*. 1998, p. 448; Rowland *et al*. 2003 p. 101; Copeland 1996, pp. 124-127; Krebs *et al*. 2007, pp. 2187-2190). This negative association with human presence is sometimes interpreted as active avoidance of human disturbance, but it may simply reflect the wolverine's preference for cold, snowy, and high-elevation habitat that humans avoid. In the contiguous United States, wolverine habitat is typically associated with high-elevation (e.g., 2,100 m to 2,600 m (6,888 ft to 8,528 ft)) subalpine forests that comprise the Hudsonian Life Zone (weather similar to that found in northern Canada),

Comment [JC24]: Something is known about the behavioral responses of individual wolverines. Sometimes they are disturbed/displaced and sometimes they are not. I would concur that little is known about the species' ability to adapt.

Comment [JC25]: I don't believe this is accurate. Exist, maybe, but "persistence" requires monitoring beyond what has been done. Plus, I don't believe Heinemeyer's report makes any such conclusions.

Comment [JC26]: If this is true then the above statement (Lines 1396-1397) cannot be true. This needs to be one or the other.

Comment [SSS27]: Disagree. Wolverines persist in the area that Kim is working in. That is a fact. Whether they are being measurably affected by the recreation occurring there is something she is studying, and it is possible that there are significant effects, but those effects, if they exist, are currently undocumented.

environments not typically used by people for housing, industry, agriculture, or transportation. However, a variety of activities associated with extractive industry, such as logging and mining, as well as recreational activities in both summer and winter are located in ~~a small amount of~~ occupied wolverine habitat.

For the purposes of this rulemaking, we analyze human disturbance in four categories: (1) Dispersed recreational activities with primary impacts to wolverines through direct disturbance and/or displacement (e.g., snowmobiling and heli-skiing); (2) disturbance associated with permanent infrastructure such as residential and commercial developments, mines, and campgrounds; (3) disturbance and mortality associated with transportation corridors; and (4) disturbance associated with land management activities such as forestry, or fire/fuels reduction activities. Overlap between these categories is extensive, and it is often difficult to distinguish effects of infrastructure from the dispersed activities associated with that infrastructure. However, we conclude that these categories account for most of the human activities that occur in occupied wolverine habitat.

Dispersed Recreational Activities

Dispersed recreational activities occurring in wolverine habitat include snowmobiling, heli-skiing, hiking, biking, off- and on-road motorized use, hunting, fishing, and other uses.

Comment [JC28]: I think if you are going to qualify this as such ("small amount"), you should probably be able to present what is meant by "small."

Comment [JC29]: I believe it is important to distinguish between disturbance and displacement. Intermittent "disturbance" might cause an animal to move or hide or experience physiological stress, but it might not actually displace the individual. Disturbance that occurs regularly over an extended period and extended spatial scale might effectively displace individuals from critical habitat, such as denning, foraging, or dispersal habitat.

Comment [SSS30]: Displacement would be a significant effect to individuals and has not been documented.

One study documented (in two reports) the extent that winter recreational activity spatially and temporally overlapped modeled wolverine denning habitat in the contiguous United States (Heinemeyer and Copeland 1999, pp. 1-17; Heinemeyer *et al*. 2001, pp. 1-35). This study took place in the Greater Yellowstone Area (GYA) in an area of high dispersed recreational use. The overlap of modeled wolverine denning habitat and dispersed recreational activities was extensive. Strong temporal overlap existed between snowmobile activity (February–April) and the wolverine denning period (February–May). During 2000, six of nine survey units, ranging from 3,500 to 13,600 (ha) (8,645 to 33,592 (ac)) in size, showed evidence of recent snowmobile use. Among the six survey units with snowmobile activity, the highest use covered 20 percent of the modeled denning habitat, and use ranged from 3 to 7 percent over the other survey units. Snowmobile activity was typically intensive where detected.

Three of nine survey units in this study showed evidence of skier activity (Heinemeyer and Copeland 1999, p. 10; Heinemeyer *et al*. 2001, p. 16). Among the three units with activity, skier use covered 3 to 19 percent of the survey unit. Skiers also intensively used the sites they visited. Combined skier and snowmobile use covered as much as 27 percent of potential denning habitat in one unit where no evidence of wolverine presence was detected. We conclude from this study that in some areas, high recreational use may coincide substantially with wolverine habitat. The authors of the study cited above chose the study area based on its unusually high level of motorized recreational use. Although we do not have information on the overlap of wolverine and winter recreation in the remaining part of the contiguous United States range, it is

Comment [JC31]: I believe the study was conducted here was because the Targhee Forest asked that it be done, not because of an "unusually high level of recreational use."

Comment [SSS32]: Follow up with Kim/Jeff on this comment.

unlikely that any of the large areas of wolverine habitat such as the southern Rocky Mountains, Northern Rocky Mountains, GYA, or North Cascades get the high levels of recreational use seen in the portion of the GYA examined in this study across the entire landscape. Rather, each of these areas has small (relative to wolverine home range size) areas of intensive recreational use (ski resorts, motorized play areas) surrounded by a landscape that is used for more dispersed recreation such as backcountry skiing or snowmobile trail use.

Although we can demonstrate that recreational use of wolverine habitat is heavy in some areas, we do not have any information to suggest that these activities have negative effects on wolverines. No rigorous assessments of anthropogenic disturbance on wolverine den fidelity, food provisioning, or offspring survival have been conducted. Disturbance from foot and snowmobile traffic associated with historical wolverine control activities (Pulliainen 1968, p. 343), and field research activities, have been purported to cause maternal females to abandon natal dens and relocate kits to maternal dens (Myrberget 1968, p. 115; Magoun and Copeland 1998, p. 1316; Inman *et al*. 2007c, p. 71). However, this behavior appears to be rare, even under intense disturbance associated with capture of family groups at the den site (Persson et al. 2006, p. 76), and other causes of den abandonment may have acted in these cases. Preliminary results from an ongoing study on the potential impacts of winter recreation on wolverines in central Idaho indicate that wolverines are present and reproducing in this area in spite of heavy recreational use, including a developed ski area, dispersed winter and summer recreation, and dispersed snowmobile use (Heinemeyer *et al*. 2012, entire). The security

Comment [JC33]: The Targhee Forest Study area represents a pretty small chunk of wolverine habitat so I really don't think the level of recreational use is any higher there than many other places across the western U.S. This is sort of a curious paragraph in that it seems designed specifically to downplay the significance of the Targhee survey.

Comment [JC34]: I don't believe this is correct. Krebs et al. 2007 does document at least one instance of displacement. Copeland 1996 discusses the potential negative impacts at some length.

Comment [SSS35]: I did not find the reference in Krebs et al. 2007. They do find and "effect" of human activity in their models, but then aknowledge that a portion of their sample being in National Parks may bias these results and that further research is need to establish this link.

Comment [JC36]: I'm not sure we should be relying so heavily on data from Scandinavian wolverine populations, which experience high level of persecution, to predict how U.S wolverines might respond to disturbance. I think this could be considered "cherry picking" data. If we believe we should rely on Scandinavian data, then we should be considering the impact of livestock depredation as Scandinavian wolverines are the primary predator upon domestic livestock.

Comment [SSS37]: Issue: wolverines are a livestock depredation issue in Scandanavia, why do we not consider this a significant issue in the DPS?

Comment [JC38]: Presentations of data from this study have been purposely benign in their offering of interpretation due to their preliminary nature. This statement grossly over interprets those results. There is no such indication.

Comment [SSS39]: Issue: You overinterpreted the results of the Idaho recreation study. That wolverines are persistent in this area of relatively high recreation is simply a fact gleaned from the reports. At the landscape scale, wolverines are persisting and reproducing, and there is a high level of recreation going on. Whether or not wolverines are reproduncing in the highest use areas is a question we will have to wait to have answered, but the fact is that this landscape supports a wolverine population.

of the den and the surrounding foraging areas (i.e., protection from predation by carnivores) is an important aspect of den site selection. Abandonment of natal and maternal dens may be a preemptive strategy that females use in the absence of predators (i.e. females may abandon dens without external stimuli), as this may confer an advantage to females if prolonged use of the same den makes that den more evident to predators. Evidence for effects to wolverines from den abandonment due to human disturbance is lacking. The best scientific information available does not substantiate dispersed recreational activities as a threat to wolverine.

Most roads in wolverine habitat are low-traffic volume dirt or gravel roads used for local access. Larger, high-volume roads are dealt with below in the section "transportation corridors. At both a site-specific and landscape scale, wolverine natal dens were located particularly distant from public (greater than 7.5 km (4.6 mi)) and private (greater than 3 km (1.9 mi)) roads (May 2007, p. 14-31). Placement of dens away from public roads (and away from associated human-caused mortality) was also a positive influence on successful reproduction. It is not known if the detected correlation is due to the influence of the roads but we find it unlikely that wolverines avoid the type of low-use forest roads that generally occur in wolverine habitat. Other types of high-use roads are rare in wolverine habitat and are not likely to affect a significant amount of wolverine habitat (see transportation corridors section below).

Infrastructure Development

Comment [JC40]: This is an interesting hypothesis ! Not sure this sort of speculation is appropriate in this context, but an interesting hypothesis just the same.

Comment [SSS41]: That's why we should study the reasons for den abandonment prior to jumping to conclusions.

Comment [JC42]: I think we just don't know. This is probably a fair bit of speculation, but is still conjecture and as such would seem inappropriate in this context.

Comment [JC43]: Major 4-lane highways, while representing an arguably low density through wolverine habitat, could have a major influence as they effectively bifurcate large contiguous blocks of wolverine habitat (I94 through northern Idaho/Montana, I15 through western Montana…) Again, this type of conjecture ("are not likely to") is going to be very difficult to defend.

Comment [SSS44]: The sentence is not referring to dispersal, it is referring to habitat. These types of roads are not common in wolverine habitat and are not likely to reduce habitat significantly. There is no evidence that they prevent wolverine dispersal either. They might, but there is no evidence, and there are documented incidents of wolveirnes crossing them during dispersal movements.

Infrastructure includes all residential, industrial, and governmental developments such as buildings, houses, oil and gas wells, and ski areas. Infrastructure development on private lands in the Rocky Mountain West has been rapidly increasing in recent years and is expected to continue as people move to this area for its natural amenities (Hansen *et al*. 2002, p. 151). Infrastructure development may affect wildlife directly by eliminating habitats, or indirectly, by displacing animals from suitable habitats near developments.

Wolverine home ranges generally do not occur near human settlements, and this separation is largely due to differential habitat selection by wolverines and humans (May *et al*. 2006, pp. 289-292; Copeland *et al*. 2007, p. 2211). In one study, wolverines did not strongly avoid developed habitat within their home ranges (May *et al* 2006, p. 289). Wolverines may respond positively to human activity and developments that are a source of food. They scavenge food at dumps in and adjacent to urban areas, at trapper cabins, and at mines (LeResche and Hinman 1973 as cited in Banci 1994 p. 115; Banci 1994, p. 99). Based on the best available science, we conclude that wolverines do not avoid human development of the types that occur within suitable wolverine habitat.

Comment [JC45]: The "best available science" in this case is simply anecdotal observations. I really don't see this as providing anything "conclusive."

Comment [SSS46]: Lacking the citation of better science, we stand with this conclusion.

There is no evidence that wolverine dispersal is affected by infrastructure development. Linkage zones are places where animals can find food, shelter, and security while moving across the landscape between suitable habitats. Wolverines prefer to travel in habitat that is most similar to habitat they use for home-range establishment, i.e., alpine habitats that maintain snow cover well into the spring (Schwartz *et al*. 2009, p. 3227). Wolverines may move large distances in an attempt to establish new home

Comment [JC47]: There is also no evidence that it is not affected.

Comment [SSS48]: This is asking us to prove the negative.

ranges, but the probability of making such movements most likely decreases with increased distance between suitable habitat patches, and the degree to which the characteristics of the habitat to be traversed diverge from preferred habitat in terms of climatic conditions (Copeland *et al*. 2010, entire; Schwartz *et al*. 2009, p. 3230).

The level of development in these linkage areas that wolverines can tolerate is unknown, but it appears that the current landscape does allow wolverine dispersal (Schwartz *et al*. 2009, Figures 4, 5; Moriarty *et al*. 2009, entire; Inman *et al*. 2009, pp. 22-28). For example, wolverine populations in the northern Rocky Mountains appear to be connected to each other at the present time through dispersal routes that correspond to habitat suitability (Schwartz *et al*. 2009, Figures 4, 5). However, gene flow between wolverine subpopulations in the contiguous United States may not be high enough to prevent genetic drift (Cegelski *et al*. 2006, p. 208). To ensure long-term genetic viability, each subpopulation within the contiguous United States would need an estimated 400 breeding pairs, or 1 to 2 effective migrants per generation (Cegelski *et al*. 2006, p. 209). Our current understanding of wolverine ecology suggests that no subpopulation historically or presently at carrying capacity would approach 400 breeding pairs within the contiguous United States (Brock *et al*. 2007, p. 26); nor is the habitat capable of supporting anywhere near this number. It is highly unlikely that 400 breeding pairs exist in the entire contiguous United States. Because no wolverine subpopulations are likely to be large enough to maintain genetic diversity over time on their own, long-term viability of wolverines in the contiguous United States requires exchange of individuals between subpopulations.

Comment [JC49]: See Comment 8

Comment [JC50]: See Comment 8

Comment [JC51]: See Comment 8

Wolverines are capable of long-distance movements through variable and anthropogenically altered terrain, crossing numerous transportation corridors (Moriarty *et al*. 2009, entire; Inman *et al*. 2009, pp. 22-28). Wolverines are able to successfully disperse between habitats, despite the level of development that is currently taking place in the current range of the DPS (Copeland 1996, p. 80; Copeland and Yates 2006, pp. 17-36; Inman *et al*. 2007a, pp. 9-10; Pakila *et al*. 2007, pp. 105-109; Schwartz *et al*. 2009, Figures 4, 5). Dispersal between populations is needed to avoid further reduction in genetic diversity; however, there is no evidence that human development and associated activities are preventing wolverine movements between suitable habitat patches. Rather, wolverine movement rates are limited by suitable habitat and proximity of suitable habitat patches, not the characteristics of the intervening unsuitable habitat (Schwartz *et al*. 2007, p. 3230).

Comment [JC52]: I would much rather see something like, "There currently is no empirical evidence regarding the impact of human development on wolverine movement." A lack of evidence does not infer a lack of impact.

Comment [SSS53]: I agree. Make this change

Comment [JC54]: I could not find any statement on page3230 of Schwartz et al. (2007) that supported this statement.

Comment [SSS55]: This citation is a mistake. It should be Schwartz et al. 2009, p. 3230.

Transportation Corridors

Transportation corridors are places where transportation infrastructure and other forms of related infrastructure are concentrated together. Examples include interstate highways and high-volume secondary highways. These types of highway corridors often include railroads, retail, industrial, and residential development and also electrical and other types of energy transmission infrastructure. Transportation corridors may affect wolverines if located in wolverine habitat or between habitat patches. If located in

wolverine habitat, transportation corridors result in direct loss of habitat. Direct mortality due to collisions with vehicles is also possible (Packila *et al*. 2007, Table 1).

The Trans Canada Highway at Kicking Horse Pass in southern British Columbia, an important travel corridor over the Continental Divide, has a negative effect on wolverine movement (Austin 1998, p. 30). Wolverines partially avoided areas within 100 m (328 ft) of the highway, and preferred to use distant sites (greater than 1,100 m (3,608 ft)). Wolverines that approached the highway to cross repeatedly retreated, and successful crossing occurred in only half of the attempts (Austin 1998, p. 30). Highway-related mortality was not documented in the study. Where wolverines did successfully cross, they used the narrowest portions of the highway right-of-way. A railway with minimal human activity, adjacent to the highway, had little effect on wolverine movements. Wolverines did not avoid, and even preferred, compacted, lightly used ski trails in the area. The extent to which avoidance of the highway may have affected wolverine vital rates or life history was not measured.

Comment [JC56]: Given the tiny sample size provided by this MS thesis, which was never actually published, I'm not sure this warrants such a conclusive statement.

In the tri-State area of Idaho, Montana, and Wyoming, most crossings of Federal or State highways were done by subadult wolverines making exploratory or dispersal movements (ranges of resident adults typically did not contain major roads) (Packila *et al*. 2007, p. 105). Roads in the study area, typically two-lane highways or roads with less improvement, were not absolute barriers to wolverine movement. The individual wolverine that moved to Colorado from Wyoming in 2008 successfully crossed Interstate 80 in southern Wyoming (Inman *et al*. 2008, Figure 6). Wolverines in Norway

successfully cross deep valleys that contain light human developments such as railway lines, settlements, and roads (Landa *et al*. 1998, p. 454). Wolverines in central Idaho avoided portions of a study area that contained roads, although this was possibly an artifact of unequal distribution of roads that occurred at low elevations and peripheral to the study site (Copeland *et al*. 2007, p. 2211). Wolverines frequently used un-maintained roads for traveling during the winter, and did not avoid trails used infrequently by people or active campgrounds during the summer (Copeland *et al*. 2007, p. 2211).

At both a site-specific and landscape scale, wolverine natal dens were located particularly distant from public (greater than 7.5 km (4.6 mi)) and private (greater than 3 km (1.9 mi)) roads (May 2007, p. 14-31). Placement of dens away from public roads (and away from associated human-caused mortality) was a positive influence on successful reproduction (May 2007, p. 14-31). Predictive, broad-scale habitat models, developed using historical records of wolverine occurrence, indicated that roads were negatively associated with wolverine occurrence (Rowland *et al*. 2003, p. 101). Although wolverines appear to avoid transportation corridors in their daily movements, studies of the few areas where transportation corridors are located in wolverine habitat leads us to conclude that the effects are most likely local in scale. There are no studies that address potential effects of transportation corridors in linkage areas (i.e. outside of wolverine habitat). In the few documented long-distance movements by wolverines, the animals successfully crossed transportation corridors (Inman *et al*. 2009, Fig. 6). The available evidence indicates that dispersing wolverines can successfully cross transportation corridors.

Comment [JC57]: Why does this section not include a summary of the numbers of wolverines killed on highways? I am wondering if the documented number of road-killed wolverines does not approximate (or exceed) the number of documented successful dispersals.

Land Management

Comment [JC58]: I like this section more so than some of the previous sections in that it simply states what we know or don't know about the relationship between wolverine and land management, rather than providing a conclusive statement about impact or affect.

Few effects to wolverines from land management actions such as grazing, timber harvest, and prescribed fire have been documented. Wolverines in British Columbia used recently logged areas in the summer and moose winter ranges for foraging (Krebs *et al*. 2007, pp. 2189-2190). Males did not appear to be influenced strongly by the presence of roadless areas (Krebs *et al*. 2007, pp. 2189-2190). In Idaho, wolverines used recently burned areas despite the loss of canopy cover (Copeland 1996, p. 124).

Intensive management activities such as timber harvest and prescribed fire do occur in wolverine habitat; however, for the most part, wolverine habitat tends to be located at high elevations and in rugged topography that is unsuitable for intensive timber management. Much of wolverine habitat is managed by the U.S. Forest Service or other Federal agencies and is protected from some practices or activities such as residential development. In addition, much of wolverine habitat within the contiguous United States is already in a management status such as wilderness or national park (see Factor D for more discussion) that provides some protection from management, industrial, and recreational activities. Wolverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities are a threat to the conservation of the species.

Summary of Factor A

The threat of current, and future impacts to wolverine habitat due to climate change occurs over the entire range of the contiguous United States population of the wolverine. This threat is likely to have already reduced the overall areal extent and distribution of wolverine suitable habitat. Determining whether or not wolverine populations have been impacted by this threat is complicated by the historical extirpation of wolverines in the early 20th century followed by recolonization and expansion. It is possible that expansion of wolverine populations through the second half of the 20th century has masked climate change effects that would have otherwise reduced populations had they existed at presettlement levels. Despite the lack of detectable population-level impacts, it is still likely that habitat is already reduced from historical levels due to this threat.

Suitable wolverine habitat is projected to be reduced by 31 percent in the contiguous United States by 2045 and 63 percent by the time interval 2070 to 2099 due to climate warming. This reduction will likely result in suitable wolverine habitat shifting up mountain slopes, and becoming smaller and more isolated due to the conical structure of mountains. Because wolverine home ranges tend to be so large, some small mountain ranges are likely to lose the ability to support wolverine populations. We expect that the secondary effects of this habitat loss, such as increased habitat fragmentation and isolation, will intensify the overall impacts of habitat loss on wolverines.

Deep snow that persists into the month of May is essential for wolverine reproduction. This life-history parameter for the species (reproductive rate) is likely to be most sensitive to climate changes. Wolverine are vulnerable to habitat modification (specifically, reduction in persistent spring snow cover) due to climate warming in the contiguous United States. Further, it is likely that year-round wolverine habitat, not just denning habitat, will also be significantly reduced due to the effects of climate warming. Reductions in habitat would result in greater habitat isolation, thereby likely reducing the frequency of dispersal between habitat patches and the likelihood of recolonization after local extinction events. This reduced dispersal ability, if not compensated for by higher population levels or assisted dispersal, is likely to result in loss of genetic diversity within remaining habitat patches and population loss due to demographic stochasticity. The contiguous United States population of wolverines is already very small and fragmented and is, therefore, particularly vulnerable to these impacts.

Comment [JC59]: See comment 10

Human activities, including dispersed recreation activities, infrastructure, and the presence of transportation corridors occur in occupied wolverine habitat. However, the alpine and subalpine habitats preferred by wolverine typically receive little human use relative to lower elevation habitats. The majority of wolverine habitat (over 90 percent) occurs within Forest Service and National Park Service lands that are subject to activities, but usually not direct habitat loss to infrastructure development. The best available science leads us to determine that human activities and developments do not pose a current threat to wolverines in the contiguous United States.

Wolverines coexist with some modification of their environment, as wilderness characteristics such as complete lack of motorized use or any permanent human presence are likely not critical for maintenance of populations. It is clear that wolverines coexist with some level of human disturbance and habitat modification.

We know of no examples where human activities such as dispersed recreation have occurred at a scale that could render a large enough area unsuitable so that a wolverine home range would be likely to be rendered unsuitable or unproductive. Given the large size of home ranges used by wolverine, most human activities affect such a small portion that negative effects to individuals are unlikely. These activities do not occur at a scale that is likely to have population-level effects to wolverine.

Comment [JC60]: See Comment 9

Little scientific or commercial information exists regarding effects to wolverines from development or human disturbances associated with them. What little information does exist suggests that wolverines can adjust to moderate habitat modification, infrastructure development, and human disturbance. In addition, large amounts of wolverine habitat are protected from human disturbances and development, either legally through wilderness and National Park designation, or by being located at remote and high-elevation sites. Therefore, wolverines are afforded a relatively high degree of protection from the effects of human activities by the nature of their habitat. Wolverines are known to successfully disperse long distances between habitats through human-dominated landscapes and across transportation corridors. The current level of residential, industrial, and transportation development in the western United States does

Comment [JC61]: A problem here is that there are very few places that are not accessible to human disturbance. Wilderness and Nat. Parks are both open and relatively accessible to backcountry skiers. Remoteness is not a deterrent to heliskiers outside of wilderness or Parks.

not appear to have precluded the long-distance dispersal movements that wolverines require for maintenance of genetic diversity. We do not have information to suggest that future levels of residential, industrial, and transportation development would be a significant conservation concern for the DPS.

In summary, the best scientific and commercial information available indicates that only the projected decrease and fragmentation of wolverine habitat or range due to future climate change is a threat to the species now and in the future. The available scientific and commercial information does not indicate that other potential stressors such as land management, recreation, infrastructure development, and transportation corridors pose a threat to the DPS.

Comment [JC62]: See Comment 10

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

Over much of recent history, trapping has been a primary cause of wolverine mortality (Banci 1994, p. 108; Krebs *et al*. 2004, p. 497; Lofroth and Ott 2007, pp. 2196-2197; Squires *et al*. 2007, p. 2217). Unregulated trapping is believed to have played a role in the historical decline of wolverines in North America in the late 1800s and early 1900s (Hash 1987, p. 580). Wolverines are especially vulnerable to targeted trapping and predator reduction campaigns due to their habit of ranging widely in search of carrion, bringing them into frequent contact with poison baits and traps (Copeland 1996, p. 78; Inman *et al*. 2007a, pp. 4-10; Packila *et al*. 2007, p. 105; Squires *et al*. 2007, p. 2219).

Human-caused mortality of wolverines is likely additive to natural mortality due to the low reproductive rate and relatively long life expectancy of wolverines (Krebs *et al*. 2004, p. 499; Lofroth and Ott 2007, pp. 2197-2198; Squires *et al*. 2007, pp. 2218-2219). This means that trapped subpopulations likely live at densities that are lower than carrying capacity, and may need to be reinforced by recruits from untrapped subpopulations to maintain population viability and persistence.

A study in British Columbia determined that, under a regulated trapping regime, trapping mortality in 15 of 71 wolverine population units was unsustainable, and that populations in those unsustainable population units were dependent on immigration from neighboring populations or untrapped refugia (Lofroth and Ott 2007, pp. 2197-2198). Similarly, in southwestern Montana, legal trapping in isolated mountain ranges accounted for 64 percent of documented mortality and reduced the local wolverine subpopulation (Squires *et al*. 2007, pp. 2218-2219). The observed harvest levels, which included two pregnant females in a small mountain range, could have significant negative effects on a small subpopulation (Squires *et al*. 2007, p. 2219). Harvest refugia, such as jurisdictions with closed seasons, national parks, and large wilderness areas, are important to wolverine persistence on the landscape because they can serve as sources of surplus individuals to bolster trapped populations (Squires *et al*. 2007, p. 2219; Krebs and Ott 2004, p. 500). Due to their large space requirements, wolverine population refuges must be large enough to provide protection from harvest mortality; and complete protection is only available for wolverines whose entire home range occurs within protected areas.

Glacier National Park, though an important refuge for a relatively robust population of wolverines, was still vulnerable to trapping because most resident wolverine home ranges extended into large areas outside the park (Squires *et al*. 2007, p. 2219). It is likely that the larger scale refuges provided by the states of Idaho and Wyoming (which do not permit wolverine trapping) provide wolverine habitat that is fully protected from legal harvest in Montana; however, wolverines with home ranges that partially overlap Montana and dispersers that move into Montana would be vulnerable to harvest. Due to the restrictive, low level of harvest now allowed by Montana, the number of affected wolverines would be correspondingly small.

Despite the impacts of trapping on wolverines in the past, trapping is no longer a threat within most of the wolverine range in the contiguous United States. Montana is the only State where wolverine trapping is still legal. Before 2004, average wolverine harvest was 10.5 wolverines per year. Due to preliminary results of the study reported in Squires *et al*. (2007, pp. 2213-2220), the Montana Department of Fish, Wildlife, and Parks adopted new regulations for the 2004–2005 trapping season that divided the State into three units, with the goal of spreading the harvest more equitably throughout the State.

For the 2008–2009 trapping season, the Montana Department of Fish, Wildlife, and Parks adjusted its wolverine trapping regulations again to further increase the geographic control on harvest to prevent concentrated trapping in any single area, and to completely stop trapping in isolated mountain ranges where small populations are most

vulnerable (Montana Department of Fish Wildlife and Parks 2010, pp. 8-11). Their new regulations spread harvest across three geographic units (the Northern Continental Divide area, the Greater Yellowstone area, and the Bitterroot Mountains), and established a statewide limit of five wolverines. In the four trapping seasons that have occurred since these rules were implemented, wolverine take averaged 3.25 wolverines annually (Montana Department of Fish Wildlife and Parks 2010, pp. 8-11; Brian Giddings Pers. Comm. August 30, 2012), ~~with reduced harvest being due to season closure rather than lack of wolverines~~. Under the current regulations, no more than three female wolverines can be legally harvested each year, and harvest in the more vulnerable isolated mountain ranges is prohibited. The size of the wolverine population subjected to trapping in this area is not known precisely but is likely not more than about 300 animals in states of Montana, Idaho, and Wyoming combined (Bob Inman pers. comm. 2010b).

Comment [JC63]: This statement feels a bit like propaganda. I would like to see this supported by data if it were to remain.

The Montana Department of Fish, Wildlife, and Parks conduct yearly furbearer monitoring using track surveys. These surveys involve snowmobiling along transect routes under good tracking conditions and visually identifying all carnivore tracks encountered. The protocol does not use verification methods such as DNA collection or camera stations to confirm identifications. Consequently, misidentifications are likely to occur. Given the relative rarity of wolverines and the relative abundance of other species with which they may be confused, such as bobcats (*Lynx rufus*), Canada lynx (*Lynx canadensis*), and mountain lions (*Felis concolor*), lack of certainty of identifications of tracks makes it highly likely that the rare species is overrepresented in unverified tracking records (McKelvey *et al.* 2008, entire). The Montana Department of Fish, Wildlife, and

Parks wolverine track survey information does not meet our standard for reliability described in the geographic distribution section, and we have not relied on this information in this finding.

Montana wolverine populations have rebounded from historical lows in the early 1900s while at the same time being subjected to regulated trapping (Aubry *et al*. 2007, p. 2151; Montana Department of Fish, Wildlife, and Parks 2007, p. 1). In fact, much of the wolverine expansion that we have described above took place under less-restrictive (i.e., higher harvest levels) harvest regulations than are in place today. The extent to which wolverine population growth has occurred in Montana as a result of within-Montana population growth, versus population growth attributable to surrounding states where wolverines are not trapped, i.e., population growth driven by the entire metapopulation versus just the portion of the metapopulation found in Montana, is unknown.

Current levels of incidental trapping (i.e., capture in traps set for species other than wolverine) have been suggested by the petitioners to be a threat to wolverines. In the 2008–2009 trapping season, two wolverines were incidentally killed in traps set for other species in Beaverhead and Granite Counties, Montana (Montana Fish, Wildlife, and Parks 2010, p. 2). These two mortalities occurred within the portion of southwestern Montana that is currently closed to legal wolverine trapping to ensure that wolverines are not unsustainably harvested in this area of small, relatively isolated mountain ranges. Four cases of incidental wolverine trapping have occurred in Idaho in recent years. One wolverine was trapped by a coyote/bobcat trapper in 2006 and was collared and released

after all of its toes and a portion of its left front foot were amputated (Inman et al. 2008, p. 1). That animal (a female) survived and successfully reproduced after release. The Department of Agriculture Wildlife Services trapped three wolverines (one each in 2004, 2005, and 2010) incidental to trapping wolves involved in livestock depredations. One of these sustained severe injuries and was euthanized. The other two were released without visible injury. Another wolverine was trapped in Wyoming in 2006. This animal was released unharmed (Inman 2012, pers. comm.). The three documented mortalities are possibly locally significant for wolverines in these areas because local populations in each of the mountain ranges are small and relatively isolated from nearby source populations.

Comment [JC64]: I believe there have been a number of scientific study-related mortalities. Should these not be included in this discussion?

Summary of Factor B

Legal wolverine harvest occurs in one state, Montana, within the range of the DPS. The extent to which this harvest affects populations occurring outside of Montana is unknown. However, the State of Montana contains most of the habitat and wolverines that exist in the current range of the DPS, and regulates trapping to reduce the impact of harvest on wolverine populations. Incidental harvest also occurs within the range of the DPS; however, the level of mortality from incidental trapping appears to be low. Harvest, when combined with the likely effects of climate change, may contribute to the likelihood that the wolverine will become extirpated in the future. This may occur by increasing the speed with which small populations of wolverine are lost from isolated habitats, and also by increasing mortality levels for dispersing wolverines, with the result

of reducing dispersal rates. Regular dispersal and exchange of genetic material are required to maintain the genetics and demographics of wolverine subpopulations in the contiguous United States.

The current known level of incidental trapping mortality is low. We note that it is unknown whether or not increased trapping of wolves associated with wolf trapping regulations recently approved by the states of Idaho and Montana would be likely to result in increased incidental trapping of wolverines. Idaho began its wolf trapping program in the winter of 2011–2012, and Montana began theirs in the winter of 2012–2013. These wolf trapping activities are relatively new in the DPS area, and we do not yet have reliable information on the level of incidental take of wolverines that may result from them.

Based on the best scientific and commercial information available, we conclude that trapping, including known rates of incidental trapping in Montana and Idaho, result in a small number of wolverine mortalities each year and that this level of mortality by itself would not be a threat to the wolverine DPS. However, by working in concert with habitat loss resulting from climate change, mortality due to harvest and incidental trapping may contribute to population declines. Therefore, we conclude that trapping, when considered cumulatively with habitat loss resulting from climate change, is likely to become a threat to the DPS (see discussion under Synergistic Interactions Between Threat Factors, below).

Factor C. Disease or Predation

Comment [JC65]: Again, this relates to my concerns from Comment 10.

Comment [JC66]: See Comment 10

Comment [JC67]: See Comment 10

No information is currently available on the potential effects of disease on wild wolverine populations. Wolverines are sometimes killed by wolves (*Canis lupus*), black bears (*Ursus americanus*), and mountain lion (Burkholder 1962, p. 264; Hornocker and Hash 1981, p. 1296; Copeland 1996, p. 44-46; Inman *et al*. 2007d, p. 89). In addition, wolverine reproductive dens are likely subject to predation, although so few dens have been discovered in North America that determining the intensity of this predation is not possible.

Summary of Factor C

We have no information to suggest that wolverine mortality from predation and disease is above natural or sustainable levels. The best scientific and commercial information available indicates that disease or predation is not a threat to the species now or likely to become so in the future.

Factor D. Inadequacy of Existing Regulatory Mechanisms

Based on our calculations using a composite map showing the coverage of both the Copeland *et al*. (2010, entire) and Inman et al. (2012, entire) wolverine habitat models, the majority (94 percent) of wolverine habitat currently occupied by wolverine populations in the lower contiguous United States is Federally owned and managed, mostly by the U.S. Forest Service. An estimated 144,371 km^2 (49,258 mi^2) of wolverine

habitat occurs in the occupied area in Montana, Idaho, Oregon (Wallowa Range), and Wyoming. Of that, 135,396 km^2 (46,332 mi^2) is in Federal ownership. Additionally, 47,150 km^2 (12,973 mi^2) (32.7 percent) occurs in designated wilderness, and 23,062 km^2 (1,630 mi^2) (16.0 percent) occurs in inventoried roadless areas. An additional 13,784 km^2 (3,288 mi^2) (9.5 percent) are within national parks.

None of the existing Federal or State regulatory mechanisms were designed to address the threat of modification of wolverine habitat due to the loss of snowpack associated with climate change. Several existing regulatory mechanisms protect wolverine from other forms of disturbance and from overutilization from harvesting; these are described in more detail below.

Federal Laws and Regulations

The Wilderness Act

The Forest Service and National Park Service both manage lands designated as wilderness areas under the Wilderness Act of 1964 (16 U.S.C. 1131-1136). Within these areas, the Wilderness Act states the following: (1) New or temporary roads cannot be built; (2) there can be no use of motor vehicles, motorized equipment, or motorboats; (3) there can be no landing of aircraft; (4) there can be no other form of mechanical transport; and (5) no structure or installation may be built. A large amount of suitable wolverine habitat, about 28 percent for the states of Montana, Idaho, and Wyoming,

occurs within Federal wilderness areas in the United States (Inman personal communication 2007b). As such, a large proportion of existing wolverine habitat is protected from direct loss or degradation by the prohibitions of the Wilderness Act.

National Environmental Policy Act

All Federal agencies are required to adhere to the National Environmental Policy Act (NEPA) of 1970 (42 U.S.C. 4321 *et seq.*) for projects they fund, authorize, or carry out. The Council on Environmental Quality's regulations for implementing NEPA (40 CFR 1500–1518) state that agencies shall include a discussion on the environmental impacts of the various project alternatives (including the proposed action), any adverse environmental effects which cannot be avoided, and any irreversible or irretrievable commitments of resources involved (40 CFR 1502). The NEPA itself is a disclosure law, and does not require subsequent minimization or mitigation measures by the Federal agency involved. Although Federal agencies may include conservation measures for wolverines as a result of the NEPA process, any such measures are typically voluntary in nature and are not required by the statute. Additionally, activities on non-Federal lands are subject to NEPA if there is a Federal action.

For example, wolverines are designated as a sensitive species by the Forest Service, which requires that effects to wolverines be considered in documentation completed under NEPA. NEPA does not itself regulate activities that might affect

wolverines, but it does require full evaluation and disclosure of information regarding the effects of contemplated Federal actions on sensitive species and their habitats.

National Forest Management Act

Under the National Forest Management Act of 1976, as amended (16 U.S.C. 1600–1614), the Forest Service shall strive to provide for a diversity of plant and animal communities when managing national forest lands. Individual national forests may identify species of concern that are significant to each forest's biodiversity. Outside of designated wilderness but still on Forest Service-managed lands, wolverines occur mainly in alpine areas. Their habitat is generally offered more protections from timber harvest than would otherwise be the case in lowland areas due to the difficulty of accessing wolverine habitat, especially in areas where motorized access is limited or absent, such as most National Forest land and all designated wilderness areas.

National Park Service Organic Act

The NPS Organic Act of 1916 (16 U.S.C. 1 *et seq.*), as amended, states that the NPS ''shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations to conserve the scenery and the national and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.'' Where wolverines occur in National Parks, they and their habitats are protected from

large-scale loss or degradation due to the Park Service's mandate to ''...conserve scenery... and wildlife...[by leaving] them unimpaired.'' Wolverine harvest and trapping of other furbearers is also prohibited in National Parks.

Clean Air Act of 1970

On December 15, 2009, the Environmental Protection Agency (EPA) published in the Federal Register (74 FR 66496) a rule titled, "Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act." In this rule, the EPA Administrator found that the current and projected concentrations of the six long-lived and directly emitted greenhouse gases (GHGs)—carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride—in the atmosphere threaten the public health and welfare of current and future generations; and that the combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare (74 FR 66496). In effect, the EPA has concluded that the GHGs linked to climate change are pollutants, whose emissions can now be subject to the Clean Air Act (42 U.S.C. 7401 *et seq.*) (see 74 FR 66496). However, specific regulations to limit GHG emissions were only proposed in 2010 and, therefore, cannot be considered an existing regulatory mechanism. At present, we have no basis to conclude that implementation of the Clean Air Act in the future (40 years, based on global climate projections) will substantially reduce the current rate of global climate change through regulation of GHG emissions.

Thus, we conclude the Clean Air Act is not designed to address the primary threat to wolverine of the loss of snowpack due to the effects of climate change.

State Laws and Regulations

State Comprehensive Wildlife Conservation Strategies and State Environmental Policy and Protection Acts

The wolverine is listed as State Endangered in Washington, California, and Colorado. In Idaho and Wyoming it is designated as a protected nongame species (Idaho Department of Fish and Game 2010, p. 4; Wyoming Game and Fish 2005, p. 2). Oregon, while currently not considered to have any individuals other than possible unsuccessful dispersers, has a closed season on trapping of wolverines. These designations largely protect the wolverine from mortality due to hunting and trapping. In Montana, the wolverine is classified as a regulated furbearer (Montana Fish, Wildlife, and Parks 2010, p. 8). Montana is the only State in the contiguous United States where wolverine trapping is still legal.

Wolverines receive some protection under State laws in Washington, California, Idaho, Montana, Wyoming, and Colorado. Each State's fish and wildlife agency has some version of a State Comprehensive Wildlife Conservation Strategy (CWCS) in place. These strategies, while not State or Federal legislation, can help prioritize conservation actions within each State. Named species and habitats within each CWCS may receive

focused attention during State Environmental Protection Act (SEPA) reviews as a result of being included in a State's CWCS. However, only Washington, California, and Montana appear to have SEPA-type regulations in place. In addition, each State's fish and wildlife agency often specifically names or implies protection of wolverines in its hunting and trapping regulations. Only the State of Montana currently allows wolverine harvest (see discussion under Factor B).

Before 2004, the Montana Department of Fish, Wildlife, and Parks regulated wolverine harvest through the licensing of trappers, a bag limit of one wolverine per year per trapper, and no statewide limit. Under this management, average wolverine harvest was 10.5 wolverines per year. Due to preliminary results of the study reported in Squires *et al*. (2007, pp. 2213-2220), Montana Department of Fish, Wildlife, and Parks adopted new regulations for the 2004–2005 trapping season that divided the State into three units with the goal of spreading the harvest more equitably among available habitat. In 2008, Montana Department of Fish, Wildlife, and Parks further refined their regulations to prohibit trapping in isolated mountain ranges, and reduced the overall statewide harvest to five wolverines with a statewide female harvest limit of three. Under factor B, above, we concluded that trapping, including known rates of incidental trapping in Montana, by itself, is not a threat to the wolverine DPS, but that by working in concert with the primary threat of climate change, the trapping program may contribute to population declines (see Synergistic Interactions Between Threat Factors, below).

Summary of Factor D

The existing regulatory mechanisms appear to protect wolverine from several of the factors described in Factors A and B above. Specifically, State regulations for wolverine harvest appear to be sufficient to prohibit range–wide overutilization from hunting and trapping in the absence of other threats. However, given that climate change impacts are expected to reduce wolverine populations and fragment habitat, the impact of harvest to wolverine would be expected to increase if harvest levels were maintained at current levels. Federal ownership of much of occupied wolverine habitat protects the species from direct losses of habitat and provides further protection from many of the forms of disturbance described above. Wolverines use habitats affected by human disturbance, and additional protection is afforded wolverines by the large area of their range that occurs in designated wilderness and national parks. The current regulatory regime does not address the potential impacts of dispersed winter recreation outside of protected areas; however, at this time the available information does not suggest that dispersed winter recreation is a threat to the DPS.

Our review of the regulatory mechanisms in place at the national and State level demonstrates that the short-term, site-specific threats to wolverine from direct loss of habitat, disturbance by humans, and direct mortality from hunting and trapping are, for the most part, adequately addressed through State and Federal regulatory mechanisms. However, as described under Factor A, the primary threat with the greatest severity and magnitude of impact to the species is loss of habitat due to continuing climate warming.

The existing regulatory mechanisms currently in place at the national level were not designed to address the threat to wolverine habitat from climate change.

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

Small Population Size

Population ecologists use the concept of a population's "effective" size as a measure of the proportion of the actual population that contributes to future generations (for a review of effective population size, see Schwartz *et al*. 1998, entire). In a population where all of the individuals contribute offspring equally, effective population size would equal true population size, referred to as the population census size. For populations where contribution to the next generations is often unequal, effective population size will be smaller than the census size. The smaller the effective population size, the more reproduction in each generation is dominated by a few individuals in each generation. For wolverines it is likely that high-quality home ranges are limited, and individuals occupying them are better able to reproduce. Therefore, mature males and females that are successful at acquiring and defending a territory may dominate reproduction. Another contributing factor that reduces effective population size is the tendency in wolverines for a few males to monopolize the reproduction of several females, reducing reproductive opportunities for other males. Although this monopolization is a natural feature of wolverine life history strategy, it can lead to lower effective population size and reduce population viability by reducing genetic diversity.

Comment [JC68]: Although, it likely leads to higher survivorship. I don't think it is a fair characterization to describe the wolverine's social organization as detrimental to its own persistence.

The effective population is not static, members of the effective population in 1 year may lose this status in the following year and possibly regain it again later depending on their reproductive success. When members of the effective population are lost, it is likely that their territories are quickly filled by younger individuals who may not have been able to secure a productive territory previously.

Effective population size is important because it determines rates of loss of genetic variation and the rate of inbreeding. Populations with small effective population sizes show reductions in population growth rates and increases in extinction probabilities when genetic diversity is low enough to lead to inbreeding depression (Leberg 1990, p. 194; Jimenez *et al*. 1994, pp. 272-273; Newman and Pilson 1997, p. 360; Saccheri *et al*. 1998, p. 492; Reed and Bryant 2000, p. 11; Schwartz and Mills 2005, p. 419; Hogg *et al*. 2006, p. 1495, 1498; Allendorf and Luikart 2007, pp. 338-342). Franklin (1980, as cited in Allendorf and Luikart 2007, p. 359) proposed an empirically based rule suggesting that for short-term (a few generations) maintenance of genetic diversity, effective population size should not be less than 50. For long-term (hundreds of generations) maintenance of genetic diversity, effective population size should not be less than 500 (for appropriate use of this rule and its limitations see Allendorf and Luikart 2007, pp. 359-360). Others suggest that even higher numbers are required to ensure that populations remain viable, suggesting that long-term connectivity to the reservoir of genetic resources in the Canadian population of wolverines will be required for the long-term genetic health of the DPS (Traill *et al.* 2010, p. 32). All evidence suggests that no habitat area within the contiguous United States is large enough to support a wolverine population with an

effective population size of 500 animals. Given the life history of wolverines that includes high inequality of reproductive success and a metapopulation of semi-isolated subpopulations, effective population sizes would likely never reach even 100 individuals at full habitat occupancy as this would suggest a census population of over 1,000. In this case, population connectivity exchange with the larger Canadian/Alaskan population would likely be required for long-term viability.

Wolverine effective population size in the northern Rocky Mountains, which is the largest extant population in the contiguous United States, is exceptionally low and is below what is thought necessary for short-term maintenance of genetic diversity. Estimates for effective population size for wolverines in the northern Rocky Mountains averaged 35 (credible limits = 28–52) (Schwartz *et al*. 2009, p. 3226). This study excluded the small population from the Crazy and Belt Mountains (hereafter "CrazyBelts") as they may be an isolated population, which could bias the estimate using the methods of Tallmon *et al*. (2007, entire). Measures of the effective population sizes of the other populations in the contiguous United States have not been completed, but given their small census sizes, their effective sizes are expected to be smaller than for the northern Rocky Mountains population. Thus, wolverine effective population sizes are very low. For comparison, estimates of wolverine effective population size are bracketed by critically endangered species, such as the black-footed ferret (*Mustela nigripes*) (4.10) (Wisely *et al*. 2007, p. 3) and the ocelot (*Leopardus pardalis*) (2.9 to 13.9) (Janecka *et al*. 2007, p. 1), but are substantially smaller than estimates for the Yellowstone grizzly bear (*Ursus arctos*) (greater than 100), which has reached the level of recovery under the Act

(Miller and Waits 2003, p. 4338). Therefore, we conclude that effective population size estimates for wolverines do not suggest that populations are currently critically endangered, but they do suggest that populations are low enough that they could be vulnerable to loss of genetic diversity, and may require intervention in the future to remain viable. To date, no adverse effects of the lower genetic diversity of the contiguous United States wolverines have been documented.

Wolverines in the contiguous United States are thought to be derived from a recent recolonization event after they were extirpated from the area in the early 20th century (Aubry *et al.* 2007, Table 1). Consequently, wolverine populations in the contiguous United States have reduced genetic diversity relative to larger Canadian populations as a result of founder effects or inbreeding (Schwartz *et al.* 2009, pp. 3228-3230). Wolverine effective population size in the northern Rocky Mountains was estimated to be 35 (Schwartz et al. 2009, p. 3226) and is below what is thought to be adequate for short-term maintenance of genetic diversity. Loss of genetic diversity can lead to inbreeding depression and is associated with increased risk of extinction (Allendorf and Luikart 2007, pp. 338-343). Small effective population sizes are caused by small actual population size (census size), or by other factors that limit the genetic contribution of portions of the population, such as polygamous mating systems. Populations may increase their effective size by increasing census size or by the regular exchange of genetic material with other populations through interpopulation mating.

The concern with the low effective population size was highlighted in a recent analysis that determined that, without immigration from other wolverine populations, at least 400 breeding pairs would be necessary to sustain the long-term genetic viability of the northern Rocky Mountains wolverine population (Cegelski *et al*. 2006, p. 197). However, the entire population is likely only 250 to 300 (Inman 2010b, pers. comm.), with a substantial number of these being unsuccessful breeders or nonbreeding subadults (i.e., part of the census population, but not part of the effective population).

Genetic studies demonstrate the essential role that genetic exchange plays in maintaining genetic diversity in small wolverine populations. The concern that low effective population size would result in negative effects is already being realized for the contiguous United States population of wolverine. Genetic drift has already occurred in subpopulations of the contiguous United States: Wolverines here contained 3 of 13 haplotypes found in Canadian populations (Kyle and Strobeck 2001, p. 343; Cegelski *et al*. 2003, pp. 2914-2915; Cegelski *et al*. 2006, p. 208; Schwartz *et al*. 2007, p. 2176; Schwartz *et al*. 2009, p. 3229). The haplotypes found in these subpopulations were a subset of those in the larger Canadian population, indicating that genetic drift had caused a loss of genetic diversity. One study found that a single haplotype dominated the northern Rocky Mountain wolverine population, with 71 of 73 wolverines sampled expressing that haplotype (Schwartz *et al*. 2007, p. 2176). The reduced number of haplotypes indicates not only that genetic drift has occurred but also some level of genetic separation; if these populations were freely interbreeding, they would share more haplotypes (Schwartz *et al*. 2009, p. 3229). The reduction of haplotypes is likely a result

of the fragmented nature of wolverine habitat in the United States and is consistent with an emerging pattern of reduced genetic variation at the southern edge of the range documented in a suite of boreal forest carnivores (Schwartz *et al*. 2007, p. 2177).

Immigration of wolverines from Canada is not likely to bolster the genetic diversity of wolverines in the contiguous United States. There is an apparent lack of connectivity between wolverine populations in Canada and the United States based on genetic data (Schwartz *et al.* 2009, pp. 3228-3230). The apparent loss of connectivity between wolverines in the northern Rocky Mountains and Canada prevents the influx of genetic material needed to maintain or increase the genetic diversity in the contiguous United States. The continued loss of genetic diversity may lead to inbreeding depression, potentially reducing the species' ability to persist through reduced reproductive output or reduced survival. Currently, the cause for this lack of connectivity is uncertain. Wolverine habitat appears to be well-connected across the border region (Copeland *et al.* 2010, Figure 2) and there are few manmade obstructions such as transportation corridors or alpine developments. However, this lack of genetically detectable connectivity may be related to harvest management in southern Canada.

Summary of Factor E

Small population size and resulting inbreeding depression are potential, though as-yet undocumented, threats to wolverines in the contiguous United States. There is good evidence that genetic diversity is lower in wolverines in the DPS than it is in the

more contiguous habitat in Canada and Alaska. The significance of this lower genetic diversity to wolverine conservation is unknown. We do not discount the possibility that loss of genetic diversity could be negatively affecting wolverines now and continue to do so in the future. It is important to point out, however, that wolverine populations in the DPS area are thought to be the result of colonization events that have occurred since the 1930s. Such recent colonizations by relatively few individuals and subsequent population growth are likely to have resulted in founder effects, which could contribute to low genetic diversity. The effect of small population sizes and low genetic diversity may become more significant if populations become smaller and more isolated, as predicted due to climate changes.

Based on the best scientific and commercial information available we conclude that demographic stochasticity and loss of genetic diversity due to small effective population sizes, by itself, is not a threat to the wolverine DPS. However, by working in concert with the primary threat of habitat loss due to climate change, this may contribute to the cumulative effect of population declines. Therefore, we conclude that demographic stochasticity and loss of genetic diversity due to small effective population sizes is a threat to wolverines when considered cumulatively with habitat loss due to climate change (see discussion under Synergistic Interactions Between Threat Factors).

Synergistic Interactions Between Threat Factors

We have evaluated individual threats to the distinct population segment of the North American Wolverine throughout its range in the contiguous United States. The wolverine DPS faces one primary threat that is likely to drive its conservation status in the future: habitat change and loss due to climate change. This factor alone is enough to determine that the species should be proposed for listing under the Act. Other factors, though not as severe or geographically comprehensive as the potential habitat effects from climate change may, when considered in the context of changes likely to occur due to climate change, become threats due to the cumulative effects they have on wolverine populations. For wolverines, the only such threat factors found in our analysis to have a basis of support as threats to wolverines were the effects of small subpopulation sizes and subpopulation isolation on wolverine genetic and demographic health, and the subsequent potential future influence of trapping.

Comment [JC69]: See Comment 10

As discussed in our analysis of the effects on wolverine habitat from climate change under Factor A, wolverine habitat in the contiguous United States is likely to become smaller overall, and remaining habitat is likely to be more fragmented and fragments more isolated from one another than they are today (McKelvey *et al*. 2011, Figure 8). Given that wolverine subpopulations in the DPS are already so small, and movement between subpopulations so restricted, inbreeding has become likely (Kyle and Strobeck 2001, p. 343; Cegelski *et al*. 2003, pp. 2914-2915; Cegelski *et al*. 2006, p. 208; Schwartz *et al*. 2007, p. 2176; Schwartz *et al*. 2009, p. 3229). The long term maintenance of wolverines in the DPS will require continued connectivity between subpopulations within the DPS, and with populations to the north in Canada. To the

extent that wolverine habitat becomes more fragmented, and fragments become more isolated due to habitat loss resulting from climate change, these factors will become more significant to wolverine conservation. The risk factor of small population size, including measures of effective population size and their consequent effects on maintenance of genetic diversity, is a threat to the North American wolverine DPS when considered cumulatively with habitat loss resulting from climate change.

Wolverine populations have been expanding in the DPS area since the early 20th century, when they were likely at or near zero (Aubry *et al*. 2007, p. 2151). Most of this expansion has occurred under trapping regulations that allowed a higher level of trapping than currently occurs (see Montana Department of Fish, Wildlife, and Parks 2007, p. 1). Therefore, it might be argued that wolverine trapping is not occurring at levels that would significantly affect conservation of the DPS. However, future habitat changes due to climate change are predicted to reduce habitat connectivity and extent. As described above, these changes are likely to exacerbate the problem of loss of genetic diversity and demographic stability caused by low effective population size and insufficient movement between populations, leading to inbreeding. Given these likely secondary effects of climate change, human-caused mortality due to harvest is likely to become more significant to the wolver~~e~~ine population as connectivity needs increase and connectivity simultaneously becomes more difficult. As habitats become smaller and more isolated from one another, more wolverines will be needed to attempt to move between subpopulations to maintain population viability. Harvest currently removes up to five wolverines from the population every year, reducing the number of animals available for

dispersal. In addition, incidental trapping of wolverines removes still more. For these reasons, we find that harvest and incidental trapping, when considered cumulatively with habitat loss resulting from climate change, are likely to become threats to the DPS due to the likely synergistic effects they may have on the population as habitat becomes smaller and more fragmented.

Proposed Determination

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the wolverine DPS. We have identified threats to the contiguous United States population of the North American wolverine attributable to Factors A, B, and E. The primary threat to the DPS is from habitat and range loss due to climate warming (Factor A). Wolverines require habitats with near-arctic conditions wherever they occur. In the contiguous United States, wolverine habitat is restricted to high-elevation areas in the West. Wolverines are dependent on deep persistent snow cover for successful denning, and they concentrate their year-round activities in areas that maintain deep snow into spring and cool temperatures throughout summer. Wolverines in the contiguous United States exist as small and semi-isolated subpopulations in a larger metapopulation that requires regular dispersal of wolverines between habitat patches to maintain itself. These dispersers achieve both genetic enrichment and demographic support of recipient populations. Climate changes are predicted to reduce wolverine habitat and range by 31 percent over the next 30 years and 63 percent over the next 75 years, rendering remaining wolverine

habitat significantly smaller and more fragmented. We anticipate that, by 2045, maintenance of the contiguous United States wolverine population in the currently occupied area may require human intervention to facilitate genetic exchange and possibly also to facilitate metapopulation dynamics by moving individuals between habitat patches if they are no longer accessed regularly by dispersers, or risk loss of the population.

Other threats are minor in comparison to the driving primary threat of climate change; however, cumulatively, they could become significant when working in concert with climate change if they further suppress an already stressed population. These secondary threats include harvest (including incidental harvest) (Factor B) and demographic stochasticity and loss of genetic diversity due to small effective population sizes (Factor E). All of these factors affect wolverines across their current range in the contiguous United States.

The Act defines an endangered species as any species that is "in danger of extinction throughout all or a significant portion of its range" and a threatened species as any species "that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future." We find that the contiguous United States wolverine DPS presently meets the definition of a threatened species due to the likelihood of habitat loss caused by climate change resulting in population decline leading to breakdown of metapopulation dynamics. Breakdown in metapopulation dynamics would make the DPS vulnerable to further loss of genetic diversity through inbreeding, and likely vulnerable to demographic endangerment as small subpopulations

could no longer rely on demographic rescue from nearby populations. At that point wolverine populations would meet the definition of an endangered species under the Act. We base this determination on the immediacy, severity, and scope of the threats described above. Therefore, on the basis of the best available scientific and commercial information, we propose listing the contiguous United State DPS of the North American wolverine as a threatened species in accordance with sections 3(6) and 4(a)(1) of the Act.

Under the Act and our implementing regulations, a species may warrant listing if it meets the definition of an endangered or threatened species throughout all or a significant portion of its range. The contiguous United States DPS of the North American wolverine proposed for listing in this rule is wide-ranging and the threats occur throughout its range. Therefore, we assessed the status of the DPS throughout its entire range. The threats to the survival of the species occur throughout the species' range and are not restricted to any particular significant portion of that range. Accordingly, our assessment and proposed determination applies to the DPS throughout its entire range.

Available Conservation Measures

Conservation measures provided to species listed as an endangered or threatened species under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness and conservation by Federal, State, Tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and

requires that recovery actions be carried out for all listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act requires the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed, preparation of a draft and final recovery plan, and revisions to the plan as significant new information becomes available. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. The recovery plan identifies site-specific management actions that will achieve recovery of the species, measurable criteria that determine when a species may be downlisted or delisted, and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery

teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. The recovery outline is available on our website at http://www.fws.gov/mountain-prairie/species/mammals/wolverine/ and on http://www.regulations.gov concurrently with the publication of this proposed rule. When completed, the draft recovery plan and the final recovery plan will be available on our website or from our Montana Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribal, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands.

If this species is listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost share grants for nonfederal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the States inhabited by wolverines or uninhabited states with suitable habitat would be eligible for Federal funds to implement management actions that promote the protection and recovery of wolverines. Information

on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants*.

Although the wolverine DPS is only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

Federal agency actions within the species habitat that may require conference or consultation or both as described in the preceding paragraph include management and any other landscape altering activities on Federal lands in suitable wolverine habitat within the range of the species administered by the Department of Defense, U.S. Fish and Wildlife Service, Bureau of Land Management, National Park Service, and U.S. Forest Service; construction and management of gas pipeline and power line rights-of-way in suitable wolverine habitat by the Federal Energy Regulatory Commission; construction and maintenance of roads or highways by the Federal Highway Administration in suitable wolverine habitat; and permitting of infrastructure development in suitable wolverine habitat for recreation, oil and gas development, or residential development by the U.S. Forest Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, or Department of Defense.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. The prohibitions of section 9(a)(2) of the Act, codified at 50 CFR 17.21 for endangered wildlife, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these), import, export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. Under the Lacey Act (18 U.S.C. 42–43; 16 U.S.C. 3371–3378), it is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered species, and at 17.32 for threatened species. With regard to endangered wildlife, a permit must be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of species proposed for listing. The following activities could potentially result in a violation of section 9 of the Act; this list is not comprehensive:

Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of the species, including import or export across State lines and international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Montana Ecological Services Field Office

(see **FOR FURTHER INFORMATION CONTACT**). Requests for copies of the regulations concerning listed animals and general inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Endangered Species Permits, 134 Union Boulevard, Suite 650, Lakewood, CO 80228; Telephone 303-236-4265.

A determination to list the contiguous United States DPS of the North American wolverine as a threatened species under the Act, if we ultimately determine that listing is warranted, will not regulate greenhouse gas emissions. Rather, it will reflect a determination that the DPS meets the definition of a threatened species under the Act, thereby establishing certain protections for them under the ESA. While we acknowledge that listing will not have a direct impact on the loss of deep, persistent, late spring snowpack or the reduction of greenhouse gases, we expect that it will indirectly enhance national and international cooperation and coordination of conservation efforts, enhance research programs, and encourage the development of mitigation measures that could help slow habitat loss and population declines. In addition, the development of a recovery plan will guide efforts intended to ensure the long-term survival and eventual recovery of the lower 48 states DPS of the wolverine.

Special Rule Under Section 4(d) of the Act

Whenever a species is listed as a threatened species under the Act, the Secretary may specify regulations that he deems necessary and advisable to provide for the

conservation of that species under the authorization of section 4(d) of the Act. These rules, commonly referred to as ‘‘special rules,’’ are found in part 17 of title 50 of the Code of Federal Regulations (CFR) in §§ 17.40–17.48. This special rule for § 17.40 would prohibit take of any wolverine in the contiguous United States when associated with or related to trapping, hunting, shooting, collection, capturing, pursuing, wounding, killing, and trade. In this context, any activity where wolverines are attempted to be, or are intended to be, trapped, hunted, shot, captured, or collected, in the contiguous United States, will be prohibited. It will also be prohibited to incidentally trap, hunt, shoot, capture, pursue, or collect wolverines in the course of otherwise legal activities. All otherwise legal activities involving wolverines and their habitat that are conducted in accordance with applicable State, Federal, tribal, and local laws and regulations are not considered to be take under this regulation. This includes activities that occur in and may modify wolverine habitat such as those described below.

In this proposed listing rule, we identified several risk factors for the wolverine DPS that, in concert with climate change, may result in reduced habitat value for the species. These risk factors include human activities like dispersed recreation, land management activities by Federal agencies and private landowners, and infrastructure development. However, the scale at which these activities occur is relatively small compared to the average size of wolverine’s home range, between 300 and 500 km^2 (186 and 310 mi^2). For example, ski resorts constitute the largest developments in wolverine habitats. In Colorado, the state with the most ski resorts in the range of the wolverine, ski resort developments cover only 0.6 percent of available wolverine habitat (Colorado

Comment [JC70]: I don’t believe these issues are termed “risk factors” elsewhere in the document. I believe they are referred to as “impacts” (Line 1069). Also, none of the factors listed here are considered for their cumulative impact in concert with climate change as this suggests. See Comment 10.

Division of Wildlife 2010, p. 16). Other developments are more localized still, such as mines and small infrastructure. It is possible that these forms of habitat alteration may affect individual wolverines, by causing the temporary movement of a few individuals within or outside of their home ranges during or shortly after construction. However, due to the small scale of the habitat alteration involved in these sorts of activities, we conclude that the overall impact of these activities is not significant to the conservation of the species. Dispersed recreation like snowmobiling and back country skiing, and warm season activities like backpacking and hunting, occur over larger scales; however, there is little evidence to suggest that these activities may affect wolverines significantly or have a significant effect on conservation of the DPS. Preliminary evidence suggests that wolverines can coexist amid high levels of dispersed motorized and nonmotorized use (Heinenmeyer *et al*. 2012, entire), possibly shifting activity to avoid the most heavily used areas within their home ranges.

Comment [JC71]: There is little evidence to suggest they do not. If we believed this statement we would never have initiated the central Idaho wolverine/recreation project. Besides simple common sense, there is ample evidence from both Scandinavia (Persson excluded) and North America to suggest that these activities may have significant impact.

Comment [JC72]: This statement is not supported by Heinemeyer et al. 2012.

Transportation corridors and urban development in valley bottoms between patches of wolverine habitat may inhibit individual wolverines' movement between habitat patches; however, wolverines have made several long-distance movements in the recent past that indicates they are able to navigate current landscapes as they search for new home ranges. As described above, we have no evidence to suggest that current levels of transportation infrastructure development or residential development are a threat to the DPS or will become one in the future.

Comment [JC73]: It is a bit difficult to understand how we can consider habitat isolation, reduced genetic diversity, and reduced frequency of dispersal as cumulative impacts contributing to the threat of decreasing snow pack as validation for listing, and then suggest that because "*wolverines have made several long-distance movements*" the landscape they must move through to disperse is of no consequence to the likelihood of successful dispersal. This jumps out as a bit inconsistent.

Land management activities (principally timber harvest, wildland firefighting,

prescribed fire, and silviculture) can modify wolverine habitat, but this generalist species appears to be little affected by changes to the vegetative characteristics of its habitat. In addition, most wolverine habitat occurs at high elevations in rugged terrain that is not conducive to intensive forms of silviculture and timber harvest. Therefore, we anticipate that habitat modifications resulting from these types of land management activities would not significantly affect the conservation of the DPS, as we described above.

Comment [JC74]: I would argue that Aubry et al. 2007, Copeland et al. 2010, and Inman et al. 2012 provide arguments that the wolverine is not a generalist species; that it is tied to a very specific life zone. Furthermore, the argument is made earlier in the document that decreasing snowpack will ultimately result in habitat changes that could adversely impact the wolverine. That is not consistent with this sentence.

The proposed special rule under section 4(d) of the Act will provide for the possession and take of wolverines that are (1) legally held at the time of listing (2) legally imported pursuant to applicable Federal and state statutes, or (3) captively bred without a permit. The special rule will also allow the continuation of the export of captive-bred wolverines provided applicable Federal and state laws are followed, and provide for the transportation of wolverine skins in commerce within the United States. The export of skins from wolverines documented as captive-bred will be permitted. Legally possessed skins may be transported in interstate trade without permits.

In this proposed rule, we include a prohibition against incidental take of wolverine in the course of legal trapping activities directed at other species. However, documented take of wolverine from incidental trapping has been low. In the 2008–2009 trapping season, two wolverines were incidentally killed in traps set for other species in Beaverhead and Granite Counties, Montana (Montana Fish, Wildlife, and Parks 2010, p. 2). In Idaho, the U.S. Department of Agriculture Wildlife Services trapped three wolverines (one each in 2004, 2005, and 2010) incidental to trapping wolves involved in

livestock depredations. One of these sustained severe injuries and was euthanized. We are requesting the public, Federal agencies, and the affected State fish and wildlife agencies to submit public comments on this issue, including any State management plans related to trapping regulations and any measures within those plans that may avoid or minimize the risk of wolverine mortality from incidental trapping for other species.

CRITICAL HABITAT

Section 3(5)(A) of the Act defines critical habitat as "(i) the specific areas within the geographical area occupied by the species, at the time it is listed...on which are found those physical or biological features (I) Essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed...upon a determination by the Secretaries of Commerce and Interior that such areas are essential for the conservation of the species." Section 3(3) of the Act (16 U.S.C. 1532(3)) also defines the terms "conserve," "conserving," and "conservation" to mean "to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary."

Section 4(a)(3) of the Act and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, we designate critical habitat at the time a species is determined to be an endangered or threatened species. Critical habitat

may only be designated within the jurisdiction of the United States, and may not be designated for jurisdictions outside of the United States (50 CFR 424(h)). Our regulations (50 CFR 424.12(a)(1)) state that designation of critical habitat is not prudent when one or both of the following situations exist: (1) The species is threatened by taking or other activity and the identification of critical habitat can be expected to increase the degree of threat to the species; or (2) such designation of critical habitat would not be beneficial to the species. Our regulations (50 CFR 424.12(a)(2)) further state that critical habitat is not determinable when one or both of the following situations exists: (1) Information sufficient to perform required analysis of the impacts of the designation is lacking; or (2) the biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat.

Delineation of critical habitat requires, within the geographical area occupied by the DPS of the North American wolverine in the contiguous United States, identification of the physical and biological features essential to the conservation of the species. In general terms, physical and biological features essential to the wolverine may include (1) Areas defined by persistent spring snowpack and (2) areas with avalanche debris (bottom of avalanche chutes where large trees, rocks, and other debris are swept) and talus slopes or boulder fields (debris piles of large rocks, trees, and branches) in which females can construct dens which provide security from large predators and buffer against wind and low temperatures.

Comment [JC75]: I might argue that number 1 includes number 2 thereby making number 2 redundant.

Information regarding the wolverine's life functions and habitats associated with

these functions has expanded greatly in recent years. We need additional time to assess the potential impact of a critical habitat designation; including whether there will be any benefit to wolverine from such a designation. A careful assessment of the habitats that may qualify for designation as critical habitat will require a thorough assessment in light of projected climate change and other threats. At this time, we also need more time to analyze the comprehensive data to identify specific areas appropriate for critical habitat designation. Accordingly, we find designation of critical habitat to be "not determinable" at this time.

Peer Review

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our listing determination and critical habitat designation are based on scientifically sound data, assumptions, and analyses. We have invited these peer reviewers to comment during this public comment period.

We will consider all comments and information received during this comment period on this proposed rule during our preparation of a final determination. Accordingly, the final decision may differ from this proposal.

Required Determinations

Clarity of the Rule

Executive Order 12866 requires each agency to write regulations that are easy to understand. We invite your comments on how to make this rule easier to understand including answers to questions such as the following: (1) Are the requirements in the rule clearly stated? (2) Does the rule contain technical language or jargon that interferes with its clarity? (3) Does the format of the rule (grouping and order of sections, use of headings, paragraphing, etc.) aid or reduce its clarity? (4) Would the rule be easier to understand if it were divided into more (but shorter) sections? (5) Is the description of the rule in the **SUPPLEMENTARY INFORMATION** section of the preamble helpful in understanding the rule? What else could we do to make the rule easier to understand?

Send a copy of any comments that concern how we could make this rule easier to understand to Office of Regulatory Affairs, Department of the Interior, Room 7229, 1849 C Street, NW., Washington, DC 20240. You also may e-mail the comments to this address: *Exsec@ios.goi.gov*.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501, et seq.)

This rule does not contain any new collections of information that require approval by Office of Management and Budget (OMB) under the Paperwork Reduction Act. This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or

sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with listing a species as an endangered or threatened species under the Endangered Species Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A complete list of all references cited in this proposed rule is available on the Internet at *http://www.regulations.gov* or upon request from the Field Supervisor, Montana Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT** section).

Authors

The primary authors of this proposed rule are the staff members of the Montana Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, and Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361-1407; 1531-1544; and 4201-4245, unless otherwise noted.

2. In § 17.11(h) add entries for "Wolverine, North American" to the List of Endangered and Threatened Wildlife in alphabetical order under Mammals to read as set forth below:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historical range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
Mammals * * * * * * *							
Wolverine, North American	*Gulo gulo luscus*	U.S.A. (Alaska and northern contiguous States); Canada	Where found within contiguous U.S.A., except where listed as an experimental population	T		NA	17.40(a)
Wolverine, North American	*Gulo gulo luscus*	U.S.A. (Alaska and northern contiguous States); Canada	U.S.A. (specified portions of CO, NM, and WY; see 17.84(d))	XN		NA	17.84(d)
* * * * * * *							

3. Amend § 17.40 by revising paragraph (a) to read as follows:

§ 17.40 Special rules—mammals.

(a) Wolverine, North American (*Gulo gulo luscus*).

(1) *Which populations of the North American wolverine are covered by this special rule?* This rule covers the distribution of this species in the contiguous United States.

(2) *What activities are prohibited?* Any activity where wolverines are attempted to be, or are intended to be, trapped, hunted, shot, captured, or collected, in the contiguous United States, will be prohibited. It will also be prohibited to incidentally trap, hunt, shoot, capture, pursue, or collect wolverines in the course of otherwise legal activities.

(3) *What activities are allowed?* Incidental take of wolverines will not be a violation of section 9 of the Act, if it occurs from any other otherwise legal activities involving wolverines and their habitat that are conducted in accordance with applicable State, Federal, tribal, and local laws and regulations. Such activities occurring in wolverine habitat include:

(i) Dispersed recreation such as snowmobiling, skiing, backpacking, and hunting for other species;

(ii) Management activities by Federal agencies and private landowners such as timber harvest, wildland firefighting, prescribed fire, and silviculture;

(iii) Transportation corridor and urban development;

(iv) Mining;

(v) Transportation and trade of legally possessed wolverine skins and skins from captive-bred wolverines within the United States.

* * * * *

Dated: 1/16/2013

/s/ Rowan W. Gould

Acting Director, U.S. Fish and Wildlife Service

Billing Code 4310–55–P