



August 13, 2014

Sally Jewell, Secretary  
Department of the Interior  
1849 C Street, N.W.  
Washington, D.C. 20240  
exsec@ios.doi.gov

Daniel Ashe, Director  
U.S. Fish and Wildlife Service  
Department of the Interior  
1849 C Street, N.W.  
Washington, D.C. 20240  
Dan\_Ashe@fws.gov

***VIA E-MAIL AND CERTIFIED MAIL***

**RE: Sixty-Day Notice of Intent to Sue to Remedy Violations of the Endangered Species Act in the United States Fish and Wildlife Service's Withdrawal of the Proposed Rule to List the Distinct Population Segment of the North American Wolverine Occurring in the Contiguous United States as Threatened, 79 Fed. Reg. 47,522**

Dear Secretary Jewell and Director Ashe,

On behalf of Center for Biological Diversity, Conservation Northwest, Defenders of Wildlife, Friends of the Clearwater, Greater Yellowstone Coalition, Idaho Conservation League, Jackson Hole Conservation Alliance, Klamath-Siskiyou Wildlands Center, and Rocky Mountain Wild, in accordance with the citizen suit provision of the Endangered Species Act ("ESA" or "Act"), 16 U.S.C. § 1540(g), I hereby provide notice that the United States Fish and Wildlife Service ("FWS" or "Service") is in violation of the ESA, 16 U.S.C. § 1533, and its implementing regulations, 50 C.F.R. § 402 *et seq.*, with regard to the Service's August 13, 2014 withdrawal of the proposed rule to list the distinct population segment ("DPS") of the North American wolverine occurring in the contiguous United States as threatened under the ESA. *See* 79 Fed. Reg. 47,522 (Aug. 13, 2014) ("Rule Withdrawal"). In light of the imperiled status of the wolverine, including both present and future threats to the species' survival, the Service's decision to withdraw its proposed rule violates section 4 of the ESA. 16 U.S.C. § 1533.

In its proposed rule issued on February 4, 2013, FWS proposed to list the wolverine DPS within the contiguous United States as threatened. 78 Fed. Reg. 7864 (Feb. 4, 2013) ("Proposed Rule"). This proposed listing was based on the Service's determination that climate change posed a significant threat to the snow-dependent wolverine, and that small population size and the effects of trapping also threatened the genetic diversity and survival of the species when combined with the detrimental effects of climate change. 78 Fed. Reg. at 7886. In its

withdrawal of that proposed rule, FWS examined the exact same science and reached the opposite conclusion, purporting to find that neither climate change nor other threats will pose a significant risk to the wolverine. 79 Fed. Reg. at 47,544-45. Contrary to FWS's withdrawal decision, the best available science demonstrates significant current and future threats to the North American wolverine. The Service's decision to withdraw the proposed rule contravenes its own earlier conclusions, the conclusions of scientific panel members convened to explore this issue, and the recommendations of the agency's own scientists. See 78 Fed. Reg. at 7880; U.S. Fish & Wildlife Serv., Wolverine Science Panel Workshop Report (April 3-4, 2014) ("Science Panel Report"); Memorandum from Theresa Rabot, Assistant Reg'l Dir. for Ecological Servs., U.S. Fish & Wildlife Serv., to Noreen Walsh, Reg'l Dir., Region 6, U.S. Fish & Wildlife Serv. (May 2014) ("Rabot Memorandum").

Pursuant to the citizen suit provision of the ESA, 16 U.S.C. § 1540(g)(2), this letter provides you notice that, unless within 60 days of receipt of this letter FWS promulgates a final rule listing the North American wolverine as threatened within the contiguous United States, we intend to challenge in federal district court the Service's withdrawal of the proposed rule to list the North American wolverine DPS as threatened.

## **I. The Wolverine**

The wolverine (*Gulo gulo*) is the largest terrestrial member of the weasel family. It combines the weasel's ferocity and energy with a larger and stronger body that has frequently been described as bear-like in its appearance. Adult wolverines normally weigh 20 to 40 pounds and are three to four feet long. Wolverines typically exhibit a thick, glossy, dark-brown coat of fur, often with a pale buff stripe running laterally from the shoulders along the animal's side and crossing the rump just above a long, bushy tail. The elusive wolverine has long been a subject of folklore. Native American mythology describes the wolverine as a trickster-hero, and a link to the spirit world.

Wolverines once ranged across the northernmost tier of the United States from Maine to Washington, and south into the Adirondacks of New York, the Rocky Mountains as far south as Arizona and New Mexico, and the Sierra Nevada-Cascade and Siskiyou Mountains as far south as California. The wolverine has been eliminated from all but a fragment of this historic range by the destruction of its wilderness habitat and trapping by European settlers. Wolverines were extirpated from the upper Midwest states by the early 1900s, and from the Northeast shortly thereafter. Although one wolverine each has recently traveled to California and Colorado, wolverine populations are known to exist in the contiguous United States only in the Rocky Mountain regions of Idaho, Montana, and Wyoming, in the Cascade Mountains of Washington, and in eastern Oregon. The entire population in the contiguous United States is estimated at just 300 wolverines or fewer.

Wolverines are adapted to live in high-altitude and high-latitude ecosystems characterized by deep snow and cold temperatures. Deep snow is particularly important for wolverine reproduction: females create dens by tunneling deep into the snowpack, where they give birth in protected den cavities at ground level. Wolverines of both sexes also rely on these same cold, snowy areas year-round, perhaps because snow helps provide "refrigeration" for the

carcasses that wolverines feed on, and perhaps also because there is less competition for food in these cold, harsh regions. Wolverines primarily rely on scavenging ungulates killed by other predators or by natural causes such as disease, injury, or weather. Wolverines also prey on rodents and other small mammals, and are capable of taking even large ungulates such as deer, elk, and moose as live prey when the opportunity arises.

Individual wolverines require large home ranges to access sufficient food to sustain themselves throughout the year, with the size of those ranges varying by habitat and food conditions, age, and gender. Home ranges of studied wolverines in Idaho averaged approximately 1,522 square kilometers for adult males and 384 square kilometers for adult females. In northwest Montana, adult males had home ranges of 422 square kilometers, while females occupied ranges averaging 288 square kilometers.

Wolverines have a low reproductive rate. Female wolverines attain sexual maturity at about 15 months, but fewer than half of potentially reproducing females actually produce young, known as kits, in any given year. Wolverine litter size averages two to three kits in the years when a female does give birth. On average, an Idaho study found that wolverines reproduced at a rate of less than one kit per female per year.

In sum, the remaining wolverines in the contiguous United States exist in low numbers, require large home ranges in cold and snowy areas, and have low reproductive rates. These characteristics leave the wolverine vulnerable to localized or even range-wide extinctions due to escalating threats from climate change, human disturbance, and trapping.

## **II. The Endangered Species Act**

Congress enacted the Endangered Species Act in 1973 with the goal of protecting and recovering species that are in danger of extinction or are likely to become so within the foreseeable future. In the words of the Act, its purpose is “to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved,” and “to provide a program for the conservation of such endangered species and threatened species.” 16 U.S.C. § 1531(b). In the seminal case on the purpose of the Endangered Species Act, Tennessee Valley Authority v. Hill, the Supreme Court confirmed that it is “beyond doubt that Congress intended endangered species to be afforded the highest of priorities.” 437 U.S. 153, 174 (1978). FWS highlighted this goal in its proposed rule to list the wolverine as threatened, stating that the “primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems on which they depend.” 78 Fed. Reg. at 7886.

To achieve the goal of conserving threatened and endangered species, section 4 of the Act requires the Secretary of the Interior to determine whether a species is threatened or endangered, 16 U.S.C. § 1533(a)(1), designate critical habitat for the species, *id.* § 1533(a)(3), and promulgate and implement a recovery plan for the species, *id.* § 1533(f). Under the Act, a species is “endangered” if it is “in danger of extinction throughout all or a significant portion of its range,” *id.* § 1532(6), and it is “threatened” if it is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range,” *id.* § 1532(20). The Act requires the Secretary to determine a species’ status based on five statutory 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.

Id. § 1533(a)(1). The Act mandates that the Secretary evaluate these factors “solely on the basis of the best scientific and commercial data available to [her] after conducting a review of the status of the species.” Id. § 1533(b)(1)(A) (emphasis added). See also Nw. Ecosystem Alliance v. U.S. Fish & Wildlife Serv., 475 F.3d 1136, 1147 (9th Cir. 2007) (“The ESA instructs the Service to make its determinations ‘solely on the basis of the best scientific and commercial data available ... .’”) (quoting 16 U.S.C. § 1533(b)(1)(A)).

Courts interpreting these statutory provisions have repeatedly held that “failure by the agency to utilize the best available science is arbitrary and capricious.” Consol. Delta Smelt Cases, 717 F. Supp. 2d 1021, 1060 (E.D. Cal. 2010). An agency’s failure to draw rational conclusions from the evidence before it also constitutes arbitrary and capricious action. Motor Vehicle Mfrs. Ass’n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983). FWS’s listing and delisting actions have frequently been held arbitrary and capricious on these specific grounds. A recent case on grizzly bear delisting, for instance, vacated the Service’s delisting rule because “[t]he Rule did not articulate a rational connection between the data before it and its conclusion.” Greater Yellowstone Coal., Inc. v. Servheen, 665 F.3d 1015, 1030 (9th Cir. 2011). See also Trout Unlimited v. Lohn, 645 F. Supp. 2d 929, 944 (D. Or. 2007) (agency “violated the ESA by not relying on the best available science”). The requirement to use the best available science—and the necessity of overturning agency action that fails to do so—is therefore clear in the language of the Act and is also well established in ESA case law.

### **III. History of Wolverine Listing Efforts**

Despite significant and escalating threats, FWS has repeatedly refused to apply the ESA’s protections to the North American wolverine. The Service’s withdrawal of the proposed listing rule is the latest move in a 14-year saga in which the public’s repeated attempts to secure protections for this imperiled species have met with continuous resistance from FWS, frequently requiring judicial intervention to compel FWS to take the actions required by the ESA.

On July 14, 2000, conservation groups submitted a petition to list the wolverine within the contiguous United States as a threatened or endangered species and to designate critical habitat for the species. After initial delay that required court action to resolve, the Service published a negative 90-day petition finding in the Federal Register on October 21, 2003. 68 Fed. Reg. 60,112 (Oct. 21, 2003). On June 8, 2005, a coalition of conservation organizations filed a complaint in the U.S. District Court for the District of Montana challenging the Service’s negative finding. On September 29, 2006, the Montana court ruled that the 90-day petition finding was arbitrary and capricious and violated the ESA. Defenders of Wildlife v.

Kemphorne, CV 05-99-M-DWM, slip op. at 18-19 (D. Mont. 2006). According to the court, the “petition ... included enough information to allow the Secretary to conclude the distribution of the species is substantially diminished and the wolverine’s existence is threatened.” Id. at 20. The court ordered the Service to prepare a 12-month finding on the wolverine listing petition, see id. at 21, and then later granted the Service’s motion to extend the status review and 12-month finding deadline by five months, to February 28, 2008.

FWS published its first 12-month finding, denying ESA protections for the wolverine, on March 11, 2008. 73 Fed. Reg. 12,929 (Mar. 11, 2008). The basis of this negative finding was FWS’s determination that “the contiguous United States population of the North American wolverine does not constitute a distinct population segment (DPS) under the Act,” and that the population “is not a significant portion of the range of the North American subspecies and does not warrant further consideration under the Act.” Id. at 12,941. Conservation groups again brought suit to challenge this finding, and on March 6, 2009, the Service agreed to settle that case by voluntarily retracting the challenged 12-month finding and issuing a new finding by December 1, 2010. See 78 Fed. Reg. 7866. On December 14, 2010, the Service finally published this second 12-month finding, which determined that the wolverine within the contiguous United States constituted a distinct population segment that warranted listing under the Act due to the predicted impacts of climate change and other threats. 75 Fed. Reg. 78,030 (Dec. 14, 2010). In its finding, the Service estimated that wolverines were “likely to lose 63 percent of their current habitat area over the next century,” and that “by 2045, maintenance of the contiguous U.S. wolverine population in the currently occupied area will require human intervention to facilitate genetic exchange.” Id. at 78,054. Yet the Service still refused to extend ESA protections to the wolverine, finding that an actual listing decision was “precluded by higher priority listing actions.” Id.

The Service did not even set a timetable for issuing a listing decision on the wolverine until it was required to do so by a court settlement addressing FWS’s chronic backlog of listing determinations. Endangered Species Act Section 4 Deadline Litig., Misc. Action No. 10-377 (EGS), MDL Docket No. 2165 (D.D.C. Sept. 9, 2011). As part of this settlement, the Service agreed to issue a proposed listing rule for the wolverine, or withdraw the “warranted” 12-month finding, by the end of the 2013 Fiscal Year. Id.; see also 78 Fed. Reg. at 7866. On February 4, 2013, FWS finally issued a proposed rule, which proposed to list the distinct population segment of the North American wolverine occurring within the contiguous United States as threatened. 78 Fed. Reg. at 7864. The proposed rule, discussed in detail below, found that climate change posed a primary threat to the wolverine’s survival, and that trapping and small population size also posed threats when acting in concert with climate change. Id. at 7885-86.

After publishing a proposed rule, the ESA requires the Service to publish a final rule or withdraw the proposed rule within one year, 16 U.S.C. § 1533(b)(6)(A), except that the Secretary may extend the period for 6 months for the purpose of “soliciting additional data,” id. § 1533(b)(6)(B)(i). In this case, the Service took the 6-month extension, during which time it consulted further with state wildlife agencies and an ad-hoc “science panel.” See Science Panel Report at 1-13, 15-16. Just months before the final rule was due, agency documents indicate that FWS abruptly changed course from its previous finding, rejecting the science it had previously relied on and the results of the Science Panel Workshop, and unexpectedly determined that

neither climate change nor other risks posed significant threats to the survival of the wolverine. Compare Rabot Memorandum at 1 (recommending finalization of the proposed rule with minimal changes) with Memorandum from Noreen Walsh, Reg'l Dir., Region 6, U.S. Fish & Wildlife Serv. to Theresa Rabot, Assistant Reg'l Dir. for Ecological Servs., Region 1, U.S. Fish & Wildlife Serv., 17 (May 30, 2014) ("Walsh Memorandum") (ordering staff to "prepare a withdrawal of the proposed rule"). The Service ultimately issued a withdrawal of its proposed listing on August 13, 2014, once again denying ESA protections to the wolverine. 79 Fed. Reg. 47,522.

#### **IV. Threats to the North American Wolverine**

Notwithstanding FWS's abrupt about-face on the wolverine listing determination, the best available scientific information demonstrates that the North American wolverine faces numerous current and future threats that are likely to lead to its extinction within the foreseeable future if the species does not receive protection under the ESA. These threats include habitat loss due to climate change and human disturbance, direct mortality from intentional and incidental trapping, and loss of genetic diversity due to small population size and habitat fragmentation. While all of these threats are significant, climate change—acting alone and in concert with these other threats—will likely have the largest impact on wolverine survival in the foreseeable future. The Service acknowledged these threats in its proposed rule, published on February 4, 2013, which found that the best available science demonstrated significant primary threats due to climate change, and secondary threats due to trapping and small population size working synergistically with climate change. 78 Fed. Reg. at 7886. Accordingly, the draft rule proposed to list the DPS of the North American wolverine occurring within the contiguous United States as threatened. Id.<sup>1</sup>

##### **A. Habitat Loss Due To Climate Change**

Wolverines depend on areas with deep and persistent spring snow both for year-round habitat and for the snow-tunneled dens where females give birth and wean their young. The best available science shows that this snowy habitat is predicted to shrink dramatically as climate change progresses, with significant detrimental impacts on the wolverine. The proposed rule accordingly concluded that "[w]olverine habitat is projected to decrease in area and become more fragmented in the future as a result of climate changes." 78 Fed. Reg. at 7877. These habitat changes, in turn, "are expected to have direct and indirect effects to wolverine

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<sup>1</sup> The Service also proposed a special rule under section 4(d) of the ESA, prohibiting both intentional and unintentional trapping and hunting of wolverines, but permitting development and a variety of other activities in wolverine habitat that would otherwise be considered "take" under the ESA. Id. at 7888. At the same time, the Service also issued a proposed rule under section 10(j) of the ESA, creating a "nonessential experimental population" of wolverines in Colorado, southern Wyoming, and New Mexico, which would be subject to less strict protection than the DPS in the Northern Rockies. 78 Fed. Reg. 7890 (Feb. 4, 2013). These associated proposed rules were also withdrawn by the Rule Withdrawal. 79 Fed. Reg. 47,522.

populations in the contiguous United States,” posing a significant threat to the continued survival of the wolverine DPS. Id.

The habitat analysis in the proposed rule began with an explanation of wolverines’ life history that highlights the snow-obligate nature of the species. The Service explained, for instance, that wolverines “select areas that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season.” Id. at 7867 (citing Copeland et al. (2010)). It recognized that this relationship with snow is particularly important for female denning, noting that “snow cover during the denning period [February through May] is essential for successful wolverine reproduction range-wide.” Id. at 7872. Although the precise reasons why female wolverines choose den sites in deep snow are not known, scientists hypothesize that a den dug deep below the surface of the snow provides protection from extreme cold in the early spring and also protects young kits from predators. Id. Regardless of the mechanism, it is clear that the correlation between spring snow and female reproductive dens is extremely tight: the most recent study found that every one of the 562 verified den sites in North America and Scandinavia occurred in snow. Copeland et al. (2010).

The Service explained, furthermore, that the correlation with snow extends beyond denning season. The proposed rule cited Copeland et al. (2010) to emphasize that “[w]olverine year-round habitat use also takes place almost entirely within the area defined by deep persistent snow.” 78 Fed. Reg. at 7868. Indeed, 95 percent of worldwide summer wolverine observations and 89 percent of year-round observations fell within the area that tended to have persistent spring snowpack.<sup>2</sup> Copeland et al. (2010), at 239. Accordingly, FWS concluded that “[d]eep, persistent, and reliable spring snow cover (April 15 to May 14) is the best overall predictor of wolverine occurrence in the contiguous United States.” Id. at 7872 (citing Aubry et al. 2007; Copeland et al. 2010). The Service therefore adopted the snow-dependent model of wolverine habitat developed by Copeland et al. (2010), combined with a closely aligned model developed by Inman et al. (2012),<sup>3</sup> to define a baseline wolverine habitat model that is highly correlated with spring snowpack. 78 Fed. Reg. at 7874.

The most authoritative study of how this range might shift with a changing climate was done by McKelvey et al. (2011). That study uses a combination of scientifically accepted global climate models (GCMs) to project the impacts of changing temperature and precipitation on the wolverine habitat defined by Copeland et al. (2010). Based on this sophisticated analysis, the Service’s proposed rule concluded that “McKelvey et al. (2011, entire) represents the best

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<sup>2</sup> The most recently developed model of wolverine habitat, using a different method, coincides more than 96 percent with this snow-driven model. See Inman et al. (2013), at 283.

<sup>3</sup> The proposed rule attributes this model to “Inman et al. (2012)” but neither of the papers by Inman et al. (2012) listed under “Wolverine Proposed Listing Literature Cited” contain any habitat modeling. It seems more likely that the Service is working from an advance copy of the paper ultimately published as Inman et al. (2013), which models suitable wolverine habitat across the Western United States, and which is cited in the Rule Withdrawal. 79 Fed. Reg. at 47,526, 47,534, 47,536, 47,542. Inman et al. (2013) is listed under “Scientific Literature Cited” at the end of this letter.

scientific information available regarding the impacts of climate change to wolverine habitat.” 78 Fed. Reg. at 7874. FWS found McKelvey *et al.*’s analysis to be the best available science for four principal reasons: (1) their habitat projections are based on global models that are recognized as “the most reliable predictors of future climate available,” (2) they downscaled their analysis to infer climate impacts “at a scale relevant to wolverine habitat,” (3) their hydrologic model predicts snow cover during the spring denning period, which is “the strongest correlate with wolverine reproductive success,” and (4) they used the Copeland *et al.* (2010) habitat model “to relate projected climate changes to wolverine habitat.” 78 Fed. Reg. at 7876-77. FWS noted that other studies analyzing the impacts of climate change on wolverine habitat “have been superseded by a more sophisticated analysis provided by McKelvey *et al.* (2011, entire),” 78 Fed. Reg. at 7876, but these other studies nonetheless “all support the conclusion that climate changes caused by warming are likely to negatively affect wolverine habitat,” *id.* at 7877.

The McKelvey *et al.* model, as adopted by FWS in the proposed rule, predicts that “31 percent of current wolverine habitat in the contiguous United States will be lost due to climate warming by ... 2045” and that “[t]hat loss expands to 63 percent of wolverine habitat by ... 2085.”<sup>4</sup> 78 Fed. Reg. 7876 (citing McKelvey *et al.* (2011)). Because FWS found that “deep snow maintained through the denning period is required for wolverines to successfully live and reproduce,” 78 Fed. Reg. 7874-75, this severe decline in spring snow is predicted to have a significant detrimental impact on the reproduction and survival of the species. Moreover, FWS found that these severe habitat declines would have the effect of “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, with negative consequences for gene flow and genetic viability.” 78 Fed. Reg. at 7877.

Wolverines within the contiguous United States currently exist as a “metapopulation,” or “a network of semi-isolated subpopulations” that “require some level of regular or intermittent migration and gene flow” in order to maintain genetic viability. *Id.* at 7867. As climate change shrinks the patches of suitable habitat occupied by these subpopulations and enlarges the distance between them, scientists predict that the difficulty of dispersal will increase. Thus, there will be even less gene flow between these subpopulations. McKelvey *et al.* (2011), at 2891-92. If this breakdown of metapopulation dynamics occurs, FWS concluded, “the entire metapopulation may be jeopardized.” 78 Fed. Reg. at 7867. Therefore, as severe as the projected habitat declines are, the proposed rule found that “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.” *Id.* at 7876 (emphasis added).

Based on its review of “the best scientific and commercial information available,” therefore, the Service properly concluded in its proposed rule that “the projected decrease and

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<sup>4</sup> FWS notes, however, that the model predicts the mountains of Colorado will be “slightly less sensitive to climate changes,” 78 Fed. Reg. at 7876, which is part of the reason why establishing a 10(j) population in the Southern Rocky Mountains may be an important protective measure for North American wolverines.



fragmentation of wolverine habitat or range due to future climate change is a threat to the species now and in the future.” Id. at 7880.

#### B. Other Threats to Wolverines

Wolverines in the contiguous United States are also threatened by non-climate factors, including human disturbance due to recreation and infrastructure, low genetic diversity due to small population size, and both intentional and incidental trapping. Each of these threats works alone and in concert with other threats—particularly climate change—to threaten the North American wolverine DPS.

Wolverine habitat in the contiguous United States is threatened by human disturbance in the form of recreational use, development, infrastructure, and roads. In particular, escalating motorized winter recreation, such as snowmobiling and helicopter-accessed skiing, poses a threat to wolverines’ successful denning and reproduction. Denning females are extremely sensitive to human disturbance. See Copeland (1996); Magoun and Copeland (1998). Such disturbance frequently results in den abandonment, often forcing the female to move to a less suitable site. Banci (1994). Denning females have been observed to abandon their dens even upon discovering human snowshoe tracks in the area. Copeland (1996); see also Magoun and Copeland (1998); Inman et al. (2007a) (discussing wolverine movement away from a maternal den after slight disturbance by researchers and light amount of recreational snowmobile activity). Despite the steep terrain that characterizes typical den sites, recent advances in snowmobile technology have enabled snowmobilers to reach previously inaccessible areas of suitable wolverine denning habitat. Heinemeyer et al. (2001). Further, an expanding helicopter skiing industry is impacting otherwise remote and inaccessible wolverine denning habitat in some areas with the noise and disturbance associated with numerous helicopter flights and landings throughout the winter months. See id.; see also Krebs et al. (2007), at 2188-89 (“Helicopter skiing and backcountry skiing were negatively associated with Columbia Mountain females’ use in winter.”); Ruggerio et al. (2007) at 2146 (“[r]esearchers in British Columbia found a consistent negative association between wolverine occurrence and areas where helicopter and backcountry skiing occur.”). A study of suitable wolverine denning habitat in the southwestern portion of the Greater Yellowstone Ecosystem concluded that “[w]inter recreational use, particularly snowmobile and heli-skiing, may be having potentially severe localized habitat impacts on wolverines.” Heinemeyer et al. (2001). This evidence suggests that wolverine habitat may be negatively impacted by recreational use, particularly as motorized winter recreation continues to increase in the Western mountain states.

Roads and other human infrastructure also threaten wolverine populations by causing direct mortality and limiting dispersal. Both of these impacts reduce population viability by reducing gene flow and thus threatening the critical metapopulation dynamics. Inman et al. (2007b), for instance, documented 3 verified incidents of road-kill mortality during their study period. Inman et al. (2007b), at 89. This was not an isolated result. See Preston et al. (2006) (documenting wolverine mortality in Kootenay National Park from a road); Krebs et al. (2004). Roads may also have indirect impacts on wolverine habitat and on individuals’ movements, as wolverines appear to avoid roads, especially when they are more heavily trafficked. Packila et al. (2007), at 105; Dawson et al. (2010), at 142 (“Our results also suggest that road densities may

affect selection of home ranges by Wolverines, in accordance with the broader distribution patterns of this species in the area”); Squires *et al.* (2006), at 2 (“The wolverines’ large spatial requirements and high mobility makes the species susceptible to direct road mortality as well as the barrier effects of roads on their movements.”); Austin (1998), at 30 (“wolverines avoid areas near the highway,” act agitated near highways, and are affected by the volume of traffic).

For a metapopulation in which linkage and active dispersal are required for continued genetic viability, the impact of roads on potential dispersers is particularly significant. Packila *et al.* (2007) also noted that roads and other human development also tend to be “relatively permanent,” *id.* at 109, so the dangers they pose are cumulative, long-term threats to the wolverine population.

The proposed rule briefly analyzed these threats from human disturbance but did not find them to be significant. Despite acknowledging that recreational use is heavy in some areas of wolverine habitat, *id.* at 7878, and that infrastructure development is increasing, *id.*, FWS concluded that there was not sufficient evidence to indicate that recreation, development, roads, or land management posed a significant threat to the North American wolverine DPS, *id.* at 7878-80. In fact, however, the best available science shows that human disturbance from both recreation and infrastructure may threaten the wolverine population, particularly as connectivity between subpopulations becomes increasingly difficult with escalating climate change and other threats.

The wolverine DPS is also threatened by its own small population size, because it severely limits genetic diversity. The estimated population of 250 to 300 wolverines in the contiguous United States has an “effective population”—i.e., the component of the population that engages in reproduction and thus passes on its genetic material to future generations—of just 35 breeding individuals. *Id.* at 7884 (citing Schwartz *et al.* (2009), at 3226), 79 Fed. Reg. at 47,542. The DPS’s effective population size is thus *far* below the threshold of 500 breeding animals that scientists believe is necessary to maintain long-term genetic diversity. *Id.* This makes wolverines vulnerable to inbreeding and genetic decline. The best available science thus shows that this incredibly low population size alone poses a threat to the population’s continued genetic viability. Although the proposed rule did not conclude that small population size poses a threat on its own, it did find that small population size and low genetic diversity pose a threat to wolverines when operating in concert with climate-driven habitat loss and fragmentation. The Service found that the metapopulation structure requiring genetic exchange to maintain viability—becoming more difficult as climate change increases habitat fragmentation—further amplifies this risk. *Id.* Indeed, the Service found that climate-driven isolation of certain populations “would result in a high likelihood of reduced genetic diversity due to inbreeding within a few generations.” *Id.* at 7876 (citing Cegelski *et al.* (2006), at 209). The Service therefore concluded that “the risk factor of small population size ... is a threat to the North American wolverine DPS when considered cumulatively with habitat loss resulting from climate change.” *Id.* at 7885.

Wolverine subpopulations—and thus, metapopulation dynamics—are also threatened by intentional and unintentional trapping. Wolverine trapping is still legal in Montana, the state that contains the majority of the remaining wolverines. 78 Fed. Reg. at 7881. From 2008 to 2012, an

average of 3.25 wolverines were legally trapped each year, in addition to an unknown level of incidental or “non-target” trapping (wolverines getting caught in traps set for other species). Id. Within a metapopulation structure, small subpopulations can be severely impacted by the loss of even a few individuals. Indeed, a 2007 study in Montana’s Pioneer, Beaverhead, Anaconda-Pintler, and Flint Creek Mountain Ranges observed a 30 percent population decline over the four-year study period due to trapping, with 6 of 8 known wolverine mortalities in these ranges caused by trapping. Squires et al. (2007). Given that “[m]etapopulations require ... migration and gene flow among subpopulations” to avoid inbreeding and local extirpations, 78 Fed. Reg. at 7867, such excessive localized trapping mortality, particularly in these “island” mountain ranges located between larger areas of suitable wolverine habitat such as the Crown of the Continent and the Greater Yellowstone Ecosystem, presents a significant threat to the species’ viability. In its proposed rule, the Service acknowledged that even small numbers of mortalities “are possibly locally significant for wolverines” in areas where wolverines exist in small, isolated populations. Id. at 7881.

Wolverine trapping in Montana has been suspended since late 2012, but the suspension is not permanent. Montana’s 2012-2013 trapping season was suspended by a court order in a lawsuit brought by a coalition of environmental groups. Helena Hunters & Anglers Ass’n v. Maurier, BDV-2012-868 (Mont. Dist. Ct. Nov. 30, 2012). Montana Fish, Wildlife and Parks (“FWP”) then suspended the 2013-2014 and 2014-2015 seasons in response to the Service’s proposed listing rule. See Press Release, Mont. Fish, Wildlife & Parks, Feds Seek To List Wolverine As Threatened Species (Feb. 1, 2013), available at [http://fwp.mt.gov/news/newsReleases/headlines/nr\\_4064.html](http://fwp.mt.gov/news/newsReleases/headlines/nr_4064.html); see also Mont. Fish, Wildlife & Parks, Furbearers: 2014 Montana Hunting and Trapping Regulations, available at <http://fwp.mt.gov/eBook/hunting/regulations/2014/2014furbearers/index.html>. However, these temporary suspensions do not offer permanent protection. The Montana Fish and Wildlife Commission votes on wolverine quotas each year, and FWP could easily choose to re-open the wolverine season if the Service fails to list the wolverine under the ESA.

Incidental trapping also poses a significant threat to the species. For example, the Idaho Department of Fish and Game has documented at least 7 incidents in which wolverines were incidentally trapped since 2006. Letter from Nathan Fisher, Idaho Governor’s Office of Species Conservation, to U.S. Fish & Wildlife Serv. (May 17, 2010). FWS has also documented incidental take of wolverines in Montana and Wyoming. Unreported incidents of incidental trapping likely increase the toll even further beyond the number of verified incidents. Moreover, the legal wolf trapping recently instituted in Idaho and Montana could put even greater pressure on the wolverine population through incidental trapping. Wolf trapping in these two states will cover the range of the majority of the remaining wolverine population. The Service has admitted 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.” Id. at 7882. Thus the threat of incidental trapping is already significant and is likely to intensify as wolf trapping expands in Idaho and Montana.<sup>5</sup>

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<sup>5</sup> Poaching has also been a significant threat to wolverine populations in other jurisdictions. See, e.g., Persson et al. (2009). The Service has not discussed the risk to wolverines from poaching or attempted to quantify this risk.

Although the proposed rule concludes that neither intentional nor incidental trapping is a threat on its own, in fact each of these two threats—and certainly the combination of both intentional and incidental trapping—has the potential to threaten wolverine populations. Moreover, the impact of both intentional and incidental trapping will only increase as climate change further fragments habitat and threatens metapopulation dynamics. *Id.* at 7885. The proposed rule acknowledged this risk and found that “human-caused mortality due to harvest is likely to become more significant to the wolverine population as connectivity needs increase and connectivity simultaneously becomes more difficult.” *Id.* The Service, thus, correctly concluded that “harvest and incidental trapping, when considered cumulatively with habitat loss resulting from climate change, are likely to become threats to the DPS.” *Id.* at 7886.

After “carefully assess[ing] the best scientific and commercial information available” under each of these statutory listing factors, the Service’s proposed rule ultimately concluded that the North American wolverine was threatened in the contiguous United States. *Id.* at 7886. The Service’s proposed determination stated:

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.

Id.

The Service stated that it intended to seek review of the proposed rule by “independent specialists,” per its policy on peer review, *id.* at 7889, but did not indicate any lack of confidence in the science on which the proposed rule relied. At the time the proposed rule was issued, the Service’s interpretation of the best available science was clear: wolverines are threatened throughout their range in the contiguous United States.

#### C. Listing Recommendation of FWS Scientists

In a memorandum from May 2014, the Service’s own scientific experts stated their support for finalizing the proposed rule and reiterated that the science used in the proposed rule represented the best available science on climate-change impacts to wolverines. Rabot Memorandum at 1. This memorandum was written by the Assistant Regional Director (“ARD”) for Ecological Services in FWS’s Pacific Region, summarizing the conclusions of the scientists in FWS’s Montana Field Office who had worked on the listing determination. *Id.* The memorandum based its conclusions on a review of the proposed rule, the peer reviews of the proposed rule, and the outcome of the “science panel workshop” hosted by FWS in April 2014. Based on this information, the memorandum from the ARD stated:

The Montana Field Office recommends that: 1) the wolverine listing be finalized as threatened under the Act, 2) that the 4(d) rule be finalized as well [with minor modifications] and, 3) that the experimental/nonessential 10(j) rule in the southern Rocky Mountains be finalized, facilitating a reintroduction effort there to proceed should the State of Colorado decide to pursue it.

Id. at 10. The ARD added, unwaveringly, “I support these recommendations.” Id.

The memorandum reiterated the threat findings laid out in the proposed rule, highlighting the severity of projected climate impacts. Id. at 5-6. The memorandum also explained that the conclusions in the proposed rule (and recommended for inclusion in the final rule) were generally supported by both the peer review and the science panel workshop conducted by FWS. It noted, for instance, that “[p]eer reviews were generally supportive of the way the proposed rule presented and interpreted science.” Id. at 8. However, the memorandum also noted that two of the seven peer reviewers questioned the use of the habitat model developed by Copeland et al. (2010) and thus also questioned the validity of the climate impacts predicted by McKelvey et al. (2011) because that study relied on the Copeland model. Id. at 8-9. Based on this perceived uncertainty, state wildlife directors pushed to extend the listing deadline by six months and re-evaluate the scientific information that formed the basis for the finding. Id. at 9. FWS therefore organized a science panel workshop with biologists and climate scientists, to evaluate these scientists’ confidence in the results reached by the two studies at issue. Id. State wildlife officials helped organize and were present at this workshop. Id.; Science Panel Report at 16.

Despite somewhat varying views, perhaps in part because just one of the nine panelists was a recognized wolverine expert, the science panel generally confirmed the key findings on which the proposed rule was based. In evaluating Copeland et al. (2010), the ARD’s memorandum stated that “[p]anelists agreed strongly that wolverines were obligate snow denners,” and that “panelist scores indicated their beliefs that wolverines tended toward having an obligate relationship with contiguous snow at the home range and species[] range scales,” despite somewhat wider variation on this second point. Rabot Memorandum at 9. Similarly, the ARD said that “[p]anelists indicated strong support for McKelvey et al. (2011) as an analysis of the impact of climate change to snow cover[,] indicating relatively high certainty that climate changes would reduce snow cover similarly or more severely than depicted in that paper.” Id. at 10. Ultimately, the panelists supported the central conclusion of the proposed rule: “[e]ach of the panelists agreed ... that by the end of the century, wolverine populations would likely be significantly affected by habitat loss due to climate changes.” Id. (emphasis added).

Importantly, the Rabot Memorandum highlighted that the recommendation of threatened status is supported by the best available science on wolverines. Based on the peer reviews and “the general validation of our approach to interpreting climate science by the wolverine science panel,” the ARD stated, in no uncertain terms, “we conclude that relying on Copeland et al. (2010) and McKelvey et al. (2011) as the best available scientific information regarding the effects of climate changes on wolverine habitat remains scientifically justified.” Id. at 10. The ARD went on to say:

In our review we have been unable to obtain or evaluate any other peer reviewed literature or other bodies of evidence that would lead us to a different conclusion. While we recognize there is uncertainty associated with when population effects may manifest themselves, any conclusion that there will not be population effects appears to be based on opinion and speculation. In our opinion that would not represent the best available scientific or commercial data available.

Id.

The Rabot Memorandum also provided additional information about the factors FWS took into account in determining the timing and extent of wolverine response to climate changes. It noted that the proposed rule did not explicitly define the “foreseeable future” but explained that FWS had chosen end-of-century projections based on IPCC climate models that were deemed reliable to that point. The scientists had rationally concluded that “analyses of effects to wolverine habitat based on those models would also be reliable.” Id. at 11. The ARD explained that this method was similar to the method that has been used to determine the foreseeable future for listing determinations on other species. Id. at 5, 11. Despite the fact that climate models diverge toward the end of the century under different emissions scenarios, these models have tended to underestimate climate change impacts. Id. at 11. Therefore, “long-range projections are actually more likely to reflect the magnitude of impacts or be an underestimate of impacts,” and thus the 2085 projections were reliable for the listing process. Id. (emphasis in original).

The ARD also rebutted the suggestion that possible ongoing expansion of the wolverine population—i.e., lone dispersers to California and Colorado—indicates that the effects of habitat loss will be minimal. To begin with, the ARD explains, “[t]he hypothesis that wolverines are still expanding” is highly uncertain. Id. at 12. Moreover, “whether or not there is still expansion potential in the southern portion of the currently occupied range ... , there is not likely to be enough room to accommodate a loss of 31% [of current habitat], much less the 64% losses projected for 2085.” Id.

The Rabot Memorandum made it clear, therefore, that FWS scientists continued to have confidence in the projected impact of climate change on wolverines, both on its own and in concert with other factors. The Service’s own scientists thus firmly believed that the proposed rule represented the best available science and that the Service should finalize its proposed determination of threatened status for the North American wolverine within the contiguous United States.

#### **V. The Service’s Failure to Rely on the Best Available Science in Withdrawing the Proposed Listing**

On August 13, 2014, FWS issued a withdrawal of its proposed listing determination for the wolverine. 79 Fed. Reg. 47,522. This withdrawal suddenly reversed course from the Service’s previous determination, disregarding the best available science and the recommendations of its own scientists, and instead concluded that the wolverine faces no significant threats that make it likely that it will become endangered within the foreseeable future within all or a significant portion of its range. Id. at 47,543. The Rule Withdrawal explained

that the Service no longer believes impacts from climate change pose a risk of extinction to the wolverine DPS, despite its earlier findings to the contrary. Id.

In its Rule Withdrawal, the Service violated the ESA by failing to rely on the best available science in determining that the North American wolverine should not be listed as threatened or endangered under the ESA. 16 U.S.C. § 1533(b)(1)(A)(i)(IV). The Service also acted arbitrarily and capriciously in violation of the ESA by failing to draw rational conclusions from the information before it and failing to consider important aspects of the issue in making its determination. See 5 U.S.C. §§ 551 et seq.

Under the ESA, the Service may withdraw a listing proposal, but it must also publish “the finding on which such withdrawal is based.” 16 U.S.C. § 1533(b)(6)(A). And any listing determination under the ESA—including a determination not to list a species—must be made “solely on the basis of the best scientific and commercial data available.” 16 U.S.C. § 1533(b)(1)(A); see also Nw. Ecosystem Alliance, 475 F.3d at 1137. Congress specifically provided that “[t]he finding on which a withdrawal is based shall be subject to judicial review.” 16 U.S.C. § 1533(b)(6)(B)(ii).

Here, the Service failed to rely on the best available science when it erroneously determined:

- A. That massive predicted losses of spring snow cover will not affect wolverine denning and reproduction in the foreseeable future, 79 Fed. Reg. at 47,543-44;
- B. That wolverines do not have an obligate relationship with snow at the scale of home range and species range, and that climate-driven impacts on wolverine habitat can be reliably predicted only if wolverines are snow-obligate at all life stages, id. at 47,544;
- C. That small population size, trapping, and human disturbance are insignificant threats to wolverine survival, id. at 47,541, 47,543; and
- D. That the wolverine population in the contiguous United States is currently expanding, id. at 47,543, 47,536.

As set forth below, the Service violated the ESA by relying on speculation to disregard the best available science on each of these points, providing no affirmative data or information to support its contrary conclusions. The Service also failed to adequately consider whether wolverines are threatened within a significant portion of their range based on the significant contraction of their range from area they historically occupied and on the inadequacy of existing regulatory mechanisms to ensure a viable, self-sustaining wolverine population, among other factors.

- A. Best Available Science Predicts Huge Reductions in Spring Snow, Equating to Loss of Denning Habitat, at Finest Modeling Scale Possible

The best available science unequivocally shows that wolverines depend on deep spring snow for denning and reproduction, see 78 Fed. Reg. at 7866, and the best available climate modeling shows that areas with deep spring snow are likely to shrink dramatically as the climate warms, with a commensurate impact on denning habitat, McKelvey et al. (2011). FWS failed to

accept the best available science and draw rational conclusions when it claimed that this massive decline in spring snowpack—the one feature scientists know is essential for wolverine denning and reproduction—will have no foreseeable impact on wolverines’ reproductive success. 79 Fed. Reg. at 47,536.

The Service has admitted that the best available science clearly shows that female wolverines need persistent spring snow for denning and reproduction. Id. The evidence for this obligate relationship is overwhelming: the most recent study found that, of 562 verified natal (birthing) dens in North America and Scandinavia, every single one occurred in snow. Copeland et al. (2010), at 239. None of the peer reviewers questioned this conclusion. At the science panel workshop organized by FWS and state wildlife agencies, all panelists “agreed strongly that wolverines were obligate snow denners.” Rabot Memorandum at 9; see also Science Panel Report at 32.

Nevertheless, FWS has attempted to create uncertainty about the importance of spring snow for wolverine denning by focusing on the specific date used by Copeland et al. (2010) to define persistent spring snow cover. Montana Fish, Wildlife and Parks first raised this issue in its comments on the proposed rule, and the Service incorporated many of these concerns into its rationale for the Rule Withdrawal. See Mont. Fish, Wildlife & Parks, Comments in Response to the Proposed Rule to List Wolverine as Threatened in the Contiguous United States 3-11 (May 6, 2013). In the Rule Withdrawal, the Service emphasized that not all dens fall within the habitat area described by May 15th snow cover (though 98 percent of dens do fall within this area), and further noted that Copeland’s May 15th snow model includes areas that contained snow on that date “in as few as 1 in 7 years.” 78 Fed. Reg. 47,527. But this analysis misinterprets the data presented in Copeland et al. (2010). In fact, though some sites within the model did not contain snow on May 15th of every single year, wolverines used those sites only during years when they did in fact contain deep spring snow. Copeland et al. (2010), at 239. Further, most dens (69 percent) in North America were located in areas that were snow-covered for 6 to 7 out of the 7 years studied. Id. In sum, Copeland et al. (2010) found that 100 percent of dens were located in spring snow, and 98 percent of those dens occurred in locations where the snow persisted through at least May 15th in the year they were used.<sup>6</sup> Id. The Service’s withdrawal decision attempted to ignore this 98 percent correlation and instead drew speculative conclusions from the 2 percent of outliers. However, with such incredibly strong correspondence between female reproductive dens and deep spring snow, any assertion that wolverines do not depend on snow for denning is unjustified by the best available scientific information.

Even in those portions of its discussion where it reluctantly accepted the importance of snow for wolverine denning, the Service nonetheless claimed it cannot conclude that shrinking spring snowpack will have a foreseeable effect on wolverine denning habitat. 79 Fed. Reg. at 47,534. The Service acknowledged that McKelvey et al. (2011), predicting 31 percent habitat loss by 2045 and 63 percent loss by 2085, represents “the most sophisticated analysis of impacts of climate change at a scale specific to the range of the wolverine.” 79 Fed. Reg. at 47,533 Yet the Service rejected McKelvey et al. (2011) both because of its reliance on the habitat model

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<sup>6</sup> The 2 percent (12 dens) that fell outside the May 15th snow layer were individually investigated and were determined to be snow dens.



defined by Copeland et al. (2010), as discussed above, and because McKelvey's climate modeling purportedly fails to predict habitat changes at a sufficiently precise scale for projecting impacts on individual den sites. 79 Fed. Reg. at 47,533-34. Like its unfounded rejection of Copeland's habitat estimate, the Service's rejection of McKelvey's modeling scale is similarly unjustified. To begin with, by claiming that McKelvey et al.'s analysis at the 500-meter scale is insufficient, the Service is effectively contending that wolverines make their denning decisions at a scale of less than 500 meters, with no supporting evidence. Furthermore, downscaling complex global climate models is simply not possible beyond a certain point. McKelvey et al. (2011) downscaled their modeling to a degree that is consistent with the best available climate science. McKelvey et al. (2011), at 2883-84. The courts have stressed that FWS must rely on "best scientific ... data available" and "may not ignore evidence simply because it falls short of absolute scientific certainty." Nw. Ecosystem Alliance, 475 F.3d at 1147 (emphasis in original). See also Defenders of Wildlife v. Babbitt, 958 F. Supp. 670, 680 (D.D.C. 1997) ("The 'best available data' requires the agency to consider the scientific information presently available."). The Service may not, therefore, ignore a peer-reviewed scientific study that is admittedly "the best analysis to date."

Moreover, by rejecting the best state-of-the-art modeling projections, FWS is essentially saying that it cannot make any conclusions until there is evidence of den sites actually being lost due to climate change. This position violates the precautionary principle, inherent in "the ESA's 'policy of institutionalized caution,'" which applies in section 4 and throughout the Act. GYC v. Servheen, 665 F.3d at 1030 (quoting Ariz. Cattle Growers' Ass'n v. Salazar, 606 F.3d 1160, 1167 (9th Cir. 2010)). The Service's dismissal of McKelvey et al. (2011) also contradicts the recommendation of its own scientists, who found that "relying on ... McKelvey et al. (2011) as the best available scientific information regarding the effects of climate change on wolverine habitat remains scientifically justified." Rabot Memorandum at 10.

Based on its assertion that McKelvey et al. (2011) does not project impacts at a small enough scale to predict changes at specific den sites—despite the fact that this would be scientifically impossible—the Service went on to speculate that specific den sites may not actually lose spring snow cover at the same rate as the overall projected snow loss. Without predictions at the scale of individual den sites, the Service argued, the loss of persistent spring snow cover projected by McKelvey et al. (2011) does not necessarily "represent an equivalent loss of habitat." 79 Fed. Reg. at 47,535. In essence, the Service is speculating that—despite the 100 percent correlation between den sites and snow, and despite the massive acknowledged snow loss—there might be still be some den sites that remain viable, and these sites might be enough to sustain the wolverine population. FWS is also engaging in speculation when it asserts that "it is possible that wolverines may be more adaptable [to earlier snowmelt (by denning earlier)] than currently available scientific information would suggest," despite acknowledging that earlier denning has never been reported for wolverines. 79 Fed. Reg. at 47,532. In making these assertions, FWS offered no affirmative data or information to support its position. Indeed, its own scientists stated that they had "been unable to attain or evaluate any other peer reviewed literature or other bodies of evidence that would lead ... to a different conclusion" about the impacts of climate change on wolverines. Rabot Memorandum at 10. Instead, the Rule Withdrawal impermissibly substituted speculation for the best available scientific information, in violation of FWS's statutory mandate. 16 U.S.C. § 1533(b)(1)(A).

ESA case law makes it clear that “[t]he Service may not base its listings on speculation or surmise.” Bldg. Indus. Ass’n of Superior Cal. v. Norton, 247 F.3d 1241, 1246-47 (D.C. Cir. 2001). See also Selkirk Conservation Alliance v. Forsgren, 336 F.3d 944, 954 (9th Cir. 2003). Similarly, “[i]t is not enough for the Service to simply invoke ‘scientific uncertainty’ to justify its action” under section 4 of the ESA. GYC v. Servheen, 665 F.3d at 1028. Indeed, the best available data standard “does not require the agency to rely on indisputable or unequivocal evidence.” Cabinet Res. Grp. v. U.S. Fish & Wildlife Serv., 465 F. Supp. 2d 1067, 1083 (D. Mont. 2006). Rather, “[e]ven if the available scientific and commercial data were quite inconclusive, [the Secretary] may—indeed must—still rely on it at that stage.” Sw. Ctr. for Biological Diversity v. Babbitt, 215 F.3d 58, 60 (D.C. Cir. 2000) (quoting City of Las Vegas v. Lujan, 891 F.2d 927, 933 (D.C.Cir.1989)). Thus the Service may not rely on the uncertainty inherent in downscaled climate modeling as a reason for disregarding the best available science. Moreover, the Service must take a precautionary approach—not its current dismissive approach—in dealing with the uncertainty that does exist.

Finally, the Service speculated that even if individual den sites did lose spring snow cover, this loss might not negatively impact wolverine populations. As the Service explained, “[w]e do not appear to know at this point with any reliability what the causal relationship is between the feature of deep persistent spring snow and wolverine dens; that is, we do not understand why wolverines appear to require deep persistent spring snow for denning”. 79 Fed. Reg. at 47,534. In this regard, the Service attempted to heighten the importance of understanding the causal mechanism relating snow cover to reproductive success. Id. Here again, the Service has impermissibly speculated regarding scientific uncertainties and has ignored the best available science showing a 100 percent correlation between wolverine dens and spring snowpack. Copeland et al. (2010), at 239. The Service went on to claim that, even if some den sites become unsuitable with the loss of spring snow, there is “no evidence that den sites are currently scarce or lacking, or that they currently limit wolverine reproduction” or to predict “at what level of reduced spring snow coverage den sites would become limiting.” 79 Fed. Reg. at 47,534. However, even if wolverines’ exact sensitivity to snow decline is not known, the Service’s scientists have explained that “there is not likely to be enough room to accommodate a [habitat] loss of 31%, much less the 64% losses projected for 2085” without impacting population numbers. Rabot Memorandum at 12.

The Service also has attempted to use a recent study by Inman et al. (2013), which estimates available habitat capacity at 644 wolverines, as evidence that habitat is not currently a limiting factor for the wolverine population. 79 Fed. Reg. at 47,534 (citing Inman et al. (2013)). In fact, however, that study estimated habitat capacity across the entire Western United States, including vast swaths of potential habitat in areas such as Colorado and the Sierra Nevadas where it noted that viable wolverine populations would likely only be reestablished through a reintroduction program. Inman et al. (2013), at 282-84. The study actually used current wolverine densities within occupied habitat as its baseline for determining overall carrying capacity across the Western United States, id. at 282, which suggests that the authors believed current density to be a good indicator of habitat capacity. Thus the study did not predict that there was room for significant population expansion within currently occupied wolverine habitat or areas to which wolverines could naturally expand. The study even found that “[m]aternal sites

occurred in areas of higher quality habitat,” *id.* at 283, suggesting that den sites may actually be more susceptible to the impacts of climate change than wolverine habitat in general, rather than less (as the Service suggests). The Service’s attempted use of this study to suggest that occupied habitat is not inhabited at maximum density—and thus that habitat is not a limiting factor for the wolverine population—is therefore incorrect.<sup>7</sup>

In sum, the Service failed to use the best available science in its attempts to discredit McKelvey *et al.* (2011) and to dismiss the significance of massive spring snow loss for wolverine reproduction and survival. As the Service’s own scientists have said, “any conclusion that there will not be population effects appears to be based on opinion and speculation” and “would not represent the best available scientific or commercial data available.” Rabot Memorandum at 10. That statement aptly characterizes the Service’s ultimate determination here.

**B. Best Available Science Shows That Range-Wide Habitat Is Strongly Correlated with Spring Snow**

Even beyond denning season, the best available science is also clear in demonstrating that wolverines depend year-round on areas that maintain persistent spring snowpack. The model developed by Copeland *et al.* (2010), the best available model of current wolverine habitat, makes it clear that wolverine habitat at all scales is defined by the area maintaining persistent spring snow. Copeland *et al.* (2010), at 239, 242. However, the Service unjustifiably rejected Copeland *et al.* (2010) as the best available estimate of overall wolverine habitat because, according to the Service, this snow-driven model may not represent wolverines’ year-round habitat needs at the species scale. 79 Fed. Reg. at 47,533. This analysis ignores the plain conclusions of Copeland *et al.* (2010). That study found that 89 percent of year-round wolverine observations, including 95 percent of summer observations and 86 percent of summer locations, occurred in the area defined by persistent spring snow cover. Copeland *et al.* (2010), at 239. The Service’s proposed rule noted this correlation and cited Copeland (2010) to support the statement that wolverines “select areas that ... reliably maintain deep persistent snow late into the warm season.” 78 Fed. Reg. at 7867. But the Rule Withdrawal inexplicably ignored this earlier scientific conclusion.

The Service has attempted to support its position by citing uncertainty among the panelists at the April 2014 science panel workshop. It claimed the panelists expressed uncertainty regarding whether wolverines need persistent spring snow at the scale of the species range, or just at the scale of den sites. 79 Fed. Reg. at 47,533. But in fact, the weight of the panelists’ scores indicated a general belief that wolverines do have an obligate relationship with snow at the species range. Science Panel Report at 32; see also Rabot Memorandum at 9. In

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<sup>7</sup> The Service conducted its own calculations to determine that, under the McKelvey *et al.* (2010) predictions with respect to habitat remaining after 2085, remaining habitat could support 344 wolverines. 79 Fed. Reg. at 47,535. No available science supports this rough calculation, and it is based on “average home range sizes” of wolverines, despite the fact that home range size varies immensely across the wolverine’s range and is influenced by a variety of factors. See *id.* at 47,534 (size of wolverine home ranges, and therefore wolverine densities, varies widely and is dependent on habitat quality).

concluding otherwise, the Service once again has chosen to speculate based on the outliers in the data, rather than making decisions based on the weight of the available evidence. Indeed, based on a review of the proposed rule, the peer reviews of the rule, and the science panel results, the Service's scientists in the Montana Field Office concluded that "relying on Copeland et al. (2010) ... as the best available scientific information ... remains scientifically justified." Rabot Memorandum at 10. The Service's sudden rejection of Copeland et al. (2010) in the Rule Withdrawal, contradicting this recommendation and the weight of the scientific evidence, thus constitutes a failure to use the best available science.

The Service also criticized Copeland et al. (2010) for its use of the May 15th date, again, because it does not represent the exact time period when kits emerge from their dens. 79 Fed. Reg. at 47,527. In reality, Copeland et al. (2010) chose the May 15th date not as a representation of den emergence but as a proxy to define the area that reflects current wolverine habitat use—and indeed it correlates very well with actual habitat use, as discussed above.<sup>8</sup> Copeland et al. (2010), at 235. The Service also suggests that other factors besides snow might also influence habitat suitability, and that therefore a more complex habitat model such as the one developed by Inman et al. (2013) would be a more accurate approximation of overall wolverine habitat. 79 Fed. Reg. at 57,534. The Service fails to note, however, that the Inman et al. (2013) model agrees with the Copeland et al. (2010) model over 96 percent of the Western United States. Inman et al. (2013), at 283, demonstrating that adding variables to the habitat modeling did not yield different results.<sup>9</sup> The Service simply ignores this strong corroborating evidence in claiming that the lack of habitat factors in addition to snow results in "uncertainties" in the Copeland et al. (2010) model. 79 Fed. Reg. at 47,527. These criticisms of the Copeland model are unfounded, and they fail to justify the Service's rejection of Copeland et al. (2010) as the best available scientific estimate of year-round wolverine habitat.

The Service further attempted to discount the correlation between spring snow and year-round habitat use by emphasizing that the precise mechanism or reason for this correlation is not well understood. 79 Fed. Reg. at 47,534. The Service tried to use this uncertainty to confound its "foreseeable future" analysis, based on an unreasonably narrow reading of the Interior Solicitor's memorandum defining that term. See Memorandum M-37021 from Solicitor, U.S. Dep't of Interior, to Acting Dir., U.S. Fish & Wildlife Serv. (Jan. 16, 2009). Because scientists do not fully understand the mechanism behind wolverines' snow-dependency, the Service asserted, changes in snow cover will not necessarily result in foreseeable impacts to the wolverine. 79 Fed. Reg. at 47,534. The idea that a species is not at risk unless it is threatened at all life stages has no basis in science or in the ESA. Indeed, the ESA protects many species based on significant threats at a single life stage, recognizing that a population cannot be

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<sup>8</sup> The May 15th date is also consistent with Aubry et al. (2007), the authoritative scientific paper on historical wolverine distribution, which used that date to correlate historical wolverine observations with spring snow cover. Indeed, Aubry et al. found that "[s]pring snow cover was the only habitat layer that fully accounted for the distribution of historical wolverine records in the western mountains." Aubry et al. (2007), at 2153.

<sup>9</sup> The Rule Withdrawal incorrectly portrays the fact that Inman et al. (2013) used snow depth as of April 1, not snow cover until May 15, as a point of disagreement between the two models. 79 Fed. Reg. at 47,534.

sustained if, for example, its members cannot survive and reproduce. See, e.g., Threatened Status for Central California Coast Coho Salmon Evolutionarily Significant Unit (ESU), 61 Fed. Reg. 56,138, 56,141 (Oct. 31, 1996) (“Of particular concern is the increased sediment input into spawning and rearing areas ...”).

Moreover, the Service’s own scientists have explained that “[t]he precise mechanism(s) behind the relationship between wolverines and deep snow is less important than the fact that deep snow appears to be an obligate habitat feature for this species.” Rabot Memorandum at 5. Therefore, the scientists conclude, the “remarkable concordance between wolverine habitat use and persistent spring snow,” id. at 5, means that “climate change impacts to wolverine habitat constitute a threat” to the species, id. at 6. By ignoring the scientific evidence documenting this tight, obligate relationship between wolverines and snow—at the scale of den sites, home ranges, and species range—the Service again has failed to use the best scientific information available.

C. Best Available Science Shows that Small Population Size, Trapping, and Human Disturbance Are Significant Threats Both By Themselves and When Combined with Climate Change

The Service similarly failed to rely on the best available science when it concluded that small population size, trapping, and human disturbance did not pose significant threats to the survival of wolverines in the contiguous United States. The Service also “entirely failed to consider an important aspect of the problem,” State Farm, 463 U.S. at 43, when it dismissed non-climate threats to wolverines without analyzing their potential impacts in concert with the effects of climate change. In fact, the best available science shows that both trapping and small population size are almost certainly threats to the wolverine population when working in concert with climate change, and also pose threats on their own. Human disturbance, including motorized human recreation and infrastructure development, may also pose a threat to the survival of wolverines in the contiguous United States, both on its own and in combination with the impacts of climate change.

In the proposed rule FWS concluded, based on the best available science, that “the risk factor of small population size, including measures of effective population size ... , is a threat to the North American wolverine DPS when considered cumulatively with habitat loss resulting from climate change.” Id. at 7885. Even without the effects of climate change, the small population size is a significant threat to the DPS. The best available science shows that an effective population size of 500 breeding animals is necessary to preserve long-term genetic diversity and viability. Id. at 7884. The best available estimate of the wolverine population in the contiguous United States is approximately 300 wolverines or fewer, with an effective population of breeding animals that is estimated to be just 35 individuals. Id.; see also Inman et al. (2013). FWS has admitted, accordingly, that the effective population size of the largest remaining population in the contiguous United States, is “below what is thought necessary for short-term maintenance of genetic diversity.” 78 Fed. Reg. at 7884. The current population size is therefore insufficient to maintain the species’ genetic viability, but the Service unjustifiably concluded that this small population size does not pose a threat to the North American wolverine DPS, in large part relying on an unfounded assumption that continued population growth is likely

to ameliorate the effects of small effective population size. 79 Fed. Reg. at 47,532, 47,543. The Service failed to use the best available scientific information when it made this determination.

Similarly, as the Service concluded in its proposed rule, “harvest and incidental trapping, when considered cumulatively with habitat loss resulting from climate change, are likely to become threats to the DPS.” 78 Fed. Reg. at 7886. The best available science shows that trapping may also be a significant threat on its own. Montana, the state containing the most habitat and the greatest number of wolverines within the DPS, still allows wolverine trapping. *Id.* at 7881. Recent suspensions of the wolverine trapping season are not permanent, and trapping would likely be reinstated if FWS failed to list the wolverine under the ESA. Although the number of wolverines intentionally trapped each year has tended to be relatively small, FWS has found that even small numbers of trapping mortalities in vulnerable subpopulations “are possibly locally significant” due to the structure of the wolverine metapopulation. *Id.* Moreover, recently approved wolf trapping in Montana and Idaho—two states containing the vast majority of the remaining wolverine population—may “be likely to result in increased incidental trapping of wolverines.” *Id.* at 7882. Finally, the Service’s claim that “human-caused mortality has never been demonstrated to be additive or compensatory” in the DPS is incorrect – multiple scientific studies demonstrate that human-caused mortality is additive within the DPS. *E.g.*, Krebs *et al.* (2007); Squires *et al.* (2007). The Service therefore failed to consider the best available science, and draw rational conclusions from that science, when it concluded that trapping is not and will not become a threat to wolverines, either on its own or in concert with climate change and/or small population size.

FWS also failed to consider sufficiently the threats posed by human recreation, infrastructure, and road development. Science shows that human recreation, particularly motorized recreation, may have a significant impact on wolverines. Studies have shown that denning females are extremely sensitive to human disturbance. *See* Copeland (1996); Magoun and Copeland (1998). Such disturbance can result in den abandonment, Banci (1994), with possible impacts on reproductive success. These impacts are likely only to increase with advances in snowmobile technology and increases in helicopter skiing, which bring motorized recreation ever farther into what was once remote wolverine habitat. FWS failed to adequately evaluate the best available science when it concluded that these impacts from human recreation pose no threat to wolverines. *See* 79 Fed. Reg. at 47,524.

Moreover, although the Service has repeatedly stressed the importance of connectivity for metapopulation function, *e.g.*, 79 Fed. Reg. at 47,542, it inexplicably concluded that roads and developed infrastructure bisecting important dispersal corridors will have no effect on wolverine population dynamics, *id.* at 47,538. Science shows that wolverines tend to avoid areas of human infrastructure and roads. *E.g.*, Packila *et al.* (2007), at 105. Scientists have also documented direct wolverine mortalities associated with roads. Inman *et al.* (2007b), at 89. As the Service acknowledged in the context of trapping, even these few mortalities “are possibly locally significant.” 78 Fed. Reg. at 7881. Mortalities in connective areas between islands of suitable habitat are particularly significant because metapopulation dynamics may break down—which could mean “the entire metapopulation may jeopardized”—if individuals cannot disperse between subpopulations. 78 Fed. Reg. at 7867. Indeed, several peer reviewers of the proposed rule suggested that threats to connectivity due to increasing human development may be even

more significant than threats due to climate change. Inman Peer Review at 22; Magoun Peer Review at 35, 39. Whatever the merit of this comparative assertion, the Service has failed to rely on the best available scientific information when it concluded that these threats to connectivity are insignificant.

#### D. Assertions of Current Population Expansion Are Based on Speculation

Lastly, the Service's Rule Withdrawal speculated that the wolverine population in the contiguous United States is expanding, and claimed this expansion indicates that climate impacts will not be as severe as predicted by McKelvey *et al.* (2011). *See, e.g.*, 79 Fed. Reg. at 47,543. In speculating about population expansion, the Service fails to rely on the best available science showing that significant expansion of reproducing populations is unlikely. The Service cited recent instances of individual wolverines dispersing to Colorado and the Sierra Nevadas as evidence that the population is expanding its range. *Id.* at 47,535. But individual male dispersers do not provide evidence that wolverines would be capable of establishing new reproducing populations in these currently uninhabited areas. Indeed, the best available science shows that females tend to disperse less frequently and over shorter distances than males. *E.g.*, Inman *et al.* (2013), at 281-82; 79 Fed. Reg. at 47,535. Moreover, rather than indicating population expansion, male dispersal could just as easily indicate that currently occupied habitat is already degrading due to climate change or other factors. These two individual anecdotes of male dispersal therefore do not support the Service's bold assertion that the wolverine population is expanding. In nevertheless choosing to construe these data as demonstrating population expansion, the Service has engaged in nothing more than a coin flip.

#### E. Wolverines are Threatened in a Significant Portion of their Range

In addition to these threats within currently occupied wolverine habitat, wolverine populations are also threatened in a significant portion of their overall range due to the substantial contraction of the species' historical range. Aubry *et al.* (2007), which compiled a variety of types of historical data to estimate historical range, is recognized as "the best available summary of wolverine occurrence records in the contiguous United States." 78 Fed. Reg. at 7869. That study found that wolverines' historical range extended far beyond their current range to include Colorado, California, Utah, and New Mexico in the western mountain states, Minnesota, Wisconsin, and Michigan in the Upper Great Lakes region, and even included sparse but detectable presence in Maine, New Hampshire, Vermont, New York, and Pennsylvania in the Northeast. Aubry *et al.* (2007), at 2150. None of these areas currently contain wolverine populations. 78 Fed. Reg. at 7871-72.

The loss of wolverine populations in these historically occupied areas constitutes a dramatic contraction of the wolverine's range. Inman *et al.* (2013), for example, indicates that wolverines no longer exist in nearly half of their suitable range in the western United States. Inman *et al.* (2013), at 282. Indeed, Inman *et al.* found that the Southern Rockies alone contain 21 percent of suitable habitat in the western United States, *id.* at 284, yet no breeding populations have existed there for at least 50 years, Aubry *et al.* (2007), at 2150. The ESA defines a threatened species as one that is likely to become endangered "throughout all or a significant portion of its range." 16 U.S.C. § 1532(20). The total extirpation of wolverine populations from

these vast expanses of habitat warrants a finding that wolverines are threatened throughout a significant portion of the species' range.

**VI. Conclusion**

As set forth in this letter, FWS violated the ESA in its determination that the North American wolverine distinct population segment in the contiguous United States is not threatened or endangered. The Service failed to rely on the best available scientific information in determining that climate change and other threats will not significantly impact the North American wolverine in the foreseeable future. The Service also failed to draw rational conclusions from the scientific information before it. If the Service does not retract its Rule Withdrawal and issue a final rule listing the North American wolverine as threatened within the contiguous United States within 60 days of the receipt of this letter, the parties to this notice letter will institute a legal action to challenge the Service's determination in federal district court.

Sincerely,



Timothy J. Preso  
Adrienne Maxwell

Cc: Eric H. Holder, Jr., Attorney General  
U.S. Department of Justice  
950 Pennsylvania Avenue, NW  
Washington, D.C. 20530  
AskDOJ@usdoj.gov



## SCIENTIFIC LITERATURE CITED

- Aubry, K.L., K.S. McKelvey, and J.P. Copeland. 2007. Distribution and broadscale habitat associations of the wolverine in the contiguous United States. *Journal of Wildlife Management* 71:2147–2158.
- Austin, M. 1998. Wolverine Winter Travel Routes and Response to Transportation Corridors in Kicking Horse Pass Between Yoho and Banff National Parks. Master's Thesis. University of Calgary. 46 pp.
- Banci, V. 1994. Wolverine. Pp. 99–127 *in* L.F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. USDA Forest Service Rocky Mountain Forest and Range Experiment Station, General Tech. Report RM-254, Fort Collins, Colorado, USA.
- Cegelski, C.C., L.P. Waits, N.J. Anderson, O. Flagstad, C. Strobeck, and C.J. Kyle. 2006. Genetic diversity and population structure of wolverine (*Gulo gulo*) populations at the southern edge of their current distribution in North America with implications for genetic viability. *Conservation Genetics* 7:197-211.
- Copeland, J.P. 1996. Biology of the wolverine in central Idaho. Thesis, University of Idaho, Moscow, Idaho, USA.
- Copeland, J.P., K.S. McKelvey, K.B. Aubry, A. Landa, J. Persson, R.M. Inman, J. Krebs, E. Lofroth, H. Golden, J.R. Squires, A. Magoun, M.K. Schwartz, J. Wilmot, C.L. Copeland, R.E. Yates, I. Kojola, and R. May. 2010. The bioclimatic envelope of the wolverine (*Gulo gulo*): do climatic constraints limit its geographic distribution? *Canadian Journal of Zoology* 88: 233-246.
- Dawson, F.N., A.J. Magoun, J. Bowman, J.C. Ray. 2010. Wolverine, *Gulo gulo*, home range size and denning habitat in lowland boreal forest in Ontario. *The Canadian Field-Naturalist*, 124(2), 139-144.
- Heinemeyer, K.S., B.C. Aber, and D.F. Doak. 2001. Aerial surveys for wolverine presence and potential winter recreation impacts to predicted wolverine denning habitats in the southwestern Yellowstone ecosystem. GIS/ISC Laboratory, Department of Environmental Studies, University of California, Santa Cruz. 21 pp.
- Inman, R.M., K.H. Inman, M.L. Packila, A.J. McCue. 2007a. Wolverine reproductive rates and maternal habitat in Greater Yellowstone. Chapter 4 *in* Greater Yellowstone Wolverine Study, Cumulative Report, May 2007. Wildlife Conservation Society, North America Program, General Technical Report, Bozeman, Montana, USA.
- Inman, R.M., K.H. Inman, A.J. McCue, M.L. Packila. 2007b. Wolverine harvest in Montana: Survival rates and spatial considerations for harvest management. Chapter 5 *in* Greater

Yellowstone Wolverine Study, Cumulative Report, May 2007. Wildlife Conservation Society, North America Program, General Technical Report, Bozeman, Montana, USA.

- Inman, R.M., B. Brock, K. Inman, S. Sartorius, B. Aber, B. Giddings, S. Cain, M. Orme, J. Frederick, B. Oakleaf, K. Alt, E. Odell, G. Chapron. 2013. Developing priorities for metapopulation conservation at the landscape scale: wolverines in the Western United States. *Biological Conservation* 166:276-286.
- Krebs, J., E. Lofroth, J. Copeland, V. Banci, D. Cooley, H. Golden, A. Magoun, R. Mulders, and B. Shults. 2004. Synthesis of survival rates and causes of mortality in North American wolverines. *Journal of Wildlife Management* 68(3): 493-502.
- Krebs, J., E.C. Lofroth, I. Parfitt. 2007. Multiscale Habitat Use by Wolverines in British Columbia, Canada. *Journal of Wildlife Management* 71(7): 2180-2192.
- Magoun, A.J., and J.P. Copeland. 1998. Characteristics of wolverine reproductive den sites. *Journal of Wildlife Management* 62:1313–1320.
- McKelvey, K.S., J.P. Copeland, M.K. Schwartz, J.S. Littell, K.B. Aubry, J.R. Squires, S.A. Parks, M.M. Elsner, and G.S. Mauger. 2011. Climate change predicted to shift wolverine distributions, connectivity, and dispersal corridors. *Ecological Applications* 21:2882-2897.
- Packila, M.L., R.M. Inman, K.H. Inman, A.J. McCue. 2007. Wolverine road crossings in western Greater Yellowstone. Chapter 7 in *Greater Yellowstone Wolverine Study, Cumulative Report, May 2007*. Wildlife Conservation Society, North America Program, General Technical Report, Bozeman, Montana, USA.
- Persson, J., G. Ericsson, P. Segerström. 2009. Human caused mortality in the endangered Scandinavian wolverine population. *Biological Conservation*, 142(2), 325-331.
- Preston, M. I., L. Halverson, G. Hesse. 2006. Mitigation Efforts to Reduce Mammal Mortality on Roadways in Kootenay National Park, British Columbia. *Wildlife Afield*. 3:1 June 2006 (Supplement).
- Ruggiero, L.F., K.S. McKelvey, K.B. Aubry, J.P. Copeland, D.H. Pletscher, M.G. Hornocker. 2007. Wolverine Conservation and Management. *Journal of Wildlife Management* 71(7): 2145-2146.
- Schwartz, M.K., J.P. Copeland, N.J. Anderson, J.R. Squires, R.M. Inman, K.S. McKelvey, K.L. Pilgrim, L.P. Waits, and S.A. Cushman. 2009. Wolverine gene flow across a narrow climatic niche. *Ecology* 90:3222-3232.
- Squires, J.R., D.H. Pletscher, T.J. Ulizio, L.F. Ruggiero. 2006. The association between landscape features and transportation corridors on movements and habitat-use patterns of wolverines (No. FHWA/MT-06-005/8171).

Squires, J.R., J.P. Copeland, T.J. Ulizio, L.F. Ruggiero. 2007. Sources and patterns of wolverine mortality in Western Montana. *Journal of Wildlife Management* 71(7): 2213-2220.