# Wolverine Survey in the Seven Devils Mountains of Hells Canyon

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# ABSTRACT

The distribution and connectivity of wolverine (*Gulo gulo*) populations in the northwestern United States is largely unknown. We investigated the potential distribution of wolverine in the Northwest and the importance of the Seven Devils Mountains for connecting populations in Idaho and Oregon. Mapping documented sightings suggested 3 relatively distinct subpopulations in the 1) Cascade Mountains of Washington, 2) Cascade Mountains of Oregon, and 3) Rocky Mountains of Idaho. Sightings across mountainous habitats of Oregon also suggest that the Seven Devils Mountains may provide the only suitable habitat linking wolverine subpopulations in Idaho and Oregon. We confirmed the first observation of a wolverine in the Seven Devils Mountains during a helicopter survey in March 1998. The lack of previous sightings suggested limited dispersal between Oregon and Idaho. Low dispersal may impact the regional viability of wolverine by lowering the likelihood that suitable habitat patches are inhabited over time. Maintaining and enhancing the integrity of movement corridors between the Seven Devils Mountains and other contiguous mountain habitats in Idaho and Oregon may be essential for ensuring regional wolverine persistence.

 

# 1. INTRODUCTION

Wolverine (*Gulo gulo*) populations are suspected to be small, especially sensitive to environmental perturbations, and vulnerable to local extinction (Banci 1994). This has resulted in administrative protection with the wolverine classified as a Species of Concern by the U.S. Fish and Wildlife Service and many western states, and Sensitive Species by the U.S. Bureau of Land Management and U.S. Forest Service (Conservation Data Center 1994, Oregon Natural Heritage Program 1998). An ecological understanding of a sensitive species range is essential for developing conservation strategies (Ruggiero et al. 1994). Few wolverine surveys have been conducted, however, leaving the distribution and connectivity of populations in the western United States largely unknown.

The Seven Devils Mountains are believed to contain suitable wolverine habitat and may provide an important corridor linking known populations in central Idaho (Copeland 1996) and northeast Oregon (Schommer 1994). However, the lack of wolverine surveys in the Seven Devils Mountains leaves the presence of this sensitive species unconfirmed. To understand the importance of the Seven Devils Mountains for conserving wolverine populations in the northwestern United States, our objectives were to 1) construct a hypothesized distribution map for wolverine from existing data, 2) identify potential movement corridors in the region, and 3) confirm the presence of wolverine in the Seven Devils Mountains.

# 2. STUDY AREA

The Seven Devils Mountains are in west-central Idaho and bordered by the Little Salmon River to the east and Snake River to the west. Elevations range between approximately 365 m on the Snake River and 3035 m at the tallest peak. Most of the mountain range is in the Hells Canyon Wilderness Area and Hells Canyon National Recreation Area, which is administered by the U.S. Forest Service, Wallowa-Whitman National Forest.

The Seven Devils Mountains are composed of jagged peaks with montane, sub-alpine, and alpine habitats (U.S. Department of Agriculture 1990). At least 2 episodes of island-arc volcanism and adjacent marine sedimentation formed the Seven Devils Mountains over 20,000 years ago. Glaciation created numerous high-elevation cirque basins of which many contain lakes.

Vegetation patterns in the Seven Devils Mountains follow gradients associated with elevation, topography, and precipitation (U.S. Department of Energy 1985, Harker et al. 1993). Bunchgrass, coniferous woodlands, and subalpine forest communities dominate lower, mid, and high elevations, respectively (Daubenmire 1970, Johnson and Simon 1987). Cirque basins, however, have sparse overstory cover because large rock talus limits tree establishment.

 

# 3. METHODS

To determine the potential distribution of wolverine in the Northwest, records of wolverine sightings were requested from the 1) Washington Wildlife Heritage Database, 2) Oregon Natural Heritage Program, and 3) Idaho Conservation Data Center. Sightings were plotted to develop a hypothesized species distribution map for the region. All data were plotted regardless of observer reliability, because most unconfirmed sightings were spatially correlated with confirmed sightings at the regional resolution, and no standard criteria for screening sightings have been developed (Maj and Garton 1994).

We defined the Seven Devils survey area to include all land cover ≥2123-m (≥7000-feet) elevation (Copeland 1996) within a boundary formed by the: 1) Snake River on the west, 2) Little Salmon River on the east, 3) extent of the Hells Canyon Wilderness Area on the north, and 4) Crooked River on the south. Standard ground-based survey methods, such as photographic bait stations (Zielinski and Kucera 1994), are not applicable for the remote setting of the Seven Devils Mountains. Copeland (1996) suggested that aerial surveys during February and March might provide a reliable method for detecting wolverine presence. In Idaho, wolverines predictably placed reproductive dens on north- to east-facing talus slopes of isolated, high-elevation cirques with low tree cover. Snow trails created during movements to and from den sites were highly visible from aircraft.

To focus our aerial-survey effort where detection probabilities were relatively high, we applied the GIS-based wolverine habitat model of Hart et al. (1996) to the survey area. The GIS-based model predicted habitat suitability within 30-m pixels superimposed over the landscape using spatial, vegetational, and physiographic characteristics described by Copeland (1996). We then subdivided the survey area into 64 search units that captured the spatial arrangement of predicted suitable habitat. Boundaries were defined using easily identified watershed features to facilitate a contour-following helicopter survey (Unsworth et al. 1994). Clusters of search units with concentrations of predicted suitable habitat were selected for surveying.

A single helicopter survey was conducted 19 March 1998. Flight paths followed approximately 150-m elevation contours that completely covered the search unit. When possible, we landed for close inspection of potential wolverine tracks. Otherwise we hovered within 2 m of the snow surface. Survey conditions were optimal for snow-tracking with fresh snow, clear skies, and light winds.

# 4. RESULTS

A query of the three wolverine databases revealed 587 (287 in Idaho, 150 in Oregon, and 150 in Washington) documented sightings in the Northwest. Sightings have increased steadily since the 1960s with proportional contributions from each state remaining relatively constant (Figure 1). We believe that increased reporting effort and greater human access to remote habitats accounted for most of the increase in sightings over time (Maj and Garton 1994).

 

Plotting these sightings on a large-scale topographic map indicated mountainous habitat was the only obvious landscape characteristic associated with our hypothesized distribution of wolverine at the regional level (Figure 2). Most sightings in Idaho occurred in the central portion of the state which contains large tracts of mountainous habitat associated with the northern Rocky Mountains and supports a reproducing wolverine population (Copeland 1996). Similarly, most sightings in Oregon were associated with the Cascade and Wallowa mountains in the west-central and northeastern portions of state, respectively. In Washington, most sightings spanned from the northern Cascade Mountains to the northeastern portion of the state (Figure 2).

The Seven Devils survey area was 20,282 ha with 2161 ha (11 %) predicted to be suitable habitat. During 3.5 hours of flying, we surveyed 23 (36%) of the 64 search units, which comprised 7139 ha (35%) of the total survey area and 1033 ha (48%) of predicted suitable habitat. We located and confirmed with ground inspection one set of wolverine tracks (Halfpenny et al. 1995). We followed the tracks in both directions until they were obscured by forested canopy. No den or other indication of reproductive activity was detected.

Our observation was the first of a living wolverine in our survey area. Only a dead wolverine, found in 1987 near the Rapid River, had been previously documented. Adjacent to our survey area, the most recent (<3 years) and nearest (<30 air-km) sightings in northeast Oregon and central Idaho were January 1998 in the Wallowa Mountains and September 1995 near McCall, Idaho, respectively.

# 5. DISCUSSION

Simple visual inspection of wolverine sightings plotted at the regional scale suggested three somewhat distinct clusters within our hypothesized distribution of wolverine (Figure 2). These clusters corresponded to the 1) northern Cascade Mountains in Washington, 2) southern Cascade Mountains in Oregon, and 3) northern Rocky Mountains in Idaho. The clusters may represent three subpopulations within a larger, spatially-structured population in the northwestern United States.

The Columbia River Gorge is a compelling barrier for separating subpopulations in the northern and southern Cascades. Shrub-steppe habitats of the Columbia Plateau and northern Great Basin likely separate the northern Rocky Mountain subpopulation from the northern and southern Cascade subpopulations (Banci 1994). All three subpopulations described here are likely peninsular extensions of a more extensive Canadian population (Banci 1994, Verts and Carraway 1998:427).

Although relatively discrete, the linear east-west scatterings of sightings across Washington and Oregon suggest that individuals inhabiting and moving along corridors of mountainous habitats may connect the three subpopulations to some degree (Figure 2). Therefore, wolverine demographics in these three areas may be correlated through the exchange of individuals among spatially separated subpopulations supporting the potential for metapopulation dynamics (Hanski and Gilpin 1991, Wells and Richmond 1995).

 

Individual wolverines are capable of making long-distance movements over relatively short periods and may move among subpopulations through the mountainous habitats of northern Idaho, northern Washington, and central Oregon (Figure 2). The scattering of sightings across the arid mountains of central Oregon suggest a movement corridor from the Cascade Mountains to the Wallowa Mountains. Adjacent to this potential movement corridor, the Seven Devils Mountains form a bottleneck of mountainous habitats between Oregon and Idaho. Hence, the Seven Devils Mountains may provide the only suitable habitat linking the reproducing population in central Idaho (Copeland 1996) with northeast Oregon, and also potentially with the southern Cascade Mountains.

Although we confirmed the presence of wolverine in the Seven Devils Mountains, the lack of previous sightings may indicate a small resident population with low interchange rates, raising questions about landscape barriers limiting movement to and from the Seven Devil Mountains (Stamps et al. 1987). The deep gorges of Hells Canyon and the Salmon River Canyon surrounding the Seven Devils Mountains may function as a geographic barrier to population movement. Dominated by low-elevation steppe habitats, these two canyons dissect the Seven Devils Mountains from northeast Oregon and central Idaho.

Wolverines dispersing from "source habitats" (as defined by Pulliam and Danielson 1991) in central Idaho, may be reluctant to cross canyon habitats. Assuming that these canyon habitats are relatively unsuitable (Banci 1994), the Seven Devils Mountains may resemble a stepping-stone connection (Noss 1991) and explain the lack of wolverine sightings in apparently suitable habitat. Movement rates in corridors composed of stepping-stones may be lower than in continuous-habitat corridors (Anderson and Danielson 1997). Additionally, species with inherently low densities often exhibit low dispersal rates and limited population interspersion. Dispersal carries an increased risk of mortality which may be additive in low-density species such as the wolverine. Consequently, limited dispersal may impact long-term regional population viability by reducing subpopulation connectivity and lowering the likelihood that suitable habitat patches are colonized and recolonized over time (Fahrig and Paloheimo 1988, Hansson 1991).

Generating a hypothesized distribution map and confirming wolverine presence is a first step toward identifying the spatial structure of subpopulations and key movement corridors responsible for maintaining this structure in the Northwest. However, additional understanding of 1) reproducing subpopulations, 2) source-sink habitat patches, 3) movement corridors, and 4) movement patterns within and among spatially-structured subpopulations is necessary for monitoring regional population status (Fahrig and Merriam 1985, Harrison 1991). Movement patterns among Idaho, Oregon, and Washington must be identified to specifically understand the potential importance of the Seven Devils Mountains for conserving wolverine and informed regional conservation planning in the Northwest (Banci 1994, Fahrig and Merriam 1994).

 

# 6. ACKNOWLEDGMENTS

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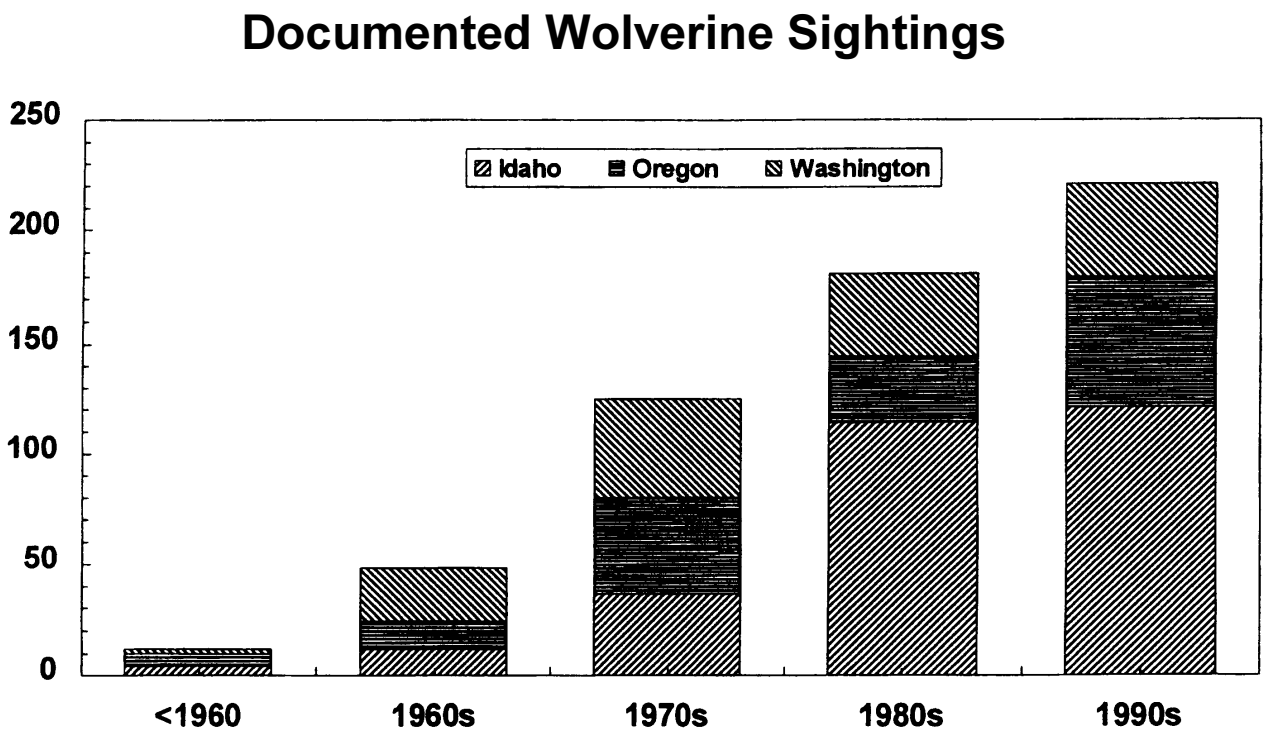


Figure 1. Temporal distribution of wolverine sightings documented in the northwestern United States, 1896–1998.

 

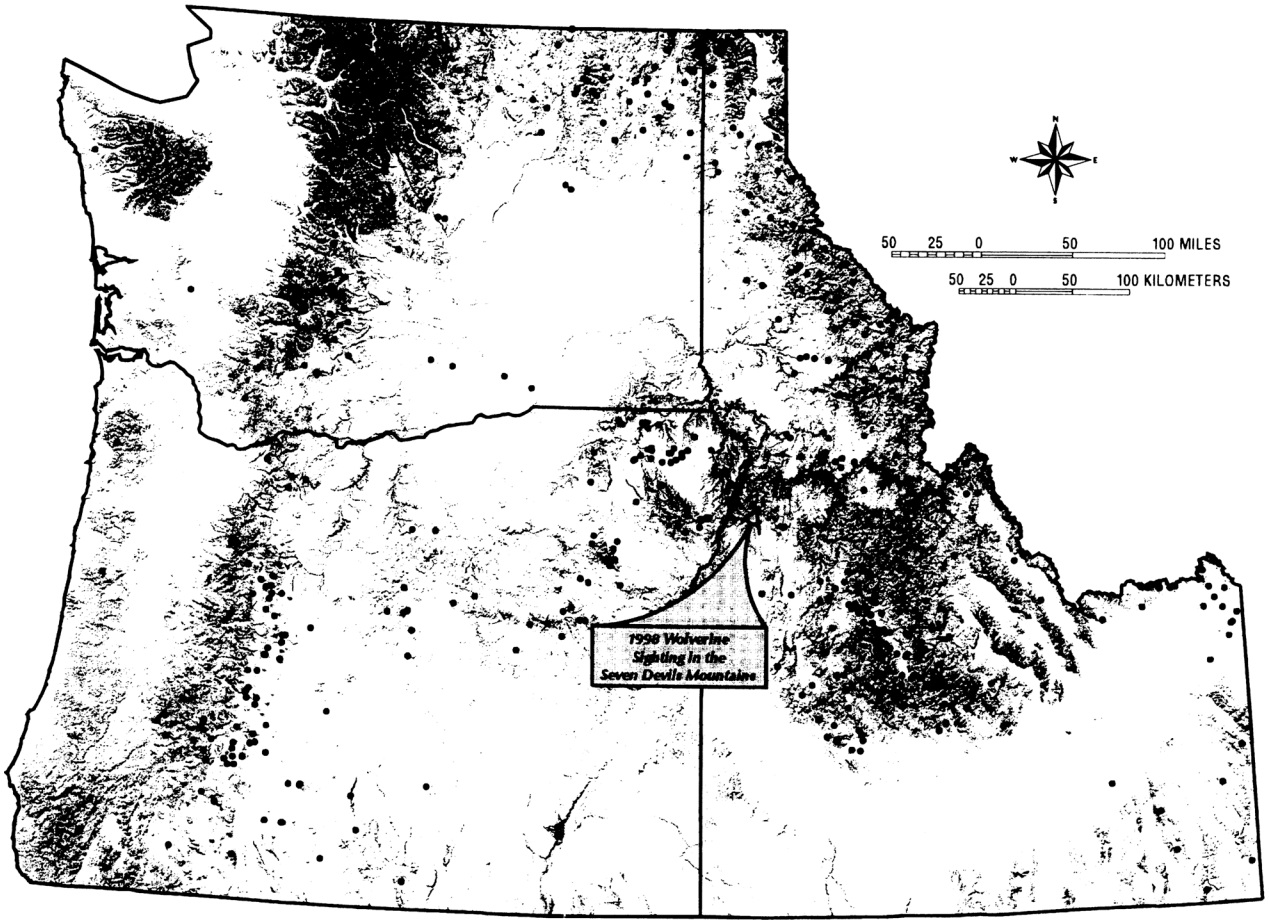


Figure 2. Distribution of wolverine sightings[1] documented in the northwestern United States, 1896–1998.

[1] Locations for all wolverine sightings documented by the 1) Washington Wildlife Heritage Database, 2) Oregon Natural Heritage Progran, and 3) Idaho Conservation Data Center were plotted regardless of reliability, because most unconfirmed sightings were spatially correlated with confirmed sightings at the regional resolution, and no standard criteria for screening sightings have been developed.