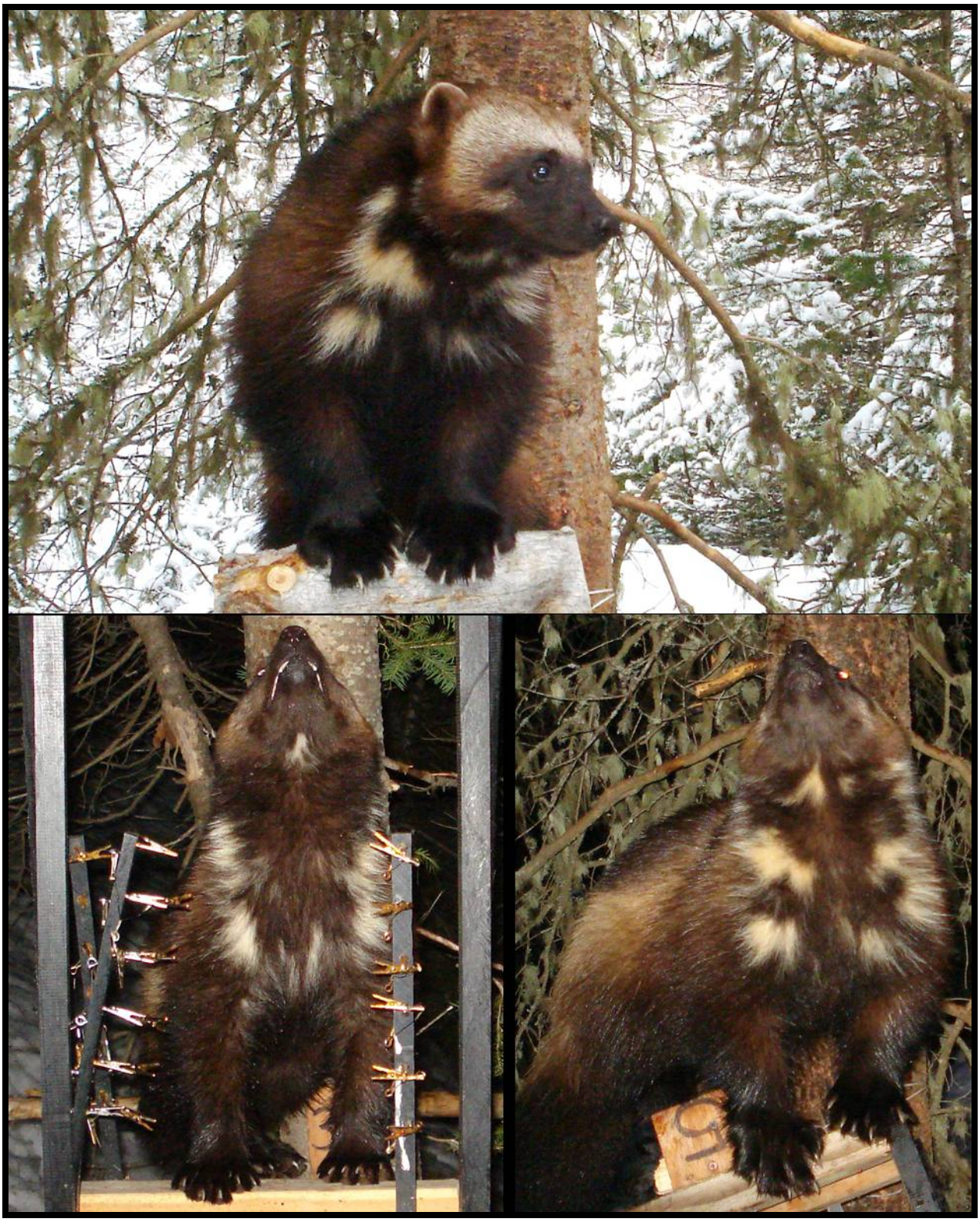
Monitoring Wolverines in Northeast Oregon – 2011



Submitted by The Wolverine Foundation, Inc.

Title: Monitoring Wolverine in Northeast Oregon – 2011

Authors: Audrey J. Magoun, Patrick Valkenburg, Clinton D. Long, and Judy K. Long

Funding and Logistical Support:

Dale Pedersen

James Short

National Park Service

Norcross Wildlife Foundation

Oregon Department of Fish and Wildlife

Seattle Foundation

The Wolverine Foundation, Inc.

U.S. Forest Service

Wildlife Conservation Society

Special thanks to all those individuals who provided observations of wolverines in the Wallowa-Whitman National Forest and other areas in Oregon. We also thank Tim Hiller, Mark Penninger, and Glenn McDonald for their assistance in the field work.

This document should be cited as:

Magoun, A. J., P. Valkenburg, C. D. Long, and J. K. Long. 2011. Monitoring wolverines in northeast Oregon – 2011. Final Report. The Wolverine Foundation, Inc., Kuna, Idaho, USA.

INTRODUCTION

The Oregon Conservation Strategy lists "species data gaps" and "research and monitoring needs" for some species where basic information on occurrence and habitat associations are not known (ODFW 2006; pages 367-368). For the Blue Mountains, East Cascades, and West Cascades Ecoregions of Oregon, the Strategy lists wolverine as a species for which status is unknown but habitat may be suitable to support wolverines. ODFW lists the wolverine as Threatened in Oregon and the USFWS has recently placed the species on the candidate list under the federal Endangered Species Act. Wolverine range in the contiguous United States had contracted substantially by the mid-1900s, probably because of high levels of human-caused mortality and very low immigration rates (Aubry et al. 2007). In their historical review of wolverine distribution in the western states, Aubry et al. (2007) concluded that wolverines detected in Oregon in recent decades "probably represent extreme dispersal events that were not representative of self-sustaining populations" because "there is no evidence of wolverine occurrence in eastern Washington or Oregon currently." These authors stated that there is only 1 verified record of a wolverine from Oregon between 1921 and 1950. Beginning in the 1960's and up to 1994, verified records increased with 2 verified records per decade in that period, but there were no verified records between 1995 and 2000 (Aubry et al. 2007). However, wolverine populations may now be established in mountainous habitats in Oregon but remain undetected because of low numbers and ineffective detection techniques. Habitat in northeast Oregon, specifically the Eagle Cap Wilderness and the surrounding Wallowa-Whitman National Forest, could potentially support a small wolverine population, as it contains apparently suitable wolverine habitat. There have been 28 unverified sightings in the area, including one in 2008 (Wallowa-Whitman National Forest database; Hiller 2011). Also, wolverines are known to occur in adjacent areas in Idaho.

The proposed study area may represent important linkage habitat for wolverines to move between core habitats in Idaho and Montana to suitable habitat in Oregon or northern California where a wolverine was recently documented on a motion-detection camera. The DNA from this individual indicated its origins were probably in the Rocky Mountains near the proposed study area (Moriarity et al. 2009). If we detect lactation in female wolverines during this study, managers will know that wolverines in northeast Oregon constitute a breeding population and not just dispersing animals moving through the area. A current lack of survey information in

Oregon limits the ability to make management decisions for wolverines, so verification of the species' presence in the Wallowa-Whitman National Forest would fill a recognized knowledge gap regarding wolverines in Oregon and have a number of implications for state and federal management and conservation organizations. The purpose of this project was to conduct camera and aerial snow track surveys for wolverines in the Wallowa-Whitman National Forest in northeast Oregon (Fig. 1), including the Eagle Cap Wilderness, to determine if wolverines are present and whether females detected in the study area show evidence of reproduction.

OBJECTIVES

OBJECTIVE 1:

Conduct surveys for presence of wolverines in the Eagle Cap Wilderness and adjacent forested areas in the Wallowa-Whitman National Forest from February through May 2011 using recently developed, proven, non-invasive techniques for detecting wolverine presence.

TASK 1.1:

Use motion-detection cameras in the forested portions of the Wallowa-Whitman National Forest in and adjacent to the Eagle Cap Wilderness to detect wolverines.

RATIONALE:

Motion-detection cameras are very effective in detecting wolverine presence, identifying individuals, determining the sex of the individuals, indicating maturation in males photographed in late winter, and determining if females are lactating in March – May (Magoun et al. 2011). This camera technique is the only known method that can provide information not only on individual identification and sex of wolverines but also on lactation in females and maturation in males.

METHODS:

Our study plan called for deploying ~30 motion-detection cameras across the study area in areas that appeared to be suitable sites for detecting wolverines (e.g., alpine areas near boulder and talus, avalanche chutes with large downed trees, meadows, lakes, streamside habitats, and areas with large herbivores such as elk, mountain goats, and bighorn sheep). The cameras

stations consisted of run poles along which wolverines approached hanging baits (e.g., road-killed deer), which lured the animals to the ends of the run poles. Motion-detection cameras were set to photograph the wolverines as they looked up at the bait. In this way, the ventral patterns of wolverines were photographed and were used to differentiate between individuals. Baits positioned at least 18 inches above the run pole enticed the wolverines to stand up to reach the bait, thereby producing photographs of the abdominal area, which can provide evidence of sex, lactation, and maturation in males (for an in-depth description of the camera-trapping method, see Magoun et al. 2011).

RESULTS:

Camera Deployment

Due to unusual heavy, frequent snowstorms in the study area during the camera-trapping period, we were only able to set up 16 of the proposed 30 camera stations. However, at 4 camera stations, we deployed 2 cameras to increase the probability of detection for wolverines when the camera stations could not be checked frequently (e.g., every 2–3 weeks). Deployment of cameras was initiated on January 29, 2011 and the last camera station was set up on April 21, 2011. All cameras except WCAM6 were located either in or within 1 mile of the Eagle Cap Wilderness. We placed WCAM6 at a location outside of the Wallowa-Whitman National Forest boundary where an unverified sighting of a wolverine in August 2010 was reported. Camera stations were set up for a cumulative total of 1,453 camera station trap-nights (range 36–137; average 91). Photo history from the cameras indicated that the camera stations were operable on at least 888 (61%) of those trap-nights (range 20−89; average 56). The highest elevation where a camera was deployed was 6,398 feet and the lowest was 4,646 feet. We placed 3 camera stations at elevations <5,000 feet, 9 between 5,000 and 6,000 feet, and 4 above 6,000 feet. See Table 1 for information on individual camera stations and Figure 2 for a map of camera locations. The camera used at most stations was Trail Watcher© (Trail Watcher, Monticello, Georgia), a camera that photographs in color both day and night, but we also used a Reconyx© model (Reconyx, Inc., Holmen, Wisconsin), a camera with lower resolution that only produces black & white photos at night, at 5 stations on the south side of the Wallowa Mountains where repeated access to the cameras was not possible. Until wolverines were detected, we simply hung portions of deer carcasses from a tree by a cable and set up the cameras to photograph animals feeding on

the bait (Fig. 3). After we began detecting wolverines in the study area, we set up a more complex camera station design (Magoun et al. 2011) for obtaining ventral pattern photos for individual identity, evidence of sex, indication of maturation in males, and lactation in females, and for collecting hair samples (Fig. 4). All camera stations were removed by June 20.

Wolverines Detected at Camera Stations

Wolverines were detected at 7 of the 16 camera stations (44%), either by photos, hair, or both. The identity of the wolverine that visited 2 of the stations was not determined, either because photos of the individual were not diagnostic of individual identity (WCAM2) or hair collected did not have sufficient DNA to identify the individual or its sex (WCAM1). At one of these stations and the remaining 5 camera stations, we identified a total of 3 individual wolverines by photographs. One of these individuals (Stormy) left enough hair to determine its genotype and verify its sex (a male that appeared to be a subadult). One of the other wolverines (Zed) was also classified as a subadult male from photos (Fig. 5), but we could not verify the sex of the third individual (Iceman), although photographs suggest it was also a male. One of the wolverines was identified at only 1 camera station (Zed), another at 2 camera stations (Iceman), and the third (Stormy) at 3 camera stations. The number of days between camera deployment and detection of a wolverine by photos varied from 4 to 75 days (range 4−75; average 41). Detection of a wolverine at one camera station (hair but no photograph) occurred after >3 months.

The earliest detection of a wolverine at a camera station was on March 14 (58 days after the camera was deployed). At this station (WCAM10-R), the subadult male Stormy (Fig. 6) spent 8 days between March 14 and April 9 feeding on the bait. He spent 50 minutes on his first visit and from 1 to 24 minutes on subsequent visits, with 1 to 5 separate visits on the days that he was at the camera station. We defined a visit as a period when a wolverine is photographed at a camera with <30 minutes between any consecutive photographs. On April 12 this same male wolverine was detected at a different camera station (WCAM8) 15.5 mi north of WCAM10-R. He visited the camera station on 7 days during April (April 12, 13, 18, 25, 27, 28, and 29) and on 3 days in May (May 8, 9, and 22). On April 22, he also began visiting a new camera station (WCAM16) 5.2 mi from WCAM8 and was documented at that camera station on April 23, 24, and 25 and on May 12), moving back and forth between WCAM8 and WCAM16, in one case visiting both stations on the same day < 3 hours apart. He spent at least 178 minutes of total time

at WCAM8 during 19 visits in April and May and at least 81 minutes at WCAM16 during 8 visits in April and May. Individual visits at these two camera stations lasted from 1 minute to 25 minutes.

The wolverine Iceman (Fig. 7) was first detected at WCAM8 on April 2 about 8 p.m. and revisited the station just after midnight on April 3 and again at around 6 a.m. on April 3 for a total of 37 minutes. Only 12 hours later he visited WCAM2, which was 7.7 mi from WCAM8, fed on the bait for 26 minutes, and then left. He was not detected again during the study.

The third wolverine, the subadult male Zed (Fig. 8), was detected at only a single camera station and was the first wolverine photographed at that station after 62 days from when the camera was first deployed. He visited the camera on May 12 for 55 minutes and returned 5 hours later on May 13, visiting the camera station that day on 5 occasions for a total of 26 minutes. He was not detected again at the camera station in the remaining days that it was deployed (removed on June 16).

No females were detected at the camera stations but the sex of the wolverine Iceman was not determined conclusively. From photos of this wolverine, we were able to tentatively identify Iceman as a male (see photo with arrow in Fig. 7).

All photos of wolverines were taken at camera stations at or above 5500 feet; however, at one station around 5000 feet elevation (WCAM1), a single wolverine hair was collected late in the field season >90 days after the camera was deployed (Table 1). The camera's memory card was full before the wolverine visited the camera station so no photos of this individual were obtained.

Detecting Wolverines by Tracking on the Ground

Although ground-tracking wolverines in the study area was not one of the techniques we proposed to use in this study, we actually found the first evidence of wolverines in the study area by detecting wolverine tracks in the Hurricane Creek drainage during one of our trips to a camera station. The wolverine had not visited the camera station, but its tracks were found within a half mile of the camera. We set up another camera close to where the tracks were found and subsequently recorded a wolverine on the camera. We do not recommend surveying for wolverine tracks from the ground as the primary detection method in the Eagle Cap Wilderness because of the danger from avalanches and difficulties moving over long distances in winter in

search of tracks. Although ground tracking might be the least expensive method for detecting wolverine presence (not including personnel time), the method is labor-intensive and provides no information on the number of individuals or their sex unless hair or scats are collected along the tracks, which requires additional tracking time. Despite numerous hours traveling to camera stations during winter 2011, we detected only the one wolverine track in Hurricane Creek, except for tracks in the immediate vicinity of the baited camera stations.

DNA Analysis

Wolverine hair was collected at 2 camera stations (WCAM1 and WCAM8) and was analyzed by the Genetics Lab at the Rocky Mountain Research Station in Missoula, Montana. Hair from WCAM1 could only be identified as "wolverine." Genotype and sex of the individual could not be determined because the DNA was degraded. Abundant hair was collected at WCAM8, which provided a genotype and verified the sex of the male Stormy. The DNA indicated that Stormy was genetically more closely related to wolverines in Idaho than to wolverines in Washington. The laboratory designation for this wolverine is "OR-Stormy-M-H."

Other Species Photographed at Camera Stations

Of the 17 other species photographed at camera stations, 13 were mammals and 4 were birds (Table 2). The most common mammal was the American marten, photographed at 12 of 16 camera stations (75%), and the most common bird was the Steller's jay, also photographed at 12 of 16 stations (75%). Photographs of red fox (Fig. 9) were archived with Keith Aubry (US Forest Service, Pacific Northwest Research Station, Portland, OR) because these foxes may be a subspecies of red fox (Rocky Mountain population of the montane red fox), which is restricted to mountain habitats and is the subject of current research by Aubry and colleagues (Aubry et al. 2009). Hairs collected from marten at our camera stations are being analyzed for DNA as part of the US Forest Service marten study underway in northeast Oregon (Mark Penninger, personal communication; Hiller 2011). Black bears began to show up at camera stations by mid April but no damage was done by bears to the stations.

TASK 1.2:

Conduct at least 3 aerial surveys for wolverine tracks in snow in and adjacent to the Eagle

Cap Wilderness, particularly high elevation sites that are difficult to access in winter.

RATIONALE:

Some areas of the proposed study area, in particular high alpine habitat within the Eagle Cap Wilderness, may not be accessible for deploying cameras in winter and yet may represent the best habitat for wolverines in the study area. Therefore, we used snow track survey flights from a fixed-wing aircraft to detect wolverine presence in open areas such as alpine habitats, meadows, and lakes. The survey technique was developed and tested in Ontario by the principle investigator and the survey pilot (Magoun et al. 2007, Koen et al. 2008). Wolverine tracks detected during these surveys help to determine the best location for camera stations and may pinpoint areas that are used by denning females.

METHODS:

We planned to fly all open areas of the Eagle Cap Wilderness and adjacent areas when winds were light and >24 hours after a fresh snowfall using a PA-18 Supercub, a fixed-winged aircraft with tandem seating allowing both the pilot and observer to see out both sides of the aircraft. However, frequent snowstorms and windy conditions during the study period resulted in routes having to be flown <24 hours after snowstorms. Both pilot and observer have many hours of wolverine survey time in the aircraft. The aircraft and survey team were located at the Enterprise Municipal Airport near the study area so that survey conditions could be closely monitored. Survey flight routes were recorded on a GPS tracking device as were locations of wolverine tracks and mountain goat tracks and sightings. Flight routes were variable depending on tracking conditions, elevation, and topographical features. All open areas of the study area were surveyed at least 3 times.

RESULTS:

Despite generally poor conditions for aerial surveys in winter 2011, we flew over 2,000 miles of survey flights in a PA-18 Supercub in and adjacent to the Eagle Cap Wilderness, including relatively large areas to the east and north of the Eagle Cap Wilderness (Fig. 10). We used a GPS to record routes in most cases, but on 3 survey days (February 26, March 17, and April 9), we drew the routes on maps and transferred them to MapSource© (Garmin, Olathe,

Kansas) data files. Flights were made on 8 days including 1 in February, 2 in March, 4 in April, and 1 in May (Table 3). Two flights per day were made on April 12 and 23 and on May 1, resulting in 11 total survey flights. Flights were made at altitudes ranging from 1,681 feet to over 10,000 feet and at speeds between 79 and 87 mph (average 82 mph). Flight time per route ranged from 1.5 hours to 4.3 hours (Table 3). Waypoints for all wolverine tracks and for mountain goat tracks and sightings were plotted on a map of the study area (Fig. 11). Seven sets of wolverine tracks were recorded during these flights (Fig. 12). Five sets of tracks were found on April 23; the greatest distance between these tracks was 11.1 miles. The other 2 sets of tracks were found on May 1 and the distance between them was 17.2 miles. The time between locating 2 sets of tracks during a survey flight ranged from 45 minutes to 1 hour and 15 minutes. Goat sightings were usually of 1 or 2 individuals, although in one instance 12 goats including 3 kids were observed.

Due to weather conditions, survey flights were more concentrated on the north side of the Wallowa Mountains within the Eagle Cap Wilderness, but 4 flights were on the south side of the mountains and 3 were in the Hells Canyon National Recreation Area (Fig. 10). All but one set of wolverine tracks were detected between the Wallowa River and the Lostine River near areas where mountain goats or camera stations were located. One set of tracks was located much further west on the North Fork of Catherine Creek. The individual that made this track traveled across the divide between Catherine Creek and the Minam River (Fig. 12). During the aerial surveys, no wolverine tracks were located outside of the Eagle Cap Wilderness, even though extensive surveys were flown over the Hells Canyon National Recreation Area (Fig.10). All wolverine tracks detected from the air could have been made by wolverines that were photographed at the camera stations.

CONCLUSIONS

CAMERA DETECTION OF WOLVERINES IN THE WALLOWA MOUNTAINS

Our cameras identified 3 wolverines in the Wallowa-Whitman National Forest, which are the first verified records of wolverines in Oregon in nearly 20 years and the first ever in the Wallowa-Whitman National Forest. Even though female wolverines were not detected, the presence of 2 subadult males suggests that there could be a breeding population of wolverines in the study area. The DNA collected from one of the wolverines indicated that this wolverine is

more closely related to individuals in Idaho than to wolverines in Washington. It is possible that this wolverine dispersed from Idaho across the Snake River and was not born in the study area. However, it seems unlikely that 3 wolverines would have dispersed from Idaho, all in late winter 2011 and found camera stations all within a relatively small area of the Eagle Cap Wilderness. It is more likely that there are resident wolverines in the Eagle Cap Wilderness. Another year of camera trapping is needed to determine if female wolverines are resident there.

Whether or not wolverines are resident within the study area, the presence of the wolverines we detected indicates that the Wallowa-Whitman National Forest and the Hells Canyon National Recreation Area, between the Eagle Cap Wilderness and the Snake River on the Idaho border, is potential dispersal habitat for wolverines moving from source habitat in Idaho and Montana to areas further west and north of our study area. The male wolverine that was recently detected in northern California could have dispersed from Idaho (Moriarity et al. 2009), possibly through the Wallowa-Whitman National Forest, or it may have originated from within the Wallowa-Whitman National Forest. Periodic reported sightings of wolverines in the study area and in mountains west of the study area in recent years and the occasional verified record of wolverines in Oregon (Hiller 2011) suggest that occurrences of wolverines in Oregon may not represent extreme dispersal events (Aubry et al. 2007; Verts and Carraway 1998). Rather, we suggest that regularly-occurring dispersal events, and possibly even small breeding populations of wolverines, could exist in Oregon but remain undetected or unverified by criteria defined by Aubry et al. (2007). In fact, we suggest that the status of the wolverine in Oregon should receive further attention with additional camera surveys in the Blue Mountains, East Cascades, and West Cascades Ecoregions of Oregon (ODFW 2006) and in some of the more isolated mountainous areas outside these areas where there have been reports of wolverines (Hiller 2011).

The use of digital motion-detection cameras makes it feasible to conduct surveys for species like the wolverine, which occur at very low densities and in habitats that are difficult to access especially in winter. There is no way to know if the failure to detect wolverines in Oregon in earlier survey attempts (Hiller 2011) was due to the absence of wolverines in those years or inability of survey personnel to detect the wolverines that were present. Regardless of the reason, our study points out the potential for using cameras in the future for detecting wolverines and for monitoring their populations over time. Although wolverines have occasionally been detected on

cameras intended for other species in other western states (e.g., Moriarity et al. 2009), as far as we know, our study in Oregon is the first time cameras have been used specifically and successfully to detect wolverines in an area where no verified records of the species exist. The combined technique we used for simultaneously capturing photos and hair from wolverines (Magoun et al. 2011) was especially useful because it provided information on identity, sex, and maturation of males and had the potential for verifying lactation in females had we detected females during this study. Now that wolverines are known to occur in Oregon, we recommend that future surveys use this technique and that archival photos of wolverines detected in Oregon are shared among researchers to provide more information on the movements and dispersal patterns of wolverines in Oregon and adjacent areas.

The wolverine is not currently listed under the Oregon Conservation Strategy as a strategy species (ODFW 2006), primarily because information on the species is lacking. The wolverine is listed as threatened under the Oregon Endangered Species Act in 1987 and reaffirmed as threatened by the Game Commission in 1989, despite the lack of information on its occurrence and distribution. Now that 3 individuals have been detected in the Eagle Cap Wilderness, a determination of the wolverine's status in Oregon is warranted, including establishing the presence of females and determining long-term occupation of suitable habitats in the state. A second field season of camera work is planned for the study area in winter 2011-2012. The primary focus of this work will be to detect females and to verify that individuals present in 2011 are still occupying the Eagle Cap Wilderness in 2012. The success of the first field season and the keen interest and excitement by members of the public and management agencies upon discovering wolverines in Oregon has helped to secure the necessary funds to continue our monitoring program through another field season. We also anticipate that monitoring for wolverines in the Eagle Cap Wilderness, as well as other areas of Oregon, will continue for some time into the future, not only because of the local interest in the species but also because of a broader interest in wolverine populations across the western states and the recent listing of the wolverine as a candidate species in the lower 48 states under the federal Endangered Species Act.

Finally, in addition to information on wolverines, camera trapping can also provide information on other species that occur in the area covered by the camera-trapping grid (Fig. 13), which could help to describe the habitat occupied by wolverines. However, camera-trapping sets

that are best for detecting wolverine may not be optimal for some species unless multiple cameras are used at the station, so caution must be used to interpret occurrences of non-target species.

AERIAL SURVEYS FOR WOLVERINE TRACKS

La Niña conditions over the western United States caused frequent, heavy snowfalls in the Eagle Cap Wilderness beginning in November 2010 and continuing through late winter and spring 2011. Aerial tracking conditions were generally poor with most days having windy, cloudy weather and few suitable tracking days occurring >24 hours after snowstorms. Poor aerial tracking conditions prevented us from conducting many survey flights south and west of the Lostine River drainage, and nearly all flights were made <24 hours after a fresh snowfall, decreasing our ability to find localized areas where wolverines were active. Nevertheless, we were able to document at least 7 sets of wolverine tracks at high elevations in the Eagle Cap Wilderness. We found additional tracks that could have been wolverine, but we only reported tracks definitively identified as wolverine by the 3X3 pattern to avoid false positive identification (see Fig. 12). Although most of the tracks were located in the Wallowa River and Lostine River drainages, at least one track farther to the west and south in the Catherine Creek drainage indicated that wolverines were widely distributed in the study area. Having a tracking aircraft and pilot on hand dedicated to the aerial track surveys made it possible to take advantage of brief periods of suitable tracking conditions. Availability of this aircraft and a pilot with extensive experience tracking wolverines from the air were crucial to the success of the aerial track surveys. The success of the aerial tracking in Feb – May 2011, despite poor tracking conditions, proves the usefulness of aerial tracking as a survey technique for wolverines in the study area.

RECOMMENDATIONS

The non-invasive methods used in this project worked well under the conditions we experienced in winter 2011. The only improvement we would recommend is to begin both the camera trapping and aerial surveys as early in the winter as possible to allow for sufficient time to deploy cameras and do aerial surveys under the winter conditions that often prevail in the Wallowa Mountains. Now that wolverines have been detected in and adjacent to the Eagle Cap

Wilderness, camera stations should be set up using run poles and hair-snagging devices (Magoun et al. 2011) at the start of the field season, rather than waiting to deploy these structures after a wolverine has been detected at a camera station. Despite the extra time and materials needed to set up the camera and hair-snagging station (C&H station), use of these stations from the start of the field work will allow identification of individuals detected only once during the field season, which is not always possible when run poles are not used. We also recommend more experimentation with C&H stations in summer and fall to avoid snow and avalanche conditions that make field work more time-consuming and risky. Although wolverines do not come as readily to bait in summer, attempts to document wolverines at high elevation snowfields in summer may increase detection of some individuals.

Based on the results of this project, we know that wolverines occupied the Wallowa-Whitman National Forest in and adjacent to the Eagle Cap Wilderness in late winter and spring 2011. The detection of at least 3 individuals, including males that appear to be subadults, suggests the possibility that additional wolverines, including breeding females, could be resident in the area. Therefore, we recommend that an additional year of intensive camera trapping and aerial surveys be conducted in the study area. Camera-trapping efforts should begin as soon as possible, even before the first snowfall occurs and extending into the summer months, to test the feasibility of running camera stations in snow-free periods when there is more opportunity to access high elevation sites in the areas designated as wilderness. Cameras capable of taking photographs for extended periods should be used at high elevation sites that may not be accessible in winter. The intensive, extended camera-trapping effort for a second year should provide definitive evidence of the presence of females in the study area, if they are present, and possibly evidence of a breeding population.

Because aerial tracking provides a means of covering the most inaccessible areas of the Eagle Cap Wilderness for signs of wolverines, we recommend additional aerial track surveys in 2011-2012. There is a 50% chance that La Niña conditions may prevail for another winter (http://oregon.gov/ODA/NRD/weather.shtml#Weather_forecasts). Therefore, aerial surveys should begin as early as October, whenever snow conditions become suitable in the Eagle Cap Wilderness, and continue through the spring months. This much longer aerial survey period may provide sufficient days of optimal survey weather to document areas of intensive use by wolverines in the study area, even under La Niña conditions. This information can then be used

to focus camera-trapping efforts in areas that may be used by female wolverines.

A 2-year data set from intensive camera trapping and aerial surveys would provide a baseline for long-term monitoring of wolverines in the study area and can also form the basis for developing additional monitoring programs for wolverines in other regions of Oregon. Regardless of the outcome of surveys in 2011-2012, we recommend continuing a monitoring program in the Eagle Cap Wilderness for an extended period (e.g., >10 years) to establish the status of wolverines using this area over time. This monitoring program need not be on the scale we used for this project and are recommending for 2011-2012. We anticipate that, following another year of intensive monitoring, managers should be able to develop a long-term monitoring protocol that requires less time and money but would be effective in verifying the status of wolverines in the Wallowa-Whitman National Forest.

LITERATURE CITED

Aubry, K. B., K. S. McKelvey, and J. C. Copeland. 2007. Distribution and broadscale habitat relations of the wolverine in the contiguous United States. Journal of Wildlife Management 71: 2147-2158.

Aubry, K. B., M. J. Statham, B. N. Sacks, J. D. Perrines, and S. M Wisely. 2009. Phylogeography of the North American red fox: vicariance in Pleistocene forest refugia. Molecular Ecology 18: 2668-2686.

Hiller, T. L. 2011. Oregon furbearer program report August 2011. Oregon Department of Fish and Wildlife. Salem, Oregon.

Koen, E. L., J. C. Ray, J. Bowman, F. N. Dawson, and A. J. Magoun. 2008. Surveying and monitoring wolverines in Ontario and other lowland, boreal forest habitats: recommendations and protocols. Ontario Ministry of Natural Resources, Northwest Science and Information. Thunder Bay, Canada.

Magoun, A. J., P. Valkenburg, D. N. Pedersen, C. D. Long, and R. E. Lowell. 2011. Wolverine images—using motion-detection cameras for photographing, identifying, and monitoring wolverines. Blurb http://www.blurb.com/bookstore/detail/1914572.

Magoun, A. J., J. C. Ray, D. S. Johnson, P. Valkenburg, F. N. Dawson, and J. Bowman. 2007. Modeling wolverine occurrence using aerial surveys of tracks in snow. Journal of Wildlife Management 71: 2221-2229.

Moriarity, K. M., W. J. Zielinski, A. G. Gonzales, T. E. Dawson, K. M. Boatner, C. A. Wilson, F. V. Schlexer, K. L. Pilgrim, J. P. Copeland, and M. K. Schwartz. 2009. Wolverine confirmation in California after nearly a century: native or long-distance immigrant?

Northwest Science 83 (2): 154-162.

ODFW. 2006. Oregon conservation strategy. Oregon Department of Fish and Wildlife, Salem, Oregon.

Verts, B. J. and L. N. Carraway. Land mammals of Oregon. University of California Press, Berkeley, California.

Table 1. Camera station locations in the Wallowa-Whitman National Forest in 2011, deployment dates, number of days deployed, and number of days to detection of a wolverine. Stations with a Reconyx© camera are designated with an "R" after the number.

Camera Stations_Wallowa Mountains_Jan-Jun 2011												
Station	Set ID#	Location	Elev	Start	End	Deployed (days)	Operable (days)	Percent Operable	Second Camera (days)	Wolverine Detected	First Detection	Days to Detection
WCAM1	30	Walla Walla_Lostine Rd	4993'	30-Jan-11	13-May-11	103	26	0.25		X	>30-Apr	>90
WCAM2	None	Maxwell Lake_Lostine Rd	5484'	30-Jan-11	13-Jun-11	137	89	0.65	31	X	3-Apr	63
WCAM3	27	Salt Creek Summit_1st	6061'	4-Feb-11	11-May-11	96	24	0.25				
WCAM4	None	Salt Creek Summit_2nd	6216'	9-Feb-11	12-Jun-11	123	33	0.27				
WCAM5	34	Hurricane Crk_Slick Rock	5469'	13-Feb-11	18-May-11	94	76	0.81				
WCAM6	10	Little Indian Creek_Imbler	4646'	15-Feb-11	7-May-11	81	63	0.78				
WCAM7	42	Lower Two Pan_Lostine	5890'	27-Feb-11	13-Jun-11	106	45	0.42	32	X	13-May	75
WCAM8	5	Wallowa_Ice Lake Tr	5643'	2-Mar-11	29-May-11	88	75	0.85	37	X	2-Apr	31
WCAM9-R	56	Buck Creek	5340'	5-Mar-11	20-May-11	76	76	1.00				
WCAM10-R	12	West Eagle Creek	5700'	6-Mar-11	19-Jun-11	105	40	0.38		X	14-Mar	8
WCAM11-R	28	Moss Springs Tr	5659'	7-Mar-11	19-Jun-11	104	75	0.72				
WCAM12	39	Upper Two Pan_Lostine	6398'	11-Mar-11	16-Jun-11	97	79	0.81	14	X	12-May	62
WCAM14-R	10	East Eagle Creek	4762'	22-Mar-11	21-May-11	60	60	1.00				
WCAM15-R	55	Cornucopia	5459'	23-Mar	20-Jun-11	89	49	0.55				
WCAM16	None	Hurricane Crk_Goat Cliffs	5692'	18-Apr	15-Jun-11	58	58	1.00		X	22-Apr	4
WCAM17	None	Upper Hurricane Crk	6016	21-Apr	27-May-11	36	20	0.56				
Totals						1453	888	0.61				

Table 2. All species detected at camera stations in the Wallowa-Whitman National Forest in 2011.

Species Detected at Camera Stations_Wallowa Mountains_Jan-Jun 2011																					
			Mammals														Birds				# Species
Station	Set ID#	Location	GG	UA	CL	LR	VF	CC	LA	MA	NC	TH	GS	ME	PM	EM		CS	PC	NC	BV	
WCAM1	30	Walla Walla_Lostine Rd								X								X				2
WCAM2	None	Maxwell Lake_Lostine Rd	X							X		X						X	X	X		6
WCAM3	27	Salt Creek Summit_1st								X												1
WCAM4	None	Salt Creek Summit_2nd		X	X		X			X								X			X	6
WCAM5	34	Hurricane Crk_ Slick Rock										X	X	X	X							4
WCAM6	10	Little Indian Creek_Imbler		X				X				X						X				4
WCAM7	42	Lower Two Pan_Lostine	X							X		X						X	X			5
WCAM8	5	Wallowa_Ice Lake Tr	X							X		X			X			X				5
WCAM9-R	56	Buck Creek			X					X								X				3
WCAM10-R	12	West Eagle Creek	X							X		X						X				4
WCAM11-R	28	Moss Springs Tr	?	X	X	X		X				X			X			X				7
WCAM12	39	Upper Two Pan_Lostine	X				X			X								X		X		5
WCAM14-R	10	East Eagle Creek			X					X		X						X				4
WCAM15-R	55	Cornucopia		X						X		X	X		X	X		X				4
WCAM16	None	Hurricane Crk_Goat Cliffs	X	X							X	X										4
WCAM17	None	Upper Hurricane Crk					X		X	X		X							X			5
Species Key:																						
Mammals		GG=Wolverine; UA= Black bear; CL=Coyote; LR=Bobcat; VF=Red fox; CC=Elk; LA=Snowshoe hare; MA=American marten; NC= Woodrat; TH=Red squirrel; GS=Northern flying squirrel; ME=Short-tailed weasel; EM=Least chipmunk; PM=Deer mouse																			
Birds		CS=Steller's jay; PC=Gray jay; NC= Clark's nutcracker; BV=Great-horned owl																				

Table 3. Data for 11 aerial tracking flights in search of wolverine tracks in the Wallowa-Whitman National Forest and Hells Canyon National Recreation Area.

Aerial Surveys for Wolverine Tracks in the Wallowa Mountains_2011							
Track #	Flight Line Color*	Date	Start (a.m.)	Elapsed Time	Length (miles)	Altitude Range (feet)	Speed (mph)
1	Green*	26-Feb	NR	3:36:00	295	NR	82**
2	Dark Blue	3-Mar	NR	2:42:00	221	3929-9288	82**
3	Magenta*	17-Mar	NR	1:42:00	139	NR	82**
4	Dark Cyan*	9-Apr	7:30	1:30:00	123	NR	82**
5	Cyan	12-Apr	7:03	3:16:18	283	3987-9673	87
6	Yellow	12-Apr	10:30	1:44:14	147	3979-7365	84
7	Dark Gray	23-Apr	5:39	4:18:09	349	2874-10,073	81
8	Blue	23-Apr	10:45	3:14:37	267	1681-6579	82
9	Dark Yellow	24-Apr	5:30	1:24:09	116	3949-9401	82
10	Red	1-May	5:18	2:44:17	217	3933-9914	79
11	Dark Green	1-May	8:13	1:40:07	135	3993-9865	82
TOTAL				27:51:51	2292		

*See Figure 10

**Average speed based on Track #5-11

Note: NR = Not Recorded

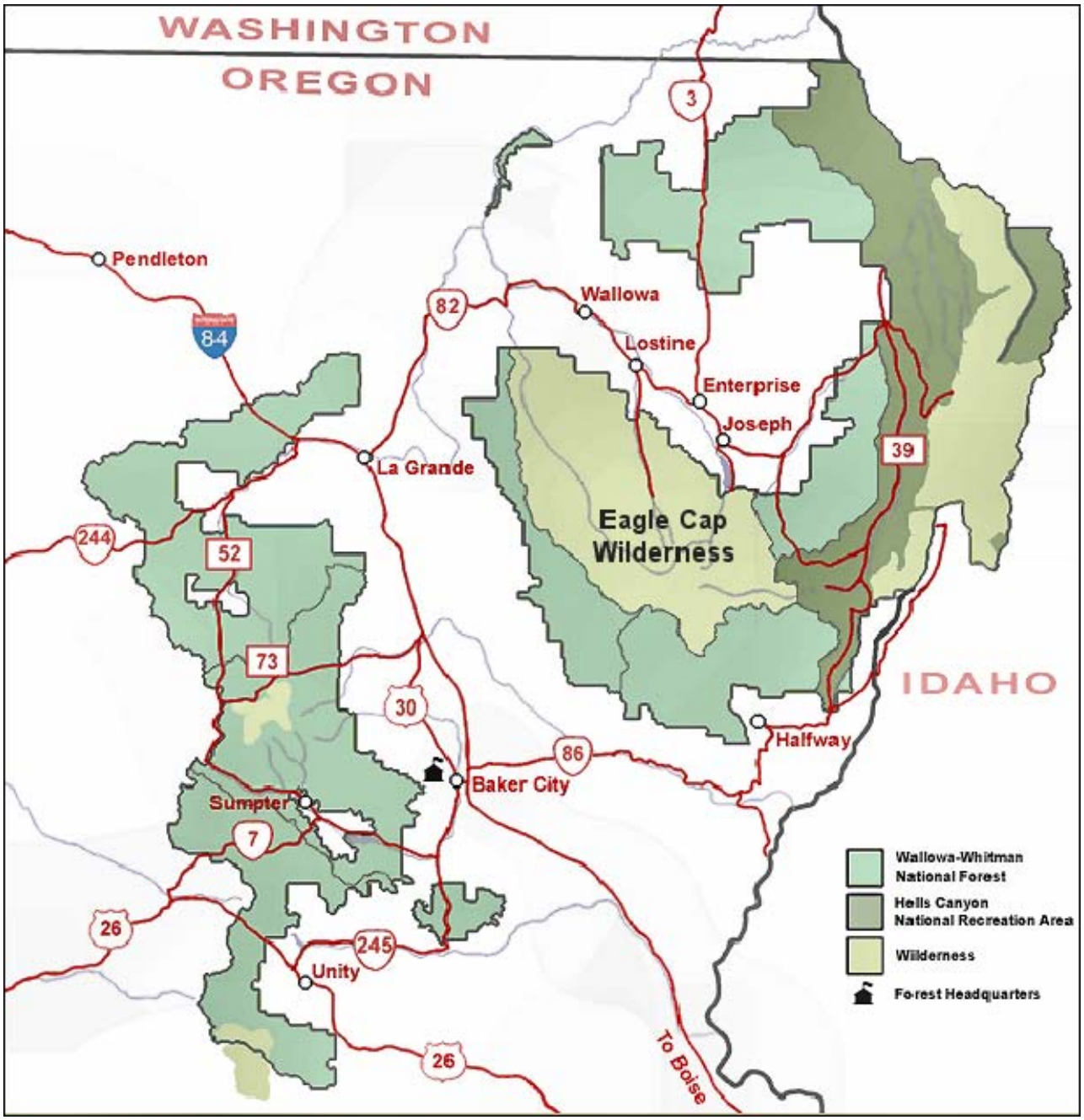


Figure 1. The study area includes the Eagle Cap Wilderness (ECW) and the Wallowa-Whitman National Forest (WWNF) immediately surrounding the ECW. Aerial surveys for wolverine tracks also extended to the Hells Canyon National Recreation Area and the WWNF north of Enterprise. No surveys were conducted in the WWNF west of Hwy 82.

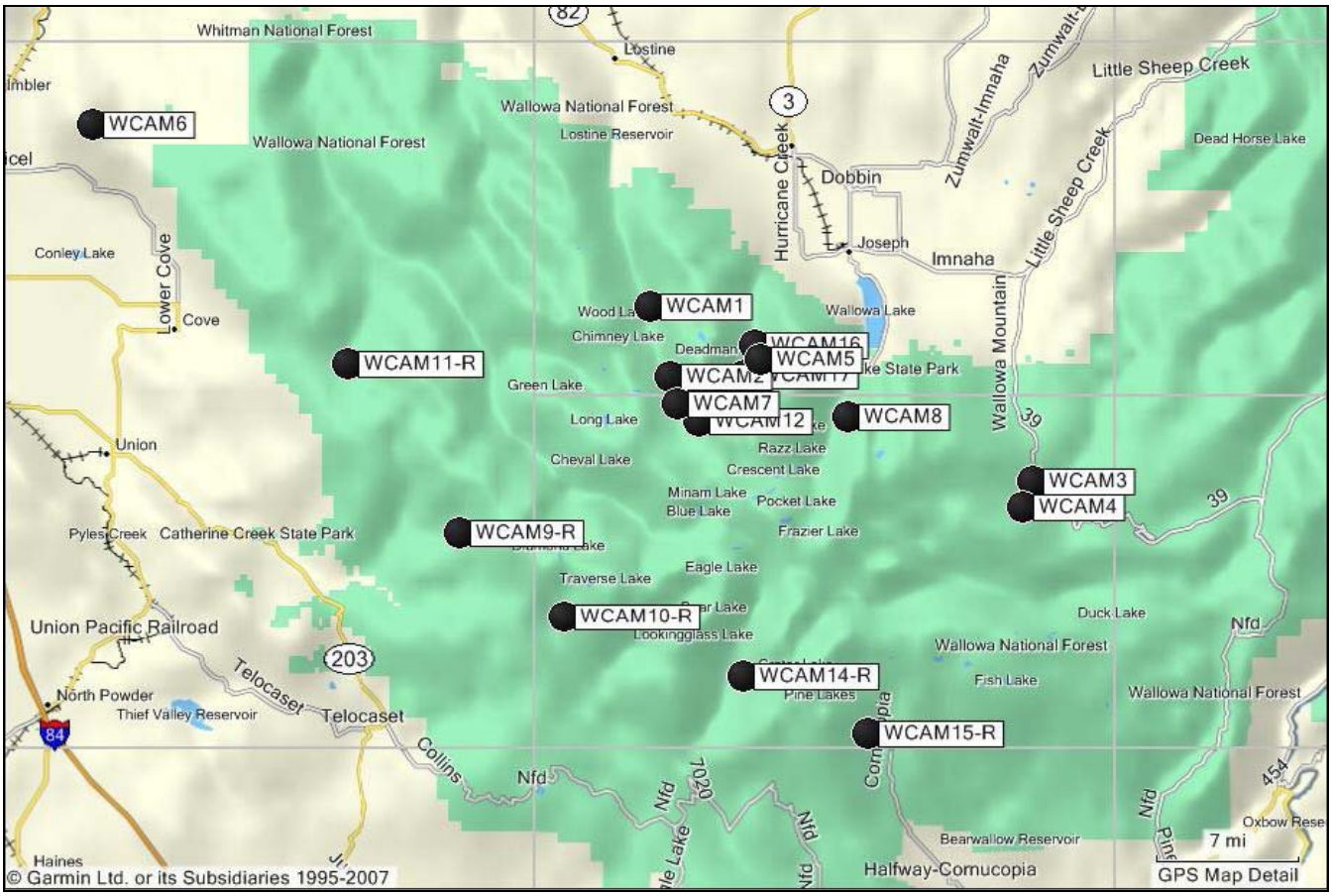


Figure 2. Location of 16 camera stations in and adjacent to the Eagle Cap Wilderness in the Wallowa-Whitman National Forest in 2011. Station names ending in "R" indicate that a Reconyx© camera model was used at that station rather than a Trail Watcher© model. Note that there is no camera station with the designation "WCAM13."

Figure 3. A photo of a young male wolverine (Stormy) taken with a Trail Watcher© camera at a camera station in the Eagle Cap Wilderness before a run pole and hair-snagging structure were added to the station.

Figure 4. The same camera station and the same wolverine as in Figure 3 after a run pole and hair-snagging structure were added to the camera station.

Figure 5. A subadult male wolverine (Zed) standing up a run pole with his forefeet on the crossbar and one leg up on the diagonal support for the climbing structure. Note the small prepuce area on the abdomen at the base of the light-colored abdominal patch and the small size of the testicles just above the base of the tail. See Magoun et al. (2011) for photographs of the abdomen of adult male wolverines.

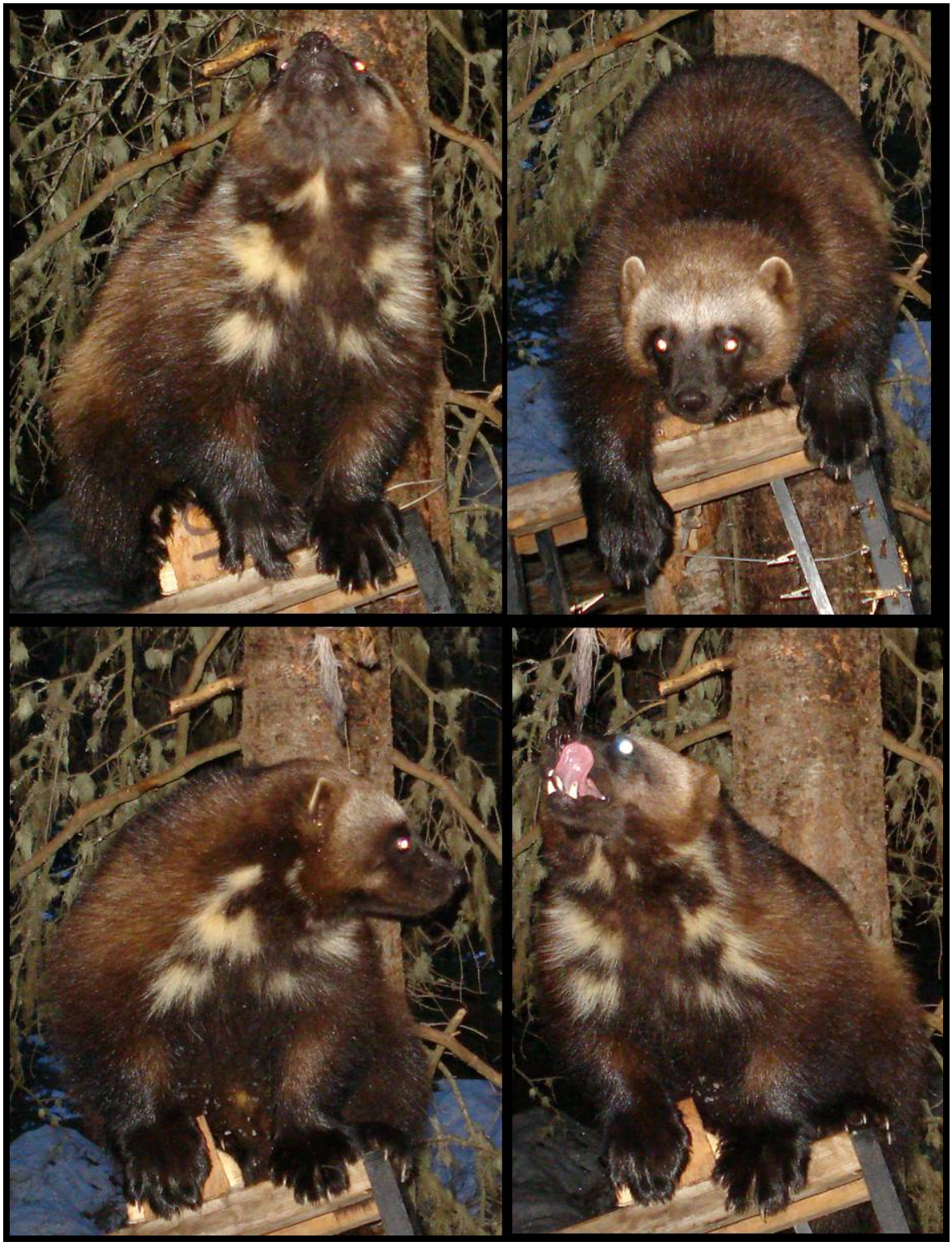


Figure 6. Photographs of male wolverine “Stormy” taken in the Eagle Cap Wilderness in late April 2011, showing views of the ventral pattern and head that can be used to identify this wolverine. Sex of this wolverine was verified by DNA analysis of his hair.

Figure 7. Photographs of wolverine “Iceman” taken in the Eagle Cap Wilderness in early April 2011. There are several good photos of the left side of the chest but few of the right side, making it more difficult to identify this individual in future visits to a camera station if no photos of the left side are available. However, the white toes on the right front foot will help to distinguish this wolverine from others with a similar ventral pattern. The white arrow in the bottom row, third photo from the left, indicates that this wolverine is probably a male, but more definitive photos or DNA are needed in order to verify the sex of this wolverine.

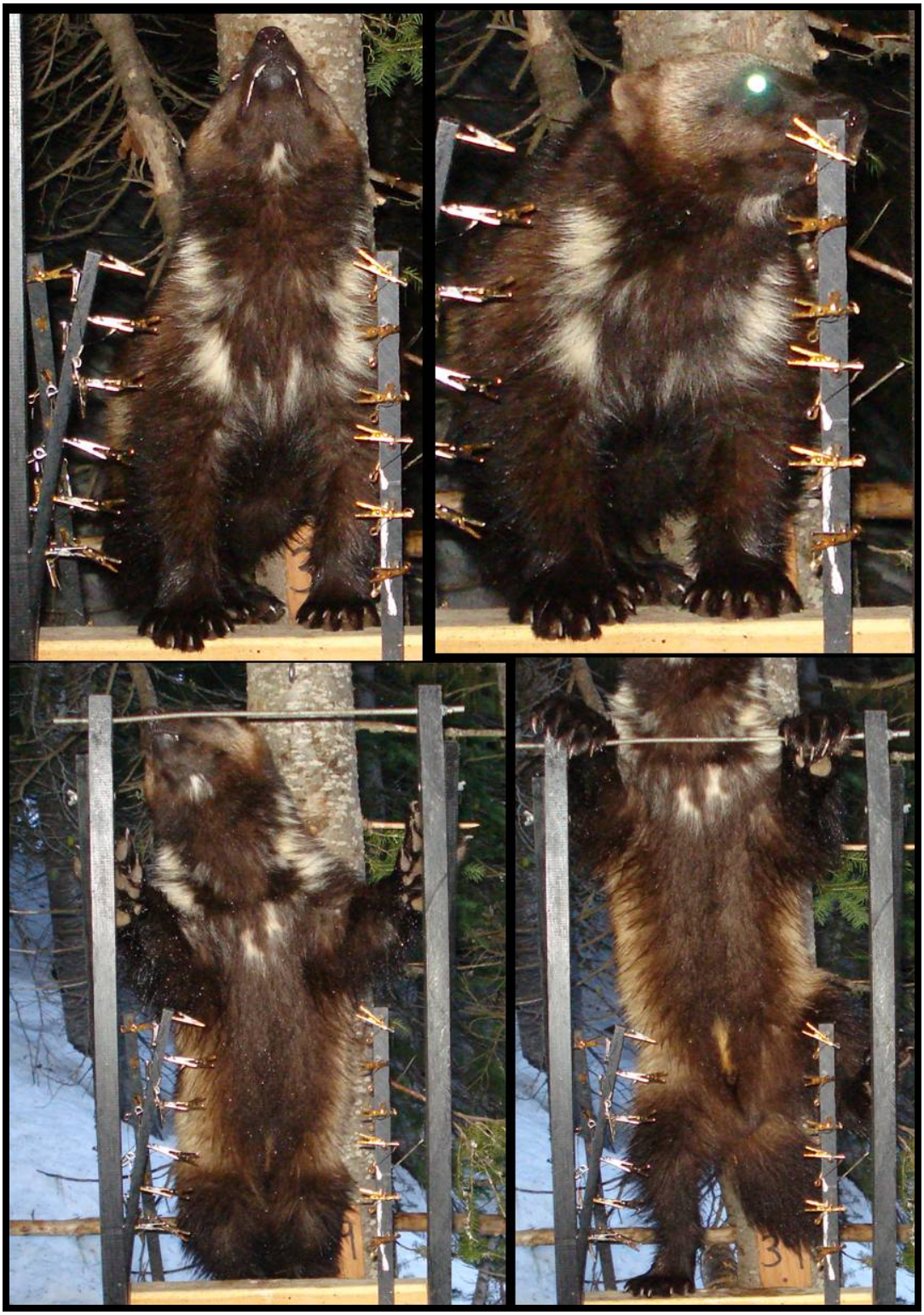


Figure 8. Photographs of the male “Zed” taken in the Eagle Cap Wilderness in mid May 2011. The bottom right photo indicate that this wolverine is a subadult male, possibly around 14 months old.

Figure 9. Three different foxes photographed at different camera stations in and adjacent to the Eagle Cap Wilderness in late winter 2011.

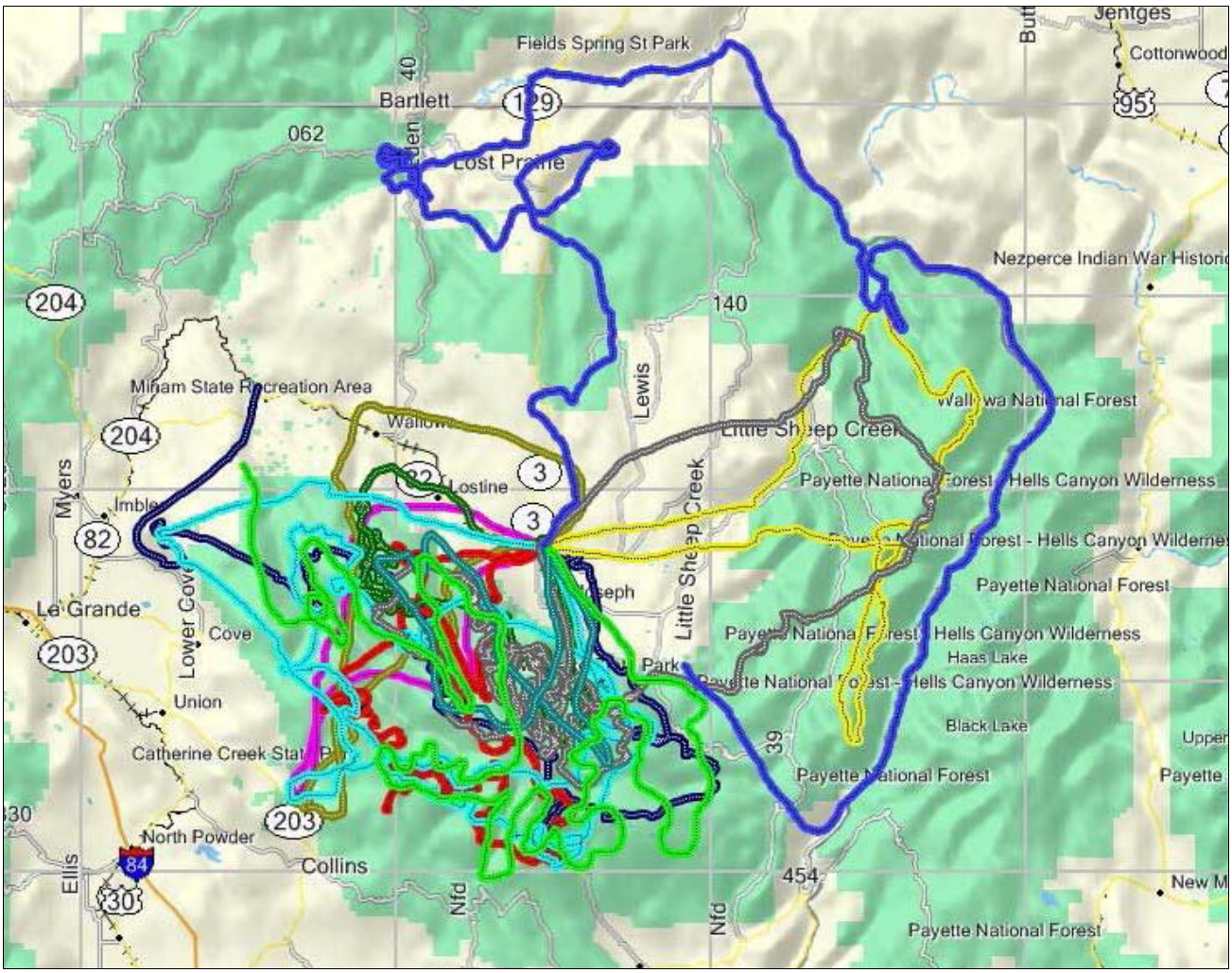
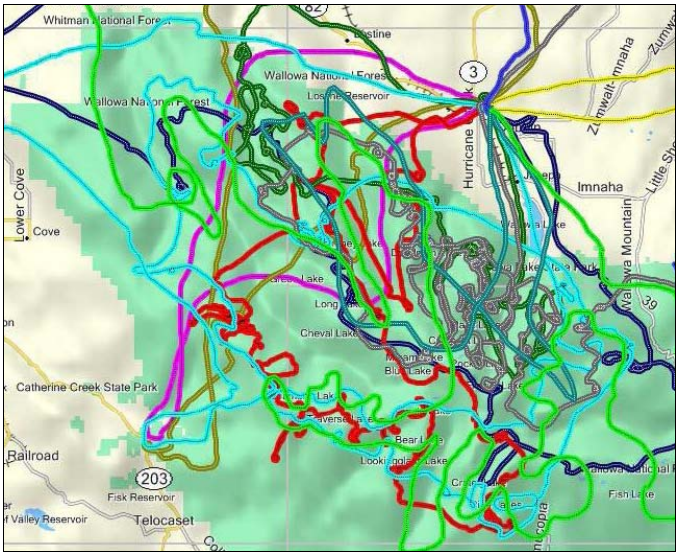


Figure 10. Eleven survey routes flown in February – May 2011 over the Wallowa-Whitman National Forest in search of wolverine tracks. Below, close-up view of routes in the Eagle Cap Wilderness.



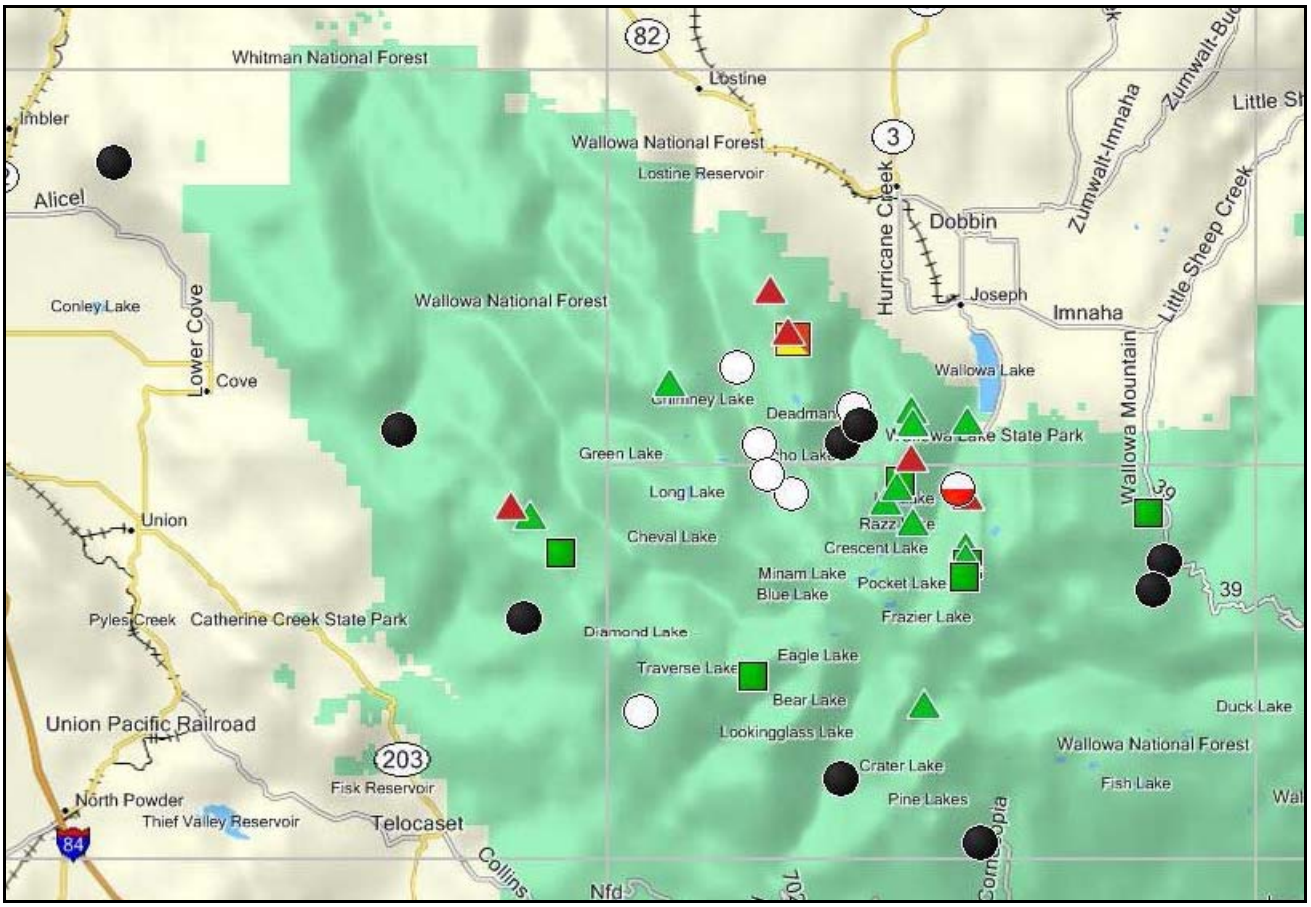


Figure 11. Location of camera stations with wolverine photos or hair (white dots) and without wolverine photos or hair (black dots). Red triangles indicate locations of wolverine tracks observed during aerial surveys. Green triangles indicate locations of mountain goat tracks and green squares indicate actual observations of mountain goats seen during aerial surveys. The square with red and yellow indicate a location with both wolverine tracks and sighting of mountain goats observed during the same survey route. The circle with white and red indicates a camera location where a wolverine was photographed and where wolverine tracks were seen during the aerial surveys.

Figure 12. Above, wolverine tracks photographed during aerial tracking in the Eagle Cap Wilderness in April 2011. Note change from a 2X2 gait in the upper right corner of the photo to an offset 3X3 gait farther to the left and then back to a 2X2 gait in the lower left corner of the photo. Also note that the wolverine did not sink very far into the new snow. Below, the 3X3 gait next to a black glove (photo taken from the ground in the Eagle Cap Wilderness in April 2011).

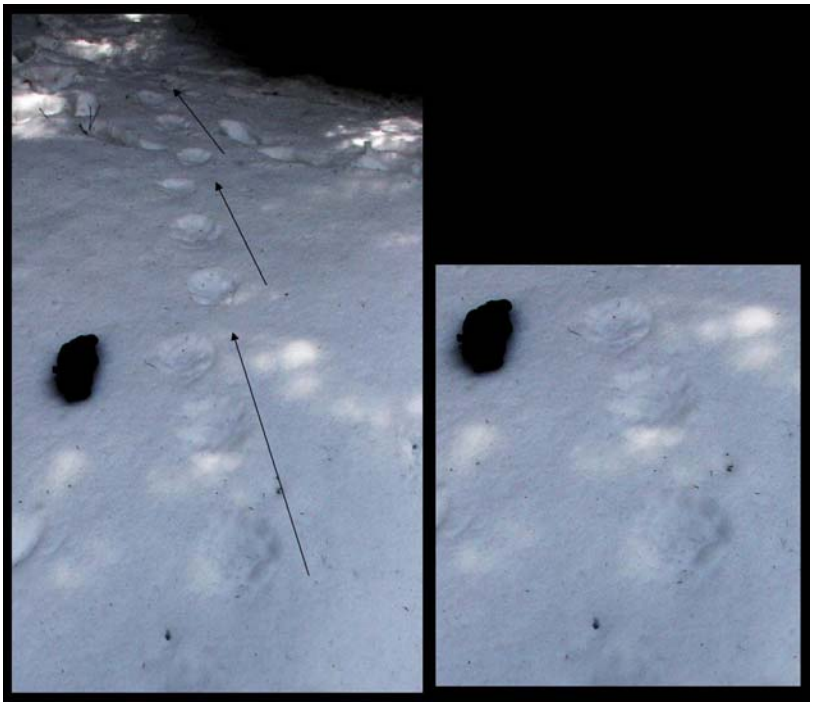


Figure 13. Twelve non-target species photographed at the camera stations in the Wallowa-Whitman National Forest in 2011. Although tracks of mountain lions were detected in the vicinity of some camera stations, no photos of mountain lions were obtained during the study.