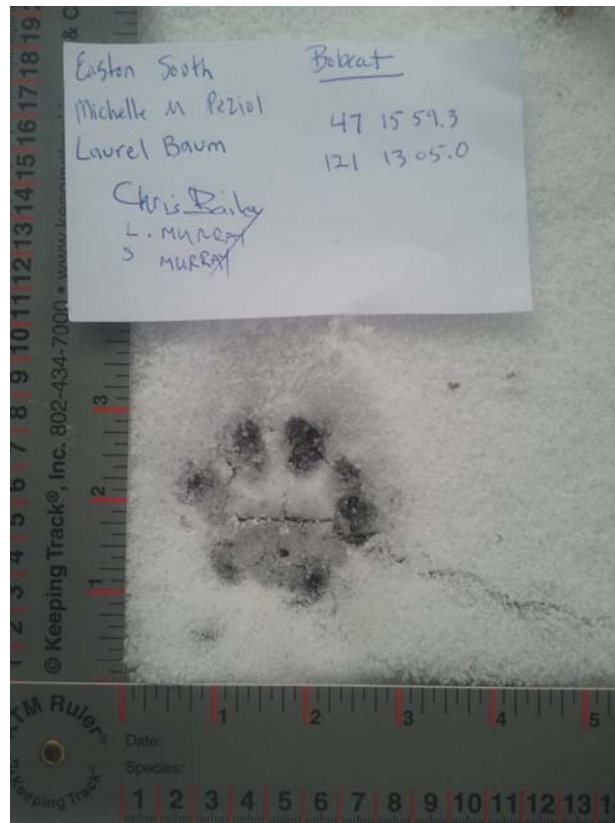


CITIZENS WILDLIFE MONITORING PROJECT
2012-2013 WINTER FIELD SEASON REPORT



June 2013

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Cover image: Bobcat track photographed on a winter transect by wildlife monitor Michelle Peziol's field team.

Full report available online at: www.conservationnw.org/monitoring

Citizen Wildlife Monitoring Project partner organizations: Conservation Northwest, Wilderness Awareness School, and I-go Wildlife Bridges Coalition



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CASCADE CITIZEN WILDLIFE MONITORING PROJECT

2012-2013 WINTER FIELD SEASON REPORT

EXECUTIVE SUMMARY

The Citizen Wildlife Monitoring Project uses trained volunteers to record the presence and movement of wildlife, through snow tracking surveys and remote camera installations, in the Washington Cascades and other wildlands across the state.

This winter marks the seventh season of data collected at fixed transects along Interstate 90, in the vicinity of proposed and recently constructed wildlife crossing structures between Snoqualmie Pass and Easton in the I-90 Snoqualmie Pass East Project, and the second winter season following the start of significant highway construction, including completion of two wildlife underpasses at one of the project's field sites. It also marks the fourth season of observer reliability assessment carried out to determine the reliability of snow tracking data collected on track transects.

The season's results included our highest number of annual tracking observations to date. Volunteers documented evidence of a cougar trail associated with the remains of a deer dragged from roadway off of our Easton transect.

Combined with informal tracking surveys and on-site hair snag devices, our remote camera stations added even better coverage of local wildlife. We set cameras within the new Gold Creek underpasses under Interstate 90 just east of Snoqualmie Pass and in more remote habitats of the Cascades and in northeast Washington.

Results from our remote camera sites continued to build our knowledge of wolverine presence in the Highway 2 corridor of the Cascades: there are now 11 wolverines documented in the state. We also documented the first image of a small mammal swimming through the wildlife underpass at Gold Creek, and we documented a range of more common species throughout this priority wildlife corridor.

72 volunteers participated in our project's wildlife monitoring this winter: 50 volunteers took part in formal transect surveys and 22 volunteers installed and maintained remote camera sites.

Findings from this year's snow tracking transects are consistent with previous years' results since the program was begun in 2008. An assessment of observer reliability of our snow tracking teams continues to reflect a high degree of accuracy in field identification of tracks and signs. We've been performing this accuracy check for the past two years.

PROJECT OVERVIEW

The Cascades Citizen Wildlife Monitoring Project (CWMP) is a joint project of I-90 Wildlife Bridges Coalition (a group of organizations focused on advocating for infrastructure improvements included in the I-90 Snoqualmie Pass East Project and designed to improve habitat), Wilderness Awareness School (an environmental education organization), and Conservation Northwest (a conservation and advocacy group). CWMP uses trained volunteers to monitor the presence, location, and movement of wildlife in the vicinity of proposed wildlife crossing sites east of Snoqualmie Pass along Interstate 90 in the Washington Cascades, and elsewhere in Washington State. The project has a particular focus on rare and elusive carnivores, such as wolves and wolverines. CWMP is designed to support the conservation of our region's wildlife and wildlands by enhancing our knowledge of wildlife-habitat connections in our region, supporting the monitoring and management efforts of transportation and wildlife agencies, and providing engaging educational field experiences for volunteers.

The I-90 Snoqualmie Pass East Project is a 15-mile highway improvement project that includes measures for connecting wildlife habitat, including construction of wildlife crossings. Construction on the first phase of the I-90 Snoqualmie Pass East Project has

started with funding from the Washington State Legislature. Construction activities were not active during the snow tracking season.

A complete description of the project's goals and methods, as well as a record of previous season reports, is available online at www.conservationnw.org/monitoring. Amendments made to standard protocols for the program for this season are described in greater detail below.

SUMMARY OF WINTER FIELDWORK

The winter season ran from November 2012 through April 2013 and included wildlife snow tracking surveys conducted just east of Snoqualmie Pass along I-90 in critical connectivity areas and wildlife remote camera stations set in important wildlife habitats in the Cascades and in northeast Washington.

Interstate 90 snow tracking transects

Snow tracking surveys were performed on nine transects from Hyak to Easton. This winter's fieldwork included fairly typical conditions and results as compared to other years. All transects were walked by project teams at least three times each over the course of the winter. Porcupine (*Erethizon dorsatum*), a species previously undetected on transects, was found on two transects this winter. Though not a surprise (porcupines were expected to be in the study area based on habitat and sign found previously adjacent to actual transects), this is the first year porcupines have been detected on the project's snow tracking transects.

Observer reliability

To analyze observer reliability, two experts (David Moskowitz and Marcus Reynerson) reviewed track photographs taken in the field by team leaders. The first recorded field observation on each leg of a transect was photographed and documented by the team leader and submitted to the project manager via email. The field protocol was amended to add written field observations to the photos submitted by team leaders in

order to help reviewers analyze the sample tracks submitted. This supplemental information reduced the number of tracks deemed “unidentifiable” by reviewers. According to reviewers, this year—as in the first two field seasons—not a single photo was misidentified by the tracking teams.

Remote cameras

In 2012-2013 winter, twelve camera sites were installed and maintained around Washington: 5 cameras in 2 sites in the I-90 corridor to detect wildlife use of the newly constructed Gold Creek wildlife underpasses, three sites in the central Cascades between I-90 and Highway 2 to detect the presence of wolverine and collect hair samples for genetic information, one site in the Wedge in northeast Washington to detect presence of wolverine, five sites in the central and south Washington Cascades between Highway two and Highway 12 on the eastside of the crest to detect the presence of wolves, and one site in the Sherman Pass vicinity of northeast Washington to detect the presence of lynx. All remote camera sites focused on detecting wolverine used a monitoring protocol amended to include construction and use of a run pole station and hair snagging brushes (See Appendix A for photo of wolverine run pole station). The station dedicated to finding lynx included rub scratch pads to collect hair samples in addition to photographs.

Specific site locations listed north to south by general geography include Sherman Pass in the Colville National Forest (lynx), the Wedge in the Kettle River Range (wolverine), Chiwaukum Mountains in the Okanogan-Wenatchee National Forest (wolverine), Johnny Creek near Icicle Creek Canyon (wolverine), Snow Lake in the Alpine Lakes Wilderness (wolverine), Gold Creek in the Alpine Lakes Wilderness (wolverine), Table Mountain in the Okanogan-Wenatchee National Forest (wolf), Gold Creek under Interstate 90 in the two Gold Creek underpasses (all wildlife), Naneum Canyon in the Naneum State Forest (wolf), Colockum Wildlife Area (wolf), Bumping Lake in the Okanogan-Wenatchee National Forest (wolf), and Mud lake in the Oak Creek Wildlife Area (wolf).

RESULTS

Interstate 90 Transects

Transect data

Volunteers recorded 136 observations this season, more than in any season of the project. The average number of observations per year for the length of the project to date is 99. Observations identified ten different species. Track observations of coyotes were most common followed by bobcats (see Table 1). Consistent observations of beavers at Gold Creek made that species our third most numerous, documented animal. During the 2009-2010 season, monitors recorded the most observations of ungulates; but this year's number of observations was higher than any year since then. The only level one species recorded this season was a cougar at Easton Hill North, where it was associated with the remains of a deer less than 50 meters from the highway. The Price Noble transect complex again had the highest diversity of species recorded (Table 1), while Easton Hill South had the most observations on any single transect (Table 2).

Species	% of all observations	Most frequent area
coyote	43.1%	Price Noble
bobcat	20.8%	Easton Hill
beaver	12.5%	Gold Creek
elk	9.0%	Price Noble
ambiguous	6.9%	Price Noble
mule deer	2.1%	Price Noble
raccoon	2.1%	Price Noble
porcupine	1.4%	Price Noble / Easton
cougar	0.7%	Easton Hill
mink	0.7%	Price Noble
river otter	0.7%	Gold Creek

Table 1. Summary of species detected 2012-2013 winter field season

Site	# of obs
Easton Hill South	20.1%
Price-Noble East North	18.1%
Gold Creek North	15.3%
Price Noble West South	14.6%
Easton Hill North	11.8%
Price Noble East South	9.7%
Price Noble West North	9.0%
Gold Creek South	0.7%
Hyak / Silver Fir	0.7%

Table 2. Detections by transect

Along the Hyak / Silver Fir transect, volunteers observed only one species all season. This transect has consistently had the least amount of observations every year. The Gold Creek South transect is often underwater in winter and cannot be surveyed except under conditions cold enough to make the ice stable. Due to that consistent environmental factor, this year's low number of observations is also typical there.

Trailing

This year there were thirteen trailing events recorded, seven coyotes, five bobcats, and one cougar. Typical of years prior, when behaviour was associated with the interstate, the tracks either traveled parallel to I-90 or towards and then away from it; there were no documented crossings of the interstate. However, the cougar that volunteer monitors trailed this year near the Easton Hill South transect traveled directly from the freeway to about 50 meters away where the remains of a mule deer were located. Deer hair was found in a linear pattern from I-90 to the feeding area. The evidence suggests that the cougar may have retrieved a road-killed animal from the interstate. At this site multiple species trails, primarily bobcat and coyote, were observed radiating towards and away from the sheared area. This was the first documented ungulate carcass on our transects.

Species	Number of Trailing Events	Transect	Notes
Coyote	9	Gold Creek S, Price-Noble West N, Price-Noble East N, Price-Noble East S, Easton S	
Bobcat	6	Price-Noble West N, Price-Noble West S, Price-Noble East S, Easton N, Easton S,	
Cougar	1	Easton N	Trail associated with the remains of a deer dragged from roadway

Table 3. 2013 trailing records

Observer Reliability

Twenty-four observer reliability data points were collected from team leaders over the course of the winter as per the protocol discussed above and thoroughly detailed in the past two seasonal reports. Coyotes were the most commonly reported species in the sample again this year. Of all species, putative coyote tracks were the only tracks reviewers were unable to consistently verify through photos of tracks provided by team leaders. (See Table 4)

The overall experience and training level of this year's team leaders was slightly higher than last year's. Many team leaders hold professional certifications in wildlife track and sign identification. All team leaders came to the winter monitoring season with significant amounts of training in wildlife tracking outside of the project training, primarily through the Wilderness Awareness School. Nine out of ten have participated in the project for three or more years. (See Table 5)

Table 4. Summary of observer reliability data		
	2012-13 winter	2010-2013 totals
Number of Observers Tested	10	14

Total Samples Submitted	24	68
Correct	18	47
Incorrect	0	0
Definitive Identification Impossible from Photograph	6	21
Species Positively Identified	Beaver, Bobcat, Coyote, Elk, Raccoon	American marten, Beaver, Bobcat, Coyote, Elk, Cougar, Raccoon, River otter

Table 5. Summary of team leader experience, training and certification		
Training, Certification, or Experience		Number of Team Leaders
Cybertracker Conservation Certification*	Level 3	7
	Level 2	1
	No Certification	2
Wildlife Tracking Intensive *	Participation, no certification	2
	Primary Path certification	1
	Advanced Path certification	4
	Never participated	3
Other Tracking Training	Greater than 3 weeks of training	10
	Less than 3 weeks of training	0
	None outside of project trainings	0
Years Involved with Project	0-1 years	1
	2 years	0
	3 years	1
	≥4 years	8

*For information about Cybertracker Conservation Certification and the Wildlife Tracking Intensive, see the 2010-2011 Winter Field Season Report, available at: www.conservationnw.org/monitoring.

Volunteer effort

Volunteer effort was similar to years past in regards to the number of transects completed and the total number of people involved with the project. Fewer leadership hours are needed each year as the administrative experience level of volunteers goes up and the project becomes more routine.

Table 6. Summary of Volunteer Hours for the Project	
Number of Transect Volunteers	55
Number of Transect Field Days	25
Project Leadership Volunteer Hours	79
Transect Volunteer Hours	1152

Remote Cameras

Eight species were detected by our remote cameras this season including one of our target species – wolverine at the Chiwaukum mountain sites. In the Cascades we expected to record wolverine in this location, since three individuals were recorded in the vicinity by our cameras in our 2012-2013 fall-spring season. In addition to wolverines, our cameras in the Cascades and northeast Washington also detected the presence of marten, cougar, bobcat, coyote, elk, mule deer, and an unidentified small mammal in the Gold Creek underpass (see Appendix A for sample photos). Several of these species are of interest to our program because they are either an indicator of ecosystem function or of interest to our project advisors (see listing of project advisory members in Acknowledgements).



Figure 1. Map of all remote camera sites (red flags indicate locations with site names in boxes)

A review of species detection by site is detailed below and organized by geography.

I-90 Gold Creek underpasses

Five remote cameras installed within the two newly constructed wildlife underpasses at Gold Creek recorded visits by people (both recreational and construction related), Canadian geese (not tracked in our project database), and an unidentified small mammal swimming through the large underpass following the return of water in April.

Site	Camera #	Months Monitored	Lure	Camera Model
I-90 A	1	March to April 2013	None	Reconyx RC55
I-90 B	1	March to April 2013	None	Reconyx RC60
I-90 C	1	March to April 2013	None	Bushnell XT
I-90 D	1	March to April 2013	None	Bushnell XT
I-90 E	1	March to April 2013	None	Bushnell XT

Table 7. I-90 remote camera site names and details



Figure 2. GPS locations of I-90 Winter Monitoring Project sites. Terrestrial Bridge-SW seen at A, Terrestrial Bridge-NE at B, Large Underpass SE at C, Large Underpass-N at D, Large Underpass-SW at E

Central and south Cascades

A total of 8 camera sites were installed in the central and south Cascades. In total, these sites recorded the majority of wildlife throughout the winter 2013 monitoring season, with the highlight being continued presence of wolverine recorded at our Chiwaukum site throughout the winter. These sites also recorded bobcat, cougar, coyote, elk, marten, and mule deer. The Colockum site recorded the greatest species diversity, while marten were only recorded at our two high elevation sites targeting the detection of wolverine (Chiwaukum and Snow Lake).

Site	Camera #	Months Monitored 2012/2013 winter	Lure	Camera and Model
Chiwaukum	4	December to Present	Gusto	Reconyx RC55 & Trailwatcher
Colockum	2	December to April	Gusto	Bushnell XT
Johnny Creek	2	December to April	Gusto	Reconyx RC55
Naneum Canyon	2	January to April	Gusto	Bushnell XT
Oak Creek	1	January to April	Gusto	Bushnell XT
Snow Lake	1	January to April	Gusto	Bushnell XT
Gold Creek	2	March to Present	Gusto	Bushnell XT

Table 8. Central Cascades remote camera site names and details

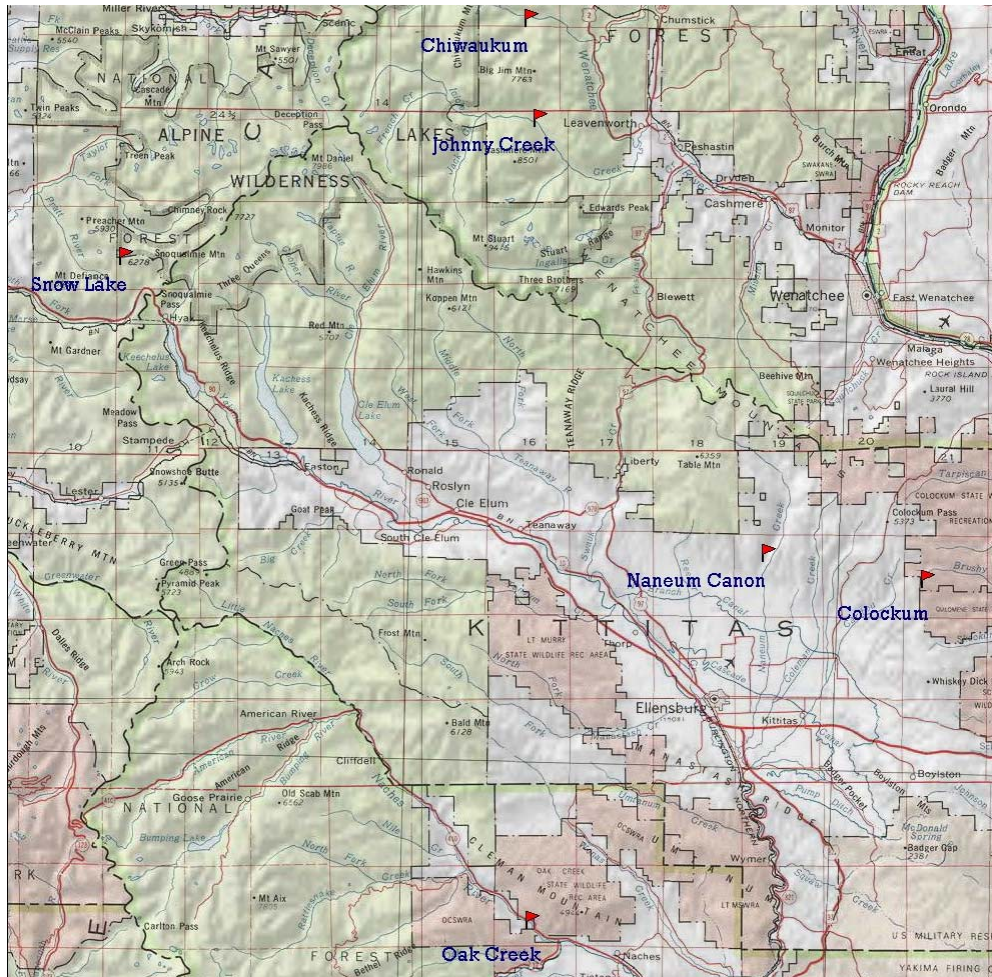
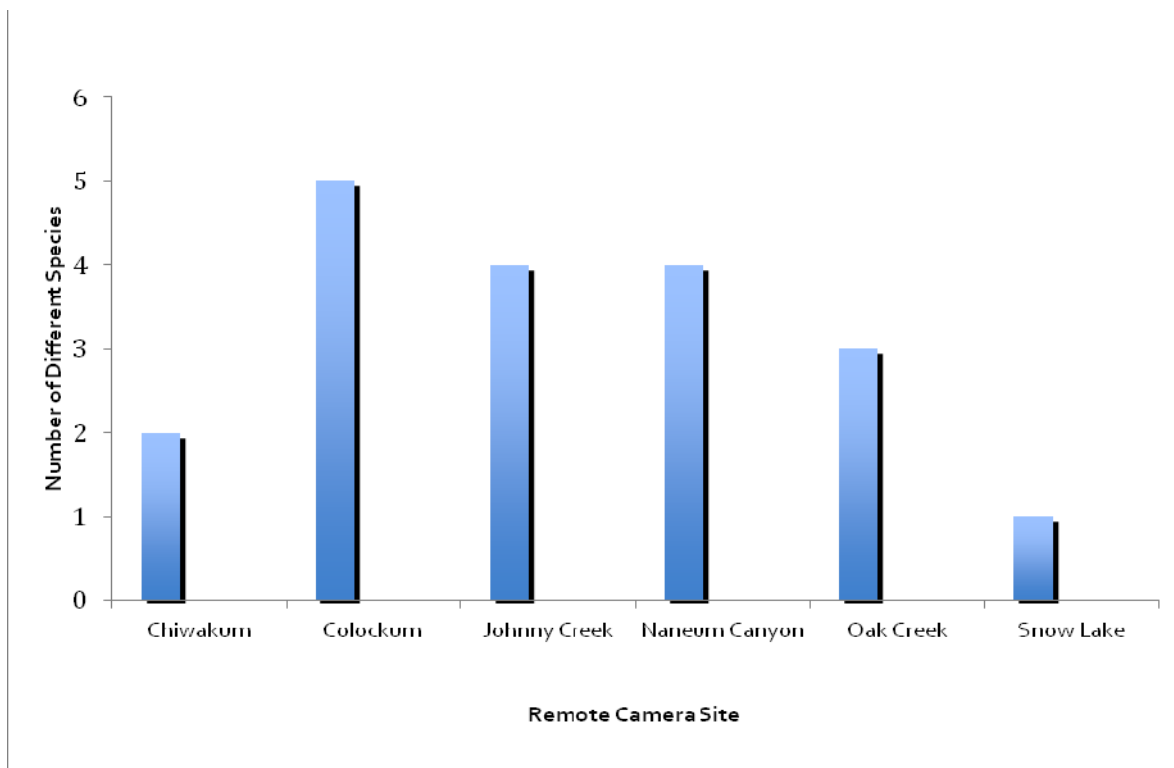


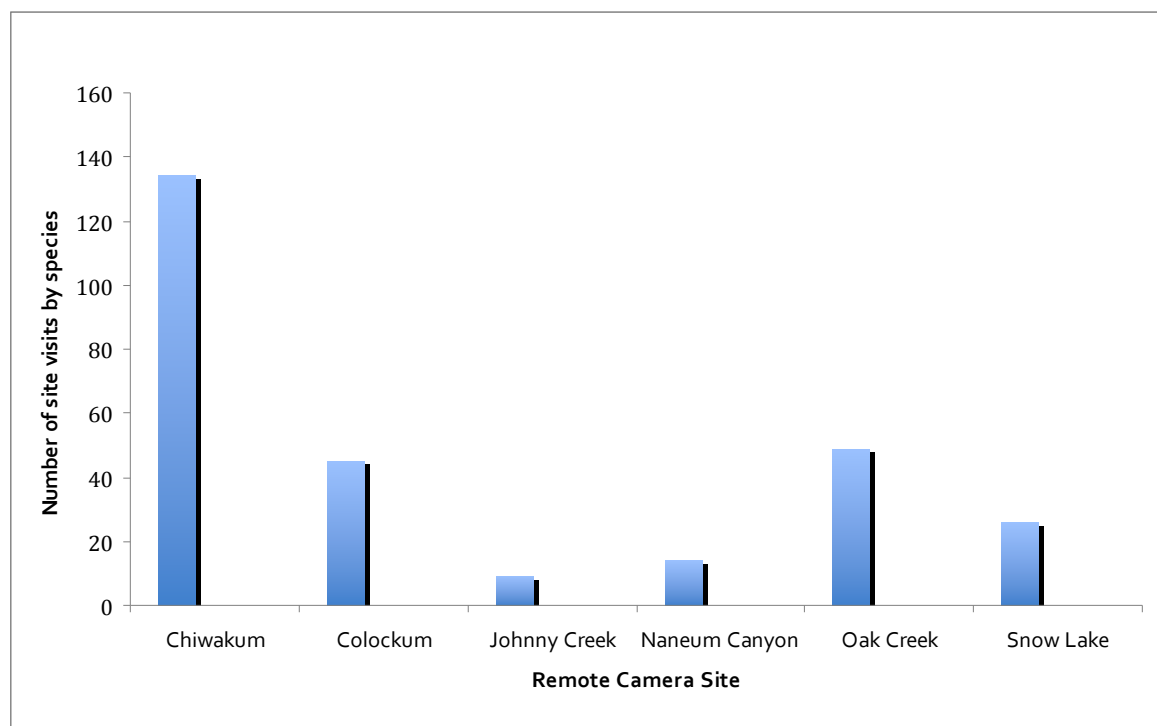
Figure 3. Central Cascades remote camera sites

Site	Target Species	Bobcat	Cougar	Coyote	Elk	Marten	Mule deer	Wolverine
Chiwaukum	Wolverine					X		X
Colockum	Wolf	X	X	X	X		X	
Johnny Creek	Wolverine	X	X		X		X	
Naneum Canyon	Wolf	X		X	X		X	
Oak Creek	Wolf			X	X		X	
Snow Lake	Wolverine					X		

Table 9. Species recorded by site in the central Cascades



Graph 1. Number of different level species captured by remote camera sites in the central Cascades



Graph 2. Number of independent site visits by species captured by remote camera sites in the central Cascades

Northeast Washington

In northeast Washington, a remote camera site at Sherman Pass served as a pilot project to record lynx presence. Bobcat and coyote were recorded at this site during the season, but not lynx. Another remote camera site focused on recording wolverine was maintained in the “Wedge” (between the Kettle and Columbia Rivers) but was not checked for data during the winter season.

Site	Camera #	Months Monitored 2012/2013 winter	Lure	Camera and Model
Sherman Pass	2	January to April	Gusto	Bushnell XT

Table 10. Northeast Washington remote camera site name and details

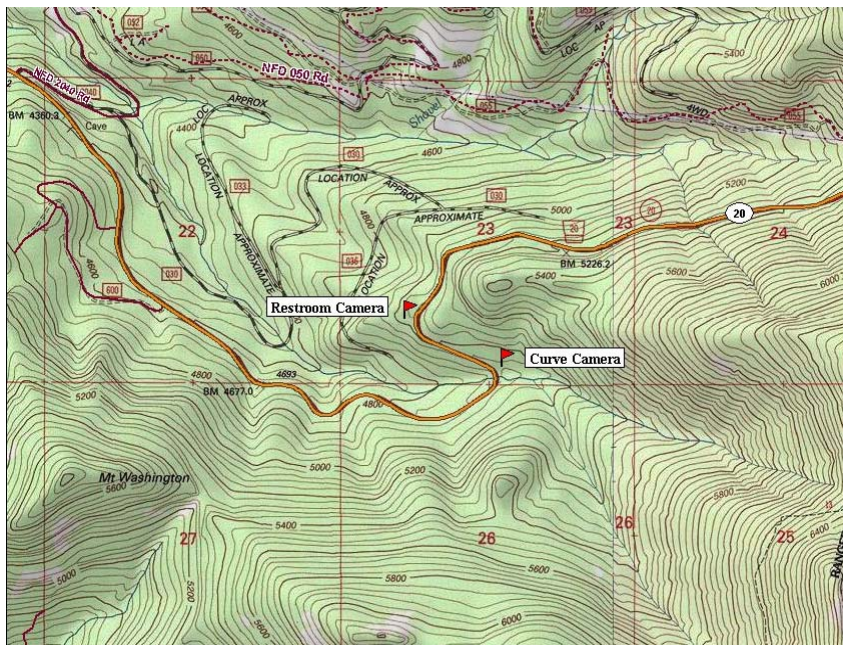


Figure 4. Sherman Pass remote camera site location

Site	Target Species	Bobcat	Coyote	Elk	Mule Deer
Sherman Pass	Lynx	X	X		

Table 11. Recorded species by site in northeast Washington

Volunteer effort

Remote camera volunteers averaged three visits to each site for the season with an average site visit taking 7 to 8 hours round-trip. Remote camera volunteer hours for the 2012-2013 winter season totalled 528 hours.

DISCUSSION

Interstate 90 Transects

This season's transects showed very similar wildlife activity in the study area compared to years past, with the notable addition of a single species previously undocumented during the project.

Trailing data documented the use of the interstate corridor by three carnivore species. In sixteen trails followed, there was not a single documented road crossing. However, trails of all three species showed these carnivores traveling, hunting, and feeding in close proximity to the road. The cougar trail in particular, which likely represents this animal obtaining a deer carcass from the freeway, and the associated tracks of scavenging coyotes and bobcats, suggest that these carnivores have a complex relationship to the interstate. The freeway provides challenges to movement and safety but opportunities for carrion.

Observer reliability

Results this winter are similar to our findings from the two prior seasons, further bolstering evidence that the reliability of data being collected by our team leaders is very high. In three years of collecting data on observer reliability, we have yet to document an error of field identification by team leaders (n=68).

However, as with the previous two years, it was not possible to definitively confirm or reject the field observer's species identification for a significant number (25%) of data points. In the three years of data collection, the majority of these non-definitive ratings (62%, n=21) were classified as "likely correct but photo is inconclusive" by

reviewers. Reviewers consistently found it most difficult to positively identify tracks that team leaders identified as coyotes in the field. Tracks identified as coyote accounted for 19 out of 21 data points unverified by reviewers. Some breeds of domestic dogs leave tracks very similar to those of coyotes. While team leaders in the field can sometimes use contextual clues and/or clues collected from a long stretch of trail to make their diagnosis, distinguishing coyote tracks from those made by domestic dogs gets tricky, particularly when based solely on photographs of a single paw print or a few sets of prints from a trail. Attempts to have team leaders submit additional photographs and written documentation have helped but not eliminated this issue. These data may include mistakes in field identification. Many of these data points reflect challenging field conditions and the need to discern between species whose tracks and signs are difficult to distinguish in the field even under good conditions. Conversely, the fact that the majority of them were deemed “likely correct” by validators (the rest were classified as “indiscernible based on photo”), along with the fact that no clear errors have been documented, suggests that it is unlikely there are a high percentage of errors in this part of the sample.

Remote Cameras

This season provided further evidence that maintaining a winter remote camera monitoring program can provide valuable data on presence and movement of key focal wildlife. It also allows us unique opportunities not afforded in our larger spring-fall season. During the winter months, interstate project construction is on hiatus and we are able to install remote cameras directly in the wildlife underpasses associated with the I-90 Snoqualmie Pass East Project. In more remote habitats, we are able to use the scarcity of resources and our ability to clearly see tracks on snow to improve our documentation of species such as wolverine, lynx, and wolves. Results from our remote camera sites documented the first image of a small mammal swimming under one of the new Gold Creek wildlife underpasses, built on our knowledge of wolverine presence in the Highway 2 corridor of the Cascades, and documented a range of more common species throughout our coverage area.

The documentation of a wolverine at our Chiwaukum Mountain site added further location data, visual documentation, and genetic information on wolverine presence in the central Cascades to our 2012-2013 fall-spring monitoring results in the Highway 2 corridor. Those earlier results included images and hair samples recording 3 individual wolverines south of Highway 2, including one confirmed female our volunteer team lead named “Peg” and one confirmed male known as “Bootjack male” (see Appendix B for a timeline and analysis prepared by project advisors Keith Aubry and Cathy Railey regarding wolverine detections at the Chiwaukum camera site for 2012-2013 fall-spring).

This winter’s images confirm the continued presence of a genetically unidentified wolverine in the Chiwaukum Mountains south of Highway 2 known as CHWK-03, while providing diagnostic visual evidence via chest marking patterns. Hair samples were collected from a hair snagging bole wrap are believed to be from CHWK-03 in late March 2013 at the Chiwaukum site, and have been sent to a Forest Service research lab for analysis. Also, during the period between March 3 to March 13, 2013 Chiwaukum camera #1 captured images believed by biologists to be both CHWK-03 and CHWK-01 (also known as the Bootjack male). In total, pending potential genetic results from hair samples, the Chiwaukum camera sites are believed to have captured images of two individual wolverines.

Our monitoring in the Highway 2 corridor was also featured this winter in a *Seattle Times* article, “Once extinct here, wolverines on the rebound,” highlighting the remarkable recovery of this species in Washington’s Cascades, which our project is helping to document. The article also discussed the potential listing of this species by the US Fish and Wildlife Service as a “threatened” species affording it Endangered Species Act protections. (See Appendix C for full text of *Seattle Times* article and online photos). The article included a site visit to Johnny Creek with staff and volunteers and highlighted a secondary benefit: this program allows us to place a face of the critters living on the landscape and the volunteers working to monitor them.

Under Interstate 90, a small mammal believed to be a river otter or beaver was documented using the newly constructed large Gold Creek underpass as it filled with water in April. This is the first photographic evidence of wildlife using the underpass since the completion of construction. The season also provided our first attempt to directly monitor within these two new underpasses, allowing a pilot of protocols and set up we can repeat in future seasons.

The site experienced many false triggers from traffic on the interstate itself, light changes, and weather. We experimented with different angles of the camera and settings to improve this, but found that some level of false triggers in this location is to be expected. Human traffic, not only construction but recreational use including kayaking, was documented during the season, and anecdotal reports of heavy snowmobile use in the underpass was reported during site preparation. This human use may impede wildlife use.

The central Cascade winter monitoring locations witnessed the bulk of winter wildlife activity for this monitoring season. Every site in the central Cascades (Chiwaukum, Colockum, Johnny Creek, Oak Creek, Snow Lake) documented at least one species of interest to our program and several sites, including Chiwaukum, Colockum, and Oak Creek, documented over 40 separate site visits by individual species. The Chiwaukum camera alone had over 130 separate site visits, mainly from one individual wolverine. The sheer number of visits to the Chiwaukum site is likely because the site was baited throughout the winter. The Colockum monitoring site documented the highest number of species with five separate species documented throughout the course of the winter monitoring season (bobcat, cougar, coyote, elk, and mule deer). This lower elevation site in the foothills bordering the eastern edge of the Wenatchee-Okanogan National Forest offers a tangible example of the value of lower elevation habitat for wildlife during the winter months. Additional lower elevation winter monitoring locations, including Naneum Canyon, Oak Creek Wildlife Area, and the Johnny Creek site in Icicle Creek Canyon, also showed consistent movement of wildlife through these lower

elevation sites, bolstering the case for continued focus on lower elevation monitoring during the winter months, with a focus on potential predator/prey hotspots for wolves and ungulate interaction.

Both the Chiwaukum and Snow Lake monitoring sites recorded multiple site visits of American marten, adding additional documentation to ongoing professional research of presence of marten in the Cascades north of Interstate 90.

This season marked a return to winter citizen monitoring in northeast Washington, where we piloted a new protocol for lynx including the use of rub pads to collect hair samples. The lack of detection of wildlife in the Wedge was surprising, but allowed us to experiment with run pole stations and access in this location for future monitoring. Although lynx were not detected at our Sherman Pass site, there was value in piloting this protocol with volunteers and new project advisors to guide future monitoring expansion.

Citizen Science

With this season we have seven years of successful use of trained citizen wildlife monitors carrying out snow tracking surveys in the I-90 Snoqualmie Pass East Project area and have collected a consistent series of annual data. The use of a leadership team composed of a small number of volunteers and limited use of paid staff continues to be both efficient and highly effective at meeting Citizen Wildlife Monitoring Project goals. Using the a field team structure of highly trained team leaders working with entry level volunteers, the project maintains high quality in data collection while providing excellent educational experiences and recruiting future team leaders.

The photographic results of our remote camera work continue to provide value to visually document wildlife presence, while our expanded protocols, which now include hair sample collection, allow us to contribute important genetic information. The close relationship of our project advisors to our field team leaders and to staff has proven helpful to amend the protocols and site set ups as needed throughout the season, and

to lend advice on access and locations for initial set up. Winter always provides a challenge to our camera stations as conditions change quickly.

RECOMMENDATIONS FOR NEXT FIELD SEASON

Interstate 90 Tracking and Trailing

1. *Data Collection:* All of the project's current handheld computers will be retired. Rather than replacing these devices, an online service allowing teams to enter data through any smartphone will be set up for the next field season. Cellular service is ubiquitous on project transects for most carriers. This system will have at least two added benefits. All data will be automatically backed up online, and team leaders will be able to access the database from home via computer to add data collected on paper in the event of a device failure in the field.
2. *Hyak Transect:* Research will be conducted on the feasibility of either adding a new transect along the interstate west of the construction zone at Snoqualmie Pass proper or replacing the current Hyak/Silver Fir transect.
3. *Trainings:* In order to ensure that returning volunteers have the opportunity to participate in subsequent years, a period of time for returning volunteers to sign up for trainings will be provided prior to opening up registration to new volunteers. This helps ensure that the project has the most experienced people in the field during the field season. Similarly, we will see that the roster created for the winter training includes information on whether participants are new or returning, better preparing trainers for training sessions.
4. *Transect Flagging:* This field season, we arranged for the first team leader on each transect to be familiar enough with that transect to renew flagging for subsequent team leaders' use. This system of flagging maintenance worked very well and will be repeated in future seasons.
5. *Weatherproof Field Guides:* For the next field season we'll print more copies of the field guides for the study area.

Remote Cameras

1. *Communication with Volunteers:* We will improve communication and direction for volunteers to ensure that remote camera data and photos are submitted consistently and frequently to aid proper reporting and analysis of results.
2. *Bait adjustment:* We will reduce and closely monitor the level of bait installed at wolverine stations to ensure we use the minimum amount needed to gain results.
3. *Timing/other cameras:* In coordination with WSDOT staff, we're going to install cameras in the Gold Creek underpasses even earlier next season, so that cameras are in place as soon as the 2013 construction season ends. We will also explore the potential of adding a remote camera to monitor the Rocky Run underpass, scheduled for construction in the 2014 season.
4. *Skills Trainings:* We plan to implement additional skills based trainings (i.e., tracking trainings, navigation trainings, field equipment trainings, and biologist lectures) to improve field capability of volunteers.
5. *Recommend to WSDOT:* We recommend that the Gold Creek underpass be signed as "closed to the public" to reduce human impact to wildlife using this crossing structure.

ACKNOWLEDGEMENTS

Once again, Mallory Clarke's effort contributed to all aspects of another successful winter field season of track transects. Similarly, Adam Martin again spent many hours preparing for and implementing the field season as an active part of the project leadership. He carried out important GIS and data analysis of this season's data for this report. A new addition to the project's volunteer leadership team, Dan Gusset, helped with trainings and field season activities. Thanks to Track and Sign Specialist Marcus Reynerson for taking the time to help review our observer reliability photos. Our

volunteer team leaders are the backbone of the project. Thanks to our returning team leaders: Joe Kiegel, Brian Booth, David Snair, Thomas Murphy, Kerrie Murphy, Mallory Clarke, Adam Martin, Michelle M. Peziol, and Kelly Frazee. Welcome and thanks to our three new team leaders: Jeremy Williams, Chris Russel, and Dan Gusset. We hope to see you again next year!

Thank you to all of the transect volunteers who participated in this year's fieldwork: Adrian Rus, Ayako Donofree, Brittany Morgan, Brock Roden, Carleigh Fairchild, Chris Baily, Chris Russell, Chris Shipway, Cindy Rezaick, Cory Strop, David Froman, Denise McElhinney, Evan Adkins, Gail Pethe, Gayle Grything, Guthrie Shrenghost, Isaac Leese, Jenn Coe, Jeremy Weatherly, Johnathan Goff, Just in Scott, Kathryn Hansen, Katie Remine, Katie Watt, Kerrie Murphy, Kirsten Taeuber, Kyle Dewey, Laurel Baum, Lloyd Murray, Mark Graham, Maya Shoemaker, Melinda Mast, Mike Donofree, Miranda Ciotti, Nick Weaver, Russ Gerads, Ryan Hanson, Sam Kaviar, Shannon Gerads, Shannon Schelindler, Susan Murray, and Tom Porrecca.

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Appendix A – Sample photo results from 2012-2013 winter monitoring season



Photo 1. Wolverine, Chiwaukum monitoring site. February 11, 2013



Photo 2. Cougar, Johnny Creek monitoring site. March 15, 2013.



Photo 3. American marten, Chiwaukum monitoring site. January 2013.

Appendix B – North Cascades Wolverine Study, Chiwaukum Monitoring Site

Wolverine Timeline and Identification Analysis

Wolverine Detections at Chiwaukum Stations #1 and #2

Date (time) of wolverine detection	Camera station set-up details	Do photos show diagnostic characteristics for individual identification?
1 April 2012 (1259-1321)	<u>Station #2 - Original set-up</u> : bait on lower bole of a tree surrounded by chicken wire. RX.	None of the photos show diagnostic characteristics. 2 photos of a wolverine at a tree a few meters away from the bait tree show some chest patterns that look similar to the wolverine designated as CHWK-01 later on in April, but we will never be 100% sure.
Genetic samples collected on 5 April 2012 : At original set-up, Aja Woodrow collected hairs from base of bait tree and collected portions of the hardware cloth that also had hair. KBA sent the hairs to the genetics lab. Genetic Results: GUGU, haplotype C, no sex, no genotype.		
7 April 2012 (1313-1409)	<u>Station #2 - Original set-up + gun brushes</u> : bait on lower bole of a tree surrounded by chicken wire. RX.	None of the photos show diagnostic characteristics.
7 April 2012 (1409-1706)	<u>Station #2 - Milled lumber run-pole</u> : with bait both on the bole of tree and hanging above run-pole; multiple gun brush belts on tree. RX.	None of the photos show diagnostic characteristics. The wolverine was focused on the bait attached to the tree bole and not the hanging bait.
11 April 2012 (0732)	<u>Station #2 - Original set-up + gun brushes</u> : bait on lower bole of a tree surrounded by chicken wire. RX.	None of the photos show diagnostic characteristics.
Genetic samples collected on 15 April 2012 : 2 gun brushes with hair collected from the run-pole tree by Adam Kehoe. Genetic Results: new female wolverine, haplotype C, and an individual genotype was obtained (KBA 1455). Female named "Peg" by CNW; however, at this point we do not know what Peg looks like as no diagnostic photos were obtained prior to this genetic sample being collected.		
17 April 2012 (1652-1655)	<u>Station #2 - Milled lumber run-pole</u> : with bait hanging above run-pole (bait on tree removed by crew); multiple gun brush belts on tree. RX.	Photos show most of chest and throat and it is clear that the markings of this wolverine (designated as CHWK-02) are different than those of the wolverine detected on 1 April 2012. The bait was hanging low and blocking the upper chest area at times so there are only a few photos that show the markings.
18 April 2012 (2111-2112)	<u>Station #2 - Milled lumber run-pole</u> : with bait hanging above run-pole (bait on tree removed by crew); multiple gun brush belts on tree. RX.	Photos show chest and throat area and markings are consistent with those of the wolverine detected on 17 April (CHWK-02), but I wouldn't call these clearly diagnostic photos as the lighting and resolution is poor.
Genetic Samples collected 29 April 2012 : Don Youkey and Jim Clark did camera check and collected 9 gun brushes from Station #2 with hair. Genetic Results: the same female (KBA 1455; "Peg") as detected previously. Because we got diagnostic photos of CHWK-02 prior to collecting these samples, and the camera was still working when it was checked on 29 April (indicating no down time and no other wolverines visited the site), CHWK-02 is "Peg" (not CHWK-01).		

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Wolverine Detections at Chiwaukum Stations #1 and #2- continued

Date (time) of wolverine detection	Camera station set-up details	Do photos show diagnostic characteristics for individual identification?
30 April 2012 (various times 0617 to 2233)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole; no gun brush belt on tree (need to verify). RX.	Yes – diagnostic photos of a wolverine with extensive markings on chest, designated as CHWK-01 (we believe this was the same wolverine detected on 1 April 2012 but can't be positive because the photos from 1 April not diagnostic).
1 May 2012 (various time periods from 0346 to 1711)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole; no gun brush belt on tree (need to verify). RX.	Yes – diagnostic photos of the wolverine designated as CHWK-01 . Note that in some of the nighttime photos, we thought this looked like a male wolverine (but image is not sharp enough to be sure).
Camera check on 13 May 2012 and 27 May 2012, no genetic samples collected either time. No wolverines were detected at Station #2 thru the remainder of spring and summer.		
14 November 2012 (2101-2217 and more?)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole; no gun brush belt on tree. TW-pole & RX-scene.	Yes – diagnostic photos from TW camera of a different wolverine (not CHWK-01 or CHWK-02). This individual designated as CHWK-03 .
15 November 2012 (various times 0212 to 2015)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole; no gun brush belt on tree. TW-pole & RX-scene.	No – TW camera quit working, so only photos from RX. None are diagnostic as they are side views, but appears to be CHWK-03 .
16 November 2012 (various times 0023 to 1639)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole; no gun brush belt on tree. TW-pole & RX-scene.	No – TW camera quit working, so only photos from RX. None are diagnostic as they are side views, but appears to be CHWK-03 .
2 December 2012 (1014-1015)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole; no gun brush belt on tree. TW-pole & RX-scene.	No – TW camera quit working, so only photos from RX. None are diagnostic as they are side views, but could be CHWK-03 .
Camera check 9 December 2012, no genetic samples collected.		
28 December 2012 (various times 1257-1931)	<u>Station #1 - Natural log run-pole:</u> with bait hanging from cable above run-pole; no gun brush belt on tree. TW-pole & RX-scene.	Yes – diagnostic photos from RX (TW damaged) of CHWK-03 (although snow obscures part of view, and photos are from the side, there are a couple of shots where you can see the diagnostic chest pattern).

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Wolverine Detections at Chiwaukum Stations #1 and #2- continued

Date (time) of wolverine detection	Camera station set-up details	Do photos show diagnostic characteristics for individual identification?
29 December 2012 (048-0108)	<u>Station #1 - Natural log run-pole:</u> with bait hanging from cable above run-pole; no gun brush belt on tree. TW-pole & RX-scene.	No – Photos from RX (TW damaged) and are from the side but appears to be CHWK-03 but no real diagnostic photos during this particular time period.
30 December 2012 (2325-2326)	<u>Station #1 - Natural log run-pole:</u> with bait hanging from cable above run-pole; no gun brush belt on tree. TW-pole & RX-scene.	N0 – Photos from RX (TW damaged) and are from the side but appears to be CHWK-03 but no real diagnostic photos during this particular time period.
Camera check on 6 January 2013 – no genetic samples collected. Hair-snag belt installed at Station #2 during this camera check but none installed at Station #1.		
17 January 2013 (1741)	<u>Station #1 - Natural log run-pole:</u> with bait hanging from cable above run-pole; no gun brush belt on tree. TW-pole & RX-scene.	No – just see top of head so can't tell which wolverine it is.
17 January 2013 (0907-1021; 1214-1216)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole and gun brush belt on tree. TW-pole & RX-scene.	Yes – photos from TW is CHWK-03 (also some diagnostic photos from scene camera)
Camera check on 3 February 2013 – no genetic samples collected (hair snag belt at St. #2 did not have hair even though wolverine visited the run-pole). A hair-snag belt was installed at St.#1 during this camera check.		
4 February 2013 (0859-0900; 2139-2205)	<u>Station #1 - Natural log run-pole:</u> with bait hanging from cable above run-pole and gun brush belt on tree. TW-pole & RX-scene.	Yes – photo from TW is CHWK-03
4 February 2013 (0705-0752)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole and gun brush belt on tree. TW-pole & RX-scene.	Yes – photos from TW is CHWK-03
5 February 2013 (0348-0434)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole and gun brush belt on tree. TW-pole & RX-scene.	Yes – photos from TW is CHWK-03

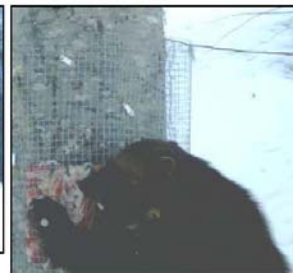
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Wolverine Detections at Chiwaukum Stations #1 and #2- continued

Date (time) of wolverine detection	Camera station set-up details	Do photos show diagnostic characteristics for individual identification?
9 February 2013 (1116-1122)	<u>Station #1 - Natural log run-pole:</u> with bait hanging from cable above run-pole and gun brush belt on tree. TW-pole & RX-scene.	No – the TW camera quit working on 2/7 so just have scene camera (side view). It does appear to be CHWK-03 but not straight-on photos.
9 February 2013 (0931-0936)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole and gun brush belt on tree. TW-pole & RX-scene.	Yes – can tell it is CHWK-03 from RX photos; wolverine standing up in photos from TW but can see some characteristics.
10 February 2013 (1029-1030)	<u>Station #1 - Natural log run-pole:</u> with bait hanging from cable above run-pole and gun brush belt on tree. TW-pole & RX-scene.	No – the TW camera quit working on 2/7 so just have scene camera (side view) and there are no diagnostic photos of the wolverine – can't even make a guess.
11 February (1017-1025)	<u>Station #1 - Natural log run-pole:</u> with bait hanging from cable above run-pole and gun brush belt on tree. TW-pole & RX-scene.	No – the TW camera quit working on 2/7 so just have scene camera (side view) and there are no diagnostic photos.
11 February 2013 (0807-0824; 1909-1911)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole and gun brush belt on tree. TW-pole & RX-scene.	Yes – photos from TW not that great (dark and wolverine standing up most of time) but can tell it is CHWK-03 . RX scene photos foggy – wolverine climbed up that tree and messed with camera. Note – can't tell what wolverine visited at night (1909-1911), TW quit working so only scene camera – no more detections during rest of survey period.
Camera check on 3 March 2013 – although wolverines detected at both St. #1 and #2, Jim Clark could not find any hair on the gun brushes so no genetic samples.		
16 March 2013 (0622-0647; 0852-0855)	<u>Station #2 - Natural log run-pole:</u> with bait hanging from cable above run-pole and gun brush belt on tree. TW-pole & RX-scene.	No – the lighting is poor and there are only 3 photos from TW where you can see chest/throat markings of wolverine and the images are not that clear (2 are from 1 st time period and 1 is from 2 nd time period). However, it appears that there were 2 wolverines on this day: CHWK-03 during 1 st time and CHWK-01 (Bootjack Mountain male; KBA 1461) during 2 nd time period. Scene RX only shows side views so did not help in this case.
Genetic samples collected on 31 March 2013: hair collected from 1 gun brush by Jim Clark. The TW (run-pole) camera quit working on 3/16 but the RX (camera) worked until the camera check on 31 March. Genetic Results pending. Because there were hairs on only 1 gun brush, it is unlikely we got hair from both wolverines, but when we send the sample to the genetics lab we will inform them that 2 wolverines were detected during this time period.		

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Detection on 1 April 2012 – Photos from the original camera set-up at St. #2 were not diagnostic (most were similar to photo on far right). The photo at near right shows some of the wolverines markings and, although it has similarities to the individual later designated as **CHWK-01**, we will never be able to make a positive photo identification. **Genetic samples collected after this detection only confirmed wolverine and haplotype C (no individual genotype was obtained).**



Detections on 7 April and 11 April 2012 - Photos from the original camera set-up at St. #2 and those from the 1st run-pole (milled lumber run-pole) were not diagnostic. Genetic analyses on hair from 2 gun brushes collected after these detections identified a new female wolverine (KBA 1455) that CNW named "Peg". But we don't know what Peg looks like as no diagnostic photos were obtained during the time period from which the hair samples were collected.

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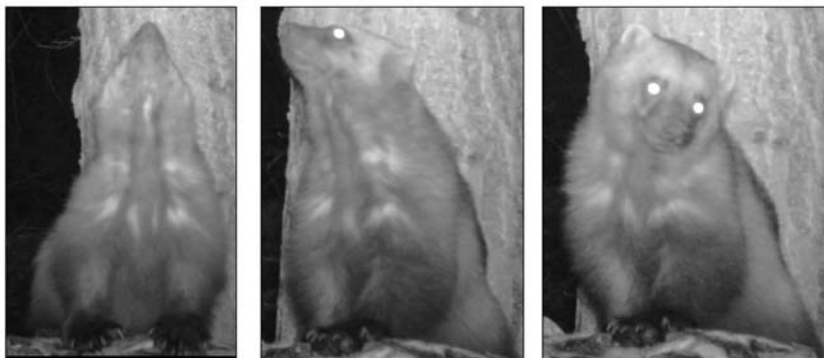
CHWK-01 = Bootjack Mountain Male (KBA 1461)

Detections on 30 April and 1 May 2012 – photos from St. #2 (both daytime and nighttime photos) are diagnostic and wolverine was designated as **CHWK-01**.

No genetic samples were collected after these detections. This is the wolverine some were associating with the genetic results for the new female “Peg”. But the chronology of detections, when genetic samples were collected, and genetic results indicate that this wolverine is not “Peg”.



Note: This same wolverine (based on comparison of diagnostic photographs) was detected at Bootjack Mountain in September and October 2012. Genetic results from that detection indicate that this is a new male (KBA 1461) now called “Bootjack Mountain male” (see results for Bootjack Mountain).



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CHWK-03

Detections on 14 November and 28 December 2012; 17 January and 4, 5, 9, and 11 February 2013 – photos from St. #2 and #1 (not both stations on all dates) are diagnostic and wolverine was designated **CHWK-03**. No genetic samples were collected after these detections.



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Detections on 16 March 2013 at St. #2 – only 2 photos from the 1st time period (0622-0647) and 1 from the 2nd time period (0852-0855) that show the chest markings but none of the photos are clearly diagnostic. However, it appears that there were 2 different wolverines this day: **CHWK-03** during the 1st time period and **CHWK-01 (Bootjack Mountain male, KBA 1461)** during the 2nd time period. Genetic samples were collected after these detections but have not been analyzed yet.



16 March: 0622 to 0647

Appears to be **CHWK-03**.

Based on shape of chin patch and chest pattern (most visible on right side of animal in left photo) where there is a continuous semi-curved linear pattern with 2 small spots towards midline.



16 March: 0852 to 0855

Appears to be **CHWK-01 = Bootjack Mountain male**.

Based on chest pattern which in general has an upper and lower patch on both sides of the chest that line up with each other and then a marking in the middle between the bottom side patches.

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Appendix C – Seattle Times story, “Once extinct here, wolverines on the rebound”

See link for full story and photos:

http://seattletimes.com/html/localnews/2020260612_wolverinereturnxml.html

Once extinct here, wolverines on the rebound

Once trapped and poisoned to extinction, Washington wolverines are making a comeback. Their recovery here has new importance as climate change is predicted in the future to melt much of the deep, late snow cover wolverines need to survive.

By Lynda V. Mapes, Seattle Times staff reporter

LEAVENWORTH, Chelan County — Biologist Don Youkey picked his way along a log nailed to a tree trunk nearly five feet above the ground and reached overhead to hang a cow knuckle bone and chunk of raw rib meat.

He hopes the tasty new bait will lure one of the newest carnivores cruising these snowy woods to trigger a remote camera that will snap its photo: *Gulo gulo*, the wiley wolverine.

Once shot on sight, trapped and poisoned as vermin, wolverines were extinct in Washington by the 1930s. But they are making a comeback, repopulating portions of their historic home range for the first time in decades. On Friday, they were proposed for listing as a threatened species under the Endangered Species Act.

Wolverines used to range along the Cascade Crest from the Canadian border all the way to Mount Rainier, but now remain exceedingly rare, with perhaps just 25 animals in Washington, and only about 250 to 300 in the Lower 48.

The wolverine’s return to Washington is amazing scientists. “We are witnessing what we think is the expansion of wolverine into their former range,” said Keith Aubry, research wildlife biologist with the U.S. Forest Service, Pacific Northwest Research Station in Olympia. Aubry for eight winters had led the first-ever radio-tracking study of wolverines in Washington.

Genetic testing shows the animals they are finding can be traced to populations in Canada that recolonized here once the persecution stopped. Now, those animals, once just visitors, have established resident populations — and they are spreading. “We have growing evidence of them using larger and larger areas over time,” Aubry said.

So far, scientists have confirmed resident wolverine populations from the North Cascades to as far south as this bait lure south of Highway 2 west of Leavenworth.

"When you see a species like wolverine that needs openness and connected habitat coming here all on its own, this is the celebration moment. It's the success, the reward," said Jen Watkins of Conservation Northwest, a Seattle nonprofit, as she dunked pine-branch tips into a bottle of foul-smelling scent lure. So foul, she packed it on snowshoes up the Icicle Creek drainage in a double plastic bag, sealed in a kayaker's dry bag, and handled it only with rubber gloves. "There!" she said, hastily screwing the top on the bottle, "Now all we need is a visitor!"

Even as wolverines rebound, threats loom in their future, with climate change over the next 100 years expected to melt out 63 percent of the landscapes where deep snow that wolverine need to survive persists into May. The U.S. Fish and Wildlife Service on Friday proposed listing wolverine for protection as a threatened species under the Endangered Species Act in at least six Western states, including Washington. Any decision to list would be at least a year away, after an extensive public comment period.

Gulo gulo

Smaller than a Labrador retriever, *Gulo gulo*, or "the gluttonous glutton," is pound-for-pound among the most ferocious carnivores in Washington, capable of sniffing out frozen carcasses and tunneling through five feet of snow to crack open bones and tear apart even frozen carrion. Their powerful jaws and molars are specially adapted to shear off chunks of rock-hard flesh and bone.

Wolverines roam Washington's wildest country in its most punishing weather, devouring miles with a loping stride and cruising over even deep powdery snow with oversized, snowshoe-like feet.

Their long, thick, brown-and-gold coat sheds frost and is underlaid with a soft insulating layer of fur that defeats the most brutal cold. Semi-retractable claws enable them to climb trees and scabble up and down rocky slopes.

"They are the superheroes of the animal world," said Shawn Sartorius, a wildlife biologist based in Helena, Montana, for the U.S. Fish and Wildlife Service. "When you follow the tracks of these things, you see they are not taking the easy way around; they will go straight over mountaintops, craggy peaks, the rockiest, steepest, cliffiest place; they will go right over that in the middle of winter, at night."

John Rohrer, supervisory wildlife biologist with the U.S. Forest Service, Okanogan-Wenatchee National Forest based in Winthrop, has been astounded to learn in his work on Aubry's research team just how much territory wolverines cover, even in winter.

"They live in places that are frozen in suspended animation more than six months a year and one of the few animals that is not is the wolverine," Rohrer said. "The North Cascades in winter are pretty hostile to life. Most animals will avoid it in winter or

hibernate. It's amazing to see how they move in rugged, remote terrain in 10 to 12 feet of snow. In summer there are cougar and black bear and bobcat and coyotes and great horned owls. In winter time, it is only the wolverines."

A wolverine trapped and radio-collared by Aubry's team covered more than 14 air miles over the peaks of the North Cascades from a recent Saturday afternoon to Monday, "and if you were to lay it flat it covered double the distance," Rohrer marveled.

The dominant radio-collared wolverine in that drainage — dubbed Rocky by the researchers — has been known to cover the home ranges of two or three females, or about 700 square miles. "And that's a 30-pound animal," Rohrer said. "Most dogs are bigger than that."

And wolverine are ferocious. "When you see one in a live trap you never forget it," Rohrer said. "They are growling, trying to bluff you, they are not cowering in the corner, if you crack open the lid they are charging and coming up to the front, snapping their jaws and drooling. They put on quite a show."

But hikers have nothing to worry about: Wolverines are primarily carnivorous scavengers, feasting on a wide variety of foods, including carrion of every type, usually elk and deer. But they will also take live small mammals, including pikas, marmots, ground squirrels, porcupines and snowshoe hares. They will sometimes devour bugs, berries, eggs and roots.

For now, ensuring wolverine survival is about planning for the future, Watkins said, by preserving and providing safe access to the strongholds the wide-ranging wolverine are returning to now. Highway 2, for instance, is a travel corridor wolverines will need to cross if they are to make it as far south as Mount Rainier. They haven't been seen there yet, but one lone wolverine already has been documented on Mount Adams.

"For these animals to come back to these places on their own, and take up residence there again, sticking around, and calling it home," Watkins said, "That is thrilling."

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