CASCADES CITIZEN WILDLIFE MONITORING PROJECT

2013 SPRING-FALL FIELD SEASON REPORT

January 2014

Prepared by:

Alison Huyett, Outreach Coordinator
Conservation Northwest

Mike Hitchner, Project Intern

Jen Watkins, Project Director
Conservation Northwest and I-90 Wildlife Bridges Coalition

Seattle, Washington

With contributions from Erin Moore, editor, Conservation Northwest

Image on cover: American marten (*Martes americana*), Chiwaukum, Okanogan-Wenatchee National Forest, Wenatchee River Ranger District, Leavenworth, WA.

Our monitoring work in the Cascades is currently done through a partnership effort that began in 2006. The Cascades Citizen Wildlife Monitoring Project is collaboratively run by Conservation Northwest, I-90 Wildlife Bridges Coalition, and Wilderness Awareness School.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

For over a decade, the Citizen Wildlife Monitoring Project has marshalled citizen scientists looking for Washington's rare and sensitive wildlife. Using remote cameras and snow tracking, project volunteers monitor wolverines, gray wolves, North Cascades grizzly bears, Canada lynx, and more, while also focusing on detecting on wildlife present in places of critical wildlife connections, conservation, and habitat such as along the Interstate 90 (I-90) corridor.

Citizen scientists contribute valuable new information on presence and patterns of wildlife in our state. Our project efforts cover geographic areas outside those where professional research efforts are ongoing, adding to and strengthening the work of agencies, biologists, and others.

From May through November, 2013, 74 volunteers in the Citizen Wildlife Monitoring Project installed and maintained 26 sites in Washington and British Columbia. Sites were focused on Washington's Cascade Mountains and the Rossland Range in British Columbia. The main objectives for the 2013 Spring-Fall field season were to 1) monitor gray wolf (*Canis lupus*) presence in the Southern Cascades, 2) detect wolverine (*Gulo gulo*) presence in the North, Central, and Southern Cascades, 3) observe all wildlife presence between Hyak and Easton adjacent to I90, and 4) document transboundary Canada lynx (*Lynx canadensis*) activity between northeast Washington and British Columbia.

With the assistance of Conservation Northwest program staff and our Advisory Council (Appendix I), we established two sites in the North Cascades, two sites in the Central Cascades, six sites in the I-90 corridor, and ten sites in the Southern Cascades. Though six sites were installed in the Rossland Range in British Columbia, only one site received data in time for this report. Additional data will be captured in a future addendum. Since this was our first season in this region, we expected challenges in recruitment and implementation, but as we gain familiarity in the region and capacity on the ground we will continue monitoring in the Rossland Range during our 2014 monitoring season.

Over the course of the 2013 Spring-Fall season, we detected ten species. Our greatest success this field season was continued documentation of wolverines where we know they occur in the Central Cascades but continued genetic profiling and documentation of new individuals is meaningful. These wolverines are on the frontlines of recovery for the species. Other season highlights include:

- Wolverines were documented at both Ice Lake and Union Gap in the North Cascades and at Chiwaukum in the Central Cascades. Genetic results from tests run by the project advisors from the USDA Pacific Northwest Research Lab showed that in 2012, volunteers at the Chiwaukum site detected four distinct wolverines, judging from visual and genetic data collected at the site. Late in the 2013 Spring-Fall monitoring season, the

site received additional visits and genetic analysis of fur collected on gun brushes is currently underway.

- American martens were recorded at multiple sites, a sign of late successional forests nearby where martens often den and hunt. While not a target species of our project, data collected on martens will be shared with the Cascades Carnivore Connectivity Project[1], which is studying the barrier effects of highways in genetic diversity among populations of black bears and martens.

- Detection of Cascade red fox at our Big Crow Basin site in the South Cascades. While not a target species of this project, other researchers with the Cascade Carnivore Project[2] are studying the populations of Cascade red fox in Washington's Cascades.

- The highest diversity of species observed at our I-90 sites occurred at Price Noble and Price Creek, which included deer, elk, black bear, coyote, and bobcat. These sites are in habitat directly adjacent to where several wildlife crossing structures will be constructed as part of Phase 2 of the I-90 Snoqualmie Pass East Project. These include the first wildlife bridge in Washington, which breaks ground as soon as 2015.

- Animals documented at Gold Creek North and Gold Creek South are of particular interest this season due to the completion of two wildlife underpasses at Gold Creek. The recording of deer, elk, black bear, coyote, and bobcat in habitat adjacent to these new crossing structures speaks to their potential use for wildlife to safely cross under I-90. As this underpass transitions from construction to restoration, continued monitoring of the underpass is important for documenting wildlife as they use the structure.

- Though many of our Rossland Range sites do not have data available in time for this report, the Christina Crest site within a well-documented habitat linkage for wildlife documented moose, bobcat, black bear, and deer. This region will continue to be our focus for in 2014.

The work of our volunteers through the Citizen's Wildlife Monitoring Project increases our understanding of wildlife on the Washington landscape and in the transboundary region between Washington and British Columbia. Not only does visual documentation of species influence research and policy decisions, these images create a narrative and put a face to our wildlands; the Citizen Wildlife Monitoring Project underscores the importance of monitoring and conservation efforts to ensure a stable landscape for Washington's wildlife.

[1] Cascades Carnivore Connectivity Project, http://www.cascadesconnectivity.org/
[2] Cascades Carnivore Project, http://cascadescarnivoreproject.blogspot.com/

PROJECT OVERVIEW

Over a decade ago, Conservation Northwest began using citizen science as a way to fulfill our mission of protecting and connecting wildlife and wildlands from the Washington Coast to the BC Rockies. Although the technology has changed since then, we continue to train and deploy hundreds of citizen scientists each year throughout our mission area with the Citizen Wildlife Monitoring Project (CWMP). The project uses remote cameras and snow tracking to document rare and sensitive species throughout core areas, providing security habitat for rarer wildlife, as well as more common species in strategically important locations. Since its inception, CWMP has remained an asset to wildlife agencies and professionals by providing additive monitoring efforts in areas identified as potential core habitat for some of our region's rarest wildlife. Our main project objectives are:

1. To engage and educate citizens on wildlife species and monitoring in critical habitat areas;
2. To record wildlife presence in the I-90 corridor and along the I-90 Snoqualmie Pass East Project in strategic locations and in core habitat through remote cameras and snow tracking;
3. To record the presence of rare and sensitive species that regional and national conservation efforts aim to recover including fisher, gray wolf, grizzly bear, lynx, and wolverine;
4. To facilitate exchange of information on wildlife, including data from monitoring efforts, between public agencies, organizations, and interested individuals.

Due to the number of partners in the Cascades ecosystem, CWMP operates in the Cascade Range through a collaborative effort, formalized in 2006, between Conservation Northwest, the I-90 Wildlife Bridges Coalition, and Wilderness Awareness School. Throughout each monitoring year, each organization leads a faction of the project: Wilderness Awareness School leads in the snow tracking portion of the project active from December to March, while I-90 Wildlife Bridges Coalition leads in remote camera work along the I-90 corridor. Conservation Northwest acts as the main volunteer coordinator for all efforts, as well as taking the lead in all remote camera efforts beyond the I-90 corridor in the north and south Cascades.

CWMP has broadened its positive impact through an Advisory Council made up of project partners, government agency biologists, and professional researchers (Appendix I). Our Advisory Council provides valuable input to the review of our program; it also steers our

yearly monitoring objectives and site locations. Councilmembers assist in developing our protocols, confirm identification of priority images from the season, and provide a scientific audience for results gained in the field from hair samples to tracks. These collaborations between project partners and advisors are crucial to the success of the program year to year. Collaboration keeps our efforts scientifically informed and relevant, ensures coordination rather than duplication of monitoring efforts statewide, and adds valuable on the ground information to the conservation community.

Monitoring seasons are broken into two terms: April – November (Spring-Fall) remote camera monitoring and December – March (Winter) remote camera monitoring and snow tracking. At the finale of each season a monitoring report is prepared and made public through Conservation Northwest's website (conservationnw.org/what-we-do/northcascades/cascades-citizen-wildlife-monitoring). For the purposes of this report, we focus here on our results from the 2013 Spring-Fall monitoring season.

This season, we concentrated our study area in two distinct regions – the Cascade Mountains in Washington and the Rossland Range in British Columbia (the Rossland Range lies east of the Kettle Mountains, between the Kettle and Columbia Rivers). Within the Cascade Mountains, we have refined the study area into four distinct regions:

1. North Cascades: North of US 2 and west of US 97
2. Central Cascades: Between I-90 and US 2
3. I-90 Corridor: Between Hyak and Easton along I-90
4. Southern Cascades: South of I-90

At the start of each season, monitoring objectives are established by project staff with feedback and guidance from the Advisory Council. These objectives are typically in response to current statewide priority species and habitat identified as important for these species. In 2013, our Spring-Fall monitoring objectives were to:

1. Monitor the recovery of gray wolves (*Canis lupus*) in the Cascade Mountains, with a particular focus on the Southern Recovery Zone. These sites were identified to respond to identified high-quality habitat where wolves are expected to expand their existing range and recover.
2. Document the presence of wolverines (*Gulo gulo*) in the North, Central, and Southern Cascades outside of the geographic scope of the ongoing North Cascades Wolverine

Study.[3] In addition to collecting visual documentation through remote cameras, these sites also are set up to collect genetic information valuable to wildlife agencies.

3. Observe the behavior and presence of all wildlife species in key habitat connectivity areas east of Snoqualmie Pass along Interstate 90, where wildlife crossing structures are completed, under construction, or planned for construction under the I-90 Snoqualmie Pass East Project.[4]
4. Detect transboundary wildlife activity between northeast Washington and British Columbia with a specific focus on documenting and collecting genetic information of Canada lynx (*Lynx canadensis*).

WOLF MONITORING

Since 2008 when this program's remote cameras documented the first wolf pack in Washington in over 70 years, Conservation Northwest placed major focus on wolf recovery in Washington. As of March 2013, Washington is home to ten confirmed wolf packs making up over 51 wolves.[5] Though the majority of these packs have established territories in eastern Washington, three packs now reside in the North Cascades. Conservation Northwest partners with the Washington Department of Fish and Wildlife to implement the state's wolf conservation and management plan developed in 2011. In addition to shaping wolf policy in Washington, Conservation Northwest through CWMP provides on-the-ground data used to better understand the distribution of wolves across the state.

The Wolf Conservation and Management Plan, written in 2011, identifies three recovery zones in Washington: Eastern Washington, the North Cascades, and the Southern Cascades and Northwest Coast.[6] According to this plan, wolves will be considered recovered in the state of Washington if there are 15 successful breeding pairs for three consecutive years. Additionally, each recovery zone must have at least four breeding pairs for three consecutive years. To date, there are 12 packs in Washington, none of which have been documented in the Southern Cascades and Northwest Coast recovery zones. To address the lack of documentation in the

---

[3] North Cascades Wolverine Study. Lead Principle Investigator: Keith Aubry (USDA Forest Service, Pacific Northwest Research Station, Olympia, WA)

[4] The I-90 Snoqualmie Pass East Project is designed to improve wildlife movement across I-90 between Hyak and Easton. The I-90 project design includes 14 key animal-travel areas, where one or more improvements will be made to allow for wildlife to better move across the interstate and waterways under the interstate. Maps of the identified areas for wildlife passage can be found at: wsdot.wa.gov/NR/rdonlyres/F6513B4C-12AE-43D3-ABA1-95104CAAD29D/72075/I90_Project_Folio_ConstWeb.pdf

[5] Washington Department of Fish and Wildlife Gray Wolf Packs Map: wdfw.wa.gov/conservation/gray_wolf/packs

[6] Gary J. Wiles, Harriet L. Allen, and Gerald E. Hayes, *Wolf Conservation and Management Plan: State of Washington* (Olympia, WA, USA: Washington Department of Fish and Wildlife, December 2011).

Southern Cascades, during the CWMP 2013 monitoring season we focused our efforts on responding to anecdotal reports of wolf activity south of I-90.

WOLVERINE MONITORING

The largest terrestrial members of the weasel family, wolverines are one of the rarest carnivores in North America.[7] Wolverines prefer alpine environments where snow packs persist well into summer months. In addition to living in these difficult environments where food is scarce, wolverines are extremely mobile carnivores with home ranges between 100 km² to upwards of 900 km²; this means they typically live in low densities across large landscapes.[8] After almost complete eradication in the 1900s from the lower 48 states, wolverines have begun a comeback to places such as the North Cascades; and since 2005, state researchers have identified a dozen individual wolverines. But much is still unknown about these rare and elusive species, and that's where the Citizen Wildlife Monitoring Project comes in.

Though currently unprotected, wolverines are candidates for endangered status under the Endangered Species Act at both the federal and state levels. In 2014, the USFWS is planning to publish their final ruling on the listing status for wolverine nationwide.[9] Conservation Northwest and other organizations are pushing decision makers to create state and federal safeguards for wolverines as they recover across Washington and the lower 48 states.

Through CWMP monitoring activities, Conservation Northwest will help shape recovery and critical habitat plans for Washington, inform land management, and build upon ongoing research in the Cascades. Our goals for wolverine monitoring in 2013 were to 1) help the Entiat Ranger District of the Okanogan-Wenatchee National Forest monitor wolverines' presence in the Entiat Valley in the Glacier Peak Wilderness in the North Cascades, with a specific interest in documenting Sasha, a potentially denning and reproducing female wolverine, 2) document the presence of wolverines in the Central and Southern Cascades; and 3) collect genetic data through hair samples to help identify individual wolverines documented. In 2013, our wolverine monitoring continued in the Chiwaukum and Bootjack Mountains where our remote cameras have documented four individual wolverines to date. To ensure that our efforts add to existing research, we focus on areas that lie outside of the current study area established by the

---

[7] Keith B. Aubry, Kevin S. Mckelvey, and Jeffrey P. Copeland, "Distribution and Broadscale Habitat Relations of the Wolverine in the Contiguous United States," *Journal of Wildlife Management* 71, no. 7 (2007): 2147, doi:10.2193/2006-548.; Vivian Banci, "Wolverine," in *The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the Western United States.*, ed. Leonard F. Ruggiero et al. (Fort Collins, Colorado, USA: USDA Forest Service Technical Report, 1994), 99–127.

[8] Banci, "Wolverine."

[9] Washington Department of Fish and Wildlife December 17, 2013,press release: fws.gov/mountain-prairie/pressrel/2013/12172013_wolverine.php

North Cascades Wolverine Study and on geographic locations where specific requests for assistance from ongoing researchers are made to complement their efforts.

I-90 CORRIDOR MONITORING

Historically, I-90 has been known as a major barrier to north and south wildlife movement in the Cascades. As a result of an earlier large scale connectivity analysis of the Cascade Mountains, a narrow crucial corridor across Interstate 90 was identified for wildlife passage.[10] In an effort to create a more permeable interstate, the Washington Department of Transportation has developed a 15-mile highway expansion project (I-90 Snoqualmie Pass East Project) where measures for safe wildlife passage have been incorporated into the plan. Multiple crossing structures, including two overpasses, are slated for construction within the next five years.

For over five years, our project has worked in concert with the Washington Department of Transportation and Western Transportation Institute to monitor wildlife activity along I-90 in the project area. Through both remote camera monitoring and snow tracking, CWMP has provided valuable data informing the I-90 Snoqualmie Pass East Project (I-90 SPE) throughout its planning and implementation phases. During the 2013 monitoring season, construction of Phase 1 of the I-90 SPE project was underway while the three wildlife underpasses at Gold Creek and Rocky Run were structurally complete and awaiting habitat restoration of habitat within them.

Our goals in 2013 for monitoring the I-90 stretch from Hyak to Easton were to document wildlife activity in the habitat leading into to these completed wildlife crossing structures, while also documenting wildlife presence in key connectivity emphasis areas in future phases of the project.

TRANSBOUNDARY LYNX MONITORING

Washington is home to one of the largest populations of Canada lynx, the rarest wild cats in North America in the lower 48 states.[11] Much like the history of wolverines in our state, lynx were targeted for trapping and hunting in the fur trade in the 1800s and early 1900s. Hunting pressure along with habitat decline reduced their numbers drastically in Washington.[12] As a result of these pressures, lynx are protected under the federal and state Endangered Species Acts. Based on the preferred habitat of lynx, Koelher et al. estimate that Washington has

[10] I-90 Wildlife Bridges Project description and connectivity analysis: i90wildlifebridges.org/project-info
[11] Derek W. Stinson, *Washington State Recovery Plan for the Lynx* (Olympia, WA, USA: Washington Department of Fish and Wildlife, 2001).
[12] Ibid.

approximately 3,800 km^2 of available habitat.[13] Researchers have documented dispersal of lynx across the Canadian border in northeastern Washington.[14] Since wildlife often move across political boundaries, Conservation Northwest works closely with US and Canadian conservation allies to ensure that lynx and other wildlife can travel safely and seamlessly across the border. In 2013, Conservation Northwest began a pilot season in the Rossland Range of British Columbia to document lynx activity near the U.S.-Canadian border.

Our major objective for 2013 lynx monitoring in British Columbia was to 1) document the presence of lynx in the transboundary linking habitats between British Columbia and Washington, and 2) collect genetic data from hair snags placed at each remote camera site to increase our understanding of lynx here and their relation to adjacent, better studied, lynx populations in the Rockies and Cascade Mountains.

METHODOLOGY

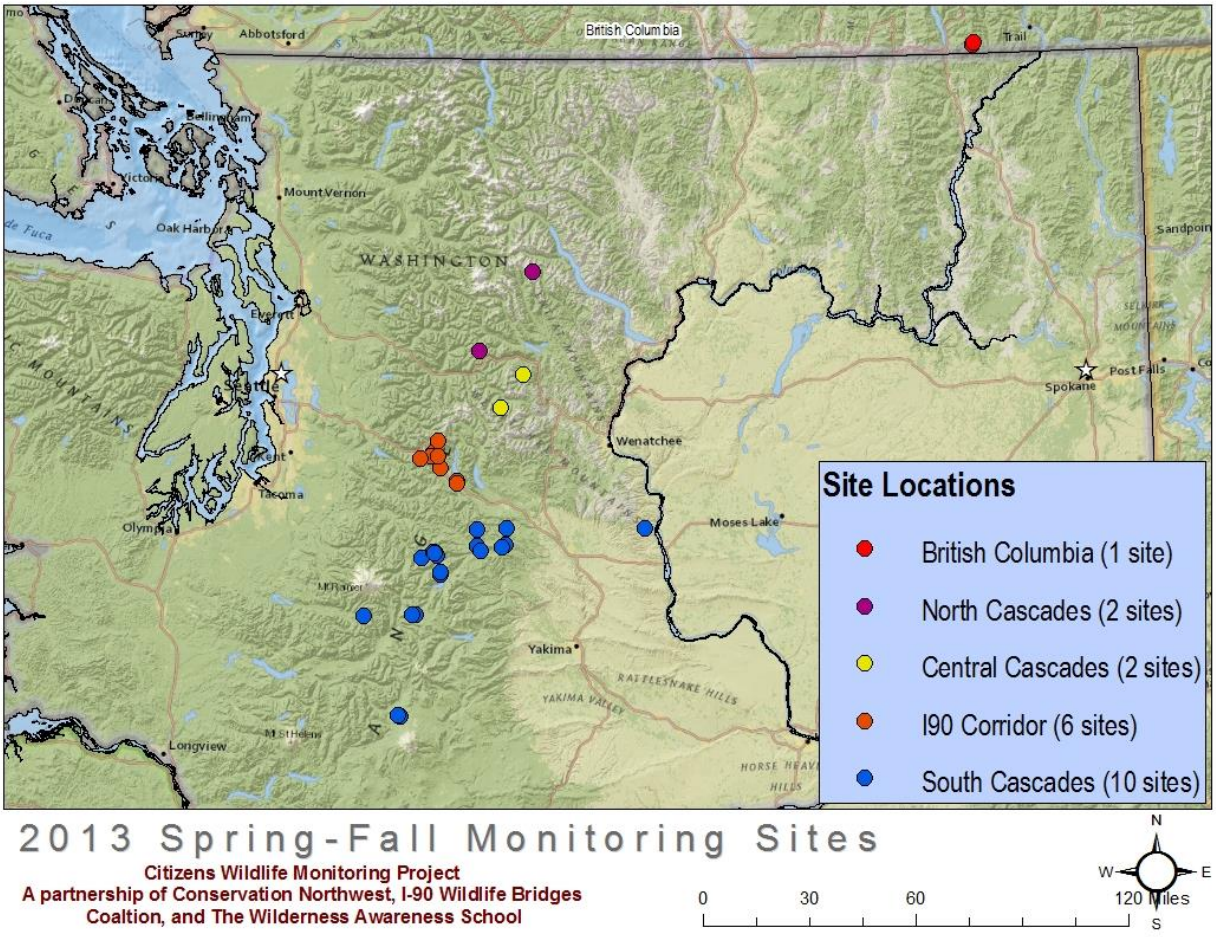
CWMP is an entirely volunteer-based project supported by Conservation Northwest, interns, and other project partner staff. Though our winter monitoring season includes snow tracking techniques, the bulk of our work is accomplished through the use of remote motion-triggered cameras. The use of motion-triggered cameras represents an easy and verifiable method of documenting wildlife presence and has been used as a significant research tool in many projects worldwide.[15] Additionally, motion-triggered cameras provide a tangible, low-cost way to engage citizens in wildlife monitoring and conservation. Together, our network of volunteers and cameras provide invaluable verifiable data on rare and sensitive species presence.

---

[13] Gary M. Koehler et al., "Habitat Fragmentation and the Persistence of Lynx Populations in Washington State," *The Journal of Wildlife Management* 72, no. 7 (2008): 1518–1524, doi:10.2193/2007-437.

[14] Stinson, *Washington State Recovery Plan for the Lynx*.; J.D. Brittell et al., *Native Cats of Washington, Section III: Lynx*, Unpublished (Olympia, WA, USA: Washington Department of Fish and Wildlife, 1989).; and Kim G. Poole, "Dispersal Patterns of Lynx in the Northwest Territories," *The Journal of Wildlife Management* 61, no. 2 (1997): 497–505.

[15] Masatoshi Yasuda, "Monitoring Diversity and Abundance of Mammals with Camera Traps: A Case Study on Mount Tsukuba, Central Japan," *Mammal Study* 29, no. 1 (2004): 37–46.; and Christen Wemmer, Thomas H. Kunz, and Virginia Hayssen, "Mammalian Sign," in *Measuring and Monitoring Biological Diversity.*, by Don E Wilson et al. (Washington: Smithsonian Institution Press, 1996).



STUDY AREA

This season our primarily focus was on the Cascade Mountains in Washington. However, we also established a pilot project in the Rossland Range region of British Columbia looking for lynx in areas not far from the U.S.-Canadian border. To further delineate core habitats and to give geographic context to our site selections, we have defined our study area by the following boundaries:

1. North Cascades: North of US 2 and west of US 97
2. Central Cascades: Between I-90 and US 2
3. I-90 Corridor: Between Hyak and Easton along I-90
4. Southern Cascades: South of I-90
5. British Columbia's Rossland Range: east of the Kettle Mountains, between the Kettle and Columbia Rivers

SITE SELECTION

At the beginning of each season, we select and prioritize monitoring sites in collaboration with all project partners and our Advisory Council. Sites are initially selected based on target species and core habitat with consideration to equipment inventory, as well as staff and volunteer capacity. Our list of sites goes through numerous iterations as we discuss priorities and capacity with our Advisory Council. The finalized list of sites serves as a guide for volunteer recruitment.

Each site is chosen with a particular target species based on our monitoring objectives for the year. For the 2013 Spring-Fall season, our priorities were wolves, wolverines, all wildlife at I-90, and lynx in the Rossland Range in BC. Project staff works with specific advisors from our Advisory Council to develop site descriptions that include the purpose of the site, special considerations, and general information useful for site construction.

Throughout the season, volunteer field knowledge and experience help CWMP staff and the Advisory Council reassess each site based on data gathered during the season. Thanks to their constant presence on the ground in core habitat, our volunteers provide invaluable feedback on best site locations, as well as actual field conditions and habitat.

Over the course of our 2013 Spring-Fall field season, we placed cameras at 26 sites throughout our study area. 20 of these sites were located in the Cascade Mountains with the remaining six located in the Rossland Range of British Columbia, designated for our transboundary lynx monitoring. Guided by our Advisory Council, nine of these Cascade Mountain sites focused on documenting wolves, five focused on capturing wolverine, and the remaining six were dedicated to documenting species along I-90.

CAMERA STATIONS

Depending on the targeted species and location of each site, remote camera station setup can vary. In conjunction with project staff, protocols were developed for each type of remote camera station. All camera stations targeting wolves, lynx, or I-90 structures have a similar setup that includes motion-triggered cameras secured to trees and scent lure, unless specifically instructed otherwise. (Camera protocols are covered in depth in Appendix III). Generally two cameras are placed within the same designated area; however, they are far enough apart to potentially capture different individual animals.

Sites targeting wolverine have a setup conducive to capturing visual documentation of their chest blazes (Appendix IV). These sites, called run-pole stations, are constructed with natural materials on site. Wolverine run-pole stations include two cameras, one set directly across from the run pole and the other off to the side. Each run-pole site includes bait strung strategically above the run-pole. Wild bait (deer, elk, etc., often from road kills) is preferred for these sites.

However, in cases where wild bait was unavailable, bait was purchased at butcher shops. In addition to run-pole structures and bait, each site designated for wolverine detection was also equipped with snags for hair collection. Though individual wolverine can be identified visually from chest blaze photographs, DNA analysis is important to confirming individuals and retrieving additional information. The hair snag system CWMP employs consists of a gun brush belt with eight gun brushes attached horizontally. This belt is attached just below the run-pole around the tree. Hair samples are removed from the gun brushes using latex gloves at each visit and are sent away immediately for lab analysis.

During the 2013 Spring-Fall season, the majority of our cameras were Bushnell Trophy Cam XLT though a few sites also had Reconyx RC55 or RC60 and Cuddeback No Flash motion-triggered cameras. Camera settings are standardized across each site for comparability across the study area as outlined in the protocols (Appendix III). Volunteers are trained in camera installation and maintenance prior to each season at a training held by project staff.

All sites, regardless of target species, are marked with a scent lure with exceptions made in the I-90 corridor where the proximity of the site is too close to the roadway. Wildlife use scent markings as important means of communication to establish territories, find mates and prey, assess levels of danger, and ascertain other individuals within the same vicinity.[16] Scent lure mimics this natural mode of communication and acts as an attractant bringing individual wildlife into the remote camera site.[17] The application of scent lure in our project adheres to guidelines and best practices established by our Advisory Council.

SPECIES PRIORITIZATION

Though each site is established with a specific target species in mind, data gathered on the presence of non-target wildlife is also valuable. We use a species priority list that categorizes Washington species in order of significance to our project as established by project staff in consultation with our Advisory Council. Using our category structure, we are able to establish protocols for documenting certain species of interest and facilitating timely communication with project partners during the season. All Level 1 species detected at a remote camera site during the season are immediately reported to project staff for confirmation and further communication. The priority listing for our 2013 season is as follows:

Level 1
Wolverine
Fisher

[16] Fredrick V. Schlexer, "Attracting Animals to Detection Devices," in *Noninvasive Survey Methods for Carnivores*, by Robert A Long (Washington, D.C.: Island Press, 2008).
[17] Ibid.

Lynx
Wolf
Grizzly bear

Level 2
Cougar
Marten
Mountain goat
Mountain red fox/Cascades red fox

Level 3
Black bear
Bobcat
Coyote
Elk
Mule deer
Raccoon
Snowshoe hare and smaller mammals

RESULTS AND DISCUSSION

Our 2013 Spring-Fall field season began in May and ran through October. Over the season, 20 camera sites were monitored in the Cascades with an additional camera site monitored just over the Washington border in British Columbia. The following results include only species of interest to this program as identified by our Advisory Council and project staff. Only species falling within our three priority levels are included, thus excluding photographs of birds, hares, small rodents, and domestic dogs and cats. Due to increasing interest in the interaction of wolves and livestock in Washington, we include domestic livestock captured at our sites in our analyses as a Level 3 species.

Though our program expands knowledge of wildlife presence in Washington, limitations to the breadth of our data do exist. Our data cannot ascertain species diversity, population size, or species absence. Rather, our data focuses on species richness, which has invaluable application to the conservation and management of rare and sensitive species in Washington. Species richness is defined as the number of different species present within a defined area. For the purposes of our project, we assess species richness by site, which we can then extrapolate out onto our larger defined study areas. In addition to assessing species richness, we also assess the number of identified priority-level species per site. Thus the more species recorded from each level (with a particular emphasis on Level 1 species), the greater the importance to the goals of our project.

To give geographical context to our data, we have summarized our results following our five study area divisions described in our methodology. Additionally, each site represents combined data from two separately situated motion-triggered cameras set up within the same vicinity.

CASCADES MOUNTAINS

North Cascades

Designated as the area North of US 2 and west of US 97, the North Cascades region consisted of two sites in 2013. Both the Ice Lake and Union Gap sites were dedicated to wolverine detection (Table 1). Due to terrain conditions, Ice Lake was established later in the season than the other two North Cascades sites. Because of this, the Ice Lake site monitoring will carry over into the 2013-2014 Winter monitoring season.

Table 1: North Cascade site information for the 2013 season.

North Cascades Camera Sites				
Site Name	**Target Species**	**Date Installed**	**Date Uninstalled**	**Lure/Bait**
Ice Lake	Wolverine	16-Aug-2013	N/A*	Both
Union Gap	Wolverine	9-Jun-2013	21-Sep-2013	Both

*denotes site continued into the 2013-2014 Winter monitoring season

Ice Lake was the only North Cascades site to receive documented visits by species from all three priority levels, including a visit from a target species (wolverine) for the 2013 season (Table 2). Though a wolverine was documented at the site, identifiable chest blazes were not captured on camera as a result of misapplied lure. The site was established within the known home range of Sasha, a previously documented female wolverine through the North Cascades Wolverine Study who was believed to be denning in this area. Our goal was to record not only Sasha's presence but kits or other evidence of her reproduction. Therefore, while we did document wolverine presence we were unable to specifically link the photograph to her and we did not document reproduction. This site will continue to be monitored through the winter under the guidance of Forest Service biologists in the Entiat Ranger District and Pacific Northwest Research Lab in hopes of achieving our goals. Additionally, to aid in identification, gun brushes will be added to collect hair samples for DNA analysis.

Table 2: Species detected by site in the North Cascades.

North Cascades								
Species Priority	Level 1	Level 2			Level 3			
Site Name	Wolverine	Cougar	Marten	Mountain Goat	Black Bear	Coyote	Deer	Elk
Ice Lake	x	x	x				x	
Union Gap			x		x			

Central Cascades

The central cascades region, defined as North of I-90 to US 2, housed a total of eight sites. However, six of those sites fell within the I-90 corridor and will be discussed in the following section. This section describes results of the Chiwaukum and Bootjack Mountain sites (Table 3). Both sites were established early in the monitoring season. As with previous years, the Chiwaukum site will remain active during the 2013-2014 winter season. Due to difficulty of access, the Bootjack Mountain site was decommissioned for the winter but will be reinstated at the start of the 2014 Spring-Fall season.

Table 3: Central Cascades site information for the 2013 season.

Central Cascades Camera Sites				
Site Name	Target Species	Date Installed	Date Uninstalled	Lure/Bait
Chiwaukum	Wolverine	7-Jun-2013	N/A*	Both
Bootjack Mountain	Wolverine	8-Jul-2013	6-Oct-2013	Both

*denotes sites continued into the 2013-2014 Winter monitoring season

During the 2012-2013 monitoring season, these two sites documented four individual wolverines discovered visually and then, later, confirmed genetically (see figure below). We kept this site active over the 2013 Spring-Fall season in hopes of documenting the same or new individuals – and our hopes bore fruit. Late in the season as weather in the mountains cooled around December, the Chiwaukum site received its first visit of the season (Table 4). At the same site last year, the first documented wolverine occurred just a month earlier in November. Although a positive ID on the recently documented individual was not made; hair samples were collected and will be analyzed for identification purposes.

Summary of Wolverines Detected at Chiwaukum Stations #1 and #2

Prepared for Conservation Northwest by C. Raley and K. Aubry, USDA Forest Service, Pacific Northwest Research Station

CHWK-01 = Bootjack Mountain, male (KBA 1461)

Detected multiple occasions at Station #2 in April and May of 2012 and once again in March of 2013. However, genetic and gender information were not obtained until this wolverine was detected at the Bootjack camera station in October of 2012 (hair collected from gun brushes during the 12 Sep – 3 Nov 2012 survey period).

Note: at Bootjack camera station, this male was detected on multiple occasions in August, September, and October of 2012.

Diagnostic photo of CHWK-01, Bootjack Mtn.

CHWK-02 = Peg, female (KBA 1455)

Detected at Station #2 on April 17 and 18 of 2012. There are no diagnostic photos of this female, but photo on the right matches up with genetic samples collected during the survey period and shows enough characteristics to distinguish this wolverine from CHWK-01 (the only other wolverine we could identify from photos who had visited this station prior to these dates). Because we do not have diagnostic photos, future identifications of Peg from photos alone will not be possible.

Best photo of CHWK-02, Peg

CHWK-03 = Lacy, female (KBA 1466)

Detected multiple occasions at Stations #1 and #2 in November and December of 2012 and in January, February, March, April, and May of 2013. Hair collected from gun brushes during the 3 March – 31 March 2013 survey period provided gender and genetic information at 10 of 16 possible loci, but no haplotype. PNW is in the process of sending in additional genetic samples collected at the Chiwaukum stations that might provide the missing genetic data for Lacy.

Diagnostic photo of CHWK-03, Lacy

CHWK-04 = Clark, male (KBA 1467)

Genetic results from hair samples collected at Station #1 during the 31 March – 28 April 2013 survey period revealed a new male wolverine. We believe the photo on the right from 3 April 2013 is the new male. All the daytime photos during this time period were poor (auto flash wasn't on). Although this photo shows that this male wolverine has fewer markings than CHWK-01 (Bootjack) or CHWK-03 (Lacy), it is not diagnostic. Thus, future identifications of Clark from photos alone will not be possible.

Best photo of CHWK-04, new male

Currently, the U.S. Fish and Wildlife Service are in process of making a final ruling on their proposal to extend wolverines protection under the Endangered Species Act. As the U.S. Fish and Wildlife Service moves toward a final decision, a better understanding of the populations, ranges, and behaviors of wolverines in Washington will become crucial as conservation and management plans are developed by agencies. Thus, CWMP will continue to put an emphasis on detecting wolverine in Washington. Though wolverines were not detected at Bootjack Mountain this season, it was important to return to both successful sites from last year to continue collecting information on this population of wolverines residing in part or completely south of Highway 2.

Both sites also documented the presence of American marten (Level 2 species). This is not surprising given that these wolverine sites also coincide with prime American marten habitat. The presence of American marten in these areas may prove useful to the Cascades Carnivore Connectivity Project, which is studying the barrier effects of highways in genetic diversity among populations of black bears and martens. The results of this study will help to inform future transportation infrastructure and policy as it relates to wildlife and road interactions.

Table 4: Species detected by site in the Central Cascades.

Central Cascades							
Species Priority	Level 1	Level 2		Level 3			
Site Name	Wolverine	Cougar	Marten	Black Bear	Bobcat	Coyote	Deer
Chiwaukum	x		x	x		x	x
Bootjack Mountain		x	x				

I-90 Corridor

The stretch of I-90 of interest to CWMP lies between Hyak (milepost 54) and Easton (milepost 70). As a result of connectivity analysis, this section of I-90 was identified as a crucial corridor for wildlife passing from the North Cascades to the South Cascades. Unfortunately, I-90 represents a major barrier to wildlife moving across the expansive Cascade Mountains. Monitoring these sites gives invaluable information to the Washington Department of Transportation and other decision makers as they upgrade and retrofit the interstate.

CWMP has prioritized the I-90 corridor for multiple years with both remote camera monitoring and snow tracking. In the 2013 Spring-Fall season, six cameras were installed in the I-90 corridor to document all wildlife activity (Table 5). During the 2012 season only Level 3 species were detected and this continued to be true for 2013 (Table 6). However, in contrast to the 2012 season, our cameras this season detected black bear at all but one site.

Table 5: I-90 site information for the 2013 season.

I-90 Camera Sites				
Site Name	Target Species	Date Installed	Date Uninstalled	Lure/Bait
Price Creek	All	14-May-2013	29-Sep-2013	Lure
Gold Creek North	All	30-Jun-2013	20-Oct-2013	Lure
Gold Creek South	All	22-Jun-2013	12-Oct-2013	Lure
Easton Island	All	7-Jul-2013	27-Oct-2013	Lure
Mt Margaret	All	13-Jul-2013	8-Oct-2013	Lure
Price Noble	All	14-May-2013	29-Sep-2013	Lure

Price Creek and Price Noble sites saw the most wildlife activity including deer, elk, black bear, coyote, and bobcat. However, each site received a variety of Level 3 species. This higher level of activity is consistent with data from past years in both our winter and spring-fall seasons at this site. It is notable that these sites are in habitat directly adjacent to where several wildlife crossing structures will be constructed as part of Phase 2 of the I-90 Snoqualmie Pass East Project, including the first wildlife overpass, which may break ground as soon as 2015.

Species documented at Gold Creek North and Gold Creek South was of particular interest this season due to the recent completion of two wildlife underpasses at Gold Creek. Over the past few years, construction of Gold Creek underpass has been ongoing; however, 2013 marked the end of structural construction of the underpass. Construction equipment and activity still remains within the underpasses during the construction season this year, and restoration of habitat within the underpasses began to compliment the continued habitat restoration adjacent to these structures. As this underpass transitions from construction to restoration, continued monitoring of the underpass is important to record wildlife as they use the structure. During this season our cameras remain in the habitat approaches to the underpasses, while in winter we monitor directly within the underpass. The recording of five species in habitat adjacent to these new crossing structures speaks to their potential use by wildlife to safely cross under I-90.

Table 6: Species detected at sites in the I-90 corridor.

I-90 Species Documented					
Species Priority	**Level 3**				
Site Name	**Black Bear**	**Bobcat**	**Coyote**	**Deer**	**Elk**
Price Creek	x	x	x	x	x
Gold Creek North	x	x		x	x
Gold Creek South	x		x		x
Easton Island	x		x	x	x
Mt Margaret				x	x
Price Noble	x	x	x	x	x

South Cascades

The South Cascades, defined as south of I-90, represents the Southern Recovery Zone as designated in the Washington Wolf Conservation and Management Plan. To date, no wolves have been confirmed south of I-90. However, anecdotal reports have placed wolves in this area for years. Wolves over the past five years have quickly expanded from packs in northeast and central Washington. Now, three packs have made the North Cascades home, two of which are just north of I-90 in the Teanaway and Wenatchee areas. As wolves recover in the state, documenting their dispersal to new areas of Washington is crucial to inform land and species management of wolves.

As a result, nine of our ten monitoring sites in the Southern Cascades were dedicated to wolves (Table 7). The exception being Lookout Mountain, which was a run-pole site focused on wolverine detection just south of Mount Rainier on the Gifford Pinchot National Forest. All sites were located in the Cle Elum and Naches Ranger Districts of the Okanogan-Wenatchee National Forest, and in a new region for our program in the Gifford Pinchot National Forest. CWMP

deployed three sites during the 2013 Spring-Fall season in the Gifford Pinchot National Forest; but future activities require greater planning for this new landscape. Because of delayed access to the three site areas, cameras were deployed late in the season and therefore only monitored for a few months. Additionally, for other reasons, Bumping Lake was installed late in the season with the intention of allowing it to continue in its same location throughout the 2013-2014 Winter season.

Though we have experienced a low attrition rate for cameras in the past, two sites in the Southern Cascades lost cameras – both in the Manastash are. Manastash 1 had a site camera stolen while Manastash 2 potentially lost both cameras to wild fires in the region.

Table 7: South Cascades site information for 2013.

South Cascades Camera Sites				
Site Name	**Target Species**	**Date Installed**	**Date Uninstalled**	**Lure/Bait**
Taneum	Wolf	11-Jul-2013	N/A*	Lure
Manastash 1	Wolf	20-Jun-2013	22-Sep-2013	Lure
Manastash 2	Wolf	13-Jun-2013	N/A**	Lure
Raven's Roost	Wolf	28-Jun-2013	5-Oct-2013	Lure
Bumping Lake	Wolf	25-Aug-2013	N/A*	Lure
Crow Lake	Wolf	26-Jun-2013	13-Oct-2013	Lure
Lookout Mountain	Wolverine	9-Sep-2013	25-Oct-2013	Both
Soda Springs	Wolf	16-Aug-2013	16-Oct-2013	Lure
Spring Creek	Wolf	3-Aug-2013	19-Oct-2013	Lure
Big Crow Basin	Wolf	29-Jun-2013	5-Oct-2013	Lure

*denotes sites continued into the 2013-2014 Winter monitoring season

**denotes the unretrieved cameras from the site as a result of forest fires in the region

Neither wolves nor wolverines were detected at any of the South Cascades sites (Table 8). Despite non-detections, CWMP will continue to monitor the Southern Recovery Zone and respond to anecdotal reports as directed by agency biologists in 2014. Despite not recording target species at each site, almost all sites documented deer and elk, which are primary prey for wolves.

In addition to documenting multiple Level 2 and 3 species, Big Crow Basin documented Cascades red fox. This species was also recorded in the 2012 monitoring season at American Ridge, not far from Big Crow Basin. While not a target species of this project, other researchers with the Cascades Carnivore Project are studying the populations of Cascades red fox in Washington's Cascades. This research is looking at the historic and current species distribution and the impact of reduced connectivity and habitat across the landscape. Detections of red fox

at any CWMP site further inform this important research. In addition to Cascades red fox, American marten was detected at two sites on the Naches Ranger District, indicating a functioning late successional forest in the area.

Table 8: Species detected by site in the Southern Cascades

South Cascades									
Species Priority	**Level 2**					**Level 3**			
Site Name	**Bobcat**	**Cougar**	**Marten**	**Mountain Goat**	**Red Fox**	**Black Bear**	**Coyote**	**Deer**	**Elk**
Taneum		x					x	x	x
Manastash 1	x						x	x	x
Manastash 2						x	x	x	x
Raven's Roost							x	x	x
Bumping Lake			x			x	x	x	x
Crow Lake				x			x	x	x
Lookout Mountain									x
Soda Springs		x				x	x	x	x
Spring Creek								x	x
Big Crow Basin			x	x	x		x	x	x

BRITISH COLUMBIA

The Rossland Range in British Columbia is a new and exciting expansion of the program across the U.S. and Canadian border. In its pilot year, six sites were established to document transboundary lynx activity. Only one site, Christina Crest, received data by the time of this report as a result of conditions to access cameras and capacity changes during the season. Therefore additional results from the remaining cameras will be captured in an addendum report in the coming months, and this report will focus on this one site that we have information for. This site was established in late July and removed in late September due to winter access issues. Despite some setbacks for the study area, the Christina Crest site did produce exciting results including documentation of a moose. Additionally, the site recorded other Level 2 and 3 species, including bobcat, black bear, and deer.

Although data and sites were limited in this pilot year, information on transboundary activity of rare and sensitive species is sparse and much needed. This makes our efforts in this area vital to the understanding of species near political boundaries. Due to differing management techniques and wildlife policies, transboundary issues are paramount to Washington's management of its wildlife. For many of Washington's wildlife, British Columbian species act as source populations, increasing the genetic variation and, subsequently, stability of our U.S. wildlife populations. Further expansion of sites on both sides of the border is planned for CWMP in 2014.

RECOMMENDATIONS FOR FUTURE MONITORING

At the end of each field season, we reflect on lessons learned as we begin the process of planning for the next field season. Information and guidance from volunteers, project advisors, project partners, and project staff helps us compile best practices for remote camera monitoring in Washington. These recommendations improve the efficacy, efficiency, and power of our work.

Already being assessed and incorporated into the 2014 Spring-Fall monitoring season are specific recommendations. In 2014, CWMP will:

- Review of protocols and training documents to ensure they are up to date and include the most relevant remote camera methods; and add detailed protocols for placing hair snare devices and scent lures at sites.
- Continue to focus on wolverine sites in areas that can be monitored safely year-round. This year, some sites designated for wolverine detection were located where winter access was too dangerous or difficult to navigate.
- Continue to move south for wolf monitoring in areas such as the Gifford Pinchot National Forest.
- Reach out to colleges and universities to engage upcoming wildlife professionals in wildlife monitoring in the state.
- Ensure early coordination with other monitoring efforts throughout our coverage area both professional and citizen.
- Develop a new strategy to provide volunteer and coordination capacity to build off of pilot year effort in the Rossland Range in British Columbia to study wildlife in this transboundary region, and compliment with monitoring on the Washington side of the border in the Kettles as well.
- Create a new data management system to facilitate data exchange between volunteers and project staff. On both the volunteer end and the project staff end, data management has become difficult and inefficient. Given the availability of new wildlife monitoring methods and technologies, our system should be updated to maintain accuracy and efficiency.
- Provide expanded opportunities for connections between volunteers and other ongoing wildlife field research in our state, and field skill trainings.

As we plan for the 2013-2014 Winter monitoring season and the 2014 Spring-Fall monitoring season, we will continue discussions with project staff, volunteers, and our Advisory Council to ascertain improvements and recommendations for the Citizen Wildlife Monitoring Project.

ACKNOWLEDGEMENTS

We appreciate supportive grants from Sustainable Path Foundation, WDFW ALEA Cooperative Grants Program, The Elinor Baker Pattersen Fund, The Mountaineers Foundation, Patagonia, and The Snoqualimie Tribe. We're also very grateful for the following individuals who adopted teams and team members: Jed Marshall, Barbara Hawkins, Mariann Carrasco, and Paula Mackay.

We thank the individual advisory council members, specific site advisors, and project collaborators for the the talent, time, and guidance they provided: Jocelyn Akins (Cascades Carnivore Project), Keith Aubrey (USDA Forest Service, PNW Research Station), Paul Balle (I-90 Wildlife Bridges Coalition Steering Committee and Woodland Park Zoo), Scott Becker (WA Dept. of Fish and Wildlife), Michael Borysewicz (Colville National Forest), Craig Broadhead (WA Department of Transportation), Carol Chandler (Gifford Pinchot National Forest), Roger Christophersen (North Cascades National Park), Scott Fitkin (WA Department of Fish and Wildlife), William Gaines (Conservation Science Institute), Patty Garvey-Darda (Okanogan-Wenatchee National Forest), John Jakubowski (Gifford Pinchot National Forest), Gregg Kurz (US Fish and Wildlife Service), Chris Loggers (Colville National Forest),Robert Long (formerly Western Transportation Institute, Woodland Park Zoo), Andrea Lyons (Okanogan-Wenatchee National Forest), Paula Mackay (formerly Western Transportation Institute), Kelly

McAllister (WA Dept. of Transportation), Jesse McCarty (Okanogan-Wenatchee National Forest), William Moore (WA Department of Fish and Wildlife), Chris Morgan (Western Wildlife Outreach and BearTrek), Dave Moskowitz (Wilderness Awareness School), Sonny Paz (Mt. Baker Snoqualmie National Forest), Jesse Plumage (Mt. Baker-Snoqualmie National Forest), Cathy Raley (USDA Forest Service, PNW Research Station), Jo Ellen Richards (Okanogan-Wenatchee National Forests), John Rohrer (Okanogan-Wenatchee National Forest), Jay Shepard (WA Dept. of Fish and Wildlife), Joan St. Hinclair (Okanogan-Wenatchee National Forest), David Volsen (WA Dept. of Fish and Wildlife), Aja Woodrow (Okanogan-Wenatchee National Forest), Don Youkey (Okanogan-Wenatchee National Forest), and Josh Zylstra (WA Department of Transportation).

We would like to thank our volunteers, whose hard work in and out of the field made this season possible: Amy Peterson, Amy Tsui, Andrew Torok, Apurva Goel, Avery Meeker, Ayako Donforee, Bill Whipple, Bryan Torell, Carrie Mussey, Cathy Clark, Chad Maurer, Chris Bailey, Chris Russell, Courtney Ward, Danielle Richards, Debbie and David Rodenhizer, Drew and Cathy Gaylord, Emily Rhoades, Eric Zalenski, Erin Thorson, Gail Pethe, Gayle Grything, Gib Primeau, Graeme Riggins, Hailey Starr, Janice Liang, Jeff Martin, Jenni Beetem, Jeremy Sullivan, Jim Clark, Julianne Houver, Katie Remine, Kellene Collins, Kelli Young-Beach, Kelly Frazee, Keri Young, Kira Jannusch, Kyla Caddey, Kyle Ebenhoch, Lara Ramey, Laurel Baum, Lincoln

Rutter, Liz Heinrich, Lonnell Kyle, Marcus Bianco, Melinda Mast, Mike Webb, Patrick Paulett, Paul Balle, Paul Ryhajlo, Pete Kelly, Rae Nickerson, Richard Connely, Roger Crafts , Sarah Stewart, Selena Nuutinen, Shannon Schelinder, Susan and Lloyd Murray, Tom and Kerrie Murphy, Tom Porreca, Tom Stonehocker, and Troy Montgomery.

We have many volunteers and active supporters who contribute their time and expertise in various ways throughout the course of the program and the potential to miss people ever looms. Thank you to any we have missed!

REFERENCES

Aubry, Keith B., Kevin S. Mckelvey, and Jeffrey P. Copeland. "Distribution and Broadscale Habitat Relations of the Wolverine in the Contiguous United States." *Journal of Wildlife Management* 71, no. 7 (2007): 2147. doi:10.2193/2006-548.

Banci, Vivian. "Wolverine." In *The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the Western United States.*, edited by Leonard F. Ruggiero, Keith B. Aubry, Steven W. Bushkirk, Jack L. Lyon, and William J. Zielinksi, 99–127. Fort Collins, Colorado, USA: USDA Forest Service Technical Report, 1994.

Brittell, J.D., R.J. Poelker, S. J. Sweeney, and Gary M. Koehler. *Native Cats of Washington, Section III: Lynx*. Unpublished. Olympia, WA, USA: Washington Department of Fish and Wildlife, 1989.

Koehler, Gary M., Benjamin T. Maletzke, Jeff A. Von Kienast, Keith B. Aubry, Robert B. Wielgus, and Robert H. Naney. "Habitat Fragmentation and the Persistence of Lynx Populations in Washington State." *The Journal of Wildlife Management* 72, no. 7 (2008): 1518–1524. doi:10.2193/2007-437.

Poole, Kim G. "Dispersal Patterns of Lynx in the Northwest Territories." *The Journal of Wildlife Management* 61, no. 2 (1997): 497–505.

Schlexer, Fredrick V. "Attracting Animals to Detection Devices." In *Noninvasive Survey Methods for Carnivores*, by Robert A Long. Washington, D.C.: Island Press, 2008.

Stinson, Derek W. *Washington State Recovery Plan for the Lynx*. Olympia, WA, USA: Washington Department of Fish and Wildlife, 2001.

Wemmer, Christen, Thomas H. Kunz, and Virginia Hayssen. "Mammalian Sign." In *Measuring and Monitoring Biological Diversity.*, by Don E Wilson, F. Russell Cole, James D. Nichils, Rasanayagam Rudran, and Mercedes S. Foster. Washington: Smithsonian Institution Press, 1996.

Wiles, Gary J., Harriet L. Allen, and Gerald E. Hayes. *Wolf Conservation and Management Plan: State of Washington*. Olympia, WA, USA: Washington Department of Fish and Wildlife, December 2011.

Yasuda, Masatoshi. "Monitoring Diversity and Abundance of Mammals with Camera Traps: A Case Study on Mount Tsukuba, Central Japan." *Mammal Study* 29, no. 1 (2004): 37–46.

APPENDIX I: Advisory Council

(includes specific site advisors and project collaborators)

Jocelyn Akins, Cascades Carnivore Project
Keith Aubrey, USDA Forest Service, PNW Research Station
Paul Balle, I-90 Wildlife Bridges Coalition Steering Committee and Woodland Park Zoo
Scott Becker, WA Dept. of Fish and Wildlife
Michael Borysewicz, Colville National Forest
Craig Broadhead, WA Department of Transportation
Carol Chandler, Gifford Pinchot National Forest
Roger Christophersen, North Cascades National Park
Scott Fitkin, WA Department of Fish and Wildlife
William Gaines, Conservation Science Institute
Patty Garvey-Darda, Okanogan-Wenatchee National Forest
John Jakubowski, Gifford Pinchot National Forest
Gregg Kurz, US Fish and Wildlife Service
Chris Loggers, Colville National Forest
Robert Long, Woodland Park Zoo, formerly Western Transportation Institute
Andrea Lyons, Okanogan-Wenatchee National Forest
Paula Mackay, formerly Western Transportation Institute
Kelly McAllister, WA Dept. of Transportation
Jesse McCarty, Okanogan-Wenatchee National Forest
William Moore, WA Department of Fish and Wildlife
Chris Morgan, Western Wildlife Outreach and BearTrek
Dave Moskowitz, Wilderness Awareness School
Sonny Paz, Mt. Baker Snoqualmie National Forest
Jesse Plumage, Mt. Baker-Snoqualmie National Forest
Cathy Raley, USDA Forest Service, PNW Research Station
Jo Ellen Richards, Okanogan-Wenatchee National Forests
Jay Shepard, WA Dept. of Fish and Wildlife
Joan St. Hinclair, Okanogan-Wenatchee National Forest
David Volsen, WA Dept. of Fish and Wildlife
Aja Woodrow, Okanogan-Wenatchee National Forest
Don Youkey, Okanogan-Wenatchee National Forest
Josh Zylstra, WA Department of Transportation

APPENDIX II: 2013 Photo Highlights

Elk (*Cervus elaphus*), Big Crow Basin

Black bear (*Ursus americanus*), Chiwaukum

Cougar (*Puma concolor*), Soda Springs

Cougar (*Puma concolor*), Bootjack Mountain

Wolverine (*Gulo gulo*), Ice Lake

Wolverine (*Gulo gulo*), Chiwaukum

Mountain goat (*Oreamnos americanus*), Big Crow Basin

Bobcat (*Lynx rufus*), Chiwaukum

Coyote (*Canis latrans*), Manastash

Cascades red fox (*Vulpes vulpes*), Big Crow Basin

APPENDIX III: 2013 Survey Protocol for Remote Camera Checks

Cascades Citizen Wildlife Monitoring Project

Survey Protocol for Remote Camera Checks – 2013 Season

Contents:

Field Preparation

1. Know your site: familiarize yourself with your location, purpose of your monitoring, target species, and site specific instructions (i.e. scent application, additional protocols).
2. Review this protocol including the Communications Protocol and Species Priority List to understand processes and priorities for the overall program this year.
3. Coordinate with your team leader before conducting your camera check to make sure you receive any important updates.
4. Gather the supplies needed for your check and schedule the pick-up either from the nearest Conservation Northwest office or your team leader/members. Conservation Northwest contacts Seattle Office: Alison Huyett (Volunteer Coordinator) 206.675.9747 ext 201, Jen Watkins (Project Director) 206.940.7914, Bellingham office: Julia Spencer 360.671.9950 ext 10
   Resources such as data sheets and protocols are available for download from our website at: conservationnw.org/what-we-do/northcascades/resources-page-for-wildlife-monitoring-volunteers
5. Before going into the field, make sure you/your team members have a copy of this document as well as everything else needed on the equipment checklist. **Most important: keys for cable locks on cameras, fresh camera batteries and memory cards, lure, blank data sheet, pencil, maps, a GPS to find your camera/document wildlife sign, and a digital camera to document wildlife sign.**
6. Ensure you review the camera technical tips and field manual for your camera, and if you have access to the camera conduct a mock set up.
7. Research the target species for your camera, including its habitat preferences, tracks and signs, and previous sightings in the area you are going. (The Background Guide to Species in the I-90 Corridor, along with a track ID field guide, are good resources for this. We also have track ID documents for specific species in the office that we can provide).

8. Research your site, consider your access and field conditions. *Where will you park? Do you need a permit to park in this location? What is your hiking route?* Call the local ranger district office closest to your site for information on current field conditions, especially when snow is possible to still be present.
9. Review this protocol the night before your check if possible.

Getting to Camera Site

1. Use the site write-up, maps, directions and/or GPS coordinates to locate your cameras. It might be helpful to take a copy of the data sheet from the installation and/or previous visit, which may have useful notes on it. Take digital photos of the site when you get there (or bring them if already available) to help you/others find and identify the camera location on future visits and to send to our office as a pictorial record of the camera location and site setup.

2. Be on the lookout for tracks, scat, or other wildlife sign on the way to the camera and if encountered, document per **Wildlife Sign Documentation Protocol** section (below).

3. Look for flagging along the route and near the actual camera location if your team has elected to place it, but don't rely on it because it can disappear and there may be flagging out there unrelated to our project. ***Be careful about placing flagging that could give away our camera locations for security reasons. Use your judgment as to whether flagging is necessary and where and how much to use.***

4. For the next team, note on the back of your data sheet any landmarks or unique characteristics of the site to make it easier for them to find the camera. Or, if you move camera location for any reason be sure to not only mark the new GPS coordinates but to make a detailed write-up that will allow others to find this camera.

Camera Setup

For the first time the camera is placed in the field for the season, or in case you move the camera

These are some things to look for when deciding where to setup the camera:

- Find a location where wildlife will most likely pass by – a game trail, a location with tracks or sign, travel corridors (valleys, river corridors), and/or excellent habitat for your target species (i.e. dense forested cover for martens). Landscape features that tend to funnel wildlife movement and areas close to water may be good sites. Place the camera so that it is pointed toward this area. Avoid sites within 500 m of campsites or human sign, or 250 m of human trails if possible (*this may be difficult for some of the I-90 locations*). At a minimum select a site out of the line of site from major trails and/or roads.
- If setting up a camera to target a trail, try to aim it at a 45-degree angle to the trail (instead of shooting up or down the trail, or directly perpendicular to it). A 45-degree angle generally captures the best images.
- Find two trees (or a tree and a rock, log or other feature the camera can be aimed downward at), about 10 feet apart; one tree that is both large enough to mount the camera on and sturdy enough that it won't sway too much in breezes. The other tree or landscape feature is for spreading the lure on and can be any size, but make sure it is large/sturdy enough though

to withstand animals rubbing and leaning against it and that the camera is angled properly to aim toward that area.

- For best results, consider how the light may affect the photos. Shadows and light changes themselves can actually trigger the camera, but note that pointing the camera in a north-south direction often offers the best results when possible.
- Look for a clear site or one that you can easily clear the camera's view if obstructed by branches, leaves, or brush – plan to use a knife or saw if needed in forested areas to clear the screen. Be diligent about removing vegetation in the camera's view, especially from the foreground, as it can produce false triggers when swaying in the wind or when the sun hits it and creates shadows.
- Attach the camera to the mounting tree, above eye level (or at chest level) and pointed downward toward the trunk of the other tree/feature that you are spreading lure on. Depending upon the camera model you have, use the laser or test feature (see details below) and other team members to help aim it at the right location. Consider the size of the animal species that you are targeting while aiming the camera. Point it low enough to capture smaller animals like wolverine and pine marten, while the placement of the actual camera on the tree is high enough to get a view of larger animals, like deer or bear, walking by in front of it. * *Most often, cameras are mounted with an error of pointing too high, so aim on the low side. Some cameras (i.e. Bushnell) have a viewer feature that will allow you to actually view the test images recorded. Use this feature if you have it, or have been supplied with a detached viewer.*
- Once you have the camera in position, use bungee cords and/or other methods to secure the camera to the tree. Branches or nearby wood may be helpful to help tilt the camera downward to ensure the aim is correct. Anticipating spring snowmelt and changing conditions in many locations, this step may need to be repeated during future camera checks. **After camera is secure, place your lock around the camera.** Make sure that lock cannot be slid off of the camera, but is secured to it.
- Placing the camera about 10' from the lure tree/feature (or even a little farther out depending on the angle of the camera) is best for most camera models to avoid cutting off or only capturing portions of animals. Full view of an animal's features is often needed for sure species ID.
- **Record the GPS coordinates (use Datum WGS 84, and lat/long coordinates) on your data sheet only if this is a camera install/move or they were not previously recorded.** Carefully fill out all of the other information requested on the data sheet.

Basic Overview of Camera Check

- Upon arriving, walk in front of the camera and trigger the motion sensor. This picture will verify that the camera is working and also serve as a reference if the date/time is incorrect. (*make sure to record the actual date and time of the check on your data sheet so that we can match against the date/time on the photos when we download them in the office in case there is any malfunction with the camera date/time*). If the camera does not trigger, your batteries may already have died or your memory card is full.

- Unlock the cable lock with your keys to access the camera
- Use the technical instructions (Pg. 8) for the appropriate camera model to replace the batteries and memory card, check/set up all of the camera settings (*Links to all models users guides is below and on our website. Hard copies of user manuals are made available to team leaders and stored in the office.*)
- Apply lure and install bait according to your specific sites instructions (*Every site has unique directions, be sure to understand and follow yours*). Please remember that a very little amount of lure goes a long ways, and that too much long can deter animals. Their noses are much more powerful than ours.
    - If you are applying bait you will receive specific instructions from our staff and/or advisory council on this. Do not apply bait at your site unless instructed. Wolverine teams are the only ones utilizing bait in the 2013 season.
- Make sure to apply the scent in the area the camera is aimed at so that wildlife spend time sniffing in the focus of the camera. Also, apply a small drop of lure higher on the tree so that the scent is better picked up in the wind. **Make sure to record the exact names of the lure(s) applied by your team on your data sheet.** This information will be entered into our database to track the wildlife response to different lures.
    - With fish oil, fish fertilizer, or oil from a sardine can, you can apply the scent more liberally by pouring some with the aid of a branch lower on the tree and also higher, creating an oil slick that will remain on the tree through rain events.
    - With professional scent lures (like those in small bottles) remember a little goes a long ways. Simply use a branch dipped into the bottle for application, and drop a few drops at the base of the tree. You can apply some to the bark of the tree as well and hang the "lure twig" there or insert it in the bark, but do remember moderation.
    - If no lure trees are available in the desired location where you would like to place the camera (game trail, etc), you can always scent a large downed log, large boulder, or pile of rocks located in the view of the camera. We have had great success with this in the past as a substitute for trees, especially for species where you are looking to utilize game trails.
- **Carefully fill out the data sheet with all requested information**
- Arm the camera to take pictures before leaving the site

After your Camera Check

1. Email a brief report of your visit to your team leader. If there are any important news/findings, such as signs of a Level 1 species, problems with the camera or location, etc…contact your team leader immediately upon return and cc: Conservation Northwest –and alison@conservationnw.org and jwatkins@conservationnw.org If not critical, still please pass on any information about the site to your team leader. The next team will greatly benefit from a brief report, including site conditions, what you learned about animals in the area, topography, hazards, and any outstanding questions. Team leaders will be the communication point between your team and Conservation Northwest.

2. Upload photos from retrieved memory cards on online Dropbox (online photos sharing service) and fill out online data form (see instructions for both below). Or you have the option of returning the memory card(s) and data sheet(s) to your team leader or the nearest Conservation Northwest office ASAP, so that we can get the photos from your camera downloaded, reviewed and store the camera check information into our database. Mark on your data sheet how data is being returned, in case the images become separated from it.

Cameras should ideally be checked roughly each month throughout the season, depending on the camera location and accessibility. Your team leader will schedule checks to ensure that cameras are being checked regularly and lure refreshed at the camera location.

Remote Camera Data Sheet and Online Photo Sharing Protocol

Options for Data Return*:

Online (Preferred Method):

See Online Data Sharing and Data Sheet instructions below

In-person

Bring in a data sheet for each camera along with a clearly labeled memory card containing all photos, or a CD with all photos downloaded and saved onto it, and folders properly labeled with camera location

Postal Mail - **Be sure to save a copy of all images until you are sure they have reached our office, especially if you have chosen this option**

Installing Online Photo Sharing service, Dropbox:

1) Download Dropbox online at: https://www.dropbox.com/install

2) If you attended training or have spoken to Alison, your email will be added to the "2013 Remote Camera Monitoring Season" folder on Dropbox. If you need to be granted access to post pictures send email request to Alison Huyett, Remote Camera Program Coordinator, at alison@conservationnw.org to be added to the shared Remote Camera Monitoring Season Folder on Dropbox. You will receive an invite which you will have to respond to in order to be added to the "2013 Remote Camera Monitoring Season" folder

Uploading Remote Camera Photos to DropBox Online:

There will be folders for each team and site within the overall "2013 Remote Camera Monitoring Season" folder. You will need to follow this protocol for creating uploading photos from each camera check:

1) There will already be an overall location folder within the "2013 Remote Camera Season" folder. (Example: Mt. Rainier_Tahoma Creek)
2) Each time you upload new photos from your last check you will need to create a folder for that check for each camera site (most teams will have two camera sites) . The folder will need to be labeled as such:
   Location_XXX (previous visit date) to XXX (current visit date)_

   Example: Mt. Rainier Camera #1_8/12/12 to 8/30/12

   And for second site:

   Mt. Rainier Camera #2_8/12/12 to 8/30/12

3) With your memory card viewer (hooked to computer via USB) or via your own computer internal memory card reader insert memory card from a camera and go through all photos in whatever photo viewer program you use (window media, Divx, Mac photo program, etc). Determine if you have any series of photos taken by false triggers such as light changes, temperature changes, waving branches, etc. If those photos number in the hundreds/thousands, do not place those photos in Dropbox.
4) Transfer all photos, for any species recorded in your Dropbox folders for each respective camera. Include a note in each camera folder (via word document, etc) for any instances of runaway photo taking from false triggers
5) There will also be a folder named "General Photos" in your site photo for any relevant photos you take with your own digital camera of the site/route to site/wildlife tracks sign, etc.
   Within the "General Field Photos" folder create a folder for each time you head into the field.

   Example "Mt. Rainier site visit 8_30_12"

   Label individual photos as best you can prior to uploading into the folder and include a word document with additional details such as GPS coordinates of specific photos and route descriptions, etc

Entering Remote Camera Data to Online Data Form:

All data from each camera install, check, location change, and removal needs to be entered in the field on your Camera Data Deployment/Check form while in the field.

Once you get home and are ready to transfer your camera photos into Dropbox, enter all data from field data forms into the online form:

conservationnw.org/ccwmp/ccwmp-remote-camera-data-sheet

Be sure to enter data into each field for each camera site. Enter date into the online form for every Install/check/location change/retrieval

CCWMP Communications Protocol

Due to the potential social and political sensitivity of some species and the importance of this work being shared in a scientific and thoughtful manner, the Cascades Citizen Wildlife Monitoring Project has a Communications Protocol for all volunteers and staff of the effort.

All photos taken by cameras owned by the CCWMP are owned by the non-profit organizations sponsoring this effort, and we strongly encourage that any cameras not owned by our effort but participating in it please follow this protocol as well.

- All photos taken by cameras and retrieved by teams are only released to people outside the program by one of the three program sponsor organizations or by an agency affiliated with our Advisory Council. *Volunteers are not to share their results with anyone outside the program directly*.
- Photos gathered off of a camera are sent in per the protocol above for review and decisions about communicating.
- If you feel you have captured a photo of your target species, a Level 1 or 2 species, or a unique photo that interests you – you can upload it to Dropbox and alert our staff to view OR email directly to our staff. Photos can be emailed simultaneously to alison@conservationnw.org and jwatkins@conservationnw.org (to ensure that even if one of us is on vacation they are viewed).
- Selected photos are shared on our website, and results reported monthly in our volunteer e-newsletter. Requests for any photographs can be made through our program to alison@conservationnw.org or jwatkins@conservationnw.org
- Photos that need further identification or discussion are taken to our Advisory Council prior to any wider release, and we will notify you of the discussion and outcome.
- Any interaction with the media based on the results of a camera is decided upon by the host non-profit organizations, and shared with the Advisory Council.
- An annual report is prepared at the close of each season that will report on all results, and at that time all results, with the exception of details of camera locations, are public knowledge.

If any member of the press approaches you about the program, please re-direct them to our offices and staff.

Contacts for Remote Camera Work for 2013:

Project Director: Jen Watkins, jwatkins@conservationnw.org or 206.940.7914

Volunteer/Data Coordinator: Alison Huyett, alison@conservationnw.org or 206-637-9747 ext 201

Citizen Wildlife Monitoring Program, updated May 2013

Technical Instructions for cameras by model

Please also review the field manual for your camera
(hard copies available in our office, links to manuals on our volunteer resource page)

Cuddeback No Flash Camera Model:

To install this camera you will specifically need:
Four D-Cell Batteries
#25 Torx screwdriver *(if you want to attach it to a tree using the supplied screw)*
Bungee cord(s) to further secure camera to tree. *This camera model can sometimes be flipped upside down when only secured with the screw, so it's best to use a bungee as well.*

- Unlock the lock on the camera and Open camera by unscrewing the gold screw on the front of the camera body and pulling off the face plate.
- MAKE SURE THE CAMERA IS IN THE OFF POSITION FIRST, AND THEN REMOVE THE COMPACT FLASH CARD IF IT HAS ALREADY BEEN INSTALLED. (If so, place the card in a case or Ziploc and clearly label to return the card with images to the CNW office).
- Unscrew the other gold screw near the bottom inside of the camera (the battery plate screw) to and remove the battery plate (*this can be a little tricky – pull up and out*). Insert four D-cell batteries if needed, using proper orientation (*an icon right next to the battery plate screw depicts battery orientation*) and replace the battery plate. *For backcountry sites or those that are far away, we suggest replacement of batteries at each check, even if they are still showing life. For closer sites, such as those along I-90, use your judgment based on the battery life left (see below)
- INSTALL THE COMPACT FLASH CARD YOU BROUGHT THAT IS CLEAN OF IMAGES – MAKE SURE THE CAMERA IS STILL OFF - THE CF CARD SHOULD ONLY BE REMOVED OR INSERTED WHEN THE CAMERA IS OFF. Orient the CF card so that the side with the small lip on it is pointed down toward the batteries and slide it in firmly.
- Turn camera on and use the keys and LCD screen to confirm all settings (listed below).

Buttons: M = Mode - to view information or go between menus
S = Settings – to set date, time, delays, etc…
C = General Purpose key

TURN ON YOUR CUDDEBACK CAMERA AND CHECK/SET SETTINGS:

1) If it asks you "EZ Mode Change?" … do nothing until the question goes away.
2) The display will then read "Please Wait…"
3) Next, it will display the battery life remaining and the date and time.
4) Confirm that the date and time are correct (within a minute or two)

5) Press the "S" key and scroll through the settings. Make sure "Camera Delay" is 1 minute

IF either THE TIME OR CAMERA DELAY NEEDS TO BE RESET:
Use the "S" (Settings) key to scroll through "Set Date" "Set Year" and "Set Time" and "Camera Delay" and use the yellow up and down arrow buttons to change if needed

6) When you see "Utilities" C=Yes, press the red "C" button. Confirm that Sensitivity is "High". If not, use the yellow arrow keys to scroll through and select "High".
7) Cycle through the utilities by pressing S until it says "Format Card?" and press "C" for Yes.
8) Press M to display how many images have been recorded onto the card. (**Record this on your data sheet unless this is the Install, in which case Images should be 0**).
9) Pressing M again will display the MODE (Either Standby, Test, or Live Mode) – next step…

Summary of Recommended Settings for the Cuddeback in EZ Mode:

Camera Delay: 1 Minute* or set to VIDEO mode so that there is no delay

*Note: this camera does not have "rapidfire" capabilities and this is the shortest option for delay unless you choose to use video mode. (*Video Mode is set in the Advanced Mode settings, which are not detailed in this protocol . Refer to the Cuddeback user manual for instructions.)*

Set Date: (Current)

Sensitivity Level: HIGH

Format Card: YES when inserting a fresh, replacement card. THIS ERASES ALL IMAGES ON THE CARD – do not format a card that you are retrieving from the field!!!

CHECK THE CAMERA'S AIM USING THE TEST FEATURE:

1) Press M until it displays what MODE it is in (either Live Mode, Test Mode, or Standby)
2) Press either yellow key until it says "TEST MODE."
   This feature will allow you to walk in front of the camera and when you are in the center of the detection area, the red LED will illuminate without triggering the camera. *The camera needs a "warm-up period" for this to work properly; this may take up to 3 minutes*. During the "warm-up", the LED will flash every few seconds and eventually quit flashing, indicating the TEST mode is ready for operation.
   *You can also use STANDBY MODE to play around with the camera without it triggering

This is a good time to do the following:

- If you have one, affix Zorb-it (moisture absorbing) packet inside camera body
- Wipe lens with cleaning cloth or soft cloth and a Windex product if needed

- Apply any lures that need to be applied to the tree after most or all camera handling has been completed orr have separate team members handling the camera and lure. This keeps the
  camera clean and free of lure.

ARM THE CAMERA TO TAKE PICTURES:
1) Press M until it displays what MODE it is in (either Live Mode, Test Mode, or Standby)
2) Press either yellow key until it says "LIVE MODE MOTION."
3) Screw the face plate back on, relock the camera to the tree, and secure with bungees if needed
** THE CAMERA IS NOW ARMED AND READY TO TAKE PICTURES.

For more info on the Cuddeback No Flash camera:

- Use the printed instruction manual provided, which is also available online at: cuddebackdigital.com/images/pdfs/NoFlash_7_11_07.PDF
- FAQ's and tips: http://app.cuddebackdigital.com/faq.aspx

Reconyx RC55 & R60 Camera Models:

To install this camera you will specifically need:
Six C-Cell Batteries
A bungee cord to attach it to a tree*

- Unlock the Masterlock cable with your keys so that you can open the camera
- Open camera by unhooking the latch on the front of the camera body and removing the cover
- Press "OK" to disarm (the camera will then show you the status)
- The status on the LCD display will show the number of pictures, remaining battery power and % full the card is. **Record the number of pictures on your data sheet under** "No of Images Shown on Camera Display" (*You can also check this anytime by using the arrow buttons to scroll to "Check Status"*)
- Turn the camera off and insert 6 fresh C batteries if needed* using the proper orientation – there are icons depicting this where you insert the batteries. *For backcountry sites or those that are far away, we suggest replacement of batteries at each check, even if they are still showing life. For closer sites, such as those along I-90, use your judgment based on the battery life left.
- MAKE SURE THE CAMERA IS IN THE OFF POSITION, AND THEN REMOVE THE COMPACT FLASH CARD IF IT HAS ALREADY BEEN INSTALLED. Place the card in a case or Ziploc and clearly label to return with its images and your data sheet to the CNW office (*The card slot is located below the arrow buttons*).
- Install the compact flash card you brought that is clean of images – MAKE SURE THE CAMERA IS STILL OFF - THE CF CARD SHOULD ONLY BE REMOVED OR

INSERTED WHEN THE CAMERA IS OFF. Orient the CF-card face up so that the side with the small lip is facing away from you and slide it in firmly.

- Turn camera on and **check the time and date** which will come up on the LCD display. If needed, reset or set the date and time. To do this, select "Change Setup" from the Main Menu by hitting the "OK" button on Change Setup, and then select "Advanced" (by again using the OK button) and using the arrow keys to scroll to "Date/Time".
- Use the arrow keys and LCD screen to program or confirm other basic settings (listed below). This camera model is quite easy to use – use the arrow keys scroll through the menus and the "OK" button to select various menus and options.

Recommended Settings for Reconyx:

Set from "Trigger" Menu, which is under "Advanced" Menu:

Motion Sensor: ON

Sensitivity: HIGH (the camera may miss images of animals passing by quickly with any setting lower than this)

Pics per Trigger: 3

Picture Interval: 1 SEC

Quiet Period: NO DELAY * These are the same settings as using the "QuickSet Trail" option

- Recommended mounting height for this camera is about chest level and angled slightly downward (using branches/wood blocks, etc…). Alternatively, it can be mounted a little higher and angled down a little more. The camera has a 40 degree field of view.
- To ensure proper aim, use the Walktest mode (from the main menu) and use the red light to determine when the camera is detecting you in the field of view – the red light will flash when it detects you. The camera will self-arm from Walktest mode after a 2 minute delay.
- If your camera is already setup and mounted and the Walktest is not needed on this site visit, just scroll to "Arm Camera" on the Main Menu once you have spread lure and are completed and select "OK". The camera will arm in 10 seconds. This will give you time to put the cover back on, relock the camera to the tree, and walk away.

For more info on the Reconyx Cameras:

- Use the printed instruction manual provided, which is also available online at: trailcampro.com/miscfiles/rapidfire_instruction_manual.pdf
- Technical tips: http://www.reconyx.com/page.php?id=58

Bushnell Trophy Cam XLT:

To install this camera you will specifically need:

Eight to Twelve AA batteries

Python Cable Master lock / Small Keyed Master lock*

(*used to lock access panel shut)

- To mount this camera, use a Python Cable Master lock to lock the camera to a tree, and use the small brass Master lock to lock the access panel shut. Read the above info about placing a camera. The below info is in regard to installing as well as checking cameras throughout the season.
- Unlock the small brass Master lock so that you can get into the access panel.
- Open camera by unhooking the latches on the right side of the camera and swinging door open.
- Turn switch from 'ON' to 'SETUP,' in order to view pictures and battery life. This info will be shown at the top of the screen. **For a camera check, record the number of pictures on your data sheet under** "No. of Images Shown on Camera Display."
- If batteries are at less than 50% full, **turn camera switch to the 'OFF' position**, remove old batteries, and replace with 8 new AA batteries (make sure and note orientation of positive/negative ends).
- If you are checking the camera, MAKE SURE THE CAMERA SWITCH IS IN THE OFF POSITION AND REMOVE THE SD (SECURE DIGITAL) CARD. Place the card in a case or Ziploc, CLEARLY LABEL IT ACCORDING TO WHICH CAMERA IT WAS IN, and return it with your data sheet to Conservation NW either via mail or email if there aren't too many photos.
- Install the SD card you brought that is clean of images – MAKE SURE THE CAMERA IS STILL OFF - THE SD CARD SHOULD ONLY BE REMOVED OR INSERTED WHEN THE CAMERA IS OFF. Orient the SD card face up so that the side with the cut corner is facing away from you and slide it in firmly. It will click into place.
- Turn camera on and **check the time and date by clicking the menu button, and using the arrow button to scroll right or left until you reach 'Set Clock'**. If needed, reset or set the date and time.
- Use the arrow keys and LCD screen to program or confirm other basic settings (listed below). This camera model is quite easy to use – use the arrow keys scroll through the menus and the "OK" button to select various menus and options.

Recommended Settings for Bushnell XLT:

Mode: Camera
Image Size: 5M
Capture Number: 3
(disregard video settings unless we specifically ask you for video or check in with Alison if you have desire to utilize video mode)
Sensor Level: Normal

Set Field Scan: OFF

SPECIES PRIORITY LIST

This list determines the importance of a sighting in our reporting system, and indicates tracking priority for this study in descending order. This list is slightly different than our winter season which is focused entirely in the I-90 corridor, as our summer season is more likely to encounter rare species.

Level 1
Wolverine
Fisher
Lynx
Wolf
Grizzly bear

Level 2
Cougar*
Marten
Mountain goat
Mountain red fox/Cascades red fox**

Level 3
Black bear
Bobcat
Coyote
Elk
Mule deer
Raccoon
Snowshoe hare and smaller animals—do not record

KEY

Level 1 species are rare or threatened and endangered species in the Cascades and/or Washington. Evidence, sightings or photographs of any of these species should be immediately reported to Conservation Northwest per the Communications Protocol.

Level 2 species, although not T&E, these species are rare or sensitive in some locations or of special interest to the project. Please report sightings of these animals (except deer and elk, which are categorized as Level 2 due to their abundance and interest to the I-90 project)

***Cougar although not Level 1 are noteworthy in the I-90 corridor due to relation to other projects. Cascades red fox are a priority species being studied in the Cascades system, so all information on this species is of interest.**

Level 3 species are more common throughout the project areas, and thus lower priority in terms of communication of their presence

APPENDIX IV: 2013 Wolverine Run-pole Camera Station Protocol

Run-pole Camera Station Protocol Developed for Conservation Northwest (CNW) by the North Cascades Wolverine Study (NCWS) 17 December 2012

Keith B. Aubry (kaubry@fs.fed.us) and Catherine M. Raley (craley@fs.fed.us)
Pacific Northwest Research Station, 3625 93rd Ave SW, Olympia, WA.

Objectives: Camera survey results contribute important information on the current distribution of wolverines in our region. The primary objective for installing and operating run-pole camera stations is to detect any wolverines in the area and obtain the best possible photos of ventral blazes on the chest and throat. These markings are unique among individuals; thus, with good photos we are able to identify individual wolverines and determine how frequently they are detected and whether they are detected at multiple locations or during multiple years. This protocol follows the basic run-pole and camera set-up design developed and used by Audrey Magoun in Alaska (Magoun et al. 2011). However, this protocol does not include the hair-snag frame developed by Magoun et al. (2011). The frame they developed requires substantial effort to install and maintain, and has not been adequately tested in our region. Thus, when the deployment of hair-snagging devices is needed, we recommend that CNW volunteers use a simple gun-brush belt.

The run-pole sets should be constructed using natural logs (not milled lumber). When determined by the survey coordinator, a hair-snagging device may also be deployed at a run-pole camera site, as in many cases it will be important to collect genetic samples for DNA analyses. Regardless, to maximize the chances of detecting wolverines, the run-pole camera sites need to be kept as natural looking as possible with the minimum number of necessary detection devices.

Selecting a camera site: The objectives are to: 1) survey areas that are adjacent to the North Cascades Wolverine Study Area to document additional resident wolverines in the Cascade Range, and 2) survey areas that have a high potential of containing wolverines based on the spring snow coverage developed by Copeland et al. (2010). Based on results from Copeland et al. (2010), and telemetry locations of wolverines monitored by the NCWS thus far (Aubry et al. 2012), wolverine occurrence in the northern Cascade Range of Washington is closely associated with those areas that have snow cover persisting into the late spring (mid-April to mid-May). The NCWS has provided CNW staff with a map of late spring snow cover to assist with locating the best areas in which to deploy run-pole camera stations for detecting wolverine.

Camera sites should be >100 m from regularly used snowmobile routes and ski trails, or other activities that may deter wolverines from approaching the area. The site must have at least a couple of trees that are of the appropriate size and distance apart for constructing and supporting a run-pole, hanging the bait, and setting up the camera according to the specifications below.

If possible, use Trail Watcher systems at all run-pole stations; i.e., these will be the cameras focused on the run-pole. Trail Watchers take higher resolution photos than Reconyx systems and have a flash that can be set to be "on" continuously. Trail Watchers enable us to obtain high-resolution photos during both the day and night. This increases our ability to identify individual wolverines, and our chances of determining the gender and reproductive condition.

Survey period: Run-pole camera stations should be operated for as long as possible during the winter months. Although run-pole camera stations have been successfully operated during the snow-free period in Washington and British Columbia, the probability of detecting a wolverine is greater during the winter than at other times of the year. There is no maximum survey period; thus, surveyors should continue to operate a station for as long as possible and regardless of whether a wolverine has been detected. It is not uncommon for an individual wolverine to revisit a site weeks or months later or for >1 wolverine to be detected at a single camera station.

Constructing the run-pole and setting up Trail Watcher cameras (see Figures 1 thru 8):

1. Pick a site with 2 suitable trees (1 for the run-pole and 1 for the camera system) about 10 feet apart for Trail Watcher cameras (Figures 1 and 2). If you must use a Reconyx system for the run-pole, the trees need to be about 11-12 feet apart. If the trees are too far apart, we won't obtain the best possible photos. The run-pole tree should be >11-12 inches in diameter (at breast height), and the camera tree needs to be sturdy enough to support the camera system (note that the camera will need to mounted on the bole of the tree above the height of the run-pole) and, more importantly, to prevent the tree from swaying too much in windy conditions. Also, it is best if the camera is not facing south (glare from the sun can interfere with the camera operation and quality of photos) unless there is enough canopy cover to block the sun. The bait is hung from an overhead horizontal braided steel cable (not rope) that is anchored to 2 nearby trees. You can use any 2 suitable trees that put the overhead cable in the right position, including the camera and/or the run-pole trees (Figure 3).

2. For the run-pole itself, use a log that is about 4 inches in diameter cut to 3.5-4 feet long (so that when it is bolted to the tree, it will stick out beyond the bole of the tree about 3-3.5 feet). You want to be sure the run-pole is long enough that the wolverine doesn't try to climb up the tree past the pole, and then reach out from the tree-bole to the bait.

3. Attach the run-pole to the tree at a height that will be about 3 feet above the snow surface. The run-pole must be level (not at an angle) in order for the camera to take the best possible "straight-on" photo of the chest area (and so that the end of the pole does not obstruct the camera's view of the chest area). If the site will get a lot of snowfall, it will be difficult to get high enough on the tree bole to install the run-pole, bait, and camera (because bait and camera need to be higher than the run-pole). In that case, just install the run-pole as high as you can easily reach and then raise the height of the run-pole periodically during the winter as the snow pack builds. Use lag bolts and a cordless drill (take a couple of extra battery packs) to construct

run-pole and for attachments to tree bole (much better method than nails or screwing in bolts by hand).

4. At the end of the run-pole, secure a 14-16 inch crosspiece (you can use a piece of the same log you made the run-pole from – shave off some wood at the end of the run-pole and on the underside of the cross-piece to create flat spots for a tighter, better-fitting joint). The crosspiece is critical to making this system work effectively, so make sure that it is attached securely and rigidly to the run-pole log!! The crosspiece provides a platform for the wolverine to stand on such that the front of their body is directly facing the camera.

5. Use another log to brace the run-pole. An angle brace (from run-pole to tree bole) is a preferable method, however, a vertical brace placed near the far end of the run-pole (Figure 2) is also acceptable as long as the base of the brace is on the ground and not resting on the snowpack (i.e., if there is snow on the ground when you install the run-pole, you'll have to dig down until you hit solid ground to secure a vertical brace). The run-pole has to be strong enough to hold the weight of a person (so you can stand on the run-pole to hang or change the bait) and sturdy enough to support a bear. A wolverine might use the brace to climb up to the run-pole (instead of approaching the run-pole by climbing up the bole of the run-pole tree), but that is okay as long the run-pole is constructed properly and the bait is hung properly.

6. The placement of the bait is critical for the run-pole stations to work properly. Hang the bait from a horizontal cable stretched and secured between 2 trees (Figures 1 and 3). Do not use rope as it will sag too much. From the horizontal cable, use another cable to hang the bait about **27-30 inches** above the run-pole and about **12 inches** in front of the end of the run-pole. Do not hang the bait any lower: the recommended height is specific for the size/length of wolverines in our area, and will force animals to at least look up (exposing the chest and neck area), if not stand up, to reach the bait. Do not hang the bait much higher because if it's too high, the wolverine may not even try to get at it; i.e., they will realize it is beyond their reach and may not go out on the run-pole or else spend their time climbing other nearby trees (which are outside of the camera's view) to try and access the bait. Ideally, we want the wolverines to have to stand up to reach the bait (they should just barely be able to reach the bait when standing on their hind feet) not only to obtain photos of their throat and chest blazes, bust also enabling us to determine gender and reproductive condition. So you may need to adjust the placement of the bait once you get detections and can see how animals are responding.

7. Bait – use a piece of bait that has a large, dense bone in it (e.g., femur, skull, or pelvis). Drill a hole through the bone and run a 3/32-inch wire cable through the bait and bone to secure it and then hang the bait using the same type of cable. Do not use baling or rebar wire (single-strand wires will break as the animals pull and work on the bait and could cut the animal's mouth). The piece of bait does not have to be large. Even if martens or other animals eat all the meat, the bone will continue to put out scent. Also, make sure not to use a chunk of bait that will eventually have long pieces of hide or limb bones hanging down, as this will change the

height of the bait, decreasing the chances that we will get diagnostic photos for identifying individuals, and may even block the wolverine from the camera's view (see Figure 4). The bait hanging from the horizontal cable should be the only bait at the camera site. However, we recommend that some lure be used at the site for an attractant and that you should refresh the lure during each site visit.

8. Set the camera high enough on an opposite tree (one that is no more than 10-12 feet away – see Figure 1) so that the field of view is squarely on the area just above the end of the run-pole and crosspiece. Take test pictures and make sure the head of the wolverine will not be cut out of the frame. Try to get the end crosspiece of the run-pole in the frame as well. Although the chest and head area are our primary focus, markings on the front feet of a wolverine can also be useful for distinguishing individuals (see Figures 5 and 6). A laser beam or pointer can also be used to help line up the camera.

9. Camera settings for Trail Watcher systems: Set flash to be ON at all times. Activity Mode = OFF. Set time delay to 5 seconds with 1 picture per event. The best sensitivity setting for the distance at which the camera will be from the end of the run-pole appears to be in the "low to medium" range (this will need to be determined in the field at each camera station). These cameras can take very high resolution photos (almost 4 MB each). 1-2 MB photos appear to have enough resolution for us to make individual ID and determine sex and reproductive condition. Only set the resolution higher than 2 MB if you know for certain that the camera card will not run out of room (remembering that you can obtain several hundred photos in a 2-week period).

10. Check time and date settings. Trail Watchers do not have an option for setting a time and date stamp on the photo. But the camera does have an internal clock, and you must make sure that is working properly so that the correct date and time are associated with the file properties for each image that is taken.

11. Take a photo of yourself next to the crosspiece at the end of the run-pole, and hold up a card with the station number written on it with a black sharpie (to make sure it can be clearly seen in the photo). Before you leave the site, make sure the flash goes off (if the camera system at that station has a flash; e.g., Trail Watchers), and that the lens retracts.

12. If you have enough cameras to set up 2 at a site (1 as the run-pole camera [Trail Watcher] and 1 as a backup/general camera [e.g., Reconyx]), we suggest the 2nd camera can be used to capture a wider view of the site to document whether a wolverine might be visiting the site but not approaching the run-pole. See Figure 7 for an example of how to set-up this arrangement.

Operating camera stations:

1. After the initial set-up, check the camera station within 1 week (without fail) to make sure everything is working properly. Crews should always approach the camera stations

carefully, checking for potential wolverine tracks and genetic samples (hair and scat; see #8 below) and avoid disturbing any potential wolverine tracks in the area.

2. After the initial 1-week check, check cameras every 2 weeks (3 weeks maximum) – do not check the camera or replace the bait more frequently than every 2 weeks. The bait needs time to age (like a carcass would), and a 2-week check schedule will also minimize disturbance at the site.

3. Every time the crew arrives at a camera station, have 1 person walk over to the end of the run-pole to trigger the camera and take a photo of that person before anyone checks the camera. Same process if there is also a Reconyx system at the site – make sure you trigger it before you check the camera. If a camera is not working, record that information on your data form so that there is a permanent record that the survey period was shorter than expected.

4. After arriving at a station and taking a check-photo, remove the memory card from each camera, enter the card # on the appropriate data form, and put in a fresh memory card. Do this every time regardless of whether there were any detections. Do not delete any photos – set-up and check photos along with detection photos are all very important. If you keep an accurate record all of the photos taken between camera station visits, including photos of the crew when they arrive to a station and then before they leave the station, that information can be used to help determine the probability of detecting a wolverine in this region (i.e., the detection rate).

5. Perform other necessary maintenance procedures including replacing batteries and checking date and time stamps. For Trail Watchers, we recommend that you replace the camera battery each visit and replace the 9 volt battery as follows: replace alkaline 9-volts every 2 weeks; replace lithium 9-volts every 2 months or sooner if temperatures fall below 0°F for an extended period (per A. Magoun recommendations). For Reconyx, record % battery remaining on the data form and then replace the C cells when battery-life is down to 75% (threshold that John Rohrer [NCWS] and his crew have been using).

6. Every time before the crew leaves the station, have the camera take a picture of 1 person standing next to the crosspiece at the end of the run-pole holding up a card with the station number written on it. This is a critical step to make sure everything is working properly and to get a photo with the station number on the memory card. If the camera is not working, the crew will need to troubleshoot any problems, and then repeat this step until the camera takes a picture properly. Perform this step for each camera deployed at the site.

7. During each camera check, field personnel should record all required information on the appropriate data form for each detection device before leaving the site. At the end of this document are the **Camera Station Data Forms** used by the NCWS: 1 data form for Trail Watcher cameras and another for Reconyx (see pages 13 and 14). These data forms can be used or modified by CNW, but show the type of information that is important to record at each

camera station and during each camera-check visit. There are different forms for the 2 camera types because of differences in settings and the type and number of batteries that need to be maintained.

8. If there is evidence that a wolverine has visited the station (e.g., tracks or a photo-detection), the crew should carefully inspect the area around the station for scats and hair (see Figure 8). If a wolverine accesses the run-pole, there is a good chance that they left hair on the run-pole arm. So it is important to inspect that surface for potential hair samples to collect. Please collect any possible wolverine scats or hair according to the directions on the NCWS's **Genetic Sample Data Form** (see page 15). To prevent potential contamination of genetic samples, wear Nitrile gloves to collect samples and place them in collection bags or envelopes. Always use paper bags for scats (a separate bag for each scat) and paper collection envelopes for hair (never plastic bags which can trap moisture and ruin the samples for DNA extraction). When using a gun-brush hair-snagging device, place each gun-brush that has a potential sample into a separate paper envelope (or small paper bag).

9. Back in the office, immediately download all photos into separate folders (do not delete any photos from the memory cards for any reason). Create a folder for each camera station and camera device and subfolders for each check date. Example: if there are 2 cameras at Easy Pass (a Trail Watcher and a Reconyx) create 2 folders "EasyPassTW" and "EasyPassRx". If you have 2 of the same camera type at a station, name the folders as follows: e.g., "EasyPassTW1" and "EasyPassTW2". Within each of these folders, create subfolders for each camera visit. The subfolder name should be the dates that go with that camera check; e.g., Feb9-Feb19. Immediately back up images on a CD, DVD, or another hard drive.

10. Back in the office, immediately make a copy of the data form for each camera station that was checked.

11. Back in the office, immediately make sure any genetic samples that were collected are processed and mailed according to instructions on the **Genetic Sample Data Form** (see page 15). This includes using desiccant to remove any moisture from the samples; do not refrigerate or freeze samples and do not place them in plastic bags for mailing. Notify CNW staff so that the samples can be mailed as soon as possible to Keith Aubry or Cathy Raley at the Pacific Northwest Research Station, Olympia, WA. The NCWS's **Genetic Sample Data Form** can be used or modified by CNW to record detailed data on each genetic sample collected by volunteers. If so, please include a copy of the completed form when sending labeled genetic samples to Keith or Cathy.

Literature cited:

Aubry, K.B., J. Rohrer, C.M. Raley, R.D. Weir, and S. Fitkin. 2012. Wolverine distribution and ecology in the North Cascades Ecosystem – 2012 Annual Report (November 21, 2012). < http://wolverinefoundation.org/resources/research-reports/ >

Copeland, J. P., K. S. McKelvey, K. B. Aubry, A. Landa, J. Persson, R. M. Inman, J. Krebs, E. Lofroth, H. Golden, J. R. Squires, A. Magoun, M. K. Schwartz, J. Wilmot, C. L. Copeland, R. E. Yates, I. Kojola, and R. May. 2010. The bioclimatic envelope of the wolverine (*Gulo gulo*): do climatic constraints limit its geographic distribution? Canadian Journal of Zoology 88:233–246.

Magoun, A. J., C.D. Clinton, M.K. Schwartz, K.L. Pilgrim, R.E. Lowell, P.K. Valkenburg. 2011. Integrating motion-detection cameras and hair snags for wolverine identification. Journal of Wildlife Management 75:731-739.

APPENDIX V: Individual Sites with GPS Coordinates (available only upon request)