Grizzly Bear Remote Camera Traps: Installation and Monitoring Protocol

Citizen Wildlife Monitoring Project
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Introduction

CWMP's effort to detect Grizzly bears (*Ursus arctos*) in the North Cascades Ecosystem (NCE) is designed to complement the work already carried out by the Cascade Carnivore Connectivity Project (CCCP). Locations for surveying are selected based on the sampling model created by CCCP (Long et al 2013) and the sampling method they employed based on the "hair corral" described by Kendall and McKelvey (2008). CWMP's field methods are adapted from these methods to focus on simple detection using remote camera data rather than DNA analysis based on genetic sample (hair) collection. CCCP's primary research objectives where to collect information on the genetic structure of carnivore populations in the NCE and secondarily to detect grizzly bears and other rare carnivores. CWMP's primary research goal is detection of grizzly bears. Because of this, replacing hair collection with a remote camera allows for a simplified set up and removal of the detection system. Data collected require much less complex and expensive analysis. Because field identification of grizzly bears as compared to black bears (*Ursus americanus*) involves features that are relatively easy to detect in close up photographs (head and shoulder shape), remote cameras set to take multiple photographs and

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photograph continuously once triggered should allow for definitive identification of grizzly bears if detected.

Methods for attempting to collect genetic samples (hair), if a putative grizzly bear is detected via photograph, are covered as well to help confirm identification and potentially shed more light on the genetic relatedness of grizzly bears in the NCE to elsewhere in the Pacific Northwest.

Safety consideration

Travel in bear country requires attention to several safety considerations, especially when hiking, and potentially camping with a powerful scent lure designed to attract bears. Teams should carefully review how to distinguish between black bears and grizzly bears and procedures for how to behave during a bear encounter. Western Wildlife Outreach's website (http://westernwildlife.org) provides an excellent overview of this topic, as well as links to more resources. Below are a few key expectations for CWMP camera teams traveling in the backcountry in potential grizzly bear country.

Always carry bear spray. CWMP provides teams with at least one canister of commercial pepper spray designed to deter bears. Teams should keep this out and accessible at all times while in bear country and be familiar with how and when to employ it. The chances of an aggressive encounter with a black or grizzly bear are relatively low but often happen unexpectedly and teams need to be prepared for this possibility.

Keep scent lure out of campsites. Carry scent lure in a sealed container inside of a dry bag (provided by CWMP) clipped to the outside of a team member's backpack. For overnight trips, **never** bring this bag into camp. Instead, before entering camp, hang the bag from a tree using a rope to hoist it out of reach of a potentially curious bear. Lure should be left at least 50 meters outside of your camp, similar to how food is handled for bear-safe backpacking.

Stick together. As part of scouting for a specific location to set a camera trap, teams will be looking for the best habitat, food sources, and marking signs of bears. Doing so inherently puts teams at a greater risk of having an actual encounter with a bear. Staying together as a group while searching for and installing a camera trap can greatly increase the chance of early detection of a bear and decrease the chances that the bear will act aggressively towards the team.

Camera Trap Site Selection

CWMP selects field locations based on the sampling model created by CCCP (2013). CWMP camera teams will sample areas as yet unmonitored by CCCP. CCCP divided the NCE into hexagonal sample units, each 2500 hectares. Each field team will be assigned two specific sample units for the summer to be monitored successively for one month each. Each unit should be sampled with two remote camera traps, set about 2-3 km apart (minimum 1 km). Each trap should be set for 1 month. Camera teams should deploy and recover both camera traps on the same visit to the study area.

Selecting a location

Once in the targeted sample area, remote camera teams need to select a specific location to set the camera trap. The attractant used for these traps is designed to appeal to a grizzly bear's foraging curiosity, though it often also elicits a marking response in bears as well. While the scent lure used for these installations is very powerful, locating the camera trap in a place where bears will likely be traveling and foraging naturally will increase the odds of detection of bears at the site.

Grizzly bears in the NCE likely depend on plant foods for the majority of their diet (North Cascades Grizzly Bear Recovery Team 2004) including glacier lily bulbs, grasses and sedges, and various species of berries. Subalpine meadows, riparian and wetlands, and forests or opens with a high density of fruiting berry bushes would all be natural attractants for grizzly bears. While plant foods likely make up the majority of grizzly bears' diet in the NCE, this species is opportunistic in its feeding and will seek out animal foods whenever possible. The carcasses of large animals are a particularly strong attractant for grizzly bears. Grizzly bears will scent mark by rubbing their bodies against trees located along travel routes as well as in and adjacent to important food resource locations.

Besides clear footprints, the foraging digs of grizzly bears are both relatively easy to detect if present and distinctive making them a particularly useful sign to search for (refer to Appendix 2 for examples of foraging and marking signs of grizzly bears).

High-quality habitat can be predicted based on a review of maps and satellite images prior to heading into the field, and then scouted for actual conditions and suitability for a camera trap once in the field. Allotting time to scout several possible locations before constructing the camera trap can help increase the effectiveness of the placement of the trap. Field teams will be briefed by project leadership and advisors on particularly promising locations to focus on in their sampling unit prior to field trips. Once an area has been selected to set the remote camera trap, follow the guidelines below to select the specific location to deploy the trap.

Camera Trap Set

This camera trap model is an adaptation of the hair corral described by Kendall and McKelvey (2008) and utilized by CCCP (Long et al 2013) in the NCE. It is based on a classic bait structure that bear hunters from around the world have used to attract both black and brown/grizzly bears.

The scent lure used for this trap is a combination of fermenting cattle blood and fish oil provided by United States Forest Service to CWMP. This lure is extremely pungent. Care in transporting the lure in the field and out is very important. The lure is designed to trigger a foraging/curiosity response in bears to draw them to its location but has also been observed to elicit rubbing behavior (a communication behavior) once they are at the location. Because of this, situating the trap in a location that will likely attract bears because of nearby natural food sources, existing marking trees, or trails and travel routes that appear to be or are predicted to be used by bears are all habitat features that can increase the chances of success of the camera trap.

If in the process of scouting for a specific location for the camera trap, a team encounters a rub tree, large animal carcass, or other feature that acts as a natural attractant for bears, this camera trap can be constructed adjacent to the natural attractant.

Once an area has been selected (see above for guidelines), look specifically for a small clearing where a debris pile can be created. Construct a pile of sticks, branches and woody debris in the middle of the clearing. The pile should be about 3 feet in diameter and height with a mix of fine and course material, and dense enough so that the full liter of scent lure poured on it will have a lot of surface area to adhere to.

The pile should be constructed in a location where the remote camera can be attached to a tree about 15 feet away facing the pile. Ideally the camera will be facing roughly north to decrease the chances of the sun triggering the camera and also to avoid backlighting animals that trigger the camera when they visit.

Follow general guidelines for remote camera trap installation in regards to situating the camera. Because the scent lure used for these traps is so powerful, **it is vital that whoever is handling the bait does not touch or go near the camera**. Ideally one person can be responsible for handling the bait and another for the camera.

Applying the scent lure should be the final thing you do at the camera trap location. Completely construct the entire debris pile and set up the remote camera and test it

first. Fill out the camera check datasheet completely. Once the camera is set with all the appropriate settings and situated facing the debris pile correctly, turn on the camera and close it. Then have one person open up the scent lure and apply it to the debris pile and any overhanging structure available.

If possible, construct the debris pile around a tree sapling or snag or under the overhanging branches of a nearby tree. This will provide additional surface area to attach scent lure to. In this instance, pour a small amount of the attractant higher on the tree or dip a branch or frond from the overhanging branch into the lure before pouring the remainder over the debris pile. Be sure that wherever you place scent lure is within the field of view of the remote camera, and that activity there will trigger the camera.
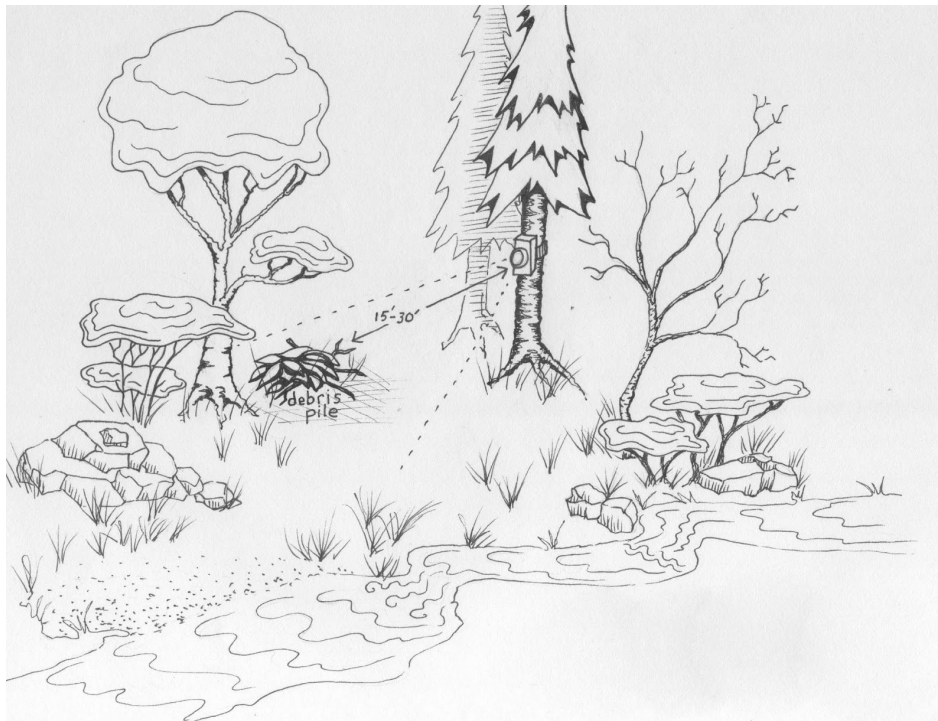

Figure 1. Layout of camera trap set. Illustration by Jenn Wolfe.

Remote Camera Settings
Photo, 3 shots in series, 1 second delay, 5 megapixels.

Data Collection
Based on the sampling protocol set by CCCP (Long et al 2013), each installation should be left for a month. The CCCP protocol called for servicing each camera at 2 weeks but this was primarily to reduce the destruction of genetic samples collected at the trap. For CWMP purposes, the scent lure should persist for an entire month and the remote cameras used can easily function for 1 month.

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At one month, return to the camera trap location and walk in front of the camera to trigger it using and index card to capture the date and time you arrive at the site. Before disturbing the debris pile, remove the memory card from the camera and review the images on it using a digital camera or device designed to review images from SD cards. *If* it appears you have captured images of a grizzly bear AND it was engaging in rubbing behavior on a tree or debris pile in the trap area, inspect these locations and see if it has left any hair. Carefully collect these genetic samples if possible, following directions below. If not, carry on with camera trap disassembly.

Fill out the camera check datasheet completely. Use a stout stick to deconstruct and disperse the debris pile. Avoid getting residual scent lure on hands or gear. Ensure that whoever is handling the remote camera does not approach or deal with the debris pile in any way.

Genetic Sample Collection

Upon arrival at a remote camera trap for servicing or camera removal, field teams should walk in front of the camera to trigger it and capture an index photo which will note exact time of arrival and thus inform the exact survey period the trap was operational. Before disassembling the site, crews should review all the images stored on the memory card of the camera. For remote cameras without an image viewing function, the card can be viewed by inserting it into a standard digital camera. As mentioned above, if the review of images reveals that a potential grizzly bear has visited the site and its behavior included rubbing on the debris pile or nearby trees, it may be possible to collect hairs from the animal.

Carefully inspect the areas the animal rubbed (as seen in the photographs). Scan the location from several different angles, since hairs may become more visible depending on lighting and background. Every effort should be made not to touch the hairs directly in order to avoid contaminating them for DNA analysis. Ideally, sterilized tweezers should be used to extract the hair(s). Deposit the hairs in a coin envelope (included in field kits provided at trainings). Label the container clearly with the location, date, coordinates, and your name (observer). Fill out a specimen collection datasheet.

Prevent contamination of genetic samples by using a clean pair of Nitrile gloves for *each* sample. At any given camera station, you will not know whether the hair or scat samples you find are from a single species or a single individual. **Do not place samples in plastic bags or other plastic containers.** Plastic traps moisture which will ruin the samples, and the genetics lab will not be able to extract DNA from them. Completely label all samples with the date, GPS coordinates, name of camera station, where the sample was found, and collector (refer to data sheet on the left for additional details). When you return from the field, check samples to make sure they

are labeled properly and contact Conservation Northwest for instructions for delivering the material to our project partners for analysis.

Photographs of potential tracks and signs

During scouting, installation and removal of remote camera traps document any tracks and signs that appear to have been left by grizzly bears. Follow the guidelines laid out in the Remote Camera Trap Installation and Servicing Protocol for this. Appendix 2 of this document provides basic guidelines for track identification and others signs to look for in the field.

Relocation of camera trap

Each camera team will be assigned two locations to monitor over the course of the summer. After deconstructing the first traps, the team will travel to a second location and redeploy their camera traps in the second target location, following all the same guidelines for the initial installation of the season.

Acknowledgements

Thanks very much to Bill Gaines and Robert Long for discussing the details of their project and helping adapt our methods to support this work, and to Aja Woodrow for helping us refine our adapted field methods and outfitting us with scent lures. The description of genetic sample collections was adapted from field methods text written for the North Cascades Wolverine Project.

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Appendix 1: Grizzly Bear Field Identification

There are three key field marks to look for in photographs of bears, or actual bears.

Shoulders: Grizzly bears have a prominent shoulder hump while black bears typically do not.

Head profile: Grizzly bears have a concave (dished) profile to their forehead and snout and have short, rounded ears. Black bears' head profile is flat and their ears are taller.

Claws: Claws on the front feet of grizzly bears can be extremely long and relatively flat (used for digging). Claws on the front feet of black bears are not as prominent and are curved (useful for tree climbing).


Figure 2. Field Marks for distinguishing black bear and grizzly bears. Source: Center For Wildlife Information (http://centerforwildlifeinformation.org/BeBearAware/Bears_of_North_America/Black-Grizzly_ID/black-grizzly_id.html, retrieved March 2014).

Appendix 2: Grizzly and Black Bear Tracks and Signs

Follow guidelines laid out in the CWMP's Remote Camera Trap Installation and Servicing Protocol for photo-documenting potential tracks and signs of grizzly bears found while in the field. Below are details for distinguishing grizzly bear and black bear tracks and a description of bear rub trees and foraging signs to keep an eye out for while scouting for where to set up camera traps.

Footprints
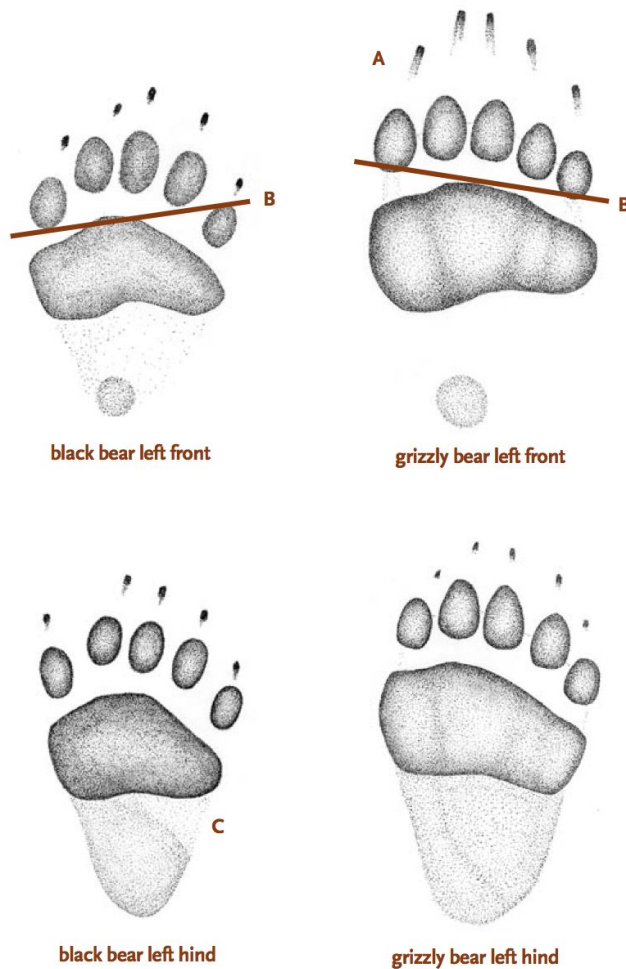
Key features distinguish black and grizzly bear tracks: **A** Claws on front tracks are usually longer than the length of associated toe and significantly longer than hind claws. **B** In black bear tracks, inner toe falls mainly below a line drawn from bottom of outermost toe and across the top of palm; inner toe falls above line in grizzly bear tracks ("Palmisciano test" most reliable on front feet). **C** Black bears have a wedge of hair on the inside of their hind foot that can leave a distinctly raised area in this portion of the track.

Figure 3. Comparison of black and grizzly bear tracks (source: Moskowitz 2010)

	Front Length	Front Width	Hind Length	Hind Width
Grizzly Bear	4–5.5 in. 10.5–13.5 cm	4 –5.75 in. 10.5–14.5 cm	4.25–5.25 in 11–13 cm (without heel) 6.25 –8.25 in. 16.0–20.5 cm (with heel)	4 –5.75 in 10.5–14.5 cm
Black Bear	3.75 –5.25 in. 9.4–12.8 cm	3.75 –5.25 in. 9.8–13.1 cm	3.75–4.5 in. 9.5–11.1 cm (without heel)	3.5—5 in. 9.2–12.5 cm

5.5 –7.5 in. 14.5–19.1 cm (with heel)

Table 1. Track measurements for grizzly bears and black bears in the Pacific Northwest (source Moskowitz 2010).

Foraging Digs

Grizzly bears do much more digging than black bears and signs of them foraging for roots and bulbs in subalpine wet meadows can be quite distinctive. Inspect meadows. Digs are often characterized by large clumps of sod that have been ripped up.

Photo 1. Foraging digs from a grizzly bear in a subalpine meadow the Selkirk Mountains in southeastern British Columbia. Sign would look similar in the equivalent habitat in the NCE. Photo by David Moskowitz.

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Photo 2. Foraging digs on the edge of a talus field in the Selkirk Mountains in southern British Columbia. Photo by David Moskowitz.

Photo 3. Close-up of a foraging dig from a grizzly bear. Note that clump of sod removed is about one bear paw width wide and the top edge of it is generally rectangular in shape. Photo by David Moskowitz.

Rub Tree Photo and Description

Both black bears and grizzly bears will scent mark by biting, clawing, and rubbing their bodies on trees and fence posts. These marking posts appear very similar for both species and maybe impossible to distinguish to species without accessory clues (hair left on the tree, tracks associated with the marking post). Grizzly bears and black bears have also been documented to use the same marking posts in places where the two species co-exist.

Photo 4. Two lodgepole pines that have been repeatedly marked by grizzly bears. Look for bark removed at about standing head height for a bear, claw marks and bite marks as well as smooth bark about rump and shoulder height for a bear. Northwestern Montana. Photo by David Moskowitz.

Photo 5. Grizzly bear marking post on an old fence post in northwestern Montana. Note bite and claw marks about head height on the post and hairs caught in the barbed wire on the post. Photo by David Moskowitz.

Appendix 3: Gear list for grizzly bear camera trap teams

For a complete list of field equipment see
http://www.conservationnw.org/files/2014cameragearchecklist.pdf. Below are
additional items specifically required for camera teams targeting grizzly bears.

Scent lure
Dry bag for carrying lure
Bear spray
GPS unit for recording coordinates

Paperwork
- Camera trap installation datasheet
- Map of targeted sample unit
- This protocol document
- General camera installation protocol

Genetic sample kit
- Nitrile gloves
- Tweezers
- Coin envelopes
- Genetic sample data sheet