

# Effects of Human Activities and Natural Processes on Wolverine Reproduction and Connectivity

*2018 Summary Report*

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Parks Canada

Parcs Canada



Forest Enhancement Society of British Columbia



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## 1. BACKGROUND AND CONTEXT

In September 2017, Mirjam Barrueto started a PhD research project at the University of Calgary, to better understand the ecology of female wolverines (*gulo gulo*) across a large study area throughout the Columbia and Rocky Mountains. The project uses a combination of remote cameras and hair snagging to look at the effects of human activities and natural processes on breeding female wolverines. Fieldwork is planned from 2018 to 2020, and the PhD (including all data analysis and write-up) is slated to end late 2021.

The research project is conducted through a partnership including the Department of Biological Sciences at the University of Calgary; Parks Canada Agency (Banff, Yoho, Kootenay, Glacier and Mt Revelstoke National Parks), Yellowstone to Yukon Conservation Initiative, and many members of the Helicopter and Cat Skiing Industry in British Columbia (Mike Wiegele Heli Ski, Helicat Canada, K3 Cat Skiing, Selkirk Tangiers Helicopter Skiing, to name some of the most prominent partners). We are exploring further collaboration with BC Parks. Strong partnerships are needed for this kind of landscape study, not only for financial and logistical reasons, but also to ensure effective sharing of knowledge and information that may otherwise not be available to researchers.

Wolverine are listed as Special Concern under the Canadian Species at Risk Act because a) populations are declining in the southern part of their range (British Columbia); b) habitat is increasingly fragmented by industrial activity and climate change especially in the southern part of their range; and c) wolverine have low reproductive rates, are sensitive to human disturbances, and require vast secure areas to maintain viable populations (COSEWIC 2014).

**Previous research** in the Columbia Mountains and the Central Canadian Rockies indicates:

- a. Wolverine may be susceptible to increasing levels of human-use (Krebs, Lofroth and Parfitt, Multiscale habitat use by wolverines in British Columbia, Canada 2007, Stewart, et al. 2016).
- b. Connectivity of females across the TransCanada Highway may be impaired (Sawaya, Clevenger and Schwartz In review).
- c. Source-sink dynamics may occur between national parks, adjacent provincial parks and surrounding unprotected areas (Heim, et al. 2017). Fewer wolverine were detected outside of protected areas, but the mechanisms (e.g. habitat quality, trapping, human activity) affecting density are unclear.

- d. Within a 9000 km<sup>2</sup> study area in Banff, Yoho and Kootenay national parks, wolverine occurred at low densities of approximately 3 animals per 1000 km<sup>2</sup> (Barrueto, Sawaya and Clevenger In Review).
- e. Within a 7000 km<sup>2</sup> study area in the Columbia Mountains, wolverines occurred at relatively high densities of approximately 6 animals per 1000 km<sup>2</sup> (Lofroth and Krebs 2007).

**Research objectives** include:

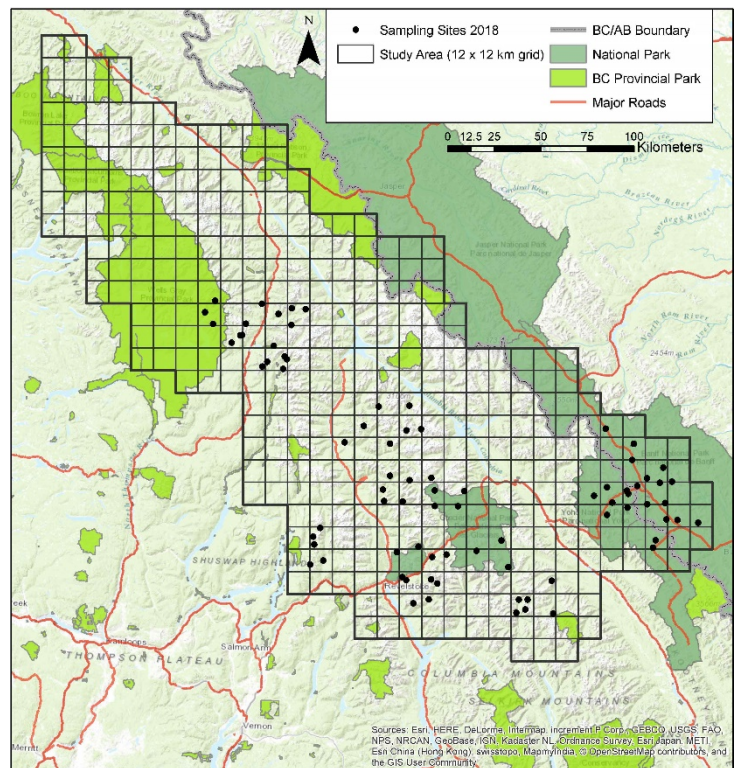
1. To determine the regional density and distribution of wolverines.
2. To evaluate and compare top-down and bottom-up effects of human activities on wolverine density, distribution and potentially on physiological status, particularly that of breeding females, while accounting for variability in natural habitat characteristics.
3. To estimate regional population structure, connectivity and source-sink mechanisms.

**2. STUDY AREA AND METHODS**

Our 2018 study area focused on two main mountain ranges: The Columbia Mountains and the Canadian Rocky Mountains (Figure 1). 2018 was the first year of a three-year sampling program. We surveyed wolverine occurrence using a clustered sampling design, consistent with previous wolverine research to enable data pooling and large-scale analyses. 2018 is not intended as a stand-alone data set.

We used a non-invasive hair and camera trap to sample each site (Figure 3). Once sites were set, two or three replicate approximately monthly visits were conducted.

For this report we calculated the percentage of sampling sites that had been visited by wolverines. No formal statistical data analysis has been conducted yet.

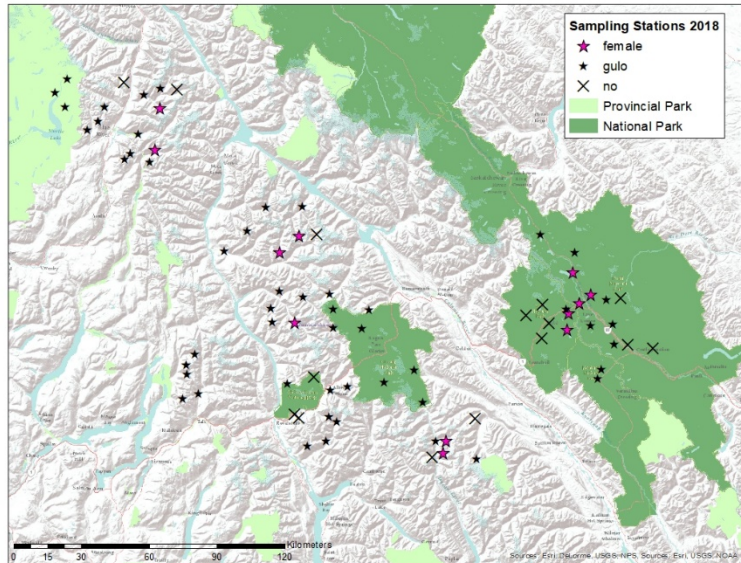


**Figure 1 Study Area**



### 3. RESULTS

Starting in February 2018, with the help of technician, collaborator staff and volunteers, we set-up 58 baited sampling sites in the Columbias, and data acquisition started immediately. Parks Canada staff, researchers and volunteers set up 22 additional research sites throughout Banff, Yoho and Kootenay National Parks (“mountain parks”) (Figure 1 and 2).



**Figure 2 Results: sites visited by wolverines, and detected lactating females**

The number of people involved in the field work was considerable. In the Columbias, there were 177 site visits during 37 field days. In the Canadian Rockies, 62 site visits were conducted on 48 work days. In most cases, one of three project staff were leading site visits, usually assisted by two or more helpers: helicopter and cat ski guides and staff, Parks Canada staff, helicopter pilots, and volunteers. Overall, this winter’s field work was conducted in approximately 675 people work days, involving over 46 individuals.

We collected 186,000 photos from the remote cameras. We collected 350 hair samples, many from wolverines. Out of 78 sites, 63 sites (80.8%) were visited by wolverines at least once (Figure 2). In the Columbias, we identified a minimum of 35 individual wolverines by their chest patterns, based on preliminary photo analysis. For the mountain parks, preliminary photo analysis is not completed yet, but a minimum of 10 individuals were identified from chest patterns. Based on photographs, four individuals, two males and two females, had been detected previously during the pilot study we conducted in winter 2017 in the Columbias. Two females and one male had been



**Figure 3 Site setup with wolverine**

detected during a previous study in Banff National Park (2011 – 2013). We detected 5 lactating females in the Columbias, and 3 lactating females in the mountain parks (Figure 2 and 4).

As analysis of the photographic data is ongoing, no occupancy or preliminary abundance estimates have been carried out yet.

Other species detected on cameras include pine marten, red and flying squirrels, birds, coyote, wolf, red fox, lynx, mountain goat, black and grizzly bears.

#### 4. DISCUSSION

In this first of three field seasons, we successfully established 80 sites across our study area and started collecting data for the three-year sampling effort. The preliminary number of individuals visiting sites, and the detection of 8 lactating females, suggests that with two more years of sampling effort including additional sites, we will be able to reach and likely surpass our minimum target of detecting 20 breeding females.

As expected, set-up was time consuming. With an experienced team of two to three people plus the pilot, we were able to reliably install between 4 and 6 helicopter-accessed sites a day, and up to three sled-accessed sites within a cat ski tenure. Site re-visits were much faster, and for the helicopter-accessed sites, up to 11 sites were revisited in a day. Within the Rockies, all sites were ground-accessed, and generally only one, sometimes two sites were set-up and re-visited per day.

With an average of 4 sites a day, in 2019 two teams could set our target of 120 helicopter sites in 15 days each. While our main consideration of site selection within a sampling grid cell is avalanche hazard, accessibility during marginal weather is also key. In 2018, helicopter and cat ski guides especially from Wiegele, Selkirk Tangiers, K3 and Mustang Powder were invaluable during planning. A surprising observation was that, unlike our experience in the southern Canadian Rockies, sites in valley bottoms were generally well visited by wolverines. Differences in topography, snow cover, habitat, predator community or human access limitations may have been factors.

In our interactions with the public (which includes collaborator staff and other interested people), what surprised people most are wolverines' immense spatial requirements and the resulting low numbers. We also experienced a huge amount of interest and goodwill, which was crucial especially during the more challenging moments of this project.

One major challenge was to create and then transport the large numbers of unwieldy run poles without them vibrating apart on the way. Another, more serious challenge was that, despite

extensive testing in 2017, a manufacturing defect in the batch of infra-red cameras we had purchased to take the (secondary) site overview photos (Spypoint Force-10) resulted in tens of thousands of photos without correct dates attached. We anticipate spending significant amounts of time to try to recover some of the information, but some of the photos will not be usable. For winter 2019, we will use a more reliable brand of infra-red cameras, which unfortunately comes at a significant cost (\$500 per camera, 120 cameras).

## 5. COMMUNICATION

An ongoing question is how streamline communication between the large number of partners and collaborators. Apart from communication before and during field visits, which cannot be planned far in advance due to changing weather conditions and rely partly on the pilot's efforts, general updates and reporting also require a lot of time. This first annual report is an attempt to streamline overall project management, and to create a report that satisfies most project partners.

## 6. CONCLUSION

While rigorous wolverine population assessments remain few and far between in Canada, the last 15 years of wolverine research, often telemetry-based, paint a picture of an elusive and relatively rare species that tends to avoid encounters with humans and their activities and infrastructure within their home-range or territory (Krebs, Lofroth and Parfitt, Multiscale habitat use by wolverines in British Columbia, Canada 2007, Heinemeyer, et al. 2017, Heim, et al. 2017, Scrafford, Avgar and Heeres, et al. 2018) and whose populations are sensitive to human-caused mortality (Krebs, et al. 2004, Lofroth and Ott 2007, Dalerum, Shults and Kunkel 2008). What is missing is knowledge of whether these human factors, which influence how wolverines use their habitat within their home-range, also impact where wolverines chose to locate their home-ranges on the landscape. This is the overarching question motivating this project.

## 7. OUTREACH AND EDUCATION

### 7.1. Public presentations

K3 Cat Skiing Guides Training Dec 18<sup>th</sup>, 2017 – Presentation

North American Congress for Conservation Biology 2018, Toronto: Presentation title: *Cameras, DNA and collaboration: Tools to understand wolverine population persistence in large multi-use landscapes*. <https://y2y.net/publications/naccb-2018-july.pdf>

Red Deer River Naturalists Speaker of the Month (Nov 22<sup>nd</sup>, 2018): Presentation to interested public and students of the Red Deer College about wolverine research. <https://rdrn.ca/event/speaker-of-the-month-10/>

Selkirk Tangiers Helicopter Skiing Guides Training (Dec 2<sup>nd</sup>, 2018) - Presentation

BCPARF - BC Protected Area Research Forum in Prince George (Dec 4<sup>th</sup>, 2018): Invited presentation. <https://www.unbc.ca/sites/default/files/sections/bc-protected-area-research-forum/bcparfagendaoctober30.pdf>

K3 Cat Skiing Guides Training (Dec 17<sup>th</sup>, 2018) – Presentation

Great Canadian Heli Skiing Guides Training (Dec 17<sup>th</sup>, 2018) – Presentation

## 7.2. Documentary film

In 2018, we teamed up with Leanne Allison and her team of experienced media creators and created a submission for the 2018 Telus Storyhive Documentary Edition Award (<https://www.storyhive.com/project/show/id/3976>). We are extremely happy to announce that we secured a \$50,000 grant to create a 20 min documentary on wolverine research and conservation. The film will bring this important topic to a wide audience and allow us to showcase our unique and highly effective collaboration between university, industry, government agencies and conservation groups. A teaser is available here (Chasing a trace – <https://www.vimeo.com/292825008>); the full film is anticipated to be available in early summer 2019.

## 7.3. Social media

*Website* – We continued to use [www.wolverinewatch.org](http://www.wolverinewatch.org) as the project website and have been, albeit slowly, updating content. The main purposes of the website are to provide information on this and our previous wolverine research projects, collect detailed information on public wolverine sightings, provide information for people interested in supporting the project, and provide links to partner organizations.

*Facebook and Instagram* – We also continue to use our linked Facebook and Instagram pages for WolverineWatch.org. The objective is to use them to inform and raise awareness of wolverine conservation, management and research in the Canadian Rockies and now the Columbia



Mountains. We have used both pages to document the research, how data are collected, the landscape surveyed for wolverines, and some of the highlights and frustrations of field work. We are currently looking to recruit volunteers that help with updating the website and social media page. The Facebook page has ~ 3700 followers.

#### 7.4. Other

RM Outlook Article: <https://www.rmoutlook.com/article/wolverine-study-hopes-to-understand-territorial-creatures-better-20180426>

CBC Radio, Current Affairs – Kelowna: short interview on Monday, April 30<sup>th</sup>, 2018

## 8. FUTURE

### **2019:**

In January 2019, we will resume monitoring all already established and additional sites for wolverine use. We will bait the sites once per month approximately and collect hair and photos for analysis. For the Columbia Mountains, an additional 60 sites are planned, some of which will be located in the Canadian Rockies. For the mountain national parks, and additional 6 ground sites are planned.

In spring and summer 2019, we will carry out photo analysis, and for fall 2019 preliminary results are anticipated. Where possible, we will begin assembling large-scale spatial data of human use and natural factors to be used in final analyses.

DNA-analysis (15 microsatellites) of two hair samples per individual detected will be contracted to WGI International, Nelson, BC.

In addition, we will carry out a pilot validation study to determine if hair collected during our sampling can be used to assess glucocorticoid (stress hormone) levels in individuals. Stress hormones in hair have been successfully used as indicators of physiological condition of other mammals and might also be indicative of individual breeding status. This pilot project will be carried out in collaboration with Prof. Janz at the University of Saskatchewan, and will be expanded, if successful.

Additionally, as this project is a PhD project, the student (Mirjam Barrueto) will spend two months preparing for the general comprehensive examination, which will likely take place in October 2019.

### **2020:**

In 2020, we will monitor the sites established in 2019 for a third field-season, and at the end of the season, remove them.

In summer 2020, we plan to conduct photo analyses, spatial data assembly, and hair analysis (DNA), as in summer 2019.

### **2021:**

No field work is planned for 2021, beyond removing potentially remaining sites, or conducting a very limited number of follow up visits. We anticipate a year of analysing the data, and writing up up results. In addition, the thesis will have to be completed and defended, which is anticipated in early 2022.

## 9. FUNDING

Funding for the 2018 research came from the University of Calgary, Yellowstone to Yukon Conservation Initiative, Natural Sciences and Engineering Research Council of Canada (NSERC), Forest Enhancement Society of British Columbia, Helicat Canada, K3 Cat Ski, Parks Canada Agency, and an anonymous donor. Generous in-kind support was received from Parks Canada Agency, Mike Wiegele Helicopter Skiing, Selkirk Tangiers Helicopter Skiing, Whitetooth Helicopters, and Mustang Powder. In addition, the University of Calgary recognizes the Habitat Conservation Trust Foundation and anglers, hunters, trappers and guides who contribute to the Trust, for making a significant financial contribution to support *Effects of Human Activities and Natural Processes on Wolverine Reproduction and Connectivity*. Without such support, this project would not have been possible.

## 10. ADDITIONAL INFORMATION

Further photos, higher resolution maps and location data is available on request. Expense and budget statements for 2018 and 2019 are also available on request.

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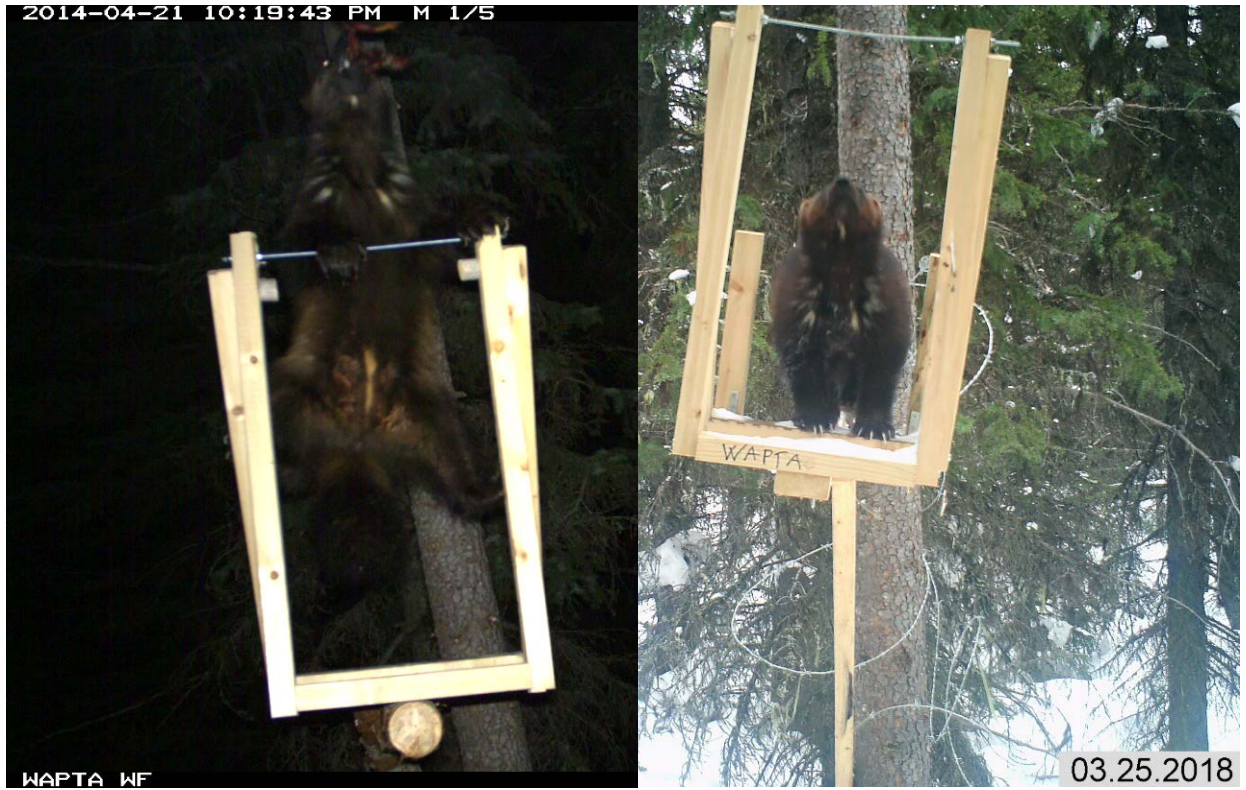
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**Figure 4 Example of chest-pattern identification: Female “F12” detected in Banff and Yoho National Parks in 2011, 2013, 2014 (left photo, lactating) and 2018 (right photo, lactating)**