Assessment of Canada Lynx (*Lynx canadensis*) Presence in the Rossland Range of Southeastern British Columbia

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RFW 271 Applied Research

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In collaboration with Conservation Northwest

April 8, 2019

Disclaimer

The contents provided on the following pages are student work produced as part of the written evaluation in the diploma program in the School of Environment and Geomatics, Selkirk College, Castlegar, British Columbia, Canada. This work obtained a minimum assessment grade of "C" (60%) and met the requirements of the assignment for which it was completed.

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1. Acknowledgments

I would like to thank Emily Bailey, Dr. Lui Marinelli, Dr. Brenda Beckwith, the School of Environment and Geomatics at Selkirk College, and Conservation Northwest without whom this project would not have been possible. Thank you Emily for completing this project with me, for your positive attitude, flexibility, laughter, and data collection. Thank you Dr. Lui Marinelli for advising us throughout this project. Your support of our passions and education is greatly appreciated. Thank you Dr. Brenda Beckwith for your time, passion, and attention to detail, which has helped us to grow as researchers and writers. Thank you to the School of Environment and Geomatics faculty at Selkirk College for the dedicated work you put into our education. And thank you to Conservation Northwest for your efforts in starting this project, allowing Selkirk College students to be involved, and providing the trail cameras for us to use.

2. Introduction

Canada lynx (*Lynx canadensis*) are among the most endangered felines in North America. They are listed as a threatened species under the United States Endangered Species Act (U.S. Fish and Wildlife Service 2000) and as an endangered species under the Washington Department of Fish and Wildlife (Stinson 2001). The Washington State population of Canada lynx is one of the last and largest remaining populations in the United States and their habitat is located primarily in the northern counties along the southern border of British Columbia (Conservation Northwest 2019). It is estimated that approximately 3,800 km^2 of suitable habitat in Washington supports as few as 87 Canada lynx (Koehler et al. 2008). North of the border the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) lists the Canada lynx as not at risk, and the province of British Columbia also considers the species not at risk of extinction (BC Conservation Data Center 2020). Because of the notable difference in status between the two countries there is interest in whether individuals are moving across the border from one habitat to the other.

Canada lynx inhabit mature forests with much horizontal structure and large woody debris (Scully et al. 2018). These same forests are home to Snowshoe hare (*Lepus americanus*), the main prey species of Canada lynx, and lynx populations have been shown to respond functionally to fluctuations in the snowshoe hare populations (O'Donoghue 1998). Due to the highly mobile lifestyle of Canada lynx, habitat connectivity across their home range plays an important role in their population health, and fragmenting habitats can be detrimental to these felines (Vanbianchi et al. 2018). Furthermore, habitat loss due to forestry development, trapping, and increased predator pressure brought about by snowmobile trails and decreasing snow depth are a few of the main threats to Canada lynx (Conservation Northwest 2019).

Founded in Bellingham in 1989, the environmental non-profit organization Conservation Northwest has been working to protect, connect, and restore wildlands and wildlife from the Washington Coast to the British Columbia Rockies (Conservation Northwest 2019). They have protected hundreds of thousands of acres of wildlands and supported the recovery of threatened species from wolves to fishers (Conservation Northwest 2019). As part of their ongoing Canada lynx program, citizen scientists throughout Washington State and around the Rossland Range of southeastern British Columbia have gathered

Canada lynx population data, specifically focusing on the collection of hair samples for genetic information (Conservation Northwest 2019).

Because animals do not observe border crossings and Canada lynx travel large distances across their home range it is possible that the Washington population is being supported by a more stable population and habitat across the border in British Columbia where Canada lynx are not at risk. Conservation Northwest is working to determine if there is a genetic link between the international populations so that management decisions can be made in regard to protecting habitat throughout the wildlife corridor between northeastern Washington and southeastern British Columbia. The collaboration with Selkirk College began in 2014 to help gather information on the British Columbia population and give students in the School of Environment and Geomatics department the opportunity to be a part of an ongoing research project.

To contribute to this important growing body of knowledge, my applied research goals were to:

- Conduct a literature review to learn about Canada lynx habitat, prey species, and lifestyle
- Survey for Canada lynx and snowshoe hare through the use of wildlife cameras and tracks surveys at three research sites in the Rossland Range, British Columbia.
- Install cheek rub plates to collect hair samples of Canada lynx to be sent to Conservation Northwest for genetic testing.
- Relay all data and samples collected to Conservation Northwest.
- With our results, provide recommendations on habitat management to protect Canada lynx populations.

The data we collected will provide Conservation Northwest with information on British Columbia's Canada lynx population, as well as snowshoe hare presence, and may supply insight as to whether there is competition from cougar (*Puma concolor*) and bobcat (*Lynx rufus*). The results of this research will help Conservation Northwest determine if a transboundary relationship exists between the Washington and British Columbia Canada lynx populations. If so, this report will assist in the development of future management plans to protect, connect, and restore Canada lynx and their habitat.

3. Methods

3.1 Study Area

The study area included three research sites located along the Old Cascade Highway, a gravel road between Rossland and Christina Lake, in southeastern British Columbia. The sites were originally chosen by wildlife biologist Dr. Lui Marinelli in 2014 based on habitat characteristics described in the National Lynx Detection Protocol (McKelvey et al. 1999), and proximity of the sites to the US border. According to Olson et al. (2018), Canada lynx tend to avoid areas with motorized land use and, because of this and the fact that very few lynx had been detected in these original sites since 2014, we decided to move the sites further away from the highway in order to get into an area with less automotive and human traffic. The sites are located between 150-500 meters from the highway: Site 1 is at 11U 437212E 5434063N, Site 2 is at 11U 436100E 54329683N, and Site 3 is at 11U 434606E 5430654N (Figure 1).

All three sites are located in the transition between the West Kootenay Dry Warm Interior Cedar-Hemlock (ICHdw1) and the Granby Moist Warm Interior Cedar-Hemlock (ICHmw5) Biogeoclimatic Ecosystem Classification (BEC) units (MacKillop and Ehman 2016). These units occur at mid elevations within the moist climate subregion and are characterized by warm moist springs, hot dry summers, and cool, dry to moist winters with shallow to moderate snowpacks (MacKillop and Ehman 2016). There is great diversity in tree species in these units including western red-cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), western larch (*Larix occidentalis*), Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), western white pine (*Pinus monticola*), Engelmann spruce (*Picea engelmannii),* trembling aspen (*Populus tremuloides*), and black cottonwood (*Populus trychocarpa*). In the understorey, black huckleberry (*Vaccinium membranaceum*), falsebox (*Paxistima myrsinites*), Prince's pine (*Chimaphila umbellata*), twinflower (*Linnaea borealis*), and queen's cup (*Clintonia uniflora*) make up the dominant plant species (MacKillop and Ehman 2016).

Canada lynx require a diversity of horizontal and vertical structure for stalking prey, avoiding predators, and raising young (Maletzke et al. 2008). This forested region, with the abundance of shrubs and horizontal structure created by trees falling in the high winds and heavy snow typical of these units, provides the vegetation cover required by Canada lynx.

3.2 Sampling Methods

My research partner, Emily Bailey, and I visited each of the three sites every two to three weeks from October 2019 to the end of January 2020. On the first visit we set up a Bushnell passive infrared camera, a hair snag trap covered in scent lure, and a visual lure hanging from a high tree branch at each site. The trails into each of these sites were marked with flagging tape so that the trails could continue to be found throughout the field season.

The passive infrared cameras were secured with a bungee cord to a tree 100-150 centimeters above the snowpack in locations that allowed for a full visual of the surrounding area with the hair snag trap centred in the camera's focal point. The settings were such that when movement was detected a photograph was taken every 10 seconds until the censor ceased to pick up movement. During each subsequent visit we checked the cameras for battery life, changed the SD cards, and moved the cameras up in height on the tree, if necessary, to keep them 100-150 centimeters above the snowpack.

For the hair snag trap, we used a square piece of carpet approximately 20 cm^2 with multiple shingle nails protruding through the front side. These traps were baited with a scent lure composed of beaver castoreum, glycerine oil, propylene glycol, and catnip oil as outlined in the National Lynx Detection Protocol (McKelvey et al. 1999). These traps were screwed into a tree across from the camera at approximate lynx cheek height (60-80 cm). The lure was intended to attract the Canada lynx to the hair snag trap so that they would rub against it to leave their own scent, and leave hairs caught in the shingle nails. The hair snag traps were moved up with snow accumulation to keep them at the correct height for use by the Canada lynx.

A visual lure was created by hanging aluminum pie plates, feathers, and smaller carpet scent lures constructed in a similar way to the hair snag traps, from coat hanger wire to tree branches within the research site. As the wind blew light was cast off the aluminum pie plates, the feathers moved, and the scent was spread out to a wider area possibly attracting the attention of nearby Canada lynx. These lures

also needed to be raised up when the snowpack got too high and snow laden branches sunk too low. During each visit we reapplied the scent mixture to both the cheek rub and the hanging lures.

When conditions were favourable (2-3 days after a minimum 2 cm snowfall) we set up four 50 m long by 2 m wide belt transects in the four cardinal directions from each site centre. We walked each of these transects looking for animal tracks and recorded the data in our field. If the same set of tracks crossed the transect more than once it was not recorded a second time. A photograph was taken of each track and was confirmed with our advisor Dr. Lui Marinelli. Upon return from the research area the SD card data were uploaded onto a computer to assess the photographs.

Upon completion of our research in January 2020, we took down all equipment from the sites. Flagging tape was left in place for future teams to carry on with this research.

3.3 Analysis

At the end of our field days we uploaded the wildlife camera photos onto a laptop and kept any photos containing wildlife. We gathered all of our snow tracking data into a table (Table 1) comparing results from each site. Then, due to the fact that the majority of wildlife signs found were left by snowshoe hare, the main prey of Canada lynx, we also created a bar graph (Figure 2) to compare the number of snowshoe hare signs found at each site to visualize which site is the most appropriate Canada lynx habitat.

4. Results

Our three sites were surveyed for a total of 14 weeks, from October 26, 2019 to January 29, 2020. Over that time we completed a total of seven site visits. Of those seven days only three days had good conditions for snow tracking.

We found 55 tracks in total, 87% of which were snowshoe hare tracks (Table 1 and Figure 2-3). Additional species detected by tracks were deer, squirrel, and one unknown species that was found at both Site 2 and Site 3. The highest occurrence of snowshoe hare tracks was at Site 2 (58%) and the lowest occurrence at Site 1 (0.04%). Site 3 had the greatest diversity in species with a total of four different species found.

Consistent with the snow tracking results, our wildlife cameras picked up only two snowshoe hare and two deer (Figures 4-6). One snowshoe hare was detected at Site 3 and one was detected at Site 2. The two deer were detected together at Site 2. Site 1 had the lowest occurrence of both tracks and, consistent with that, no wildlife camera photos.

No Canada lynx tracks were detected in our study, and no hair samples were found on our cheek rub plates at any of the sites.

5. Discussion

Over our 14 weeks of surveying, no Canada lynx were detected at any of our three sites. However, this does not indicate a lack of Canada lynx presence in the Rossland Range. Our detection of 87% snowshoe hare indicates a high probability of Canada lynx presence in the area as their populations respond functionally

to snowshoe hare populations (O'Donoghue 1998). Consistent with this probability Canada lynx have been detected in this area by RFW students in previous years. We received anecdotal information, as well, that Canada lynx are often seen at the Red Mountain Ski Resort and Castlegar Nordic Ski Trails which are both in relatively close proximity to our sites. Furthermore, on a high elevation snow tracking lab on March 3, 2020 with wildlife biologist, Dr. Lui Marinelli, we found multiple sets of Canada lynx tracks (Figure 7). The location of this lab is on the Paulson Pass beside Highway 3, approximately 22 km north of our survey sites and the area between these two sites is relatively intact wilderness, with the exception of a few forestry roads and cutblocks. Since Canada lynx home ranges average 88 km^2 (Vanbianchi et al. 2015) it is very possible that if Canada lynx are present in the area of our lab, that they make their way south to the area of our survey sites.

From our field work it seems that Site 2 has the best habitat for snowshoe hare and Canada lynx, followed by Site 3. Site 1, with only two snowshoe hare occurrences is unlikely to provide suitable habitat for Canada lynx. There are some similarities between Site 2, Site 3, and our high elevation tracking lab site that are lacking from Site 1. Site 2, 3, and the lab site all have an open thoroughfare nearby, open areas throughout the forests, and flatter terrain. In contrast, Site 1 is located in a denser stand, on steep terrain, and there is no proximal thoroughfare for ease of travel. Site 3 was located in the most open area and had lower snowshoe hare occurrences than Site 2 or the lab site, suggesting that neither too dense, nor too open of forest is ideal, but that the right balance of spaced vegetation, forest openings, and a travel corridor creates optimal habitat.

Initially, during our field work, I suspected that proximity to the road and high levels of human activity resulted in the lack of Canada lynx detection. However, after seeing Canada lynx tracks on our high elevation tracking lab located along Highway 3, and receiving anecdotal information of lynx at highly trafficked areas such as Red Mountain Resort and Castlegar Nordic Ski Club, I no longer suspect this to be the issue. It is possible that there may be other, more suitable habitat for Canada lynx driven by denser occupation of its main prey species, the snowshoe hare. For example, during our lab we found snowshoe hare tracks almost every five meters along a one kilometer transect, a much higher density than we found around our survey sites. It would be interesting to move the Applied Research sites to the lab site and to eventually survey the whole area between the lab site and our survey sites to see where the density of snowshoe hare and Canada lynx changes.

Time and resources were a limiting factor for us in this project. For example, although the National Lynx Detection Protocol recommends sampling a minimum of 25 sites (McKelvey 1999), we were constrained to only three sites. It is quite possible that with more time and more sites we may have detected the presence of Canada lynx. We also suspected camera malfunctions at Site 1 as our cheek rub plate had been torn and had two of its corners ripped out of the tree. And while the cheek rub was centrally aligned with the trail camera we found no evidence of animal presence on the camera. Consistent with this we found many snowshoe hare tracks within Site 2 on one of our visits but the camera's memory card had only one photograph of one snowshoe hare.

6. Recommendations

My recommendation for the future of this project are:

- Move the sites to the RFW 273 high elevation tracking lab area across Highway 3 from the Castlegar Nordic Ski Trails
- Survey more than three sites

- Use a larger team of researchers to allow for more days in the field
- Place the majority of sites near the thoroughfare, in rolling, moderately open, forested terrain
- Place the remainder of sites throughout denser forest, steeper terrain, and wide open terrain to allow for comparisons between habitat types
- Use new wildlife cameras to ensure accurate data collection

7. Conclusion

During the study period no Canada lynx were detected in any of our three sites in the Rossland Range. However, Canada lynx were detected nearby, both by Emily and I, and by other community members who passed anecdotal information on to us. Furthermore, many snowshoe hare were detected in our three sites, indicating a probable presence of Canada lynx. Because the area we surveyed is a mere fraction of the Rossland Range I have provided a recommendation for where to move the sites, based on Canada lynx track observations made during a tracking lab with Dr. Lui Marinelli. I look forward to hearing what students discover through this project in the future.

8. Tables and Figures

Table 1. Number of occurrences of different species by site number in the Rossland range, 2019-2020.

Site	Species	Occurrence
1	Snowshoe Hare	2
2	Snowshoe Hare	29
	Deer	1
	Unknown	1
3	Snowshoe Hare	19
	Deer	1
	Unknown (same as site 2)	1
	Squirrel	1

Figure 1. Location of survey sites in relation to Rossland, and Trail, British Columbia. Created using Gaia GPS App October 16, 2019.

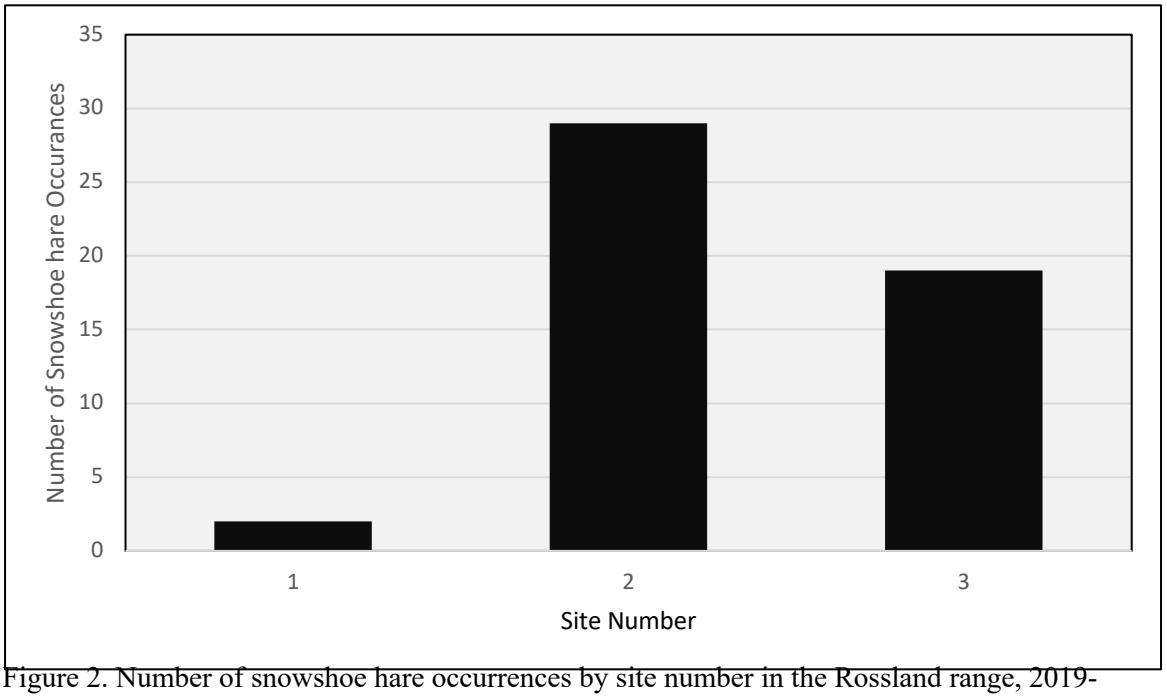

Figure 2. Number of snowshoe hare occurrences by site number in the Rossland range, 2019-2020.

Figure 3. Snowshoe hare tracks found in the Rossland Range of southeastern British Columbia, December, 2019.

Figure 4. Snowshoe hare at Site 2 along the Old Cascade Highway in the Rossland Range of southeastern British Columbia, October, 2019.

Figure 5. Deer at Site 2 along the Old Cascade Highway in the Rossland Range of southeastern British Columbia, November, 2019

Figure 6. Snowshoe hare at Site 3 along the Old Cascade Highway in the Rossland Range of southeastern British Columbia, December, 2019 (Camera date and time were not set correctly).

Figure 7. Canada lynx tracks found during a high elevation tracking lab with Dr. Lui Marinelli, March 3, 2020.

9. Literature Cited

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