

# Together for Wildlife - Interior Universities Research Coalition Student Research Grant Final Report

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**Project Title:** Informing the Management of grizzly Bear Viewing in the Declared Title Area of the Tsilhqot'in Nation

## What has been achieved over the duration of this grant award period?

Working with biologists from the BC Ministry of Forests from the Cariboo region and Tsilhqot'in National Government (TNG), 42 Reconyx Hyperfire 2 camera traps were deployed in August, 2021 across a 50 km<sup>2</sup> study area on the upper Chilko River in the Tsilhqot'in Title Lands. Cameras are spaced in a 1 km grid to avoid bias in detection histories. Approximately 1,000,000 images have been collected to date, with the majority captured during this grant award period. Cameras were serviced in August 2022, March 2023, and recently in August of 2023 to ensure each camera is functioning optimally. Servicing included replacement of camera SD cards and even the camera itself if any damage or malfunction occurred. Cameras have been continuously active since August 2021.

Given the number of images, we used an AI-based approach (MegaDetector) to develop wildlife detection histories for each camera site. In this grant award period, detection histories and activity profiles for grizzly bears (as well as other wildlife, including black bears, moose, mule deer, wolves, cougars etc.) and humans have also been compiled. For each individual grizzly bear camera detection, a sex (when possible) and life stage classification were identified including, adult male, adult female, adult unclassified sex, sub adult, yearling, or cub. Additionally, grizzly bear activity types, including bedding, foraging, fishing, and transiting, were classified for each detection. Sequential groups of wildlife images were grouped into detection 'bursts' and given a unique identifier. Rather than relying on individual images, grouping detections as bursts allowed us to develop a count of grizzly bear occurrences in the cameras and minimized double-counting individuals or family groups. This method has been applied to all wildlife detections, as well as human detections including boats, providing thorough multi-species detection histories for the Upper Chilko study area.

Preliminary trends and detection counts have been developed from the dataset in the grant award period. To date, there have been a total of 5878 multi-species occurrences with 2529 grizzly bear detections and 727 human detections. Of the 2529 grizzly bear detections, 2413 (~95%) occurred in either the fall of 2021 or 2022. Of these, 1058 and 1355 detections were in the fall (September – November) of 2021 and 2022, respectively. In the fall, a total of 1588 detections were solitary bears, and 825 detections were family groups (a sow with at least one cub). There has been an increase in family group detections from 375 to 450 in the fall of 2021 and 2022.

In total, there were 727 human detections, with 516 occurring in the fall and decreasing from 2021 (308 detections) to 2022 (208 detection), likely due to the seasonal closure of the Chilko-Newton Rd south of Henry Crossing. In the study area, the primary mode of transportation in human detection was by boat with 449 detections (62%). Of The 449 boat detections, 360 (80%) occurred during the fall and 294 (66%) were motorized. Boat detections occurred primarily between 9:00 AM and 6:00 PM, which is when the majority of boat-based viewing is conducted.

Grizzly bears were most active (i.e., more detections) during the fall hours of dawn and dusk and the nocturnal period. There was greater spatial and temporal overlap between family groups and bear viewing as family group detections were higher during bear viewing hours (9:00 AM – 6:00 PM), compared to dawn/dusk and nocturnal periods. Of the 1940 grizzly bear detections during the falls of 2021 and 2022, only 412 (21%) occurred during primary bear viewing hours, with half of these detections being grizzly bear family groups. The remaining detections (1528) occurred outside of bear viewing hours with solitary individuals representing two thirds of detections. Differences in spatial and temporal patterns of detections between family groups and solitary individuals provide preliminary evidence in support of the human shield hypothesis.

Once detection data are collected for the fall of 2023, we will complete mixed-effects models using an information-theoretic framework to test support for competing hypotheses related to the influence of human activity, boat-based viewing, and resource availability on grizzly bear detection and activity patterns. These models will consider factors such as human detections, salmon availability, habitat type, time of day, and season, on grizzly bear behavior characterized using detections (binomial) and counts (Poisson). We will account for local conditions and pseudo-replication in the detection histories by including the camera ID as a random effect.

### **How does this work contribute to the overall project objectives (i.e., to completion of your thesis?)**

This grant has supported multiple field work trips to upper Chilko River over the last year to collect data, maintain the camera grid, and liaise with Tsilhqot'in and BC biologists and operators. This grant has supported me through extensive data entry and development of AI models for developing detection histories for grizzly bears, the focus of my research, as well as for other species, which will be of use for the Tsilhqot'in and Xeni Gwet'in. This work has formed the foundation of my M.Sc. thesis, which will focus now on the development of mixed-effects models to quantify relationships between grizzly bear activity and detection counts and patterns of human activity, resource availability and habitat, which will form the core of my thesis to be completed by August 2024.

**How have you communicated about this project and work?**

- Within the academic community?
- With project partners including non-academic and community members?
- With government staff?

Project communications with the Tsilhqot'in National Government, the BC Government, and operators in the Chilko region has occurred primarily through the Upper Tsilhqox Working Group, which includes TNG staff, including their wildlife and land management (i.e., NEN planning) group (Mitchell Warne, John Lerner, Jessica Bratty), as well as BC Parks (Steven Hodgson, Kurt Williams), and provincial biologists from the BC Ministry of Forests (Shane White, Chris Swan, Garth Mowat, Lori Homstol, Christina Waddle). We have provided bi-annual updates to the Working Group for the last two years. The Upper Tsilhqox Working Group has been tasked with helping to develop guidance on the implementation of regulations for bear-viewing in the Tsilhqot'in Title Lands and has been liaising with the operators on project results. Findings from this project have been considered and influential in achieving this task and have also assisted in the creation of a province wide commercial bear viewing strategy framework.

With the help of the Upper Tsilhqox Working Group, research methods and objectives of this project have been communicated to Tsilhqot'in community members and the public within the study area. Information includes field work dates and logistics, project milestones, and findings. Results and updates have been provided to the public through the media and meetings on site with operators to gain their opinion on project objectives. By sharing this work with operators and members of the community, space was created for education on human-bear relationships and dynamics.

Initial project findings, as well as study design and methods, have been communicated through presentations and seminars among the academic community at UBCO. This has helped guide the research methods as input and suggestions from other professors, researchers and graduate students were considered.

### **How have you fulfilled the commitments of your knowledge management plan?**

Since its establishment in 2021, the Upper Tsilhqox Working Group has been the focal point of knowledge mobilization. Working with these partners, results have reached members of the Tsilhqot'in Nation, the bear-viewing operators, and the public who visit Ts'ilos Provincial Park and the region. Given the diverse group involved, knowledge has been translated into management recommendations and policies, ultimately guiding bear viewing and public access in the area for the present, and future.

Wildlife detection histories (grizzly bear and multi-species), as well as the original imagery, will continue to be shared with TNG and the BC Government using a data sharing platform (Globus) at UBCO. Besides the grizzly bear detection histories, spatial and temporal multi-species and human detection data can help support NEN planning of the Tsilhqot'in Nation which is a community-led and territory-wide planning process for water and resource management, and will support research of future students at UBCO.

As the focal species of the project, data analysis using grizzly bear detections has helped understand spatial and temporal patterns and trends in grizzly bear behaviour in relation to human activity. This information is being used by TNG for NEN planning and by the BC Government to develop bear-viewing guidelines and regulations in the Chilko, as well as province-wide. As a project partner, we have consistently communicated information on grizzly bear patterns and trends to TNG and the BC Government. This involves communicating where grizzly bear occurrences are higher and lower, as well as detections of collared individuals and whether they are with young, which is supporting additional research being led by TNG. Besides understanding the potential impacts of bear viewing on bear behaviour, TNG has also requested information on where and when bears are most active on the Chilko river during the fall salmon run. We have provided this information to help ensure safe and successful salmon harvests by Tsilhqot'in community members, which avoid areas with high bear detections and potential human-bear conflict. The detection data, supplemented with telemetry data from collared bears and genetic samples from hair snags being led by TNG, will provide a comprehensive understanding of grizzly bear biology and ecology in the Tsilhqot'in Title Lands.

### **Where will the data and/or information collected from this project be stored?**

Detection histories and imagery are being stored on servers associated with the Earth Observation & Spatial Ecology Lab at UBCO. These data are being transferred to the BC Government (Cariboo region) and TNG using Globus, which provides access to data files through a secure uplink. Moving forward, we will continue to work with the Upper Tsilhqox Working Group to make information available to operators and the public.

As I continue to work on my thesis and a peer-reviewed publication from this work, we will continue to communicate with TNG on information that we can make public to ensure reproducibility of the research while ensuring that culturally sensitive information is not divulged. All code, including training information for the MegaDetector AI wildlife detection and classification model, will be available on the lab Github. The thesis will be available through UBC Open Collection and will be shared with all project partners. We will also publish results from the research in an open access journal to make the work accessible to all partners.

**Please provide links to any publicly available information on or from your project:**

Communications with the public and operators in the region has primarily occurred through the Upper Tsilhqox Working Group, who have hosted bi-annual meetings with community members and operators, and helped guide the release of information. However, results from the project have helped inform seasonal closures of public access in the Chilko river area to minimize potential for human-bear conflict:

<https://www.mycariboonow.com/83155/featured/increased-grizzly-activity-in-the-upper-chilko-river-area-to-temporarily-close-one-road/>

**Budget Reporting**

Budget Item	Details	Proposed Amount	Actual Amount	Comments
Student stipend (MSc)		20,000	20,000	Monthly graduate research assistant stipend
Transportation		3,000	3,000	Mileage for trips between UBCO and Chilko river area
Food & accommodation		2,000	2,000	Hotels, camping fees, and food for four field work trips
<b>TOTAL</b>		<b>25,000</b>	<b>25,000</b>	