Project Profile

Project Name:	Developing and Monitoring the Efficacy of Functional Restoration of Linear Features for Boreal Woodland Caribou
Project Number:	BCIP-2016-17
Proponent:	Matrix Solutions Inc.
Funding Envelope:	Boreal Caribou
Timeframe:	October 2015 to April 2017 (Phase 1b) April 2017 to October 2018 (Phase 2)

Project objectives

The goal of this research program is to develop a mitigation strategy to facilitate the functional restoration of linear disturbances in the Parker Caribou Range, and develop a complementary monitoring design to measure mitigation success using animal data.

Project description

Environment Canada and the British Columbia Ministry of Environment (B.C. MoE) have identified that habitat restoration is required to sustain woodland caribou populations in northeast British Columbia. However, woodland caribou habitats require decades to recover to pre-disturbance conditions. Wilson [1] identified that functional restoration is needed as an interim strategy to mitigate impacts while caribou habitats recover. Wilson defines functional restoration as the outcome of a management action that mitigates a risk from ecosystem disturbances.

Caribou habitats have low overlap with predators. However linear disturbances can reduce spatial separation and increase predator efficiency [2] increasing encounters between predators and woodland caribou [3,4]. Studies show that predation is the most common source of mortality in adult woodland caribou [5], and predation rates are influenced by encounter rates and population size [6,7]. Thus, mitigations that reduce encounter rates by reducing predator movement or enforcing spatial separation between caribou and predators must, necessarily, reduce predation given constant population size. A pilot study conducted by Keim et al. [8] shows that log blocking treatments applied on linear disturbances can reduce use by wolves along 200 m segments of linear features. However, it is unclear if such mitigations disrupt the functional response between predators and caribou at larger spatial scales relevant to caribou demography [1]. A Habitat Restoration Pilot Program (Golder Associates Ltd.; BCIP-2016-16) aimed at implementing large-scale habitat restoration is currently being conducted within the Parker Caribou Range. This research program facilitates the restoration pilot by providing animal use data, which can be used to guide the design of restoration treatments

(i.e., placement and prescription). More broadly, the research program aims to provide non-invasive methods to recover and monitor functional woodland caribou habitat across portions of the Parker Caribou Range. The program is using motion-sensing cameras to collect habitat use data continuously across seasons on humans and large mammal species that interact in this ecosystem (e.g., humans, wolves, bears, caribou, moose, deer, etc.).

Project approach

In November 2015, we developed a science-based sampling design and deployed 85 motion-sensing monitoring cameras to monitor large mammal use on disturbed (linear features) and undisturbed (game trails) conditions. An additional 15 cameras will be deployed as part of Phase 2 (Summer, 2017) in areas subject to restoration activities in the winter of 2017.

Rates of habitat use are currently being collected for large mammal species that interact in this ecosystem (e.g., humans, wolves, bears, caribou, moose, and deer) at camera monitoring sites. The project will be continued using the following approach:

1) Use motion-sensing cameras to collect continuous animal use data pre-restoration treatment application (November 2015 to January 2017) and post-restoration treatment application (January 2017 to July 2018) within the Parker Caribou Range.

2) Collect vegetation data at each camera monitoring site in June 2016 to support the broader restoration program. Measuring how the rate of use by wolves and large mammals varies by naturally occurring variation in vegetation could help land managers determine when restoration treatments are warranted and guide restoration treatments.

3) Analyze animal use data collected between camera deployment and the first maintenance survey (November 2015 to June 2016) to support the timing of the implementation plan for restoration applications in the Parker Range. Ideally, the analyses would consider a full year of animal use data to account for seasonal changes in wildlife ecology. However, a preliminary analysis of animal use data using the first 7 months of data could be conducted in time to

support the Habitat Restoration Pilot Program aiming to deploy restoration treatments within the range in early 2017.

4) Based on the results from the first 7 months of data collection, recommend mitigation and monitoring strategies that can be trialed to restore functional caribou habitat.

5) Trial "scaling up" site-level mitigations to restore functional caribou habitat across portions of the Parker Caribou Range in early 2017, in cooperation with the Habitat Restoration Pilot Program (BCIP-2016-16) and Research and Effectiveness Monitoring Board (REMB).

6) Collect animal use data across the Parker Caribou Range after deploying restoration treatments to measure the efficacy of mitigations to recover functional habitat by reducing the overlap between predators and caribou.

The analyses are designed to answer the questions, "how well does the treatment reduce predator use?" and "are predators leaving the treatment area?" These questions are key to measuring how successful functional restoration is at reducing predator use and predator-caribou overlap. A schematic showing how predator use is hypothesized to change across time, mitigation treatment, and feature type is provided below. Success will be measured if the rate of predator use: (1) on linear features is lower in the treatment area than in similar control areas; (2) on linear features in the treatment area approaches the rate of use on game trails; and (3) on game trails within the treatment area remains constant or declines.

Predicted response of wolf use before mitigations and after mitigations on linear features (Line) and animal trails (Trail)
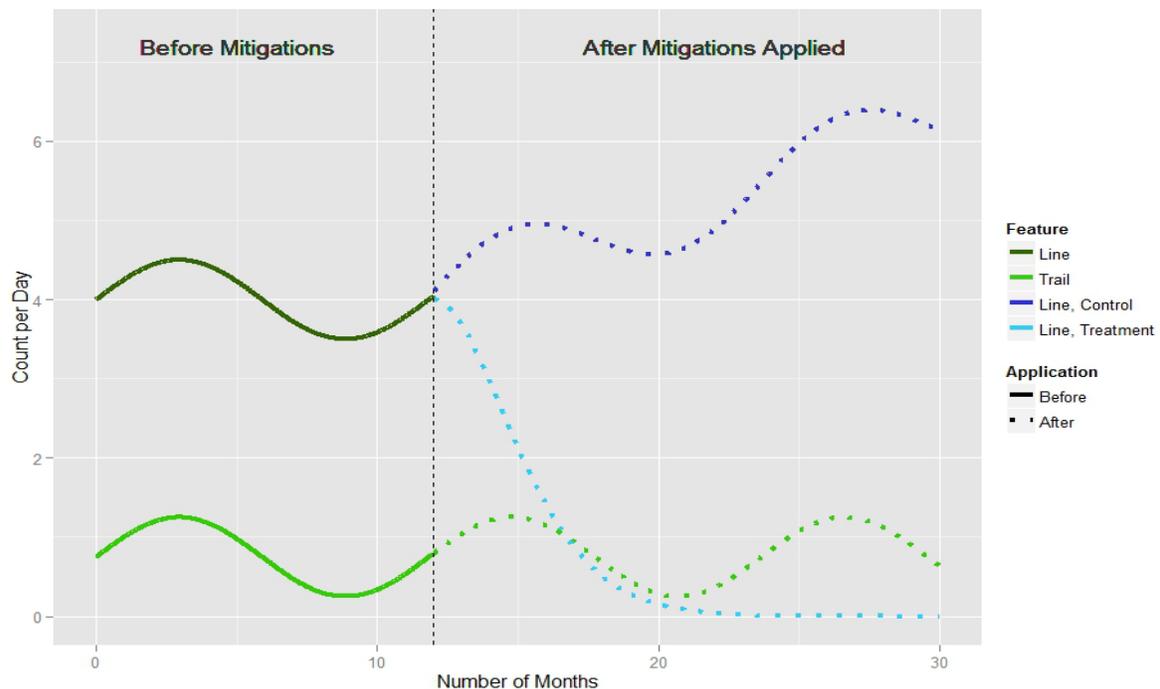
Project deliverables

The deliverables from this project include the following:

1. Technical Report (Q1 2017) – describe the sampling design, methods, and results from the first year of data collection quantifying the relationships between predators, linear features, and prey within the Parker Caribou Range when no mitigation treatment is present. The report will include recommendations related to restoring functional caribou habitat.

2. Final Report (Q3 2018) – summarize the sampling design and methods, describe line-blocking mitigations, and detail results from full research program. Results will evaluate how well functional restoration treatment is at reducing predator use and predator-caribou overlap, and propose actionable mitigation and monitoring strategies.

[1] Wilson. 2015. Role of functional restoration in woodland caribou recovery. Unpublished Report. [2] DeCesare. 2012. Separating spatial search and efficiency rates as components of predation risk. *P Royal Society B* 279. [3] Whittington et al. 2011. Caribou encounters with wolves increase near roads and trails: a time to event approach. *J Appl Ecol* 48. [4] McKenzie et al 2012. How linear features alter predator movement and the functional response. *Interface Focus* 2. [5] McLoughlin et al. 2003. Declines in populations of woodland caribou. *J Wildl Mgmt* 67. [6] Hebblewhite et al. 2005. Spatial decomposition of predation risk using resource selection functions: an example in a wolf elk predator prey system. *Oikos* 111. [7] Messier. 1994. Ungulate population models with predation: a case study with the North American moose. *Ecology* 75. [8] Keim et al. 2014. Understanding and mitigating the effects of linear features and snow condition on caribou predator prey overlap in the Alberta Oil Sands. *15th NACW, Whitehorse, YT*.