Developing and Monitoring the Efficacy of Functional Restoration of Linear Features for Boreal Woodland Caribou– 2018 Image Analysis Report

Prepared for:
BC Oil and Gas Research and Innovation Society

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

August 2018

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DEVELOPING AND MONITORING THE EFFICACY OF FUNCTIONAL RESTORATION OF LINEAR FEATURES FOR BOREAL WOODLAND CARIBOU - 2018 IMAGE ANALYSIS REPORT

PARKER CARIBOU RANGE

Report Prepared for:
BC OIL AND GAS RESEARCH AND INNOVATION SOCIETY

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Version 1.0
August 2018
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Report prepared for BC Oil and Gas Research and Innovation Society, August 2018

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VERSION CONTROL

Version	Date	Issue Type	Filename	Description
V1.0	14-Aug-2018	Final	21861-537 R 2018-08-14 final V1.0.docx	Issued to client

EXECUTIVE SUMMARY

Environment Canada and the British Columbia Ministry of Environment 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. Functional restoration (e.g. line blocking) is therefore needed as an interim strategy to mitigate impacts while caribou habitats recover. The functional restoration of linear disturbances may benefit woodland caribou by reducing predator movement rates and enforcing spatial separation between caribou and predators.

The overarching goals of our research program are to develop (1) a non-invasive mitigation strategy that facilitates the functional restoration of linear disturbances at scales relevant to caribou demography; and (2) a monitoring design to measure the merit of mitigation strategies based on animal response data. The study follows a before after control impact design that measures how predators use a caribou range in both space and time. This entails monitoring the spatiotemporal patterns of large mammal use across an entire caribou range for at least 1 year, under both disturbed (linear features) and undisturbed conditions (game trails), deploying functional restoration treatments on linear feature disturbances, and then monitoring the rates of animal use following treatment deployment.

We developed a sampling design and deployed 100 motion-sensing monitoring cameras to monitor large mammal use on disturbed and undisturbed conditions across the Parker Caribou Range. In total, we collected continuous monitoring data from November 2015 to June 2018 using motion-sensing cameras. Monitoring data were collected before and after the functional restoration mitigations were deployed in January through March 2017. All cameras were removed in June 2018, as the field data collection component of the project was completed. This 2018 report provides a tally of the photographic record from June 2017 to June 2018.

In June 2018, Matrix conducted a field survey to download images from each motion-sensing monitoring camera and to remove monitoring cameras. Data collected during the June 2018 field program represented large mammal and human use data collected across 33,026 camera monitoring days between June 2017 and June 2018. Matrix's 2018 project scope did not include data evaluation relative to the study questions. A final dataset will be delivered to the BC Oil and Gas Research and Innovation Society (BC OGRIS). Data analysis and evaluation of the entire dataset will be coordinated through BC OGRIS.

ACKNOWLEDGEMENTS

We would like to thank BC OGRIS for funding this research program, and the Research and Effectiveness Monitoring Board for providing feedback on the research program. This program has particularly benefited from the support and guidance of Brian Thomson and Steven Wilson.

We are grateful to Jonah Keim, Philip DeWitt, and Subhash Lele, who were integral to the project's conception, design, and implementation.

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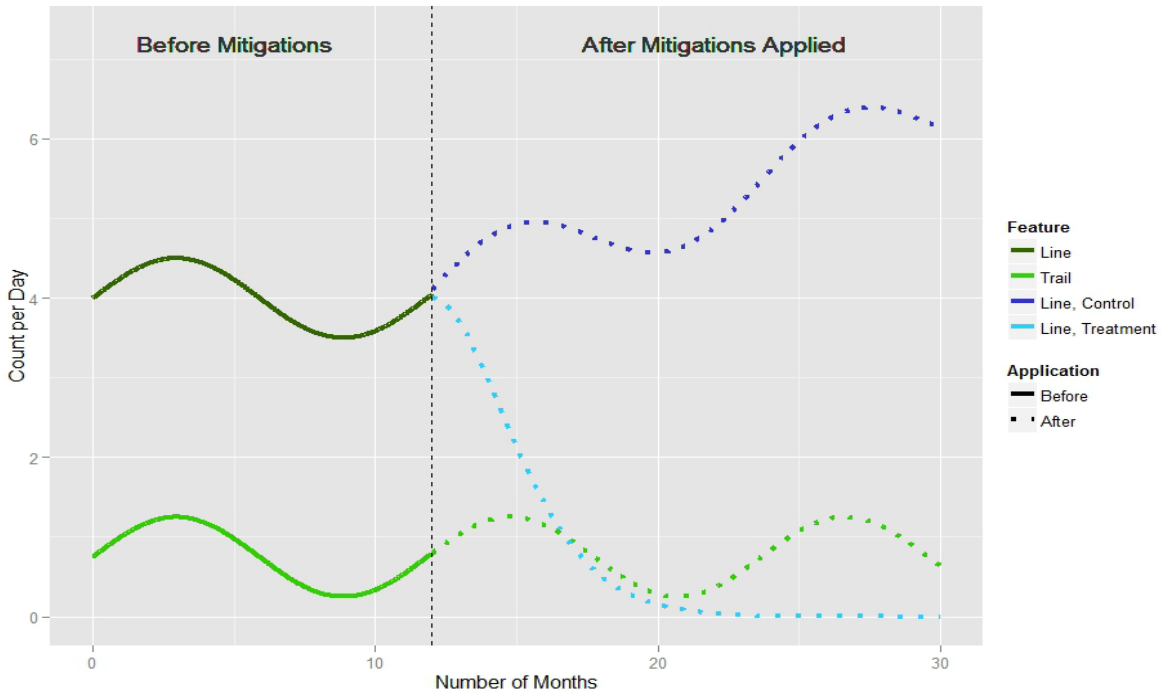
1 BACKGROUND

In 2015, Matrix collaborated with BC OGRIS to develop a wildlife monitoring program with the objectives to: (1) inform the development of mitigation strategies that facilitate the functional restoration of linear disturbances in the Parker Caribou Range; and (2) measure the success of the mitigation strategies using animal data. Specifically, the study was designed to answer the questions "how well does the restoration treatment reduce predator use?" and "are predators leaving treatment areas?" 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.

FIGURE 1 Predicted Response of Wolf Use before Mitigations and after Mitigations on Linear Features (Line) and Animal Trails (Trail)



In November 2015, Matrix deployed 85 motion-sensing monitoring cameras to monitor large mammal use on disturbed (linear features) and undisturbed (game trails) conditions across the Parker Caribou Range. Wildlife use data were collected on pre-mitigation conditions from November 2015 through November 2016. A report summarizing pre-mitigation data, containing detailed objectives, methods, and results was delivered to BC OGRIS in April 2017 (Matrix 2017a). Functional restoration mitigations were applied to Zone 1 of the study area in early 2017 (Golder 2017). In June 2017, Matrix conducted a field survey to download images from each motion-sensing monitoring camera, and ensure that the

cameras were operational to continue monitoring post-mitigation conditions. In addition, Matrix deployed 15 motion-sensing monitoring cameras at new monitoring locations within Zone 1, in order to increase data capture on Zone 1 mitigation effects. Further details on camera locations were documented in a separate report (Matrix 2017b).

Photographic data collected during the June 2018 field program represents monitoring data from June 2017 to June 2018, monitoring post-mitigation treatment conditions in the Parker Caribou Range. This report summarizes the photographic data collected during the June 2018 field program and outlines next steps for the project. Matrix's 2018 project scope did not include data evaluation relative to the study questions. A final dataset will be delivered to BC OGRIS. Data analysis and evaluation of the entire dataset will be coordinated through BC OGRIS.

2 METHODS

Motion-sensing cameras often record multiple photographs of individuals walking in front of the cameras' field of view. Since the count of photographs by species is of no value for our monitoring program, data was interpreted on an event-by-event basis. One count event is defined as an individual, or group of individuals of the same species detected across a discrete time-period in front of a camera. Defining a count event is important to avoid inflating counts, as animals often trigger a camera multiple times by moving back and forth in front of the monitoring station. A data set of multiple photographs collected continuously of a single animal that remains in front of a camera (e.g., feeding or standing) is considered one count event. When multiple individuals of the same species (e.g., a pack of wolves) trigger a camera, we consider this a single, multiple-individual count event. If an individual animal triggered a camera, left the monitoring station, and then returned more than 10 minutes after the original trigger, we considered this two count events. For each individual event, data were recorded on species, sex, age class, time, date, and the number of animals or humans counted.

3 SUMMARY OF PHOTOGRAPHIC DATA

Motion-sensing cameras collected continuous data on large mammals and humans between June 2017 and June 2018. Data from 2 of 100 motion-sensing cameras were lost due to hardware/software malfunctions. The remaining cameras collected data across 33,026 camera monitoring days. A summary of large mammal and human counts detected on linear features and game trails is provided in Table 1.

TABLE 1 Summary of Large Mammal and Human Detections on Linear Features and Game Trails and Total Camera Monitoring Days

Species	Count of Individuals Detected		
	Linear Features	Game Trails	Total
Caribou	685	143	828
Black Bears	331	260	591
Humans	402	0	402
Moose	366	265	631
Wolves	212	45	257
Elk	40	245	285
White-Tailed Deer	9	4	13
Grizzly Bears	3	1	4
Total Camera Monitoring Days	**22,277**	**10,749**	**33,026**

In addition to the species listed in Table 1, the motion-sensing cameras detected a number of additional species as listed below:

- American robin (*Turdus migratorius*)
- American beaver (*Castor canadensis*)
- American marten (*Martes americana*)
- Canada goose (*Branta canadensis*)
- Canada lynx (*Lynx canadensis*)
- Common raven (*Corvus corax*)
- Coyote (*Canis latrans*)
- Fisher (*Pekania pennanti*)
- Gray jay (*Perisoreus canadensis*)
- Mallard (*Anas platyrhynchos*)
- North American porcupine (*Erethizon dorsatum*)
- North American river otter (*Lontra canadensis)*
- Northern harrier (*Circus cyaneus*)
- Red fox (*Vulpes vulpes*)
- Red squirrel (*Tamiasciurus hudsonicus*)
- Ruffed grouse (*Bonasa umbellus*)
- Sandhill crane (*Grus canadensis*)
- Sharp-tailed grouse (*Tympanuchus phasianellus*)
- Snowshoe hare (*Lepus americanus*)
- Spruce grouse (*Falcipennis canadensis*)
- Wolverine (*Gulo gulo)*

4 NEXT STEPS

All field data collection has been completed and Matrix is now compiling a final project database inclusive of the entire monitoring period (November 2015 to June 2018). Results from the first year of monitoring (2015 to 2016) increased our understanding of wildlife and human use in the Parker Caribou Range prior to the application of functional caribou habitat restoration mitigations. Post-mitigation monitoring data collected in June 2018, in combination with pre-mitigation monitoring data collected, will be submitted to BC OGRIS. Interpretation and analysis of this compiled dataset will measure the success of the mitigation strategies using animal data. Data analysis and evaluation of the entire dataset will be coordinated through BC OGRIS.

5 REFERENCES

Golder Associates (Golder). 2017. *Pilot Boreal Caribou Habitat Restoration Program Year 1 (2017) Implementation Report*. Report prepared for BC OGRIS REMB. April 2017. http://www.bcogris.ca/sites/default/files/bcip-2017-01-final-implementation-report-may-117.pdf

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