Fort Nelson First Nation Boreal Caribou Habitat Restoration at The Kotcho Lake Restoration Area

Final Project Summary for the BC OGC and OGRIS

Summary Compiled by Katelyn White – BCOGC; based solely on the report authored by Anne Hervieux, Jesse Tigner, Susan Leech, and Katherine Wolfenden dated July 29, 2021.

Introduction

In 2020 Fort Nelson First Nation (FNFN) identified a restoration area of 60,000 hectares within the Snake-Sahtenah boreal caribou range in northeastern British Columbia, referred to hereafter as the Katcho Lake Restoration Area or KLRA. This area is of high priority to FNFN because of the high caribou use in the area, the high portion of potentially suitable caribou habitat, the area has low likelihood for future development, is proposed for protections under the provincial draft Boreal Caribou Protection and Restoration Plan, the high density of linear features (more than 16 km/km^2), and the high cultural importance of the area to FNFN.

In January of 2020 amendment number one was signed. This amendment renewed and extended the original project to expire March 21, 2021.

In August of 2020 amendment number two was signed. This amendment allowed funding support and project objectives from the original 2018/2019 agreement to be extended to include the Caribou Habitat remediation work within the Katcho Lake Restoration Area.

The objectives of this work was to answer the following questions:

- Is landscape scale restoration enough on its own to start to see an increasing caribou population over time?
- Can we do treatments in the fall, using cost-effective measures and approaches that are more acceptable to FNFN than conventional winter treatments such as mounding and planting?
- If yes, where should we focus these treatments? Which areas are most important to treat to achieve a widespread effect?
- How quickly do we see a vegetation response on the site?
- How does that affect site-level changes in wildlife movement?
- How does that translate into changes in use at a larger scale by caribou over time, and spatial separation of moose, wolves and caribou?
- And finally, how quickly does lambda start to recover in this area? This is the Snake Sahtaneh range, so caribou population growth has been below one for many years.

In 2020/2021 the research partners selected priority areas for treatment based on the intersection of large, legacy seismic lines and our experiences in 2019/2020. The selected areas were treated using a variety of approaches, including

- whole hummock transplantation
- scraping and planting
- falling trees where suitable to block lines.

To determine the effectiveness of these efforts, FNFN continued to employ three levels of monitoring used in year 1 of this project:

- landscape level winter track surveys to determine the distribution of wildlife use across the study area and a larger survey area, primarily focused on the overlap between caribou, moose and wolves
- wildlife cameras to track site-level wildlife use over time along treated and untreated lines; and
- vegetation plots to track vegetation responses to treatments.

Summary of Works

Treatments

In summer of 2020, the team delivered treatment to 13.44 km of linear features. Treatments were done on a combination of conventional seismic lines, conventional seismic lines that were reopened using LIS techniques (e.g., mulching), and new mulched LIS seismic lines. Most treatments were delivered along conventional and reopened conventional lines.

Treatments were both clustered in space along lines and focused on intersections in order to functionally restore a greater area. Specifically, clustered treatments result in segments of line with treatment areas interspersed with untreated segments. By treating lines in segments and focusing on intersections, restoration benefits are gained by line segments and lines even though they were not directly treated.

Fifty-three treatment locations were completed in 2020, and 33 were specifically delivered across individual line intersections (see Figure 1 and Figure 2).

Additionally, tree modifications were done at treatment sites and between treatments. **In total 13.44 km of seismic lines were closed to wildlife movement and were functionally restored** (3.23 km of conventional seismic lines, 4.26 km of conventional seismic lines that were reopened using LIS techniques, and 6.28 km of new mulched LIS seismic lines).

Outcomes from the restoration work in 2019, and ongoing monitoring, indicated that using a combination of a small excavator and hand tools for the restoration treatments produced the best results. We employed these approaches to transplanting hummocks, planting seedlings, and modifying trees.

A total of 4.31 ha was directly treated with transplanting hummocks, planting seedlings, and modifying trees and are considered ecologically restored.

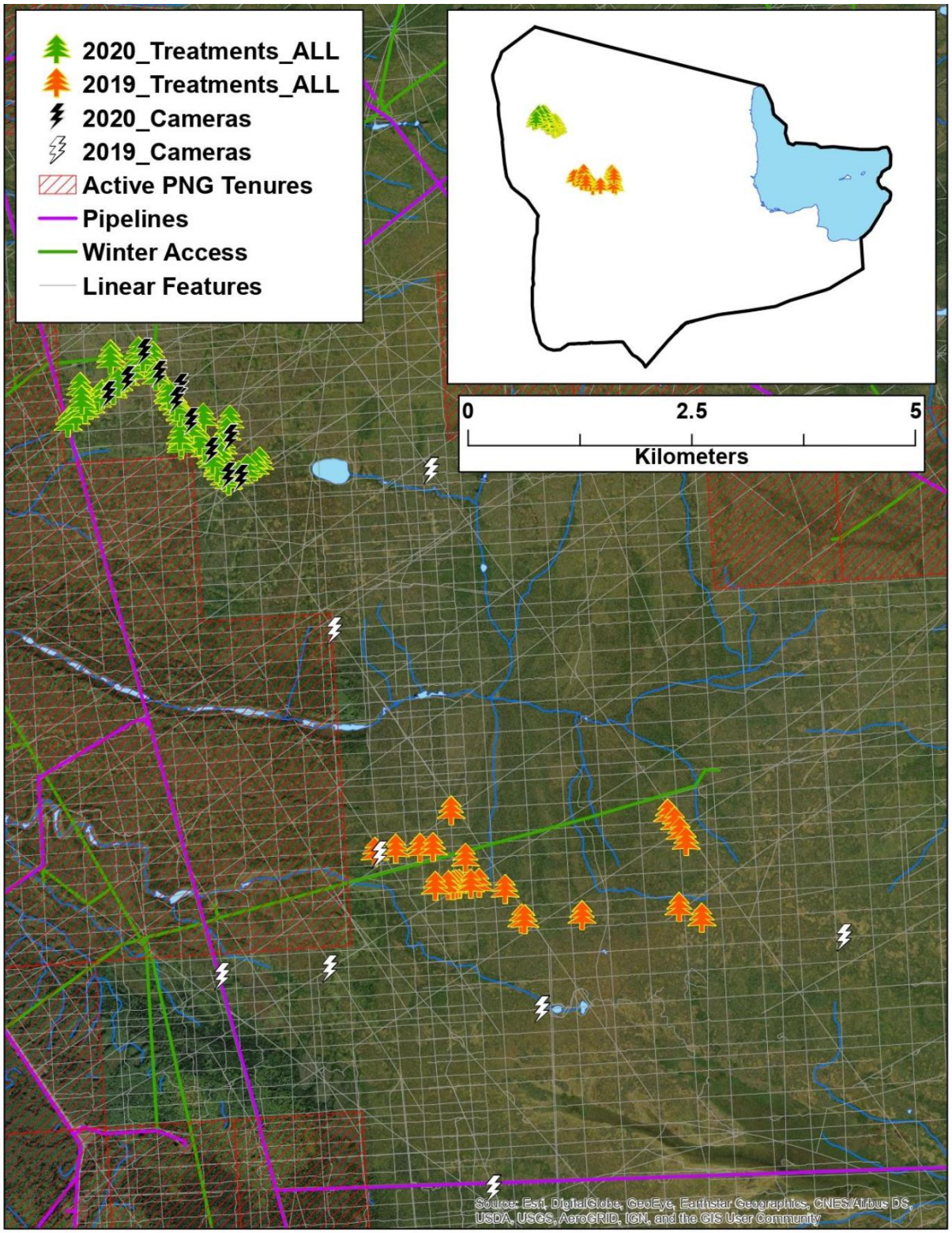

Figure 1. A map of the seismic line restoration treatment locations and wildlife camera stations within the KLRA study area from 2019 (Year 1) and 2020 (Year 2).

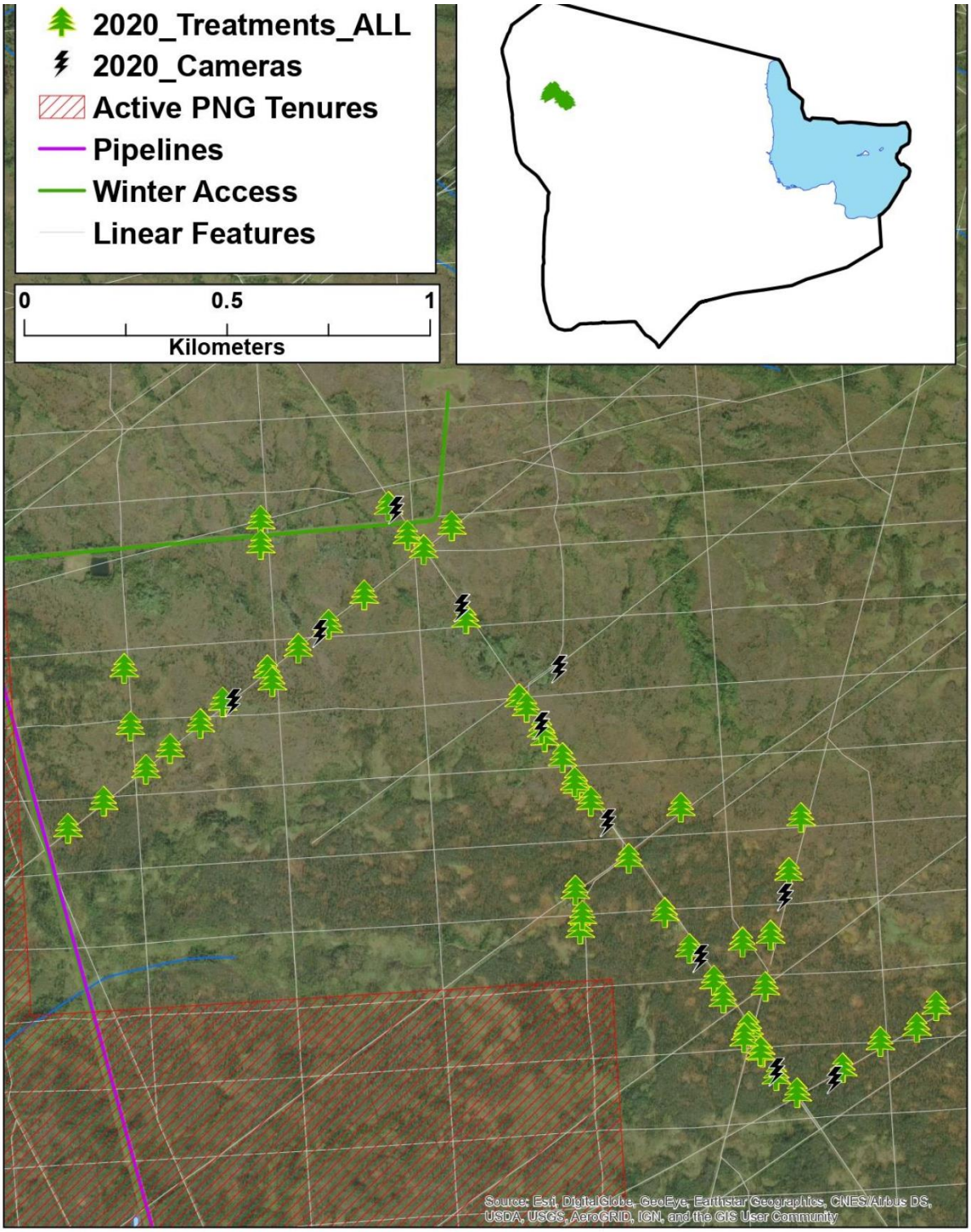

Figure 2. A map of the seismic line restoration treatment locations and wildlife camera stations within the KLRA study area from 2020 (Year 2).

Monitoring

Snow tracking is being used in the Katcho Lake Restoration Area to monitor landscape-scale wildlife use within the study area. The purpose of this monitoring is to determine a baseline of species use within segments of the study area and to evaluate how use may change in response to seismic line treatments. The design of the snow tracking surveys is meant to answer the following questions:

- What is the baseline distribution of mammals within the study area?
- How does use change in response to restoration treatments at a broad scale?
- What is the relative use across the study area by caribou and moose?
- Does landscape use by caribou and moose overlap within the study area and region, and does this use overlap with wolves?

Snow track surveys for tracks and animals was completed from air using a helicopter. The Katcho Lake Restoration Area was divided up into 10 km2 hexagons and then each hexagon has six 1.7 km long survey transects passing from one of each of the six edges and through the centre of the hexagon (Figure 3).

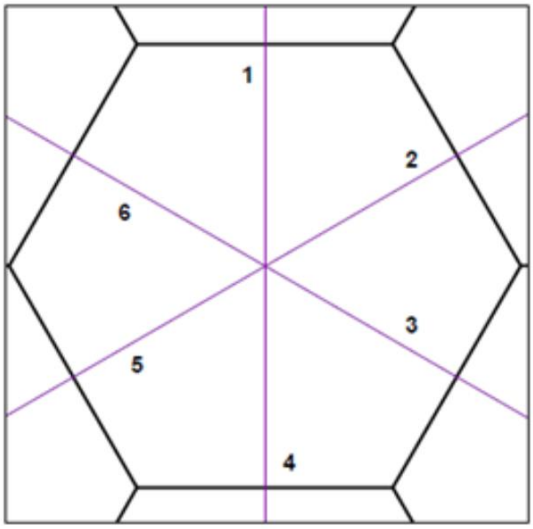

Figure 3. A single 10 km2 hexagon with six 1.7 km long survey transects.

To conduct surveys, the team searched one to six transects per hexagon while flying between 60 and 100 knots and 20 and 100 m above the ground as needed to clearly identify tracks. They circled and or followed tracks until a positive identification could be made and then returned to the point of departure along a transect to continue surveys. In 2021 they used one spotter (front seat, right side) and one spotter/recorder (rear, left) to search for track and sign; the same helicopter pilot has flown all surveys and also assisted in locating and identifying tracks and sign. In 2019, a fourth person participated (rear seat, right side) with the primary task of recorder. They recorded all observed tracks and sign that had accumulated since the last snowfall to species and marked all locations with a waypoint. All observed ungulates were also classified to sex and age and any collars were noted.

To evaluate the influence of line restoration treatments on observed caribou use in each hexagon, they compared counts of caribou detections within treated and adjacent hexagons before and after

treatment delivery. The team considered all detections equivalently when generating counts for comparison (e.g., no differentiation was made between observations of animals, tracks, or craters, and the number of unique observations were tallied even if multiple animals, tracks, or craters were observed), and pooled treated and adjacent hexagons as a single class. They ran two series of analyses to compare potential change in use one year and two years after treatments. The team used all hexagons treated in fall 2019 and 2020 to make a comparison in use between winter 2019 to 2020 and winter 2020 and 2021, respectively (n = 14). For the 2021field work they used all hexagons treated in fall 2019 to make a comparison in use between winter 2019 and 2021 (n = 7). In both they used a generalized linear mixed model to compare counts among hexagons before and after treatment (glmmTMB in r; Brooks et al. 2017) with a negative binomial family structure to account for overdispersion calculated as a quadratic parameterization with a log link function. They treated hexagon as a random effect (i.e., hexagon as the grouping factor with a constant effect).

Results

Consistently high detection probabilities in 2019 and 2020 significantly improved survey efficiency by reducing the overall required survey effort per hexagon (e.g., fewer transects were needed as species were observed consistently along multiple transects within a given hexagon). This allowed the team to increase the spatial extent of the surveyed area to include more area in the northeast where additional caribou sign had been observed in previous years and during previous survey flights. On March 3 and 5 in 2021 they surveyed a total of 77 hexagons (1-6 transects per hexagon; Figure 4). Of these hexagons, 60 overlapped the original Katcho Lake Restoration Area surveyed in all years (from 2019 through 2021; Figure 5). Within the Katcho Lake Restoration Area study area boundary: in 2019 they surveyed 560.65 km across 295 transects in 63 hexagons; in 2020 the team surveyed 466.95 km across 244 transects in 61 hexagons; and in 2021 the team surveyed 371.18 km across 218 transects in 60 hexagons (Figure 5, top middle and bottom panels respectively).

Despite the lower over all survey effort within the study area in 2021, the observed unique detections of tracks and signs across all species was comparable to other years. Similarly, the distribution of all species' detections was also comparable across years (Figure 6). Notably, we observed a sharp increase in wolf activity across the study area, including both evidence of wolf packs and lone individuals. The team also recorded fewer detections of lynx in many fewer hexagons, and anecdotally, fewer snowshoe hare tracks. Most detections were of single tracks or sign, but in some cases multiple individual tracks were observed together. All caribou craters and moose yards were considered a single detection because it was typically difficult to count individual craters or to differentiate individual tracks. Work is ongoing to evaluate species-specific detection probabilities and to incorporate those metrics into further analyses; however raw 2021 survey results support previous observations of very high detection probabilities across species within the study area

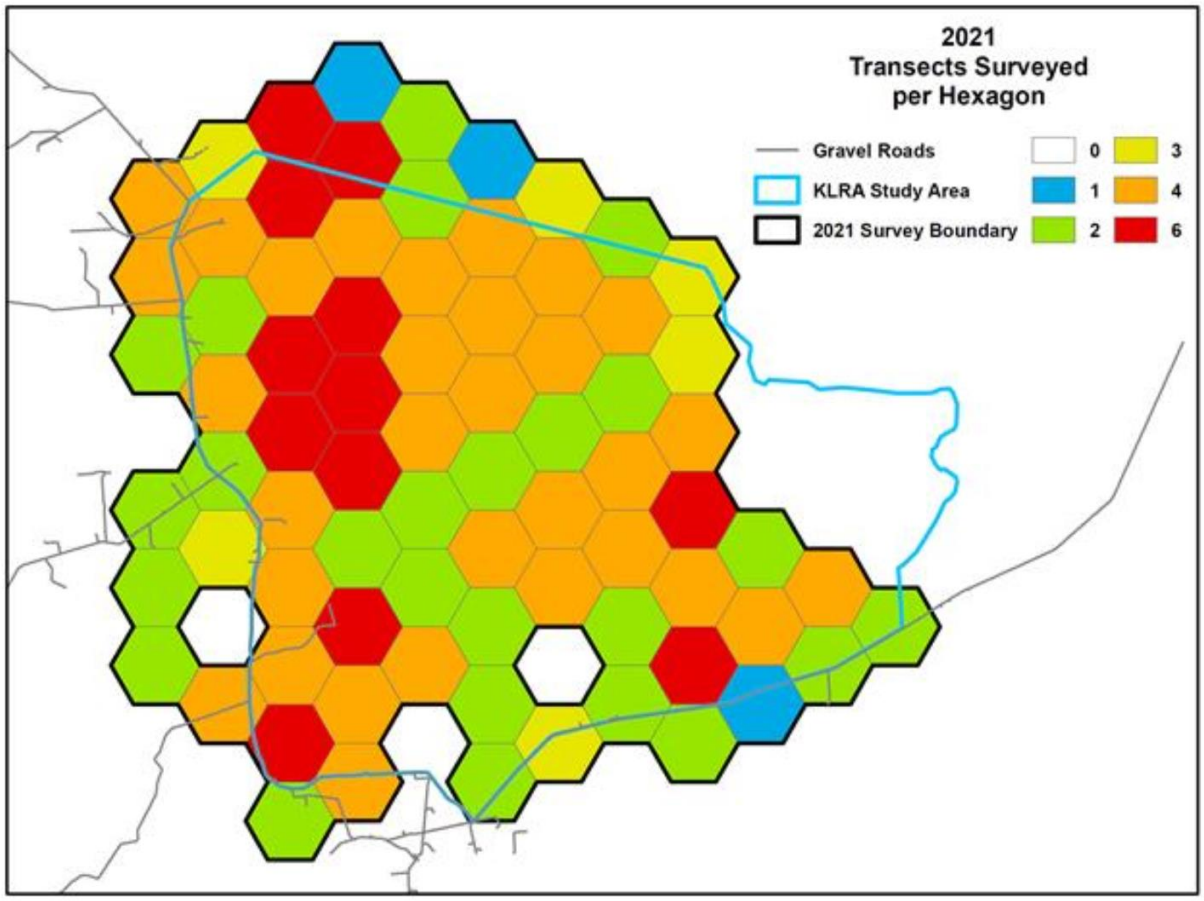

Figure 4. In March 2021, snow tracking surveys were conducted along between one and six transects (color codes in the map legend) within 77 hexagons in the greater KLRA study area in NE BC.

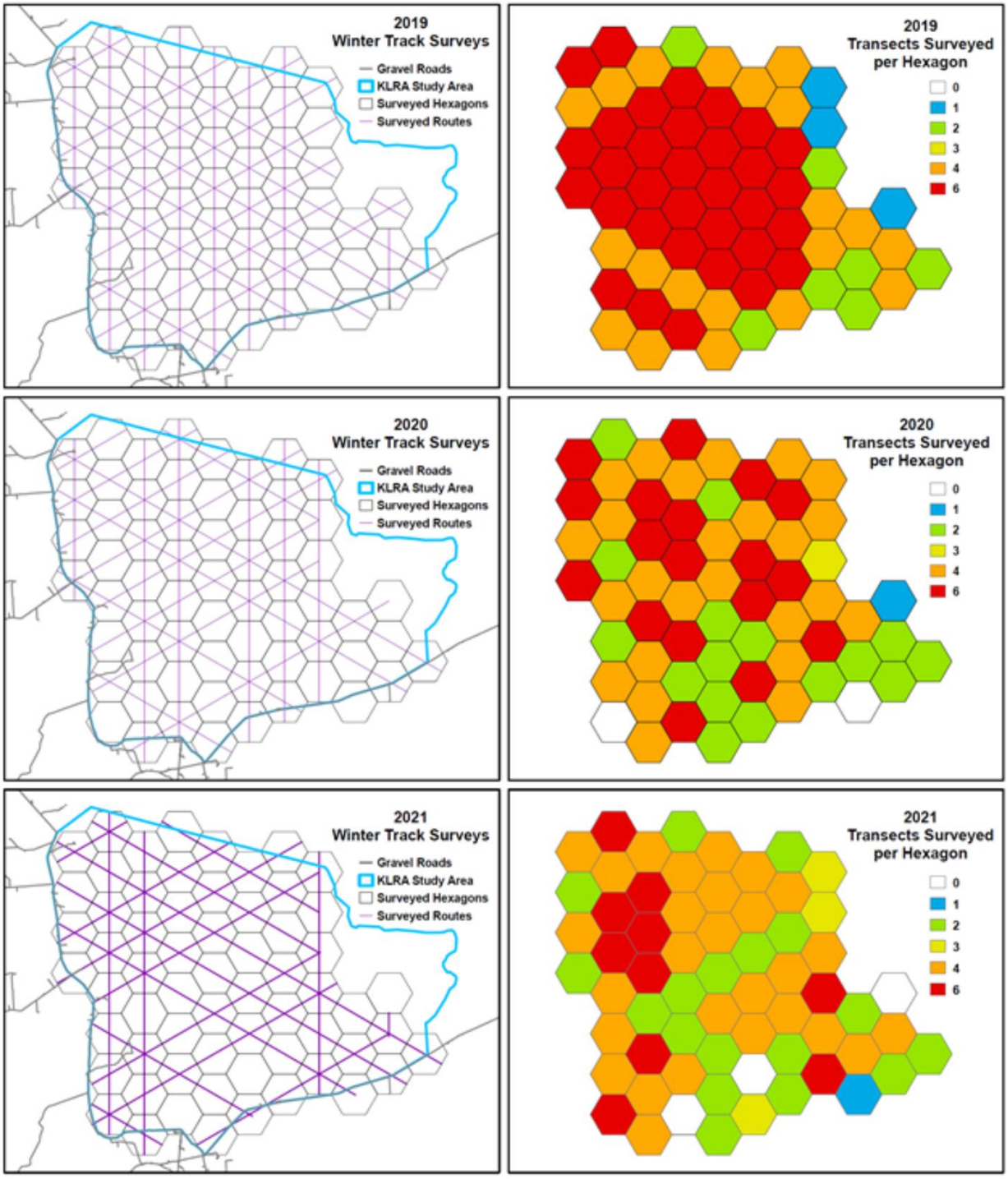

Figure 5. Repeated snow tracking survey effort within the KLRA study area in 2019, 2020, and 2021.

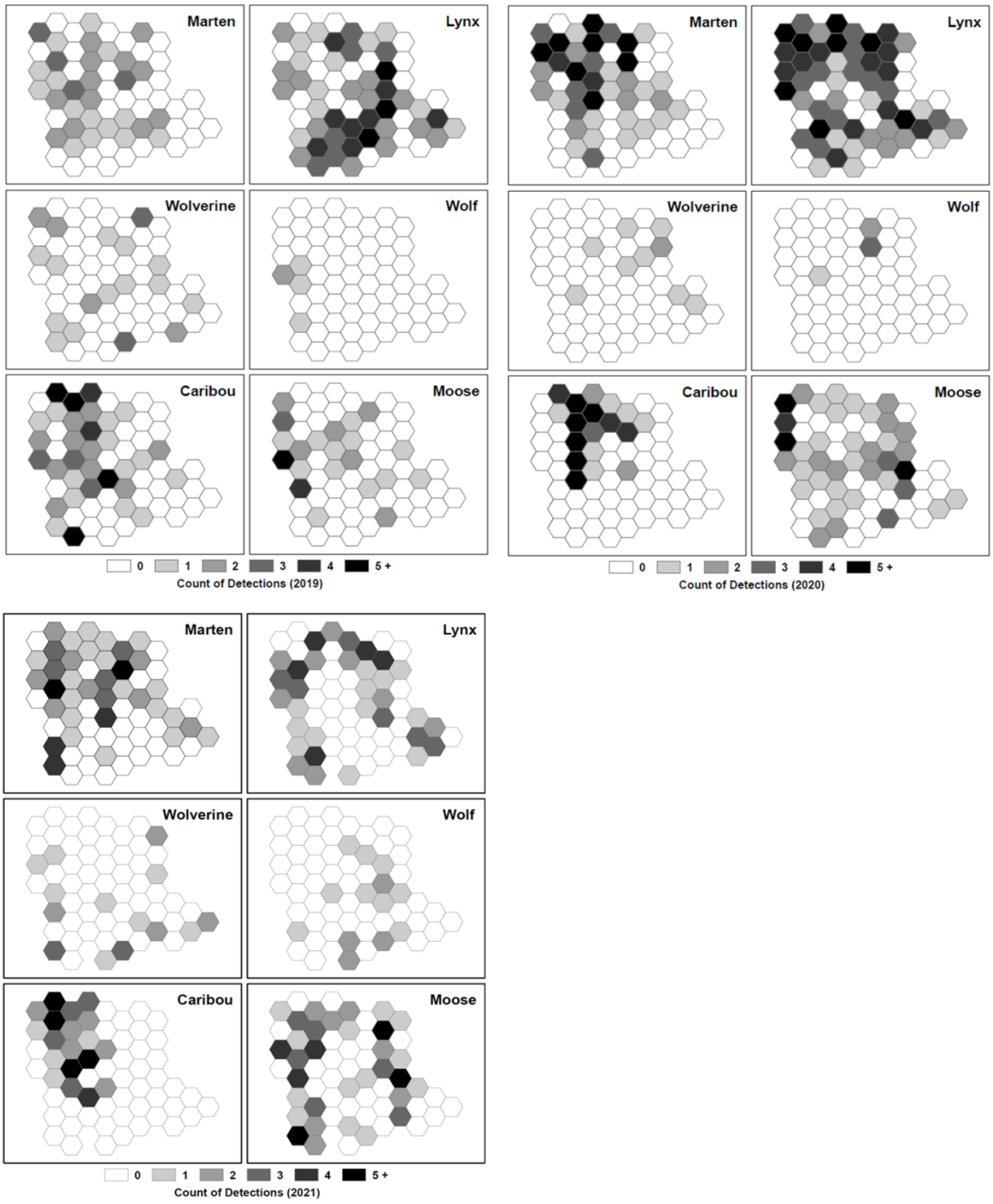

Figure 6. Count of target species detections, per hexagon, within the KLRA in 2019, 2020, and 2021 from helicopter-based snow tracking surveys.

Within the study area in 2021 the team observed more individual moose and more caribou when compared to 2020 (Table 1). Four distinct groups of caribou were observed, including two groups of two and two groups of six individuals. It is noteworthy that unlike in previous years, no collared caribou were observed in 2021. To the teams knowledge none of the deployed collars observed in past years have been removed or dropped off. This observation suggests that a different subset of caribou is using the area compared to previous years; reviewing use of the Katcho Lake Restoration Area by collared caribou could confirm whether there has been a shift of collared caribou out of this area. No moose were believed to be double counted and no collars on moose were observed. Like caribou, use by moose appears to be increasing in the Katcho Lake Restoration Area.

	Moose					Caribou					
	Total	**Cow**	**Calf**	**Bull**	**Unclassed**	**Total**	**Cow**	**Calf**	**Bull**	**Unclassed**	**Collared[1]**
KLRA (core area repeated each year)											
2019	9	1	1	0	7	14[a]	4	0	5	5	1
2020	14	0	0	3	11	8[b]	1	0	6	1	2
2021	24	1	6	10	7	14[c]	2	0	0	14	0

[a] Three distinct groups of animals were observed including one group of 2 individuals, one group of 9 individuals, and one group of 3 individuals. The group of 3 individuals was observed twice, but counts and classification here include that group only once.
[b] Two distinct groups of animals were observed including one group of 1 individual and one group of 7 individuals. The group of 7 individuals was observed twice, but counts and classification here include that group only once.
[c] Four distinct groups of animals were observed including two groups of 2 individuals and two groups of 6 individuals.
[1] In 2019 one animal in the group of 9 caribou was collared and in 2020 two animals in a group of 7 caribou were collared. No collars were observed in 2021.

.

After both one- and two-years post-treatment, we observed evidence of increased caribou use of treated hexagons (Figures 7). The average number of detections in hexagons one year post treatment increased relative to the untreated hexagons. This increase in use was even greater after two years. Despite the observed trend, these results were not statistically significant (after one year, $p = 0.657$; after two years, $p = 0.264$). Moreover, caribou use is variable among hexagons across years, making the overall patterns difficult to interpret. It is not unexpected to see weak patterns in how caribou use changes after only a couple years of treatment, though it is encouraging to see trends at this stage.

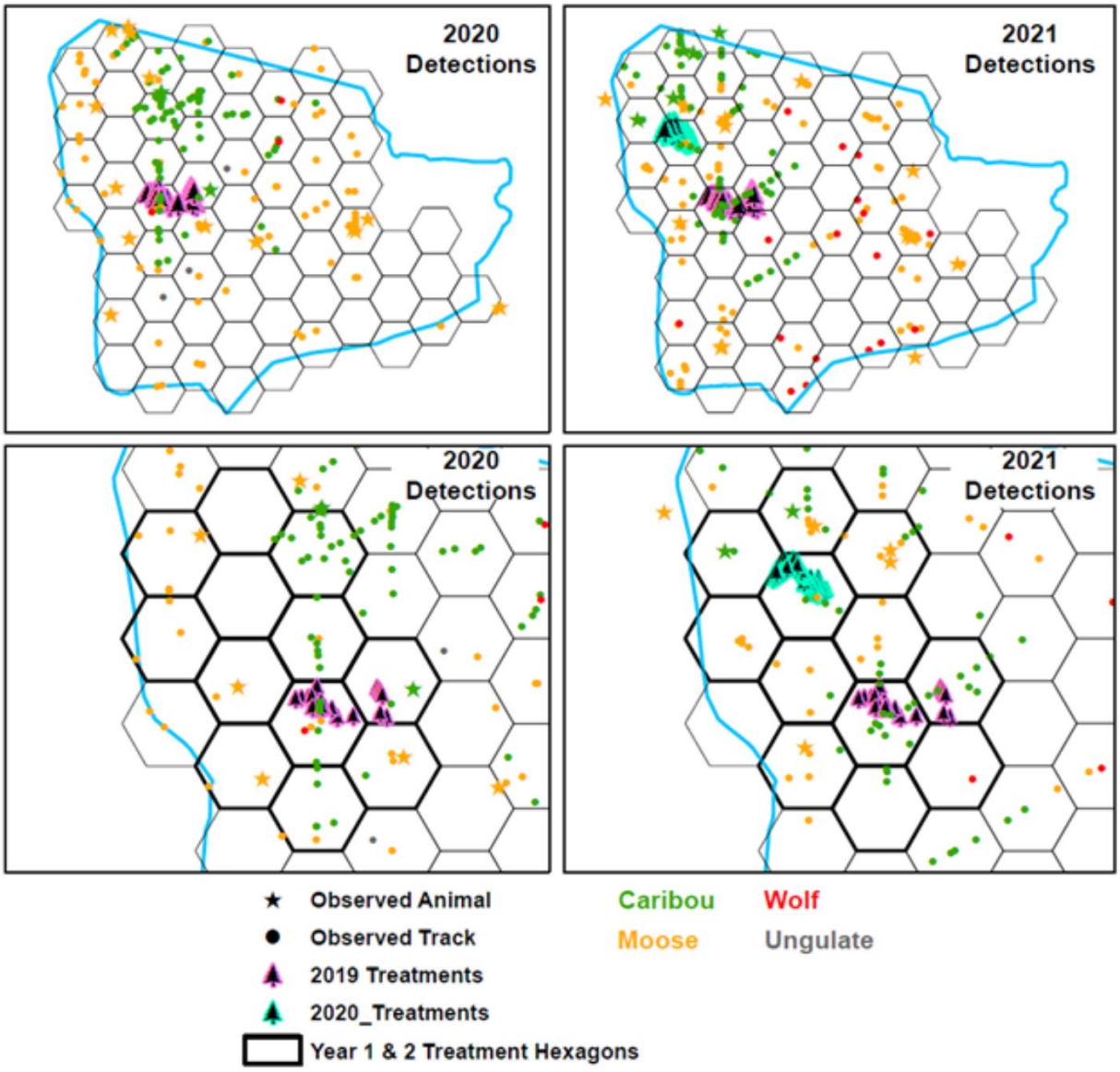

Figure 7. Caribou detections pre- and post – treatment between 2020 and 2021.

Next Steps

Current results and ongoing monitoring have indicated that transplanting hummocks into microsites with sufficient moisture (typically scraped or prepped locations) and free planting seedlings into appropriate microsites (constructed and naturally occurring) work consistently well. As a result, the team will continue to use hummock transplants and planting to treat lines in 2021-2022. Other results indicate that some types of tree modification do work, however, traditional hinging alone does not appear effective.

Next year we intend to expand on the successful treatments, and further develop restoration treatments. Concurrently, FNFN has been working on restoring another area of the Snake-Sahtaneh

range using hummock transplants in the winter. Our learnings from this approach—in particular the increased productivity and safety associated with conducting work involving heavy machinery in frozen conditions—are contributing to a proposed movement in the Katcho Lake Restoration Area towards hummock transplanting in the winter, followed by planting in the summer. We are working with Habitat Conservation Trust Fund to modify our work plan for 2021-22 to reflect this change.

In addition, we will continue to implement a range of tree modification techniques to leverage the natural growth pattern of black spruce and the responses of shrub species to disturbances. As tree hinging has not been successful, we will instead be using four alternatives: tree pushing, tree pushing and burying, tree hold-downs, and tree and shrub trimming. Tree and shrub modifications will be employed alongside other restoration methods, where feasible, primarily to obstruct line of sight and to create an immediate deterrent to movement along the seismic lines.