



Recovery of caribou forage after novel fires in the Porcupine Caribou wintering grounds

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PROJECT ACTIVITIES

What activities did you complete during your project and how did they contribute to goals and objectives?

We completed the field work and data collection for this project in July 2021. Two project members (Reid and Wasyliw) were based in Eagle Plains (Yukon) for the month where they completed fieldwork related to this project and others. During this time, they collected data at 24 sites. These sites represented a range of fire history conditions, as follows:

1. Mature Forest (n = 8; Figure 1): Areas that have not burned in the past ~90 years; dominated by late successional stage black spruce trees and fully developed understory layers. We predicted that sites would have the most lichens available for caribou foraging.
2. Long Interval (n = 8; Figure 2): Areas that burned via natural wildfire in 1990/1991 and have been recovering since. These sites have many black spruce trees regenerating as well as *Salix* and *Betula* shrubs. Ground cover is dominated by coarse woody debris, *Rhododendron tomentosum*, *Equisetum sylvaticum* and *Polytrichum* mosses. We predicted that these sites would have limited lichens available for caribou foraging but that there would be indication that lichen regeneration was occurring.
3. Short Interval (n = 8; Figure 3): Areas that burned via natural wildfire in 1990/1991 and again in 2005. These sites have very low regeneration of black spruce trees and are dominated by shrubs (*Salix* and *Betula*) and graminoids. We predicted that these sites would have no lichen available for caribou foraging.

The two main activities at each site were as follows:

- 1) In 8 x 1m² quadrats, we quantified ground cover for all vascular and nonvascular species (including lichens) and quantified biomass of terrestrial lichens. These data were collected to describe the understory community at each site and to indicate fire histories that had the greatest quantities of lichens.
- 2) In a 60m² belt transect, we identified, counted, and measured the height of all trees and large shrubs (*Salix*, *Betula*, and *Alnus* spp.). We also counted the number of tree seedlings that were present throughout this transect.

Explain how the results of your work contributed to the protection, enhancement or restoration of fish, wildlife or their habitat.

Results from this study contribute to the growing body of knowledge around the indirect effects of climate change on northern ecosystems. Understanding the recovery trajectories of ecosystems after climate-caused changes in fire histories will help resource managers with future protection and conservation decisions in the interest of significant species like barren-ground caribou and moose.

Characterizing the post-fire plant communities, environmental characteristics, and abundance of lichen in sites with different fire histories has provided a better understanding of the recovery

trajectories of these sites. Our results may help predict future habitat availability of significant wildlife species, as it confirms that the recovery of plant communities after frequent fire are shifting from black spruce-lichen towards shrub dominated sites. Caribou tend to avoid shrubbier sites, and instead these sites are generally more selected by species like moose. Shrub dominated sites act as ecosystem modifiers, warming the soil, deepening the active layer, furthering the shift of the ecosystem away from Black spruce-lichen forests. Our assessments of the environmental characteristics and abundance of lichen occurring in post-fire landscapes has provided a better understanding of the likeliness of caribou forage establishment and recovery after fire. This will help researchers better forecast potential winter food sources for barren-ground caribou in the Eagle Plains area, especially the Porcupine-caribou herd that overwinters in this region.

Ultimately, these data may help predict future habitat selection of these significant species and contribute to our understanding of range shifts that may occur in these herds as a response to ongoing climate change. These data could also help inform decisions taken by resource managers to assure that highly valued ecosystems in key areas for significant species continue to thrive. In some cases, data could even be used to aid ecosystem restoration efforts in the interest of preserving critical habitat for threatened wildlife species. In sum, our findings are helping fill the knowledge gap surrounding the recovery of ecological communities after more frequent fire on the landscape and may help inform how the wildlife use these areas.

If you were to do the project again what would you do differently?

This project would benefit from studying more sites in the same area (Eagle Plains) with different fire histories and also by expanding the scope of the study to other areas of the Porcupine Caribou Herd wintering range. By limiting the scope of the study to only Eagle Plains, we were naturally only sampling sites with the same climatic conditions, similar topographies and reliefs, etc. Expanding this study to a variety of fire histories would provide a Yukon-specific trajectory of the recovery of lichen post-fire which in turn would help with management decisions about critical caribou habitat. Based on researcher logistics, these extra sites were not possible this summer; however, we encourage future studies to replicate these or similar methods to understand patterns of lichen regeneration at a greater scale.

COMMUNICATIONS

What did you do to ensure your results were shared with the appropriate groups, people or governments? Describe how you recognized the Enhancement Trust and/or its mandate. Identify any communication materials, strategies or techniques that you used to promote your project and its objectives. Include photos of the project in action or the finished product.

Fieldwork for this project took place on the traditional territories of the Vuntut Gwitchin. During the conception of this project, we had attempted to frame the research questions based on existing priorities of the Vuntut Gwitchin. We received their approval prior to beginning our data collection. In October, Kirsten Reid and Carissa Wasyliv attended a research gathering, hosted by the

community of Old Crow (many of the Vuntut Gwitchin reside in Old Crow), to share meals and learn about ongoing research projects in the area. The gathering took place over the span of two days, involving informal poster and table sessions during the day and a scheduled set of presentations over dinner in the evenings. The event received good turn out from the community, and we had several encouraging conversations with attendees during the poster sessions. Community members were engaged with the research, well informed of the subject matter, and offered encouragement and suggestions of potential follow up to this project. We also gave two presentations to attendees, describing the research and preliminary findings. Again, there was great interest and support for the project. Community members are concerned about the effects of climate change on their traditional territories and the potential impacts on their traditional activities. There is much collective concern about the effects of climate change on the Porcupine Caribou Herd. This event allowed us to make some valuable connections with the community, and learn about first hand changes witnessed on the land. Further, we received excellent feedback and suggestions for future directions of the project. The contribution of Yukon Fish and Wildlife Enhancement Trust to this research was included in the presentation and on the poster that was presented to the community.

Photos



Figure 1. Photo of one of the Mature Forest black spruce-lichen forest sites in the Eagle Plains region. This site has not burned in over 80 years and provides winter forage for caribou.



Figure 2. Photo of a Long Interval site in the Eagle Plains region. This site was a mature black spruce forest prior to its burning in 2005. It is now following a typical recovery trajectory after fire.



Figure 3. Photo of a Short Interval site in the Eagle Plains region. This site was a mature forest when it burned in 1990. It experienced another fire in 2005, a fire return interval of only 15 years. It is experiencing an atypical recovery trajectory post-fire.



Figure 4. A photo of a researcher assessing community composition of the ecological community within the different fire histories.



Figure 5. A photo of a researcher recording environmental conditions of a long interval site.



Figure 6. Our table and poster at the research gathering in Old Crow in October, 2021.



Figure 7. One of the researchers presented our project at the research gathering in Old Crow in October, 2021.

