THE EXCHANGE:

Sharing Knowledge, Inspiring Solutions

2023
EDITION 6

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ARCKP

Alberta Regional Caribou Knowledge Partnership

Connecting Alberta's forest sector and policy makers to accessible and relevant scientific information is key to advancing woodland caribou conservation efforts across the province. To facilitate this, the Alberta Regional Caribou Knowledge Partnership (ARCKP) provides regular knowledge exchange, keeping our partners and stakeholders up to date on the research and information they need to make important forest management and policy decisions.

Credit: Mercer Peace River Pulp Ltd.

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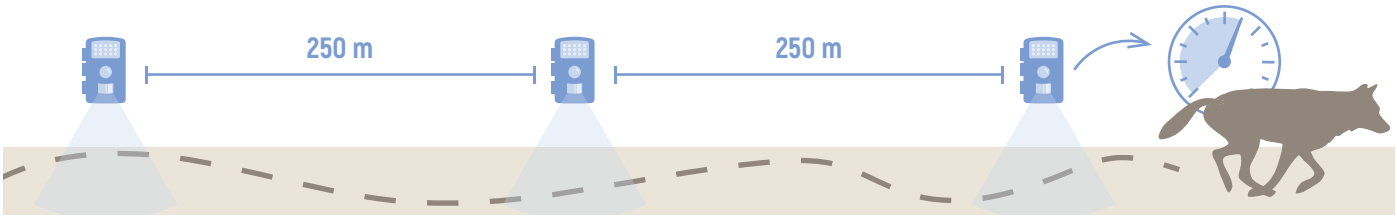
Obstacles ahead! Reduce travel speed

When hunting for prey in the boreal forest, predators like wolves must normally navigate an obstacle course: weaving between trees, stepping over fallen logs, ducking under low branches, and traversing spongy hummocks. However, linear features like seismic lines and roads present an attractive alternative. These straight, clear paths allow wolves to travel faster and farther, providing easy access into terrain like peatlands where woodland caribou seek refuge. This makes it harder for caribou to avoid predators and is a key contributor to caribou declines.

Linear feature restoration is performed with the aim of re-establishing forest cover. Depending on site conditions, this may be achieved through treatments like soil mounding, applying coarse woody debris, bending/felling adjacent trees, and tree planting. These techniques not only provide seedlings with the conditions they need to thrive, but also create obstacles to movement. If stepping over and around mounds, woody debris, and bent trees slows down predators, it could lead to reduced predation on caribou in the short term.

A recent study by Dickie et al. (2022) measured the impact of restoration on movement in the Cold Lake caribou range of northeastern Alberta. While earlier studies have assessed trends in wildlife use of linear features, this study measured fine-scale changes in travel speed for predators (wolves and black bears) and prey (caribou and moose). Wildlife cameras were spaced in groups of three at regular intervals along untreated and treated seismic lines, such that travel speeds could be calculated over a known distance.



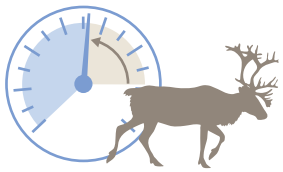
The linear features included in this study were treated with typical silvicultural restoration treatments: mounding and scalping, coarse woody debris, felling of trees across the line, and tree planting (planting densities ranged from 1,200 to 2,000 stems/ha).

The authors found that linear restoration slowed down wolves, caribou and bears, but not moose.

–25%
(–1.52 km/h)

WOLVES moved 25% (1.52 km/h) slower on treated lines, especially in lowlands. This speed reduction is similar to the difference in wolf travel speed on vegetated seismic lines compared to unvegetated.

–40%
(–2.37 km/h)



CARIBOU moved 40% (2.37 km/h) slower on treated lines. Reducing the appeal of linear features as a movement corridor for caribou may help reduce their encounters with predators.

–39%
(–0.55 km/h)

While the effect size was small, **BEARS** moved 39% (0.55 km/h) slower on treated lines. Further research is needed to understand how bears use linear features — as movement corridors or for foraging.

Linear features help predators travel more efficiently and gain easier access into caribou habitat. These findings suggest that restoration treatments can create effective movement barriers that reduce predator speed, which is thought to reduce their encounters with caribou. Restoration treatments may therefore offer a dual benefit: alleviating some predation pressure in the short and medium term, while restoring caribou habitat in the long term.

Additional research is needed to understand how much a given decrease in wolf travel speed impacts the rate at which they encounter and kill caribou. As restoration treatments continue to expand and evolve, monitoring predator responses and kill rates will be a key topic of interest. Gaining a better understanding of the effect of treatment intensity, and whether slower movement speeds are possible with different treatment approaches, is also an important avenue for research to help design more effective restoration programs.

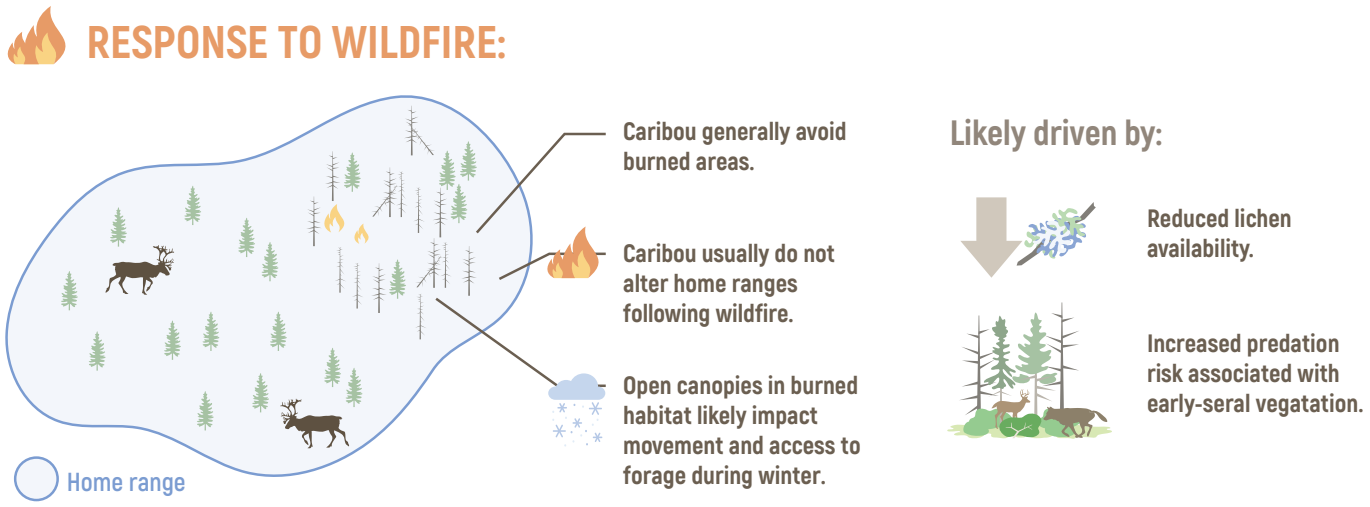
Dickie, M., Sherman, G. G., Sutherland, G. D., McNay, R. S., & Cody, M. (2022). Evaluating the impact of caribou habitat restoration on predator and prey movement. *Conservation Biology.*

Caribou responses to wildfires hold important lessons for harvest design

Wildfires are an essential part of boreal forests. While woodland caribou rely on mature forests for lichen and as a refuge from predation, they have also long coexisted with wildfires as the dominant stand-replacing disturbance on the landscape.

In recent decades, forest harvest practices have aimed to mitigate impacts on boreal forests by designing harvest patterns to more closely resemble wildfire events. While these changes can help maintain biodiversity and ecosystem function compared to historical practices, caribou may still respond differently to harvest areas compared to burns. Understanding how wildfires and forest harvest affect the way caribou use the landscape is key to developing silviculture and harvesting practices that have similar effects as natural disturbances.

A literature review conducted by the fRI Research Caribou Program summarized research on caribou responses to wildfires and forest harvest, including impacts on caribou habitat selection, home ranges, and movement:



Responses of caribou to wildfire were also found to vary between landscapes and seasons.

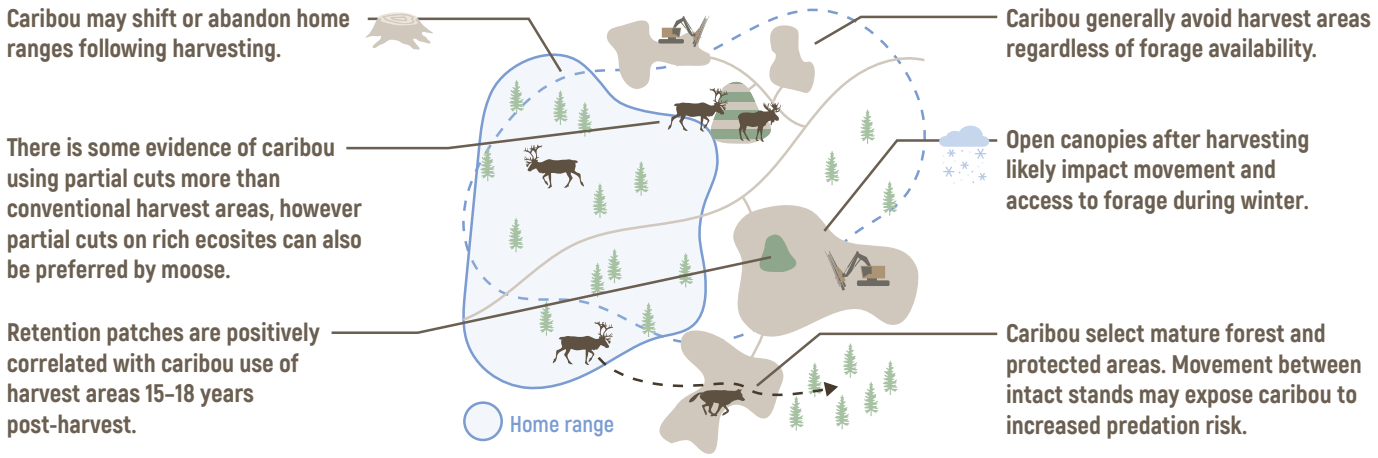
- Caribou in northern Alberta and southern Yukon generally avoid burns across seasons.
- Caribou in northern Saskatchewan select recently burned (<5 years) habitat in areas with low human disturbance during calving season.
- Caribou in northeastern BC select burned habitat across seasons.

Several factors may contribute to seasonal selection of recent burns:

- Decrease in understory vegetation leading to lower predation risk in recent burns.
- Emerging green vegetation in spring and summer may provide forage for caribou.
- Remnant unburned patches may provide foraging habitat for caribou in winter.

It's also important to keep in mind that responses to burns may change as climate change, mountain pine beetle infestations, and management practices alter the size, frequency, and severity of wildfires.

RESPONSE TO FOREST HARVEST:



Responses of caribou to forest harvest were also found to vary between landscapes and reproductive status.

- Female caribou tend to avoid harvest areas more than males.
- During calving and summer, caribou in harvested landscapes select closed canopy mature conifer forest, while caribou in unharvested landscapes tend to show equal preference for a variety of stand types.
- In Quebec, female caribou with calves select harvest areas <20 years old.

Bringing it all together

While forest harvest and wildfire both represent stand-replacing disturbances, this review concluded that caribou respond to them differently. While caribou generally avoid burns at the fine scale, wildfires generally do not affect caribou home ranges. In contrast, forest harvest can result in shifts or abandonment of caribou home ranges. By leveraging literature reviews like this, forest practitioners can begin to identify key factors that may be contributing to different responses between harvesting and wildfire. Future efforts to adjust practices to close this gap could lead to positive outcomes for woodland caribou.

Finnegan, L., Stevenson, S., Johnson, C., McKay, T. (2021). Caribou, fire, and foresty. Literature Review prepared for the Alberta Regional Caribou Knowledge Partnership, February 2012. Pp23 + iii

Peatlands likely to become even more important to caribou under climate change

While human disturbance has contributed to caribou range contractions across Canada, the role of climate change as a driver of future caribou distribution is less clear. Climate may influence caribou distribution directly (e.g., through temperature extremes that affect survival) or indirectly (e.g., by favouring deciduous vegetation or increasing wildfire activity). These changes, along with human disturbance, are expected to further contract caribou ranges. However, the direct and indirect effects of climate change have not been explicitly studied.

A recent study by Neilson et al. (2022) used a path analysis to help untangle the direct and indirect effects of climate. This kind of analysis provides better insight into systems with complex cause-effect relationships by allowing factors like habitat to respond to climate and influence caribou responses.

The authors included climate, habitat and disturbance variables in the model:

CLIMATE

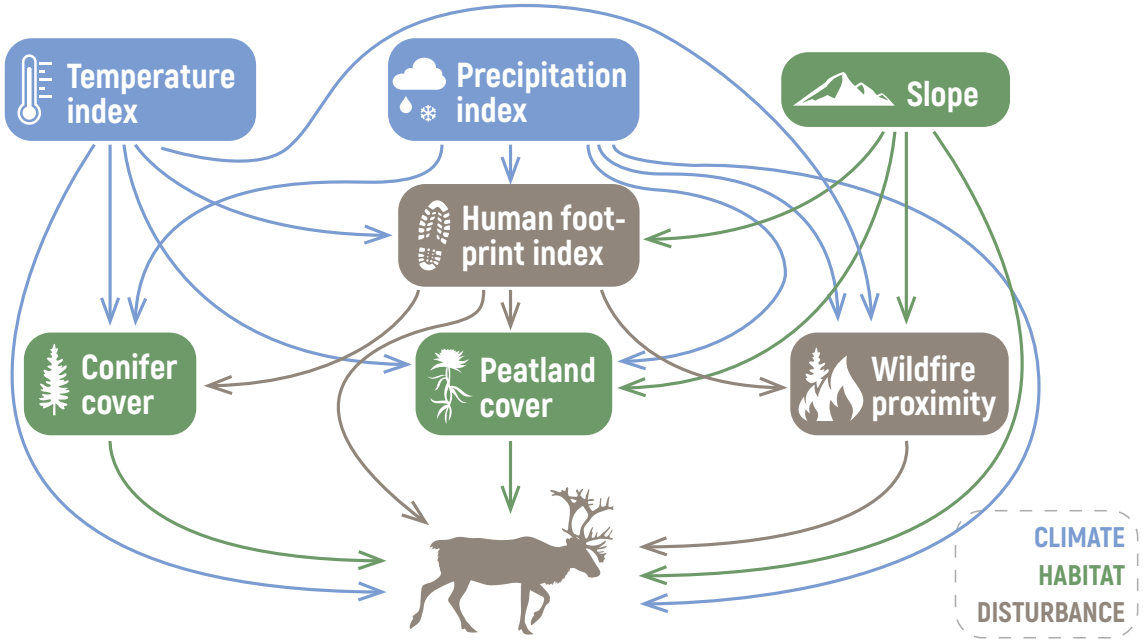
- Temperature index
- Precipitation index

HABITAT

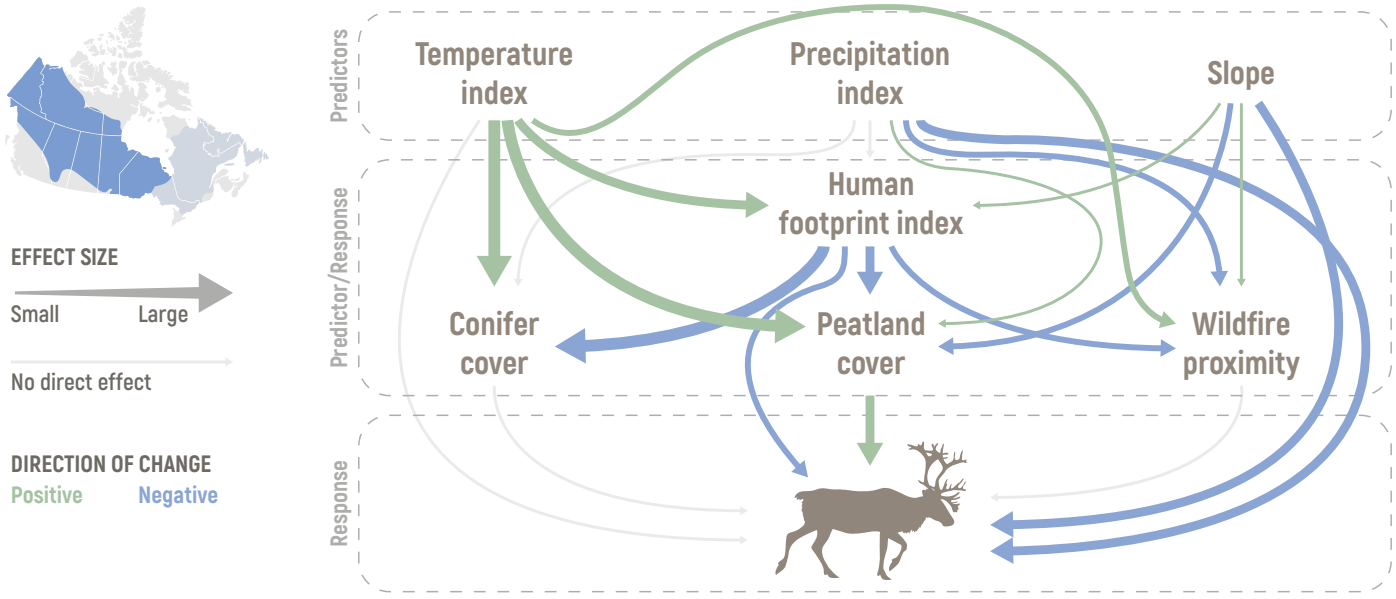
- Peatland cover
- Conifer cover
- Slope

DISTURBANCE

- Human footprint index
- Wildfire proximity



A representation of the path model used to estimate the relative effect of different factors on caribou range occurrence. Arrows indicate all potential relationships considered in the model. For instance, human footprint may respond to temperature, precipitation, and/or slope, and may in turn predict conifer cover, peatland cover, wildfire proximity, and/or caribou occurrence directly.



Results of the path model for the western region. Green lines indicate positive effects and blue lines indicate negative effects. Some relationships differ for the eastern region (not shown).

The study found that **human disturbance has a consistent, direct effect on caribou** in both eastern and western Canada, further supporting previous findings that human footprint is a primary driver of historical and ongoing contractions in caribou range occurrence. As human footprint increases, habitat features important to caribou (peat and conifer cover) decrease. This finding suggests that it is important that caribou recovery efforts continue to focus on managing human disturbance as a key driver.

The distribution of caribou ranges was less sensitive to direct effects of climate like temperature and precipitation levels (though caribou occurrence is limited in areas with especially deep snow). However, climate impacts caribou indirectly by affecting habitat through changes in vegetation age and structure. **In western boreal forests, peatlands are likely to become increasingly important for caribou**, as they are more resilient to fire and drought and are expected to change more gradually compared to upland forests. As upland forests shift towards younger stands that support more moose and deer — and therefore predators — peatlands will serve an ever more important role as refuge from predation.

While this study examines climate impacts, it does so at the broad scale of caribou range distribution. Caribou may respond differently to habitat and disturbance factors at the home-range level or even finer-scale habitat use. This study therefore serves as a 'first look' at anticipated caribou responses to climate change. Important next steps include modeling specific anthropogenic features – such as seismic lines and harvest areas — rather than a single estimate of human footprint.

Neilson, E.W., Castillo-Ayala, C., Beckers, J.F., Johnson, C.A., St-Laurent, M.H., Mansuy, N., Price, D., Kelly, A., Parisien, M.A. (2022). The direct and habitat-mediated influence of climate on the biogeography of boreal caribou in Canada. *Climate Change Ecology* (3): 100052.

WHAT IS THE ARCKP?

Who we are, and what we do

Woodland caribou are a cultural and ecological icon of Alberta's forests. However, they are also a threatened species, and represent a significant conservation challenge. In response to this challenge, and to the additional challenge of managing woodland caribou across different ecosystems, the Government of Alberta and the province's forest sector formed the Alberta Regional Caribou Knowledge Partnership (ARCKP). Together, we are committed to finding on-the-ground solutions that balance forestry activities with woodland caribou conservation.

The ARCKP is an association of fRI Research and funded by the Forest Resource Improvement Association of Alberta (FRIAA) through the support of 12 forestry companies in Alberta. Together, these partners have contributed over $1 million per year for five years to address region-specific knowledge gaps in woodland caribou ecology.

fRI Research
Informing Land & Resource Management

ARCKP
Alberta Regional Caribou Knowledge Partnership

$1M / YEAR
for 5 years

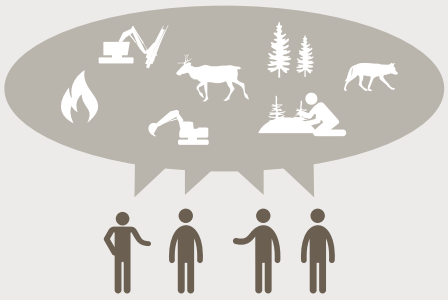
Forest Resource Improvement Association of Alberta (FRIAA)

Twelve Forestry Companies

Alberta Government

OUR VISION

A collaboration promoting self-sustaining caribou populations and a viable forest sector.



OUR MISSION

We support the development and sharing of innovative tools, techniques, strategies and understandable scientific knowledge to enhance sustainable forest management and caribou recovery efforts.

Have questions about the ARCKP? Contact our network coordinator Kristy Burke at kristy@fuseconsulting.ca or visit arckp.friresearch.ca

The ARCKP is funded by the Forest Resource Improvement Association of Alberta

ARCKP Partners

ANC Timber Ltd. · Tolko · Alberta Government · Weyerhaeuser · Foothills Forest Products · Northland Forest Products · Alberta Pacific Forest Industries Inc. · Mercer Peace River · Canfor · West Fraser · Boucher Bros. Lumber Ltd. · Vanderwell Contractors (1971) Ltd. · Millar Western

ARCKP Alberta Regional Caribou Knowledge Partnership

For more information or to contact the ARCKP, visit arckp.friresearch.ca

An Association of FRI Research