Credit: Jean-Marie Sobze, NAIT

THE EXCHANGE:

Sharing Knowledge, Inspiring Solutions

2023
EDITION 7

Credit: Adam Sprott, fRI Research

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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Can lichens be transplanted to increase caribou forage?

Lichens — particularly terrestrial reindeer lichens — are an essential winter forage for caribou in Alberta. Lichens are also very slow to disperse and grow, meaning they take roughly 40–100 years to recover after disturbances like wildfire and forest harvesting.

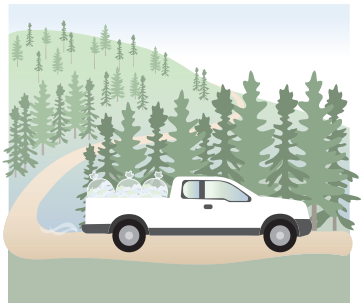
While habitat conservation and restoration are the two primary considerations in caribou recovery, lichen abundance is an important secondary consideration, and one that may be promoted through management intervention. Certain practices like winter harvesting and anchoring retention patches around large lichen mats may help reduce the impact of harvesting on lichen in the short term (*see Exchange #4*).

Lichen transplantation is another conservation technique of interest, with the potential to not only maintain but to restore lichen abundance in caribou habitats. However, there are many logistical considerations for conducting this work, and there is limited research to inform best practices. The ARCKP is funding a larger, long-term trial to determine the ideal approach for lichen transplantation in woodland caribou ranges in Alberta.

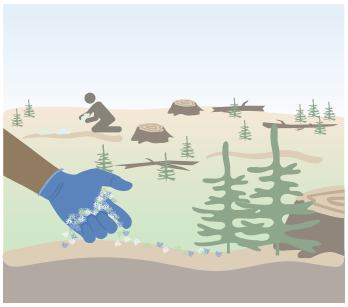
How does lichen transplantation work?

COLLECT lichens from a site where they are abundant.

TRANSPORT lichens to the site where they will be transplanted.



DISPERSE lichens, either as clumps or in smaller fragments.



DESIRED OUTCOME

Transplanted lichen become established and accelerate/ increase forage availability for caribou within a harvested stand.

Credit: Jean-Marie Sobze, NAIT

Operational considerations for lichen transplantation

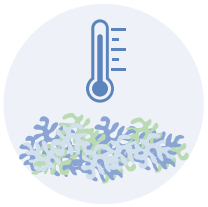
Each step of lichen transplantation includes major knowledge gaps. Studies have addressed some of these gaps, but firm recommendations remain unclear. The operational costs of each step must also be considered.

1. COLLECTION

Where are suitable stands to source lichens?

Are local lichen populations large enough to remove some?

How much lichen should be collected?



Are collected lichens adapted to the new site's conditions?

2. STORAGE

How best to store collected lichens?

How long to store collected lichens?

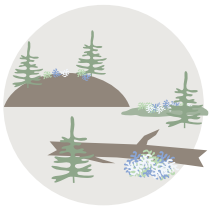
Should they be cleaned first, and how?

The collected lichens may begin to rot in storage.

3. DISPERSAL

Should lichens be dispersed as clumps or fragments?

What size of fragments?



Will transplanted lichens grow better on certain microsites?

(Substrate, temperature, light, moisture, etc.)

How much effort is required for dispersal?

Can it be dispersed using equipment, and how does that affect establishment?

4. MONITORING

Do transplanted lichens survive and grow in the long term?

Determining when and how to use transplantation

All of these unanswered questions make it unclear whether lichen transplantation is operationally and economically feasible, and whether the benefits to caribou will outweigh the costs. **However, if best practices can be determined, they will provide forest managers with another tool to benefit caribou by increasing winter forage availability.** Findings on the ARCKP project examining the feasibility of lichen seeding and transplantation will be available in 2024.

Kong, R.S., Tedla, B., Schulz, M., and Sobze, J.-M. 2022. A review of lichen transplant studies and methods. Northern Alberta Institute of Technology Centre for Boreal Research, Peace River, AB, pp. 1–52. https://arckp.ca/data/Lichen%20Literature%20Review%20%28Final%29.pdf

Caribou demographics and lichen respond differently to wildfires than harvest

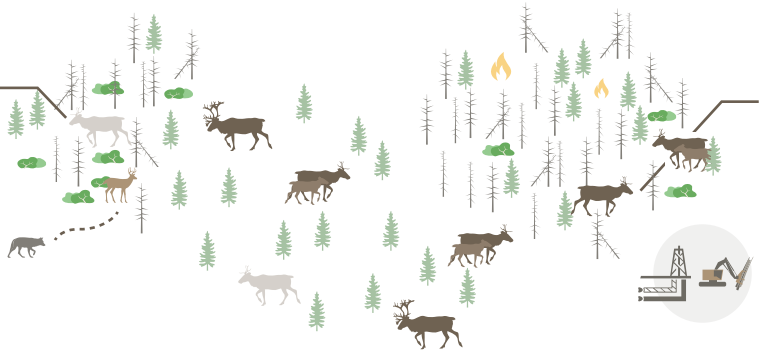
Caribou declines are strongly linked to habitat disturbance, which can result from both wildfires and forest harvesting (among other human activities). A key priority of recovery efforts is to reduce the impacts of human disturbances, and one approach is to design harvests that emulate natural disturbances. However, a strong understanding of how wildfires and forest harvest each affect caribou at several scales is needed, such that lessons from wildfire can be applied to forest harvesting.

A literature review conducted by the fRI Research Caribou Program summarized research on caribou and caribou forage (i.e., lichen) responses to wildfire and forest harvesting. The following summary includes findings on **demography** and **forage** responses. *For results on habitat selection, distribution and movement, please see pages 4–5 in The Exchange #6.*

DEMOGRAPHIC RESPONSES TO WILDFIRE:

Wildfire does not directly affect caribou **survival.**

However, recent burns may decrease caribou survival at larger scales by providing habitat for primary prey and increasing overlap with predators.



Wildfire accounts for relatively little variation in calf **recruitment**, but calf:cow ratios decrease.

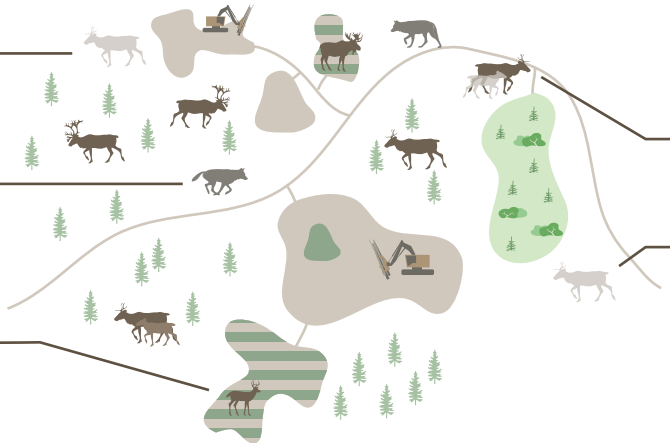
The presence of **anthropogenic disturbances** may cause recruitment to be **less resilient** to frequent burns.

DEMOGRAPHIC RESPONSES TO FOREST HARVEST:

Female **survival** decreases with area harvested.

Caribou face higher **predation risk** in harvested areas.

Primary prey may prefer partial cuts to clear cuts.



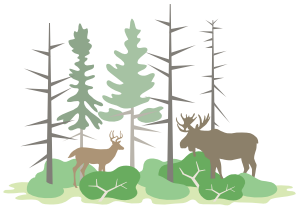
Recruitment decreases 5–20 years post-harvest.

Survival decreases as there is more early- and mid-seral forest.

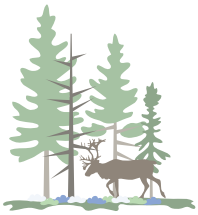
LICHEN RESPONSES TO WILDFIRE:

Lichens typically dominate 40–70 years post-fire.

Wildfire reduces **lichen abundance** in the short to medium term.



Wildfire leads to increased **competition** by early-seral vegetation.



Lichens can be **resilient** to low-intensity wildfires.

Increased snow depth and hardness can limit caribou **access to lichens**.

LICHEN RESPONSES TO FOREST HARVEST:

Understory vegetation resembles post-fire sites after about 30 years.

Harvesting uniformly reduces **lichen abundance** in the short to medium term.

Scarification decreases lichen **abundance**.

Herbicides decrease **competition** but may also **decrease lichens**.

Winter harvesting causes **less direct damage** to lichens.

Alternate harvesting **decreases impact** to lichens.

Bringing it all together

This review found that wildfire and forest harvest have different impacts on both caribou and lichen. Caribou mortality, survival and recruitment are more strongly affected by forest harvest than wildfire. After harvest, terrestrial lichen succession typically resembles post-wildfire sites after 20–30 years, but this varies depending on the region, ecosite type and the nature of the disturbance. While the factors affecting demographics may require more research to clearly identify management recommendations, beneficial practices for conserving terrestrial lichen in the short term include ground protection and partial retention harvesting or thinning.

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

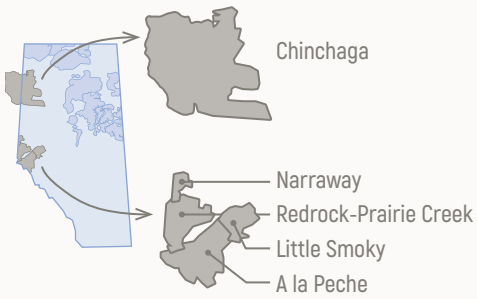
Targeting restoration to address wildlife objectives on linear features

Linear feature restoration is a high-interest strategy for recovering caribou populations. Decades worth of linear features fragment the landscape, negatively affecting caribou habitat while attracting other ungulates and their predators. The scale of the challenge is also massive, with hundreds of thousands of kilometers to be restored, meaning strategies for prioritizing efforts and maximizing benefits to caribou are critical to achieving widespread benefits. **Forest companies are uniquely positioned to contribute to restoration of lines adjacent to their harvest blocks as part of an integrated landscape approach**.

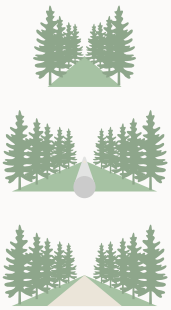
Restoration programs have a range of objectives, including reducing line use and access by other ungulates (deer, moose and elk) and predators (wolves and bears). A recent study by the fRI Research Caribou Program evaluated the relationships between ecological characteristics of linear features and wildlife use (e.g., ease of movement). A benefit of this study is its close analysis of relationships between **site-scale habitat structure and function (wildlife use)**, which can help inform site-scale restoration treatments.

Study methods

STUDY AREA: WESTERN HERDS



DATA COLLECTED AT LINEAR DISTURBANCES AND ADJACENT FOREST

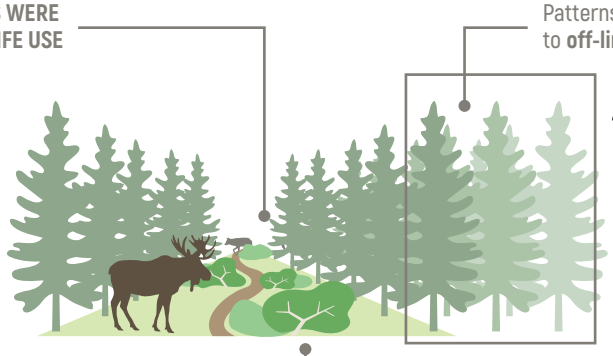


SIGNS OF USE RECORDED

Certain variables were stronger predictors of line use by different species

ON-LINE VEGETATION AND GAME TRAILS WERE THE STRONGEST PREDICTORS OF WILDLIFE USE

- Bear use negatively associated with **vegetation cover**
- Wolf use negatively associated with **vegetation height**
- Deer, moose, elk and bear use positively associated with **game trails**



Patterns of wildlife use were also observed relative to **off-line characteristics** and **forage on the line**.

- Predator use positively associated with off-line tree height and vegetation cover
- Primary prey use negatively associated with off-line tree height and vegetation cover
- Primary prey and bears positively associated with willow, birch, sedges, clover and forbs

Prioritizing treatments and combining them to achieve wildlife objectives

By identifying strong predictors of wildlife use, this study makes it possible to focus linear restoration efforts on specific vegetation and movement levers according to the wildlife objectives for an area.

OBJECTIVE: REDUCE PRIMARY PREY

RECOMMENDATIONS

Block movement on game trails.

Reduce cover of willow, birch, sedges, clover and forbs.

WHERE TO PRIORITIZE (OPTIONAL)

All types of linear feature (seismic lines, pipelines, inactive access roads).

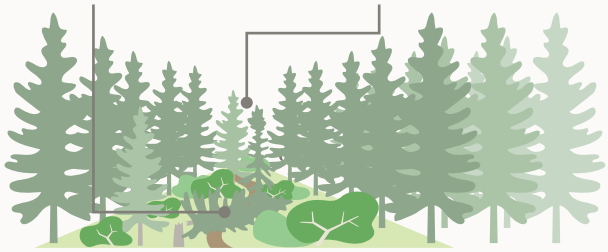
Areas with low vegetation cover and shorter trees adjacent to the line.

OBJECTIVE: REDUCE PREDATORS

RECOMMENDATIONS

(Bears): Block movement on game trails.

Increase vegetation cover and height on the line to impede predator movement.



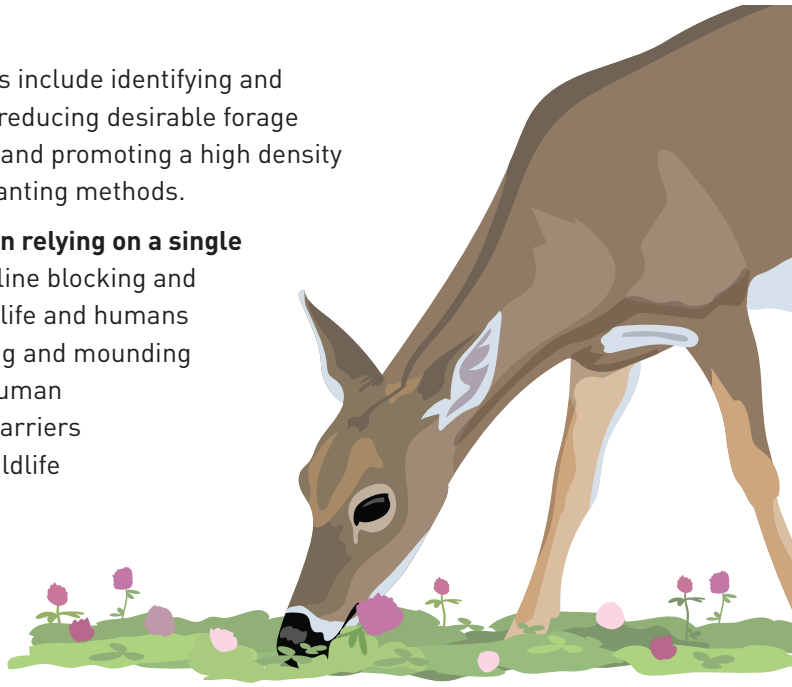
WHERE TO PRIORITIZE (OPTIONAL)

Treatments may be most effective on seismic lines.

Areas with high vegetation cover and taller trees adjacent to the line.

Potential applications for restoring lines near harvested areas include identifying and blocking game trails near the lines (e.g., using tree hinging), reducing desirable forage species using vegetation control methods (e.g., by brushing), and promoting a high density of taller vegetation using site-appropriate preparation and planting methods.

It is important to combine restoration techniques rather than relying on a single "one-size-fits-all" approach. For example, a combination of line blocking and vegetative regeneration has the potential to impede both wildlife and humans while also enhancing each other (e.g., tree felling, tree hinging and mounding create microsites for seedlings while impeding wildlife and human movement). Additionally, intensive application of movement barriers (e.g., felling or hinging trees) is more effective at achieving wildlife objectives in the short term than vegetation restoration, but vegetation restoration is essential for long-term restoration success.



Tattersal, E., Pigeon, K., MacNearney, D., Finnegan, L. (2023). Walking the line: Investigating biophysical characteristics related to wildlife use of linear features. *Ecological Solutions and Evidence* (4): e12219.

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

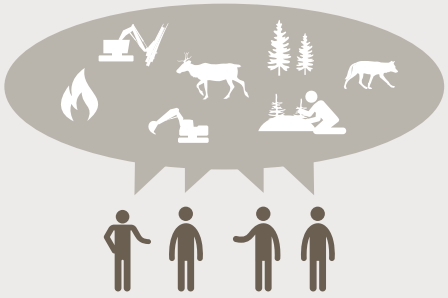
Forest Resource Improvement Association of Alberta (FRIAA)

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.ca.

Credit: Jean-Marie Sobze, NAIT

Credit: Adam Sprott, fRI Research

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

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

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