



# THE EXCHANGE:

Sharing Knowledge, Inspiring Solutions



2024  
EDITION 10



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.

# TABLE OF CONTENTS



---

**02** **CUT VS. FIRE: THE DIFFERENCES BETWEEN  
DISTURBANCES**

---

**04** **WORKING TOWARD UNDISTURBED CARIBOU  
HABITAT**

---

**06** **HABITAT ALTERATION OR CLIMATE: WHAT DRIVES  
THE DENSITIES OF INVADING DEER?**

---

**08** **WHAT IS THE ARCKP?**  
Who we are, and what we do

# Cut vs. fire: the differences between disturbances



Both forest harvesting and wildfires impact forest ecosystems, but their impacts are not equivalent. Understanding how the impacts of disturbance differ is important for forest planning and management — particularly where habitat disturbances are linked to declines in species like the woodland caribou.

It is important to understand how these forests change over time, and whether current wildfire and harvested sites are on a trajectory to become woodland caribou habitat. This recent publication is the first in a series from a significant ARCKP project. The research looked at stand attributes (basal area, stem density, tree species composition), coarse

woody debris, and the abundance of wildlife forage plants over time across different forest ecosystem types. This information is laying the foundation for future studies focused on determining which harvest strategies provide the fastest recovery path to healthy caribou habitat.

## Studying disturbance responses over time

In 2021 and 2022, data was collected from recently disturbed (< 40 years) sites in the boreal and foothill forests of Alberta. Harvested sites (with commercial tree planting), wildfire burned stands, and older (>40 years since disturbance) forest stands used by caribou were surveyed.



## The 'success' of wildfire and harvested sites recovery depends on which goals are prioritized

Tree planting in harvested sites helped quickly increase stand attributes important for timber supply including basal area, stem density, and mean diameter when compared to wildfire sites. These differences were greatest right after disturbance and lessened with time. In contrast, some ecological and habitat indicators for various wildlife were stronger at wildfire sites. For example, coarse woody debris was much higher at wildfire sites for at least 20 years following disturbance. Coarse woody debris provides important habitat for birds and small mammals and is key to nutrient cycling and long-term carbon storage.

Abundance of forage for different wildlife species is another key indicator of habitat. The older caribou habitat sites showed abundant arboreal lichens and very low levels of forage preferred by moose or bears. Following wildfire or

harvested sites disturbances, lichens were much less abundant and forage species preferred by moose and bears were much higher. Ten years after disturbance, the percent cover of lichens was higher in wildfire sites, showing that lichens regenerate quicker after wildfire than they do in harvested sites.



## Ecosystem subtypes also play a role in disturbance impacts

Study sites included forest subregions of central mixedwood, foothills, lower boreal highlands, and upper boreal highlands. These different forest types respond and recover differently to disturbance. Different species of trees and forage plants naturally recover better in certain regions. Particularly when looking at lichens important to caribou. Lichens grow best in the upper boreal highlands where they compete less with mosses. Wetter conditions in the central mixedwood and foothills mean lichens are naturally less abundant even at undisturbed sites. Understanding ecosystem subtypes can help managers prioritize recovery resources in habitats that will have the greatest impact on caribou. For example, measures to recover and regrow lichens will be most successful in upper boreal highlands where conditions are most favorable to lichen growth.

## What does this mean for forest management?

Harvest and wildfire have similar disturbance levels for some ecological indicators but diverge greatly for others. Timber harvesting strategies do a great job of quickly re-establishing timber volumes when compared to wildfire, but this does not necessarily equate to a quicker development of caribou habitat. Amounts of coarse woody debris and caribou forage were key habitat indicators that differed between the disturbance types. If harvest activities are looking to better emulate wildfires, they should consider increasing retention of both standing and downed dead trees. Including habitat indicators like wildlife forage as metrics of success can help landscape managers find a balance between prioritizing timber production and wildlife conservation. A better understanding of these dynamics can inform forest planning related to harvesting strategies with the goal of increasing the likelihood that disturbed stands will recover back to functional wildlife habitat.



Best, I.N., Brown, L., Elkin, C. et al. Cut vs. fire: a comparative study of the temporal effects of timber harvest and wildfire on ecological indicators of the boreal forest. *Landsc Ecol* 39, 81 (2024). <https://doi.org/10.1007/s10980-024-01882-4>

# Working toward undisturbed caribou habitat

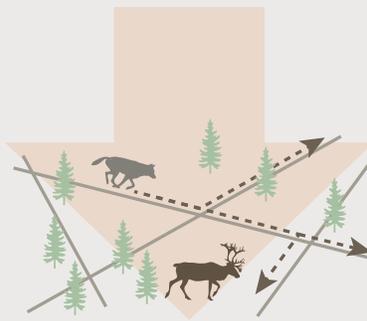
In response to declining woodland caribou populations, recovery strategies are encouraging restoration of disturbed habitat. However, what defines disturbed or undisturbed caribou habitat is not always straightforward. The overarching definition of undisturbed habitat is, “habitat capable of supporting a self-sustaining caribou population”, but what does this look like for forest managers and practitioners?

To explore this concept, the ARCKP recently invested in a jurisdictional review of how undisturbed habitat is being managed by different provinces. The review led to a series of recommendations by the report author related to strategies that can be applied in different forest types found in Alberta.

## Caribou habitat management goals



Minimize creation of early seral habitats that are known to increase primary prey and predator abundance



Minimize predator (mainly wolf) access into caribou habitat



Maintain and recover caribou forage – particularly lichens that serve as a critical winter food source

## Managing based on forest type



### Spruce-mixedwood forests

These forests are generally avoided by caribou but are important to the broader predator-prey system. The report author suggested that management should focus on minimizing primary prey habitat by reducing the shrub and forb response to harvest and shortening the post-harvest window where this habitat is enhanced.



### Black spruce-larch forests

This forest type is selected by both boreal and southern mountain caribou. Due to low productivity, forestry operations can be limited in this forest type. The creation of roads and other linear features is the greatest concern as they give access to wolves that would otherwise avoid this forest type. The report author suggested that management should focus on minimizing predator access and maintaining the caribou forage species that are often prevalent in this forest type. These forests often have terrestrial lichens, so it is important to minimize ground disturbance.

### Key Management Goals:



Minimize primary prey habitat



Maintain forage



Minimize predator access



### Pine forests

These forests can serve as an important winter range for mountain caribou and are selected by boreal caribou as well. Pine forests provide extensive ground and arboreal lichens that are key winter forage for caribou. These forests are well adapted to disturbance and well-planned harvest cycles can actually help prevent lichens

from being overtaken by moss species as forests reach later stages of succession. All three caribou management goals are vital in this forest type:

- In **wetter mesic pine forests**, controlling shrub response is the most important management goal whereas in **drier xeric pine forests**, the shrub response is not as strong, so caribou forage management becomes a key objective.
- Minimizing predator access is most important in denser forests as wolves can travel fairly easily through sparse upland pine forests regardless of road access.



### Subalpine forests

These forests are critical calving habitat for all mountain caribou in summer and are also used in winter by a fraction of most subpopulations. These higher elevation forests are less desired for harvest but are still sometimes used. The report author suggests that management should focus on maintaining or recovering

arboreal lichens by deferring harvest, implementing partial harvest strategies, or by improving stand ventilation.

### Key Management Goals:



Maintain forage



Minimize primary prey habitat



Minimize predator access



Maintain forage

## Using knowledge in practice

Although management of caribou recovery is a shared responsibility, forestry companies have a uniquely strong influence because they can directly impact forest conditions through the application of specific harvest and silviculture treatments. Providing more clarity on what ‘undisturbed’ or desirable caribou habitat looks like can lead to revised forest management plans or practices that significantly impact caribou recovery.

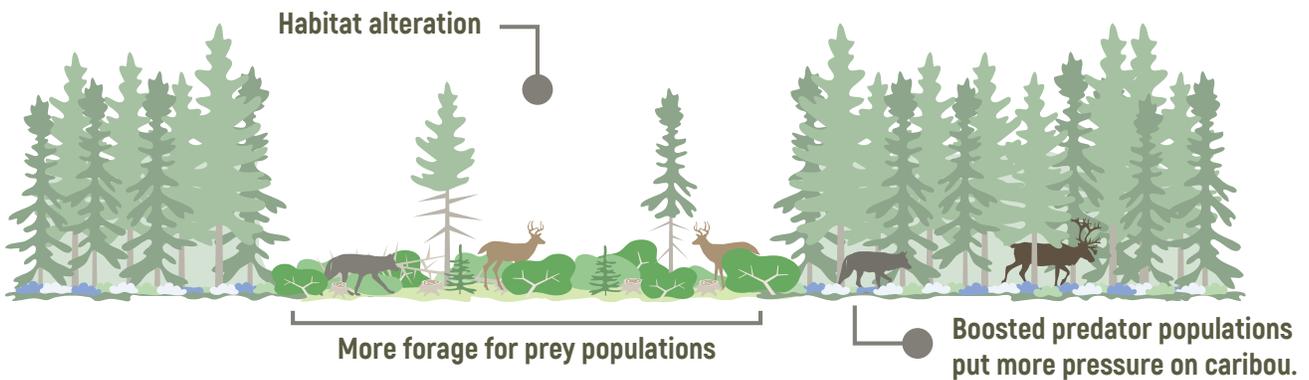


Steven F. Wilson (2024). Toward Undisturbed Habitat: Forest Management in Alberta’s Caribou Ranges. Alberta Regional Caribou Knowledge Partnership

# Habitat alteration or climate: What drives the densities of invading deer?

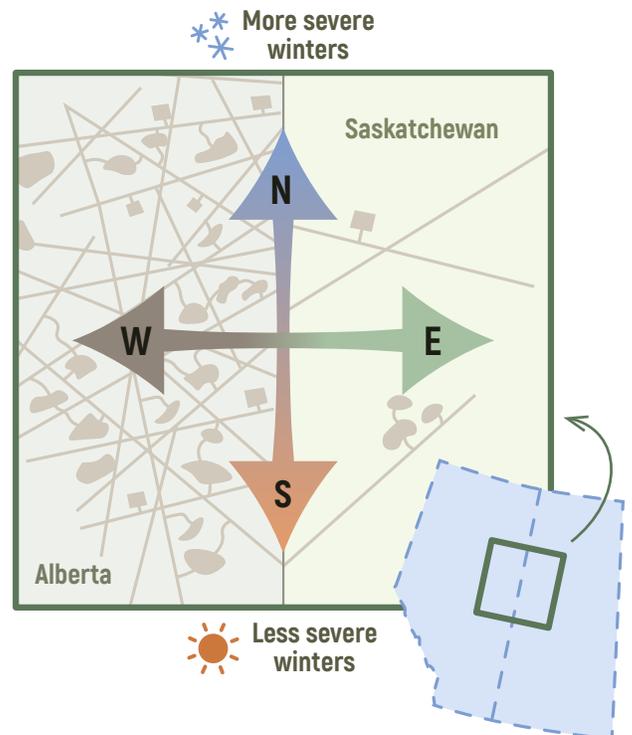
White-tailed deer populations are expanding across North America and into key caribou habitats of the boreal forest. As wolves follow deer into these new habitats, they increase hunting pressure on threatened caribou populations. When deer become available as prey, wolf densities can increase ten-fold. However, it is not clear how much the expansion of deer is being caused by changing habitat conditions and how much is being caused by changing climate conditions.

Harsh winters are difficult for deer to survive and therefore naturally limit their population to warmer, more southern areas where the growing season is longer, and more food is available. In addition, habitat alteration that removes mature trees and allows shrubs to take over benefits deer. The increase in shrubs provides ample food, allowing populations to increase. These two factors are naturally intertwined along a northwest-southeast axis as ecosystems gradually shift from parkland to boreal plains to boreal shield.



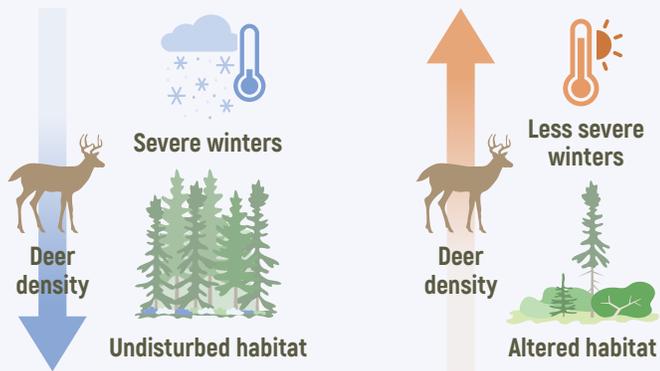
## Disentangling habitat from climate

There is an abrupt change in the level of habitat alteration across the border between Alberta and Saskatchewan, with alteration being approximately 3.6 times higher on the Alberta side. These disturbances are a result of land clearing for oil and gas exploration and forest harvest. A 5-year study starting in 2017 took advantage of this unique situation to help understand the impacts of habitat and climate separately.



Data from 300 remote cameras positioned across the landscape were used to estimate how deer densities changed from east-west (habitat alteration) and north-south (climate).





## The strongest influence on deer density is climate

Deer populations were lowest in areas with the highest winter severity (longer and snowier winters). A tendency for deer density to increase with an increase in habitat alteration was also seen but the strength was half that seen for climate and not significant. This study suggests that these two drivers of deer density, climate and habitat change, are nested within each other and operate at different scales. Climate is driving the main expansion of deer into new areas, but habitat alteration can influence their distribution on a finer scale once they are established within these new areas.

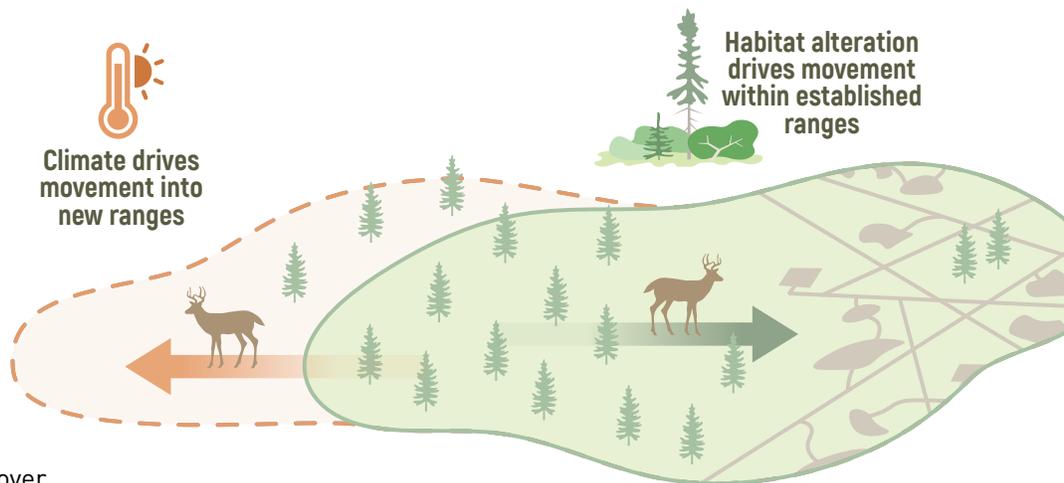
are established within these new areas. Restoration and management strategies aimed at keeping deer and wolves out of caribou habitat is even more vital in the face of climate change adding to this issue. With winters becoming increasingly drier and warmer, deer populations are expected to continue to expand far outside their natural habitat.



### What does this mean for caribou recovery?

Restoration of altered habitat is a broadly proposed management action being implemented to help recover caribou populations. Through habitat restoration, the forage plants favored by deer are reduced, which helps lower both deer and wolf populations. Although habitat alteration is known to change habitat selection of deer in areas where they are already well established, this research has revealed that the changing climate is the main factor driving the movement of deer into new areas. This brings into question whether the management strategy of habitat restoration alone will continue to be effective as the climate changes. Where deer are already well established due to changes in climate, habitat restoration may need to be paired with other management strategies like predator reduction to remain effective.

Although a connection between climate and deer densities was found, the specific mechanisms behind this connection was still not fully understood. Further long-term monitoring to help identify these mechanisms is necessary for guiding future wildlife management strategies.



Dickie, M., Serrouya, R., Becker, M., DeMars, C., Noonan, M. J., Steenweg, R., Boutin, S., & Ford, A. T. (2024). Habitat alteration or climate: What drives the densities of an invading ungulate? *Global Change Biology*, 30, e17286. <https://doi.org/10.1111/gcb.17286>

# 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



\$1M / YEAR  
for 5 years

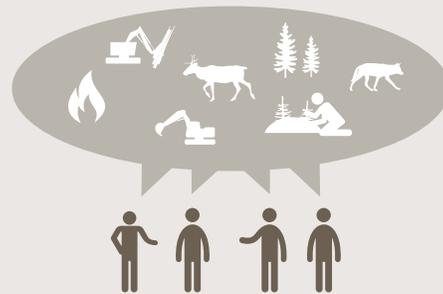


Twelve Forestry Companies



## OUR VISION

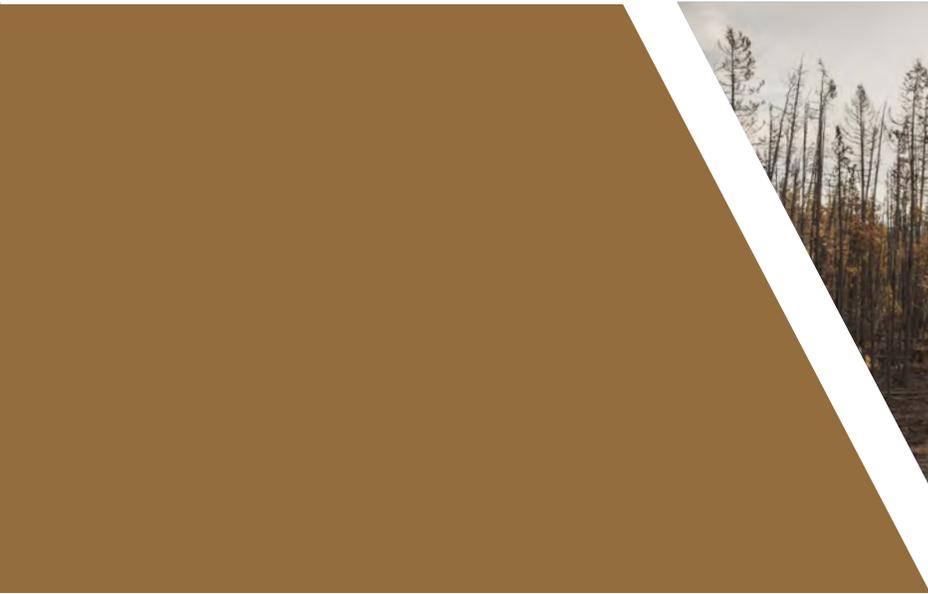
A collaboration promoting self-sustaining caribou populations and a viable forest sector.



## 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 Jen Allen-Dickman at [jen@fuseconsulting.ca](mailto:jen@fuseconsulting.ca) or visit [arckp.ca](http://arckp.ca).



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



ARCKP Partners



For more information or to contact the ARCKP, visit [arckp.ca](http://arckp.ca)

