



THE EXCHANGE:

Sharing Knowledge, Inspiring Solutions



2023
EDITION 8



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.

TABLE OF CONTENTS

02 MOUNTAIN PINE BEETLE OUTBREAKS AND
MANAGEMENT AFFECT CARIBOU SUMMER FORAGE

04 THE ROLE OF UNDERSTORY STAND DENSITY IN
BOREAL CARIBOU HABITAT SELECTION

06 PRIORITIZING CONSERVATION STRATEGIES BY
CONSIDERING MECHANISMS OF CARIBOU DECLINES

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

Mountain pine beetle outbreaks and management affect caribou summer forage

While caribou are well-known for relying on terrestrial and arboreal lichens in the winter, they also rely on certain shrubs, forbs and grasses in the spring, summer and fall. This means that natural disturbances and forest management that affect understory plants have the potential to affect caribou conservation efforts.

Caribou ranges also have a broad overlap with widespread mountain pine beetle (MPB) outbreaks across western Canada. Mountain pine beetle infestations affect forest structure by killing trees, opening up the canopy and triggering a range of management actions ranging from single-tree cut and burn to accelerated harvest or prescribed burning.

Both the MPB infestations themselves and the management actions taken to combat them could affect the understory plants caribou rely on in the spring to fall months.

Researchers at fRI Research examined how summer forage species were affected by MPB infestations and typical management responses. The findings can help forest managers strike a balance between mitigating the impacts of MPB and supporting caribou conservation goals of increasing forage availability.

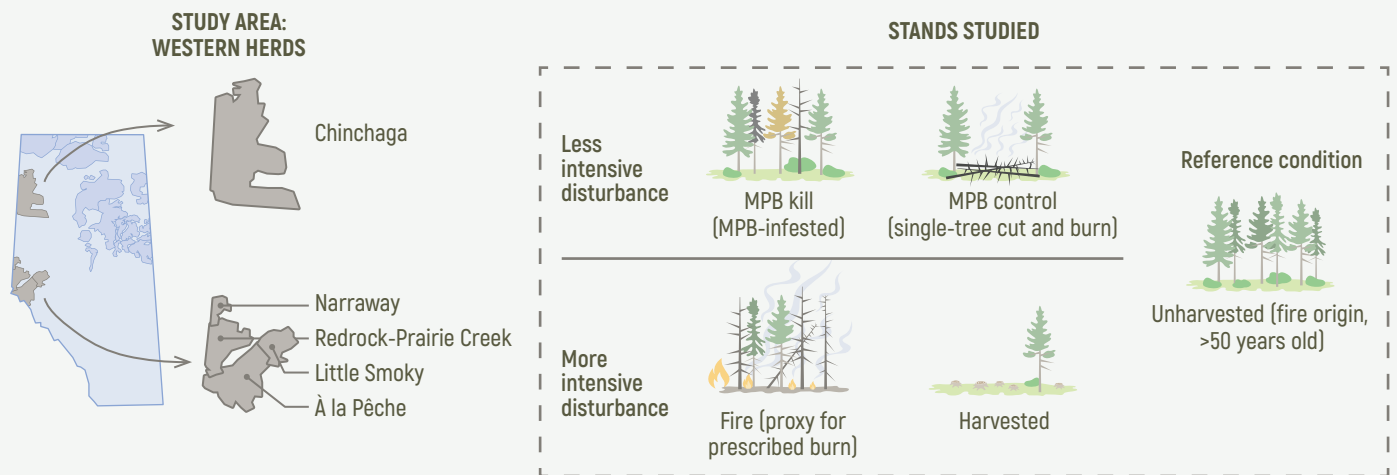
Studying forage responses across five caribou ranges

Researchers sampled vegetation on 774 transects across a 33,000 km² area that included the À la Pêche, Narraway, Redrock-Prairie Creek, Little Smoky and Chinchaga caribou ranges.

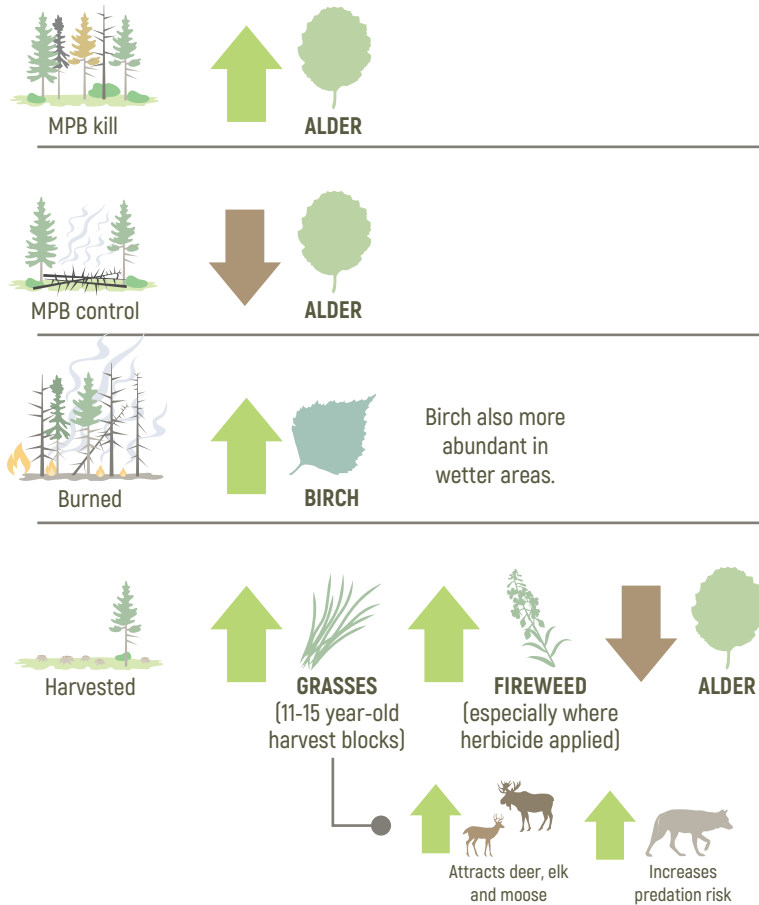
They estimated the percent cover of alder, birch and grasses and one competing species, fireweed.



Credit: Sonya Odsen, Fuse Consulting



FORAGE SPECIES RESPONSES TO DISTURBANCE INTENSITY:



Naturally disturbed stands had more summer forage for caribou

Caribou understory forage was generally more abundant in MPB-infected and burned stands than in unharvested forest, and less abundant where MPB control (single-tree cut and burn) had been implemented.

In harvested stands, grasses and fireweed were more abundant. While caribou eat grass in the summer, open grassy areas also attract deer, elk and moose, and increase caribou exposure to predators. The benefits of this boost in forage are likely outweighed by the increased risks to caribou.

Fireweed, an important food for elk, mule deer and moose (but not for caribou), was most abundant in harvested forest – particularly in harvest blocks where herbicides were applied. These stands are likely to see fireweed outcompete more valuable caribou forage species and may also increase risk to caribou by increasing apparent competition.

Striking a balance between management goals

The information gained from this study can help managers think strategically about responses to mountain pine beetle outbreaks when they overlap with areas where improving summer forage for caribou is an important goal.

For example, prescribed burns may be an effective tool for addressing large-scale infestations, balancing the need to eliminate the threat while providing more caribou summer forage (e.g., birch). There may also be opportunities to leave MPB-killed stands, which also increased caribou forage (alder), in areas where the risk to other values is low. At smaller scales, single-tree cut and burn may provide an important balance by mitigating the effects of MPB outbreaks on timber supply without the same ecological outcomes of harvesting.

While canopy thinning and variable retention harvesting were not included in this study, the results of this work and other studies suggest that they may be valuable tools for balancing caribou conservation goals and forest industry needs. For example, treatments that partially open the canopy by removing trees vulnerable to MPB infestation may have a positive effect on forage species for caribou without compromising overall habitat quality. However, more research is needed to determine how these treatments impact caribou, apparent competitors, predators and fibre flow.

McClelland, C.J.R., Nobert, B., Larsen, T.A., Pigeon, K.E., and Finnegan, L. 2023. The impact of mountain pine beetle outbreaks and their treatment methods on the abundance of plant-foods important to caribou and grizzly bears. *Forest Ecology and Management* v532: 120841. [\[URL\]](#)

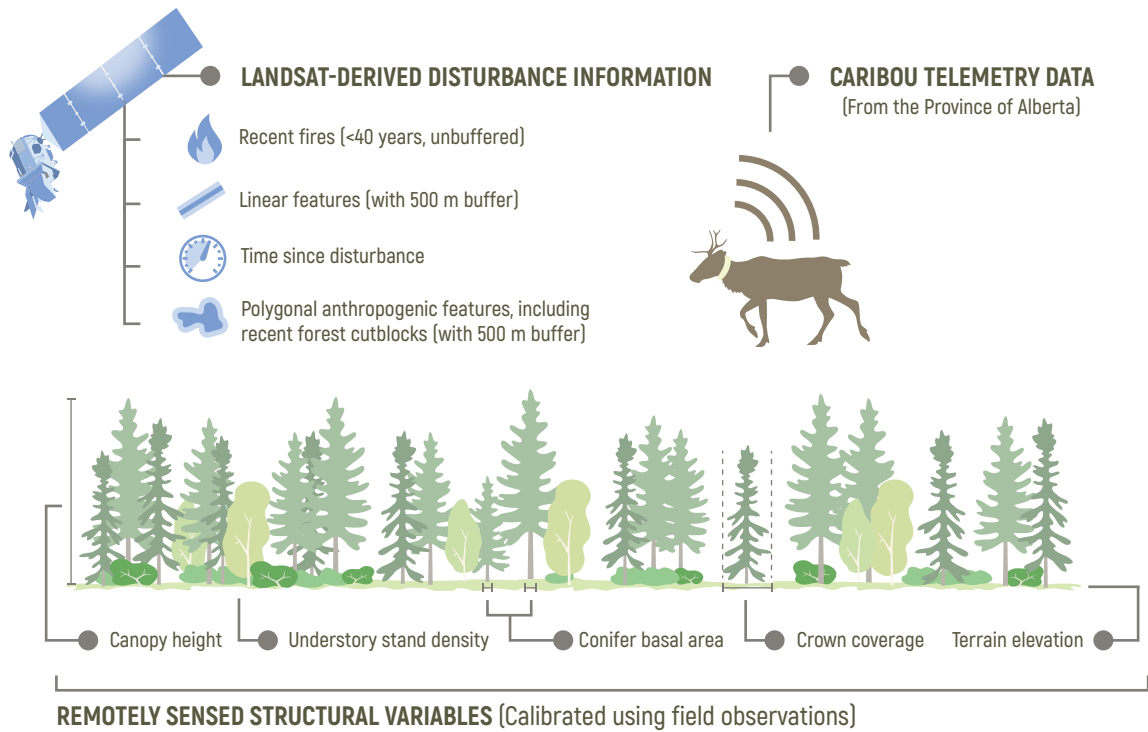
The role of understory stand density in boreal caribou habitat selection

For humans and caribou alike, moving through a forest stand thick with alder, rose and other tangled shrubs can be difficult. Indeed, **the energetic cost of movement is thought to be an important factor in caribou habitat selection**, whether they are looking for food or avoiding predators. However, there has yet to be a study using remote sensing to assess understory stand density and estimate how it affects caribou habitat selection — until now.

In this study, researchers found that caribou prefer habitats with lower understory stand density, regardless of whether they prefer dense or open conifer forests. **These findings present an opportunity for managers to promote these beneficial habitat conditions as part of a comprehensive caribou management strategy.**

Leveraging remotely-sensed data and other datasets

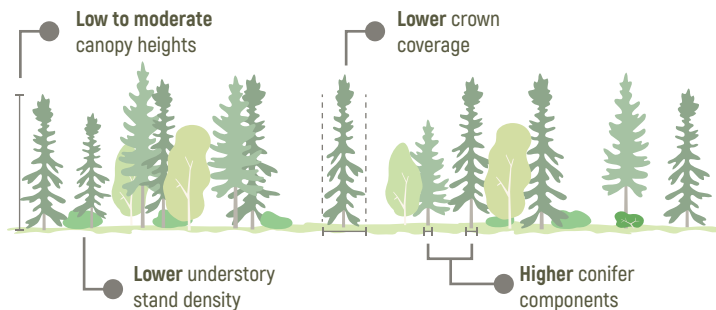
For this study, researchers combined the following data from a variety of sources for the **Bistcho** caribou range in northwestern Alberta.



This study defined understory density as "**standing and downed biomass that could impede the movement of animals,**" and included both merchantable and non-merchantable species.

Understory stand density is an important factor in caribou habitat selection

CARIBOU IN THE BISTCHO RANGE WERE MORE LIKELY TO BE OBSERVED IN HABITATS WITH:

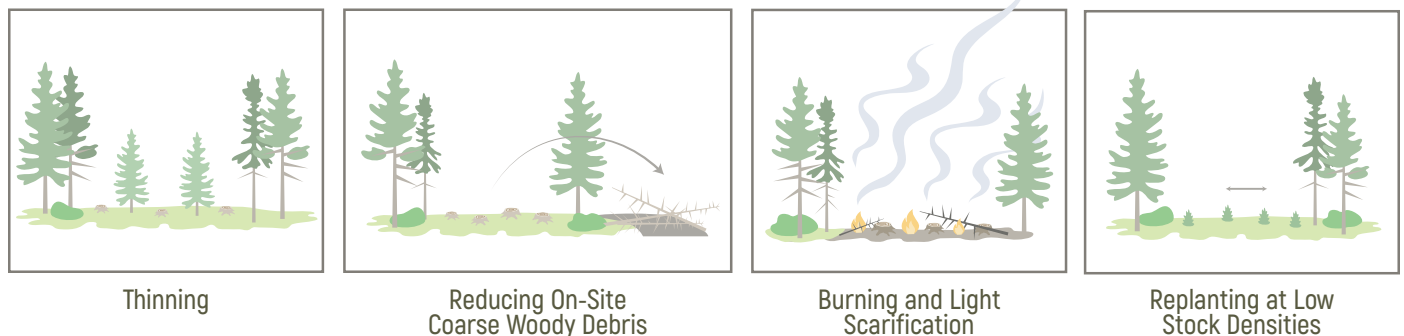


These results suggest that ease of movement and energy costs are likely an important factor driving caribou habitat selection. While these habitat features are consistent with a known preference for low-productivity environments such as lowland treed bogs and fens, a preference for stands with low understory stand density was also observed for the Trout Lake boreal caribou range in northwestern Ontario, where caribou preferred more densely treed forest habitats.

Opportunities to improve habitat quality for caribou by increasing ease of movement

This new information suggests there are **opportunities to leverage forest management to reduce understory stand density** as one strategy within a comprehensive caribou habitat management plan to avoid double strategy.

FOREST MANAGEMENT STRATEGIES TO REDUCE UNDERSTORY STAND DENSITY



However, it is important to keep in mind other factors that affect caribou habitat selection and survival. For example, site preparation is not recommended for stands with intact lichen mats as it would damage this important winter forage. Improving mobility by reducing stand understory density may also have unintended trade-offs by potentially improving habitat quality and mobility for primary prey (e.g., moose) and predators (e.g., wolves). Management to reduce understory stand density should therefore be considered within the larger context of where increasing preferred habitat for caribou will provide the most benefit, and further research will help clarify the potential risks of this strategy.

Wilson, A.T., Nudds, T.D., Green, P.E.J., and de Vries, A. 2023. Effect of forest understory stand density on woodland caribou (*Rangifer tarandus* caribou) habitat selection. *Canadian Journal of Forest Research* 00: 1-10. [\[URL\]](#)

Prioritizing conservation strategies by considering mechanisms of caribou declines

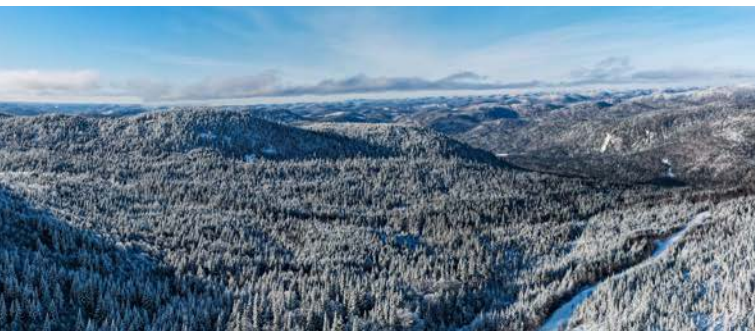
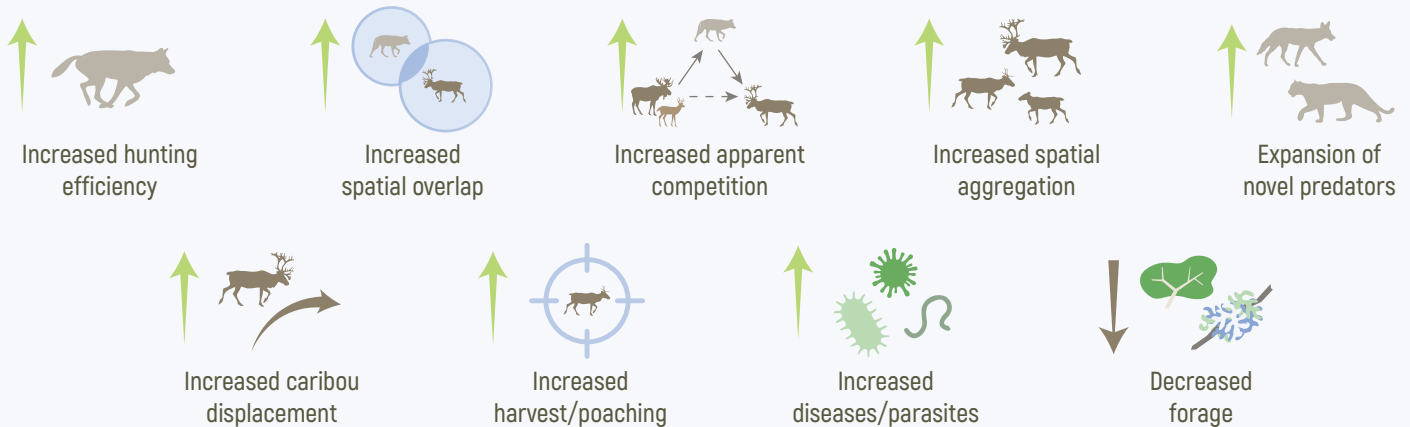
Caribou inhabit wide swaths of land and face a wide range of threats, including extensive disturbances within many ranges in Alberta. Their habitats also overlap considerably with areas of high resource value, and conservation can incur important economic trade-offs. With these variables in mind, how can managers and decision-makers most effectively prioritize their conservation efforts?

In a recent literature review and modelling exercise, researchers asked whether it is possible to **narrow the focus of conservation efforts by focusing on the mechanisms of caribou population declines**, rather than exclusively addressing the ultimate causes for their declines. They suggest that focusing on the most important mechanisms can help inform more targeted, cost-efficient and effective approaches.

Ultimate causes, mechanisms and demographic impacts

The federal recovery strategy for boreal caribou includes a strong focus on the ultimate causes for caribou population declines: human-caused disturbances (polygonal and linear) and natural disturbances (fire). However, each of these ultimate causes impacts caribou through a variety of mechanisms, and current evidence suggests some of these mechanisms may be more significant than others. This presents an opportunity to inform conservation actions according to the mechanism(s) they are meant to address, and thus increase their likely benefit to caribou.

MECHANISMS FOR CARIBOU POPULATION DECLINES

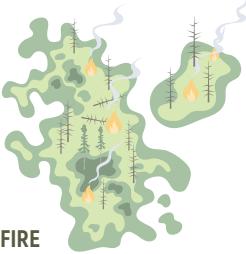

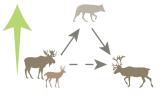




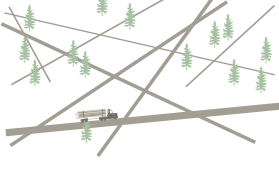





Understanding the spatial scale of apparent competition is important because this mechanism may act on caribou at scales that exceed the size of mapped ranges. Given that many ranges in Alberta are small and isolated, **it is very likely that conservation strategies will need to extend beyond range boundaries to effectively reduce apparent competition (DeMars et al. 2023).**



Examples of prioritization based on current evidence

Based on a review of the current evidence, the most important mechanisms driving demographic responses to fire, polygonal (human) disturbances and linear disturbances, along with suggested approaches for addressing these mechanisms through conservation efforts, are proposed below:

ULTIMATE CAUSE	MOST IMPORTANT MECHANISMS	SUGGESTED APPROACH
 <p>FIRE</p>	 <p>Increased spatial overlap</p>  <p>Increased apparent competition</p>	<p>Anticipate how fire and current/future anthropogenic disturbances may interact and potentially compensate for increased natural disturbances.</p>
 <p>POLYGONAL DISTURBANCES</p>	 <p>Increased apparent competition</p>  <p>Expansion of novel predators</p>  <p>Increased spatial overlap</p>	<p>Reduce polygonal disturbances within and immediately next to caribou habitat.</p> <p>Maintain large, continuous areas of caribou habitat farther from polygonal disturbances.</p> <p>Reforest cutblocks with less palatable species such as spruce within caribou ranges, and with deciduous species far from areas of high caribou use.</p>
 <p>LINEAR DISTURBANCES</p>	 <p>Increased spatial overlap</p>  <p>Increased hunting efficiency</p>  <p>Expansion of novel predators</p>	<p>Prioritize restoring linear disturbances in old forests to reduce overlap between caribou and predators.</p>

Opportunity to increase conservation “bang for the buck” by considering mechanisms

By considering mechanisms of caribou declines, it may be possible to **better prioritize conservation actions to improve both their effectiveness for caribou and cost-efficiency**. In the context of forest management, a mechanistic approach suggests considering the following strategies:

- As much as possible, planning cutblocks far from caribou habitat and prioritizing the maintenance of large, continuous areas of caribou habitat rather than small, isolated areas.
- Strategic silviculture approaches including a focus on regenerating species that are less palatable to competitors (e.g., spruce) within and near caribou habitat, and regeneration of more palatable deciduous species farther away from caribou habitat.
- Where possible, reduce harvesting within caribou habitats with a high proportion of young burned forest.

DeMars, C.A., Johnson, C.J., Dickie, M., Habib, T.J., Cody, M., Saxena, A., Boutin, S. and Serrouya, R. 2023. Incorporating mechanism into conservation actions in an age of multiple and emerging threats: The case of boreal caribou. *Ecosphere* 14: e4627. [\[URL\]](#)

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.



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 Rielle Massey-Leclerc at rielle@fuseconsulting.ca or visit 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



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