



THE EXCHANGE:

Sharing Knowledge, Inspiring Solutions



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Alberta Regional Caribou Knowledge Partnership



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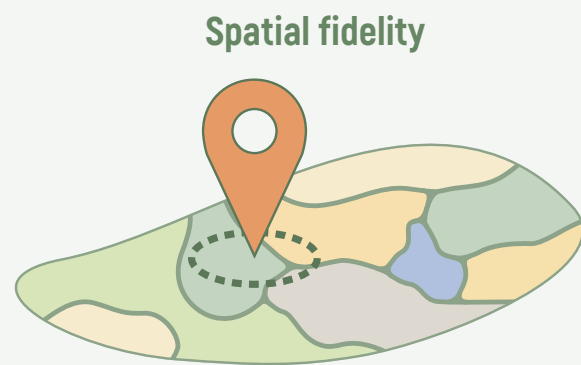


Connecting Alberta's forest sector and policy makers to accessible and relevant scientific information is key to advancing woodland caribou conservation efforts across the province. To facilitate this, the Alberta Regional Caribou Knowledge Partnership (ARCKP) provides regular knowledge exchange, keeping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

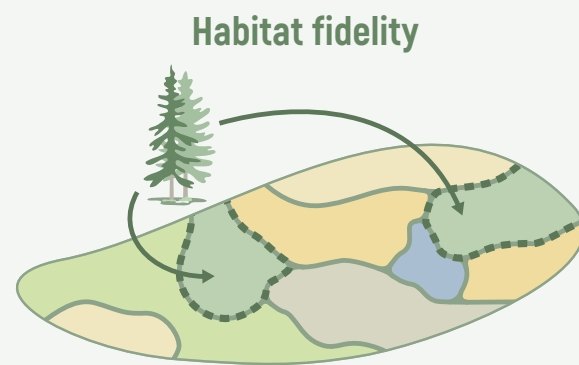
Woodland caribou calving fidelity in Ontario: Spatial location, habitat, or both?

The boreal woodland caribou of northern Ontario have been observed returning to similar areas each spring to give birth. However, a new study shows that this behaviour is not ubiquitous. Although some caribou return to the same areas, some employ alternative strategies for choosing a birthing site. As numbers of this threatened species decline, conservation of calving habitats is becoming increasingly crucial. Understanding how caribou select birthing sites is vital information for land managers looking to better protect these essential areas. While this study was completed in northern Ontario, it provides relevant implications for caribou management and potential future research in Alberta.

New research looked at two different strategies for choosing birth sites — **spatial fidelity** and **habitat fidelity**. These strategies are not exclusive; caribou can have both spatial and habitat fidelity or neither.



Spatial fidelity refers to when caribou return to a specific site each year to give birth. For example, three caribou from this study calved within 50 m of the site they used the previous year — exhibiting a very strong spatial fidelity.



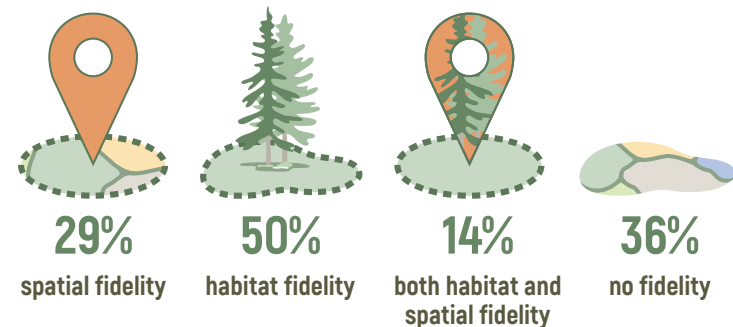
Habitat fidelity refers to when caribou choose a specific habitat type each year to give birth, which may or may not be in a similar location. For example, many caribou in this study preferred to return to lowland conifer forest habitats each year, but not always in the same area.

Caribou monitoring

Between 2010 and 2014, data were collected from 166 female caribou outfitted with GPS collars. Caribou from three different boreal regions in Northern Ontario, Pickle Lake, Nakina, and Cochrane, were included in the study. Additional data included caribou age (estimated by looking at teeth) and land cover information. The four land cover types included lowland conifer forest (bog, swamp, or fen), upland conifer forest (coniferous and sparse), mixed-deciduous forest (mixedwood and deciduous), and early seral forest (<20 years old).

Habitat fidelity is the most popular strategy for choosing a birthing site

The majority of caribou (~60%) showed some sort of fidelity. Interestingly, individual caribou did not always choose the same strategy each year. Of the 19 caribou that were monitored for more than two years, only two chose spatial fidelity every year and seven chose habitat fidelity for every year they were monitored.



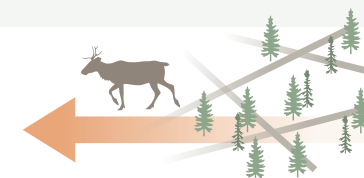
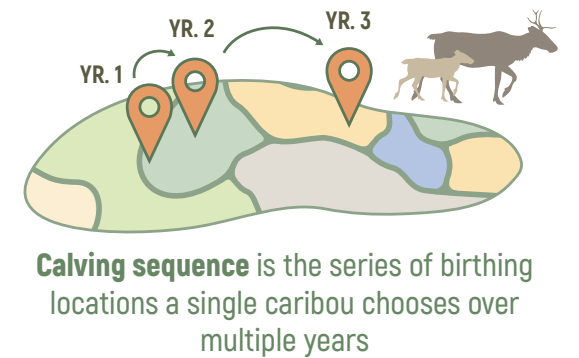
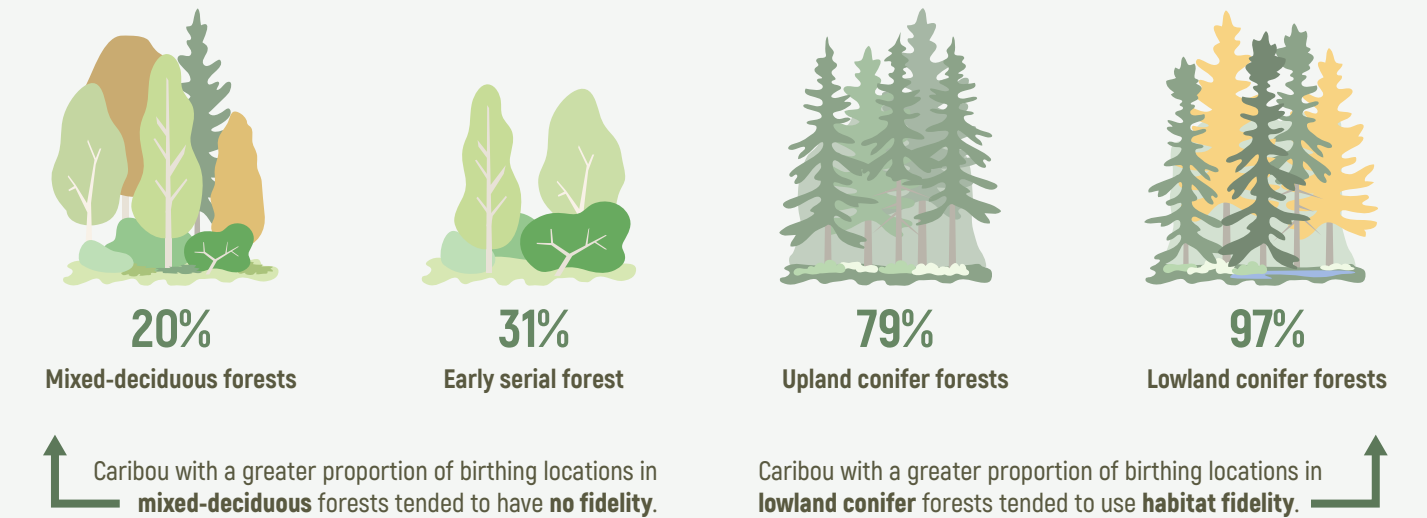
**Calving sequences that switched fidelity across years are counted more than once, resulting in a total greater than 100% for the fidelity categories above.*

The researchers anticipated that calf survival might influence the strategy chosen but no evidence was found to support this. Choosing spatial fidelity did not lead to a higher calf survival rate among the caribou studied. Alternatively, caribou age did impact fidelity strategy with older caribou being more likely to choose spatial fidelity.

Lowland conifer habitats are key calving areas

Researchers looked at the birthing locations for each calving sequence and discovered that some habitats were preferred over others:

**Calving sequences that switched habitats across years are counted more than once, resulting in a percentage total greater than 100% for the four habitats below.*



Habitat quality and availability were also key factors. Calving caribou avoided areas with a high density of linear anthropogenic features and were more likely to choose habitat fidelity as the availability of conifer forests without linear features decreased.

What does this mean for caribou management?

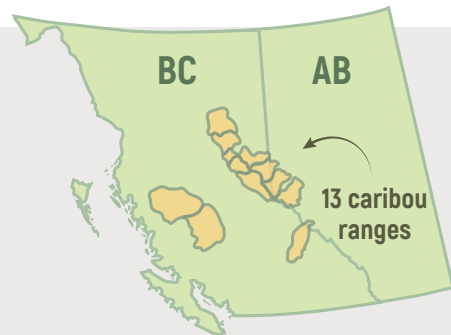
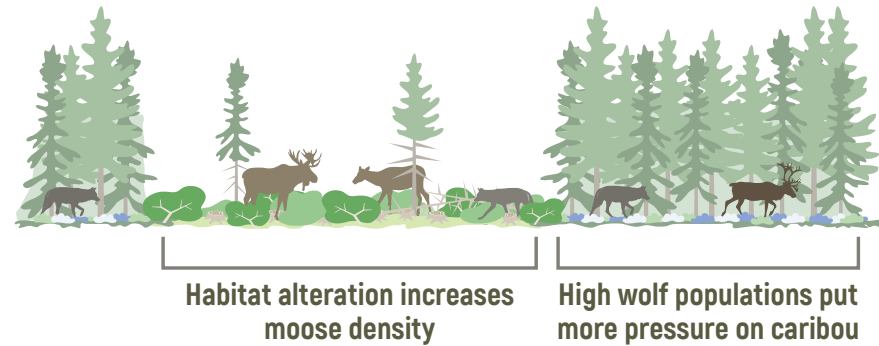
Since this is a study from northern Ontario, it is important to consider potential differences in caribou habitat and behavior before applying learnings to Alberta populations. For Ontario, researchers concluded that since more caribou used the habitat fidelity strategy than the spatial fidelity strategy, land managers should focus on protecting specific habitat types and not just known calving sites. Female caribou tend to space out and isolate themselves during calving as a strategy against predation. However, this means that it is necessary to protect large areas of calving habitat. Researchers concluded that overall, the most effective land management approach in Ontario includes the protection of large extents of upland and lowland conifer forests without linear features. Since the types of habitats selected for calving are also used by caribou throughout the year, protection of these areas will also provide year-round benefits.

Walker, P. D., Rodgers, A. R., Shuter, J., Fryxell, J. M., & Merrill, E. H. (2024). Woodland caribou calving fidelity: Spatial location, habitat, or both? Ecology and Evolution, 14, e11480. <https://doi.org/10.1002/ece3.11480>

Restoring historical moose densities results in fewer wolves killed for caribou conservation

To protect caribou populations, land managers need to employ a range of short-term recovery strategies in conjunction with longer-term habitat restoration. One common but often controversial short-term strategy involves the lethal removal of wolves in caribou ranges. Habitat alteration promoting the growth of early seral forage (young, leafy plants) has increased the number of moose and deer in caribou ranges, which in turn has increased the number of wolves — leading to unsustainable predation rates of caribou. Reducing wolf numbers reduces predation risk for caribou.

While wolf reduction offers caribou some much needed relief, other prey species also benefit and can quickly increase in such areas. Once wolf reduction efforts stop, the high abundance of prey allows wolves to rapidly rebound — an effect that becomes more intense the longer reductions take place. This is particularly evident in areas with high moose populations since moose are a primary prey of wolves. Therefore, to keep wolf populations low, the often costly and labour-intensive removals would need to be conducted year after year until habitats are restored — which rarely occurs in practice. However, a recent study suggests that if moose populations were maintained at a lower level closer to their historic density, wolf reduction efforts would be easier and more effective.

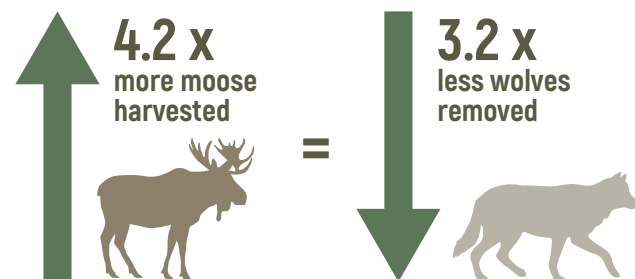


Study area

The researchers compiled data from wolf reduction efforts across 13 southern mountain caribou ranges in both British Columbia and west-central Alberta. The wolf reductions occurred across a collective area of 208 898 km² and spanned for 3-9 consecutive years depending on the range. Although southern mountain caribou occupy different areas than boreal woodland caribou, they face the same ecological challenges and respond similarly to wolf control.

Stabilizing moose abundance lowers the number of wolves requiring removal

In the Columbia North caribou range, moose harvesting policies were changed to allow hunters to take more moose each year. This resulted in 4.2 times more moose being harvested yearly and a 71% decrease in moose density. The moose density achieved (~0.44 moose /km²) better aligned with what the ecosystem would naturally support without the influence of forest harvesting. As a result of the lower moose density, wolves were less prone to rebound between removals, and the number of wolves removed per km² in

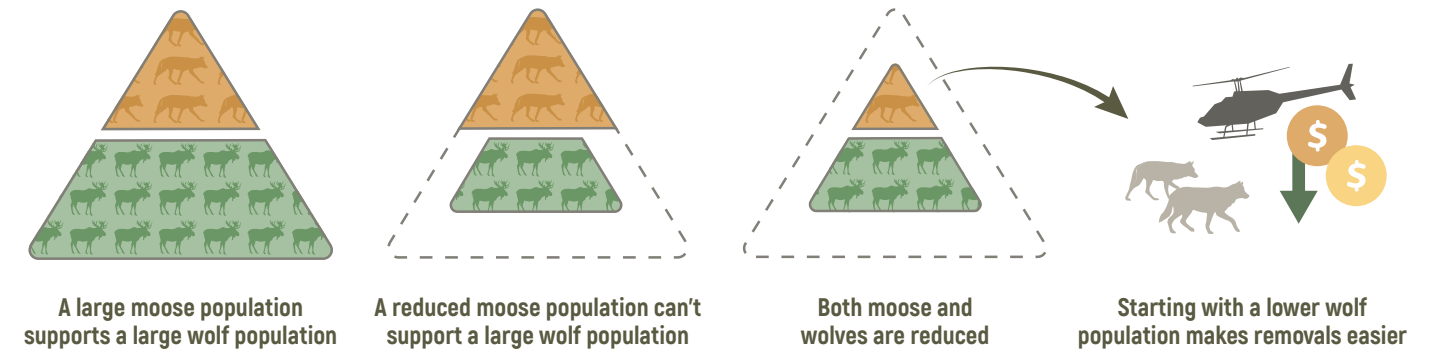


Navigating the social dimension

Both wolf and moose reductions can be controversial recovery strategies as they challenge the ethics and cultural values of many people. Allowing more moose to be harvested for meat can be seen favorably by some communities but the resulting low densities can also raise concerns for food security.

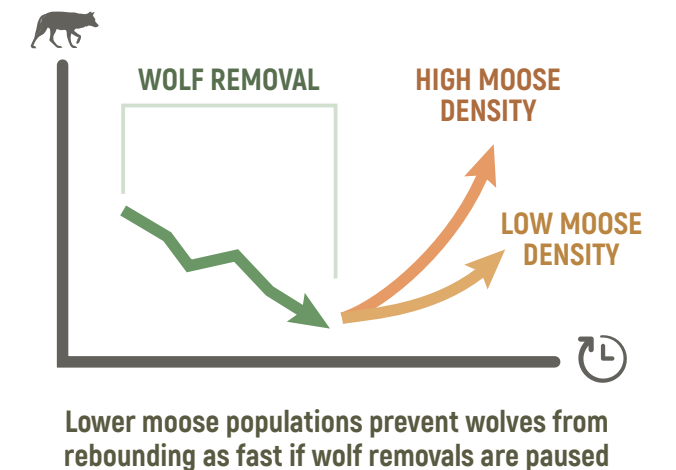
this range was 3.2 times lower. Researchers estimated that if similar moose reduction policies had been implemented across all the ranges in the study, approximately 1427 fewer wolves would have needed to be killed. This could also have reduced the cost of wolf reductions per km² by 35%.

Similar changes to moose harvest policies were made in the Hart North caribou range but moose density was only reduced by 40% initially and was not sustained over time. This weaker reduction did not have the same effect as that seen in the Columbia North range, which emphasizes the need to sustain moose densities at low historic levels to see the desired changes in wolf populations.

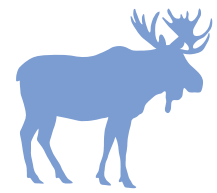


Simultaneous reductions of both wolves and moose can aid caribou recovery

Implementing changes to moose harvest policies can help reduce the number of wolves killed for caribou conservation. Currently, decisions to implement wolf reduction strategies do not consider the density of moose in the area despite the ecological impacts these species have on one another. The higher the moose density, the more difficult and costly wolf reduction becomes. Looking at the issue of caribou conservation through a wider lens and addressing multiple system components at once can help better inform recovery efforts.



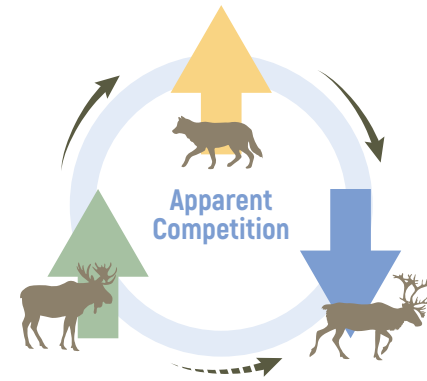
McLellan, M. L., A. T. Ford, D. Hervieux, C. T. Lamb, M. Hessami, M. C. Bridger, and R. Serrouya. 2024. Restoring historical moose densities results in fewer wolves killed for woodland caribou conservation. *Journal of Wildlife Management* e22673. <https://doi.org/10.1002/jwmg.22673>




Lethal wolf control elicits change in moose habitat selection in unexpected ways

Although the ultimate cause of caribou declines is landscape disturbance, moose and wolves play a role through an effect called apparent competition. Through this effect, high moose and wolf densities negatively impact caribou populations. Understanding the complex dynamic between these three species is important as it can help inform short-term caribou recovery strategies (like wolf control) that are used to maintain populations while long-term habitat restoration efforts take effect.

A lethal wolf population control initiated by the Government of Alberta in the winter of 2016–2017 in an already established study area provided an opportunity to compare moose habitat selection before and after a reduction in predator numbers.



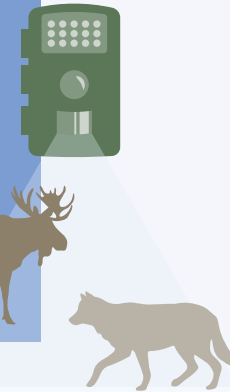
Before wolf reduction, moose prioritized secure habitats whereas after wolf numbers were reduced, they prioritized young forests with ample forage. However, these results were not as consistent as anticipated and revealed some unexpected habitat associations. Some habitats thought to be associated with security including the dense and mature forests of lowland mixed wood and lowland spruce were unexpectedly avoided by moose. Similarly unexpected, moose started using only certain types of “risky” habitats after wolf reduction and continued to avoid others. In particular, moose continued to avoid seismic line habitats after wolf control despite this habitat being associated with a high forage availability. This partial shift may indicate it takes more time for moose to become comfortable using certain habitats after wolf removal or the impact of other predator species may be unaccounted for.

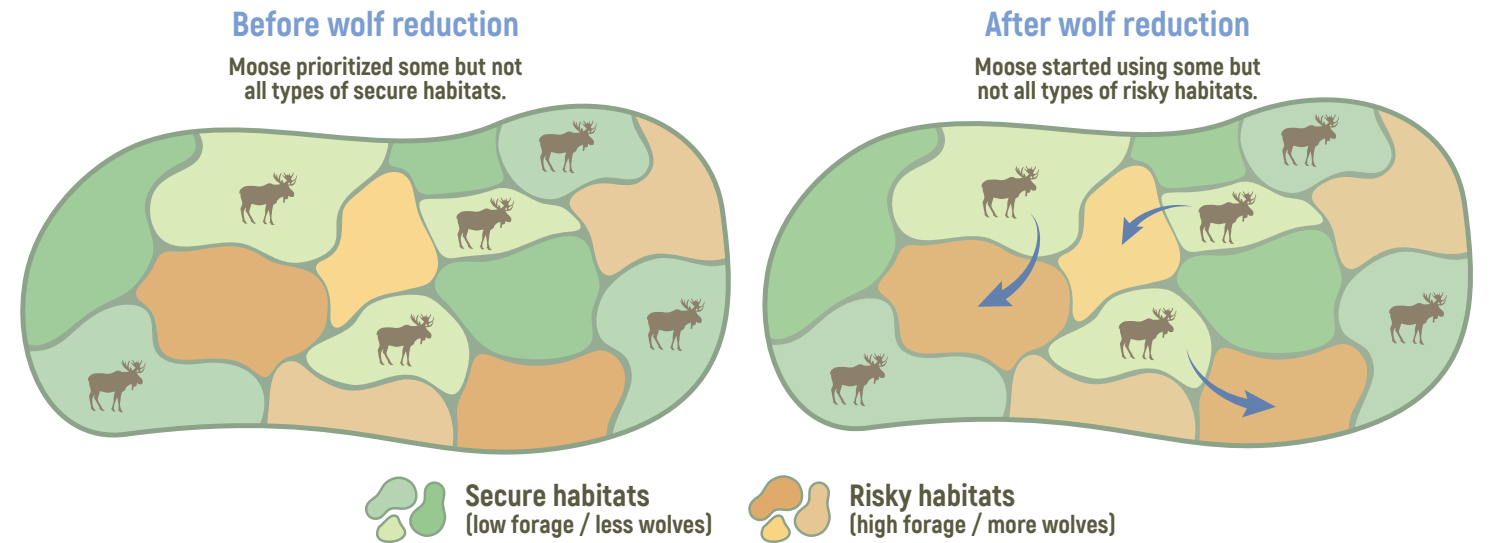


Study area

The Christina Lake study area is a 3 500 km² expanse of western boreal forest in northern Alberta that intersects with the Cold Lake and East Side Athabasca River caribou ranges. This area has been heavily altered by forestry and oil and gas activity which has put both herds at risk of extirpation.

An array of motion-sensitive cameras captured animal movement for three years (2011–2014) pre wolf control and for another three years (2017–2020) post wolf control. Moose presence was compared to land cover variables present within a 250 m and 1000 m buffer of each camera.



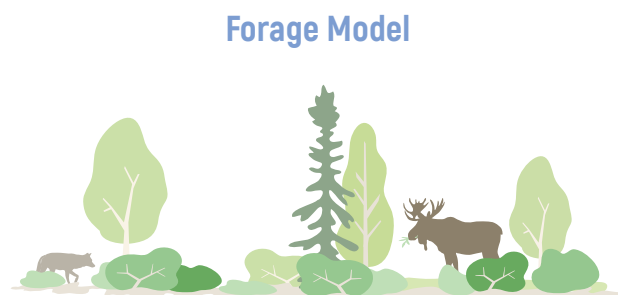


Moose habitat selection changed after wolf reduction

The removal of wolves caused a clear change in distribution of moose across habitats. At the larger 1000 m buffer scale, the two main factors that best explained moose habitat selection were the **security** vs **forage** models.

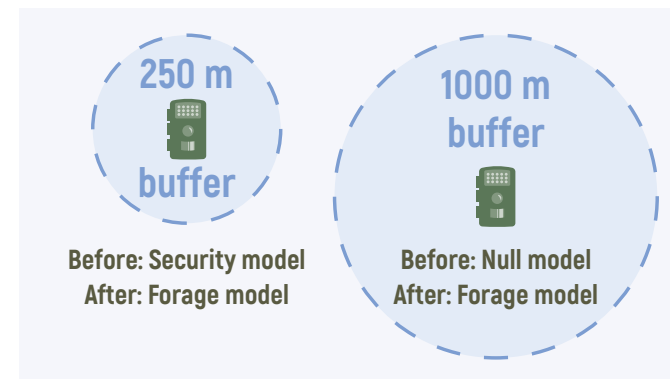


Secure habitats like dense forests reduce predation risk but often offer less forage options.



Habitats with lots of forage can reduce time and energy expenses but are usually more open and have a higher risk of predation.

At the finer 250 m scale, the forage model remained the best explanation of moose distribution post wolf control but neither the security model nor the forage model best explained distribution pre wolf control. This indicates that there are other unmeasured factors at play and further research is needed. The researchers anticipate that other factors including plant productivity, proximity to other features, and seasonal variability may play a larger role than expected.



Moving toward a better understanding

Predator control impacts moose distribution in ways that we do not fully understand. Since these three species are so closely intertwined, understanding how changes to one species impacts the others and how these patterns change or emerge over time is essential. Collecting more information on changes to the mammal community using camera traps before and after wolf culls could provide valuable data essential to answering these questions. Since many uncertainties still exist around the impact of wolf culls, this information could help improve the design and execution of management plans.

Ethier, C. A., A. F. Barnas, N. P. Boucher, K. Baillie-David, and J. T. Fisher. 2024. Lethal wolf control elicits change in moose habitat selection in unexpected ways. *Journal of Wildlife Management* 88:e22620. <https://doi.org/10.1002/jwmg.22620>

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 at ARCKP@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

