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# Status of Boreal Woodland Caribou Conservation in Canada

## A summary of range planning, restoration, and opportunities to win on caribou and climate

Dorothy Hill, Morrigan Simpson-Marran, Lorne Gould and Sarah Nason

November 2021

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# Executive summary

Canada's boreal woodland caribou (hereafter 'boreal caribou') is a critical species to conserve, not only for its ecological and cultural value, but also for the benefit of the climate. Conservation of boreal caribou habitat such as peatlands and boreal forest can benefit the climate due to the massive amount of carbon stored in these ecosystems, which would otherwise be released into the atmosphere if the land were developed. Despite strong potential benefits to many national priorities — conserving a federally listed species at risk, supporting reconciliation with Indigenous peoples, and curtailing Canada's greenhouse gas emissions — progress on caribou habitat conservation at the provincial/territorial level has been slow and is often not integrated under the framework of addressing climate change.

Several key gaps exist in current reporting and information synthesis practices with respect to boreal caribou conservation in Canada. Conservation data are collected at a provincial/territorial level using varying standards determined by each jurisdiction, making it difficult to compare progress and determine the overall status of the species when the data are funneled into national-scale reports. The contributions of Indigenous communities and First Nations are also not often formally recognized in government reporting processes, resulting in an underestimate of overall efforts and conservation potential. Finally, as habitat restoration techniques and conservation programs develop among jurisdictions, there is a need to collate this information to enable knowledge transfer and to assess progress towards national boreal caribou and climate targets.

To address these gaps, the Pembina Institute completed a comprehensive review of boreal caribou range planning and habitat restoration progress, broken down by jurisdiction across Canada. Based on this work, we conclude that:

- Only 29% of subpopulations (15 of 51) meet Environment and Climate Change Canada's criteria for self-sustaining status, and nearly half of all subpopulations (21 of 51) cannot be assessed due to a lack of data.
- Of the 30 subpopulations with sufficient data to assess, 22 are in decline (73%).

- Of the nine jurisdictional range plans that were mandated for completion by 2017, four draft plans were completed on time (with one, Ontario, using a different non-range planning-based process), one was completed between 2018-2021, three are currently in progress, and one is still undocumented (none have received federal approval yet).
- While there has been some progress on habitat restoration, it does not dent the overall scale of restoration required (e.g., an estimated 1.2% of linear features have been restored in Alberta so far), and ongoing habitat destruction currently undermines these efforts.

From this review, the key barriers identified that currently impede boreal caribou conservation in Canada are:

- Subversion of species-at-risk legislation by jurisdictional government permitting and approval processes, enabling ongoing destruction of boreal caribou habitat and rendering restoration efforts irrelevant.
- Changes in the precision and continuity of federal reporting standards, leading to an inability to assess progress at a national scale over time.
- Delays in jurisdictional range planning and lack of intermediate conservation measures to compensate for these delays.
- Jurisdictional governments and industry avoiding compliance with protection of caribou critical habitat by negotiating alternative measures not yet proven to benefit boreal caribou long-term (e.g., restoration as a mitigation for habitat destruction; Section 11 Conservation Agreements to delay enforcement of the Species at Risk Act).

Drawing on the above barriers, an overall conclusion of our work is that **stronger legislation and enforcement measures are needed at all levels of government** to ensure boreal caribou habitat is protected, range plans are completed, and jurisdictional governments are held accountable for their implementation.

In addition, we itemized Indigenous-led conservation efforts across Canada and assessed the potential for co-benefits between boreal caribou- and climate-driven policies (nature-based climate solutions). We found that there is untapped and unrecognized potential in both these areas: much positive

progress on boreal caribou conservation in Canada is the direct result of Indigenous-led conservation efforts, often unfolding outside of the more formally recognized range planning processes, and there are many opportunities to advance climate policy in conjunction with boreal caribou conservation priorities and vice versa.

Our core recommendations to promote boreal caribou conservation and its co-benefits to climate in Canada are:

1. **Prioritize conservation over restoration:** Ongoing destruction of boreal caribou habitat is the number one concern for the species' long-term outlook. Restoration occurs on a long timeframe and is not yet a proven technique to effectively replicate undisturbed habitat; therefore, protection of existing critical habitat must be a top priority to ensure survival of the species in the next 100 years.

2. **Strengthen legislation, policy, and Indigenous co-governance mechanisms to protect caribou habitat:** Legislative loopholes enabling boreal caribou habitat destruction and delays in range planning and implementation must be closed. Legislative or policy mechanisms should also be put in place and used to uphold Indigenous Treaty and inherent rights with respect to protection of boreal caribou habitat. Legislative mechanisms that promote co-governance between federal/provincial governments and Indigenous peoples (e.g., Indigenous Protected and Conserved Areas) should be used to enable collaborative caribou habitat protection.

3. **Improve data collection and reporting standards:** In many cases, a lack of data or a lack of consistency in reporting practices impedes the ability to assess long-term progress at a national scale. Consistent federal data reporting standards and increased investment in data collection for data-deficient subpopulations are urgently needed.

4. **Allocate existing restoration efforts where they will have the most impact and refine restoration evaluation standards:** Restoration work can be of greater benefit to boreal caribou if focused in the areas that have the greatest habitat benefits (e.g., linear features connected to peatlands

that female boreal caribou use during calving seasons). Restored habitat must also not be considered as equivalent to “undisturbed” habitat, as restoration is not yet proven to provide the same long-term benefits to boreal caribou.

# 1. Introduction

Designated as Threatened by Canada's Species at Risk Act (SARA)[1], boreal woodland caribou (hereafter "caribou") are considered an indicator of boreal forest ecosystem health.[2] Caribou are also listed as Threatened under provincial legislation in British Columbia, Alberta, Manitoba, Ontario, Quebec, Newfoundland and Labrador, and Northwest Territories. They require large tracts of undisturbed habitat and prefer peatlands and old black spruce forests over other available habitats.[3,4] Successful conservation of caribou will likely have carry-over effects in protecting hundreds of other species, as caribou distribution overlaps with 90% of boreal forest bird and mammal species, making them a so-called "umbrella" species.[5,6] Caribou conservation, therefore, can be considered a proxy for boreal forest conservation.

However, only 15 of the 51 subpopulations of boreal caribou in Canada are considered self-sustaining while the others are declining.[7] Increased fire frequency driven by climate change is projected to decrease the abundance of old boreal forests by 30% by 2100, even in the absence of further forest harvesting or resource extraction.[8] Unless habitat trends can be reversed, not

[1] Government of Canada, *Species at Risk Act*, S.C. 2002, c. 29. https://laws.justice.gc.ca/PDF/S-15.3.pdf

[2] Environment and Climate Change Canada, *Action Plan for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada – Federal Actions* (2018a). https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/Ap-WoodlandCaribouBorealPopulationFederalActions-v00-2018Feb-Eng.pdf

[3] W. James Rettie, Francois Messier, "Hierarchical habitat selection by woodland caribou: its relation to limiting factors," *Ecography* 23(4) (2008). https://doi.org/10.1111/j.1600-0587.2000.tb00303.x

[4] *Action Plan for the Woodland Caribou.*

[5] Mark Hebblewhite, "Billion dollar boreal woodland caribou and the biodiversity impacts of the global oil and gas industry," *Biological Conservation* 206 (2017). https://doi.org/10.1016/j.biocon.2016.12.014

[6] C. Ronnie Drever, Chantal Hutchison, Mark C. Drever, et al., "Conservation through co-occurrence: Woodland caribou as a focal species," *Biological Conservation* 232 (2019). https://doi.org/10.1016/j.biocon.2019.01.026

[7] Environment and Climate Change Canada, *Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada* (2020d). https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2019.html

[8] Philippe Cadieux, Yan Boulanger, Dominic Cyr, et al., "Projected effects of climate change on boreal bird community accentuated by anthropogenic disturbances in western boreal forest, Canada," *Diversity and Distributions* 26 (2020). https://doi.org/10.1111/ddi.13057

only caribou but other boreal forest species dependent on older forests will continue to decline.[9]

Two conservation actions are immediately important for improving the status of caribou: one is reducing predation pressure by re-establishing spatial separation between caribou and wolves; the other is improving protection of remaining intact older (more than 80 years old) forests and peatlands that caribou depend on. The co-occurrence of caribou and wolves, and thus the associated predation rates, have increased dramatically due to anthropogenic influence. Linear features allow wolves to quickly access sensitive habitat (e.g., calving grounds) they would not occupy otherwise.[10] Alberta alone has more than 250,000 km of unrestored seismic lines within boreal caribou habitat,[11,12] indicating that the scale of ongoing industrial developments is an urgent concern for the preservation of the species.

This report focuses on actions made for caribou conservation in Canada between 2012 and 2021, with an emphasis on activities within in the past three years (2018–2021). Environment and Climate Change Canada reports three key performance indicators to track caribou conservation progress: range planning, population condition, and habitat condition.[13] We begin the report examining these three metrics. We then discuss the provincial and territorial legislation protecting caribou habitat. Habitat restoration, particularly of linear features, has been a focus of much of the research since 2018. We examine the various approaches to restoration and assess which approaches have worked to advance the caribou conservation performance indicators and which have not. We also

[9] Cadieux, "Projected effects of climate change on boreal bird community."

[10] Craig A. DeMars, Stan Boutin, "Nowhere to hide: Effects of linear features on predator–prey dynamics in a large mammal system," *Journal of Animal Ecology* 87 (2017). https://doi.org/10.1111/1365-2656.12760

[11] Government of Alberta, *Draft Provincial Caribou Range Plan* (2017). https://open.alberta.ca/dataset/932d6c22-a32a-4b4e-a3f5-cb2703c53280/resource/3fc3f63a-0924-44d0-b178-82da34db1f37/download/draft-caribourangeplanandappendices-dec2017.pdf

[12] Mariana Nagy-Reis, Melanie Dickie, Anna M. Calvert, et al., "Habitat loss accelerates for the endangered woodland caribou in western Canada," *Conservation Science and Practice* e437 (2021), https://doi.org/10.1111/csp2.437

[13] Environment and Climate Change Canada, *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou (Rangifer tarandus caribou), Boreal population in Canada for the Period 2012-2017* (2017). https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-report-2012-2017.html

look to the future by examining how Indigenous-led initiatives and nature-based climate solutions are contributing to caribou conservation and might be better supported and leveraged moving forward.

# 2. Nature-based climate solutions

## 2.1 What are nature-based climate solutions?

In addition to acting as key habitat for boreal caribou, Canada's boreal forests and peatlands play a key role in absorbing and storing carbon dioxide. The boreal forest alone stores approximately 208 billion tonnes of carbon, 11% of the world's total.[14] Further to this, it is estimated that earth's forests and soil absorb roughly 30% of atmospheric carbon.[15] The role nature plays in mitigating climate change is essential.

Nature-based climate solutions (NBS) further build nature's ability to store and absorb carbon, building a natural buffer against climate change. NBS projects fall into three main categories: conservation, restoration, and management. The climate benefits of NBS projects are significant and can provide up to 78 megatonnes (million tonnes, Mt) of carbon reduction for Canada annually starting in 2030 (Table 1).[16] This reduction is equivalent to removing over 62,000,000 passenger vehicles from the road for a year.[17]

While the practice of better managing nature to serve community and societal needs is not new, it is receiving more attention as the climate crisis becomes increasingly urgent and companies and governments search for ways to be better environmental stewards. In particular, the conservation, restoration and management of peatlands and older boreal forests is an increasing priority. These ecosystems are among the most important carbon stores in Canada and

[14] Ronnie Drever, "Primer on Forest Carbon," *Nature United*. https://www.natureunited.ca/what-we-do/our-priorities/innovating-for-climate-change/primer-on-forest-carbon-in-canada-s-boreal-forest/

[15] NASA, *Examining the Viability of Planting Trees to Help Mitigate Climate Change* (2019), https://climate.nasa.gov/news/2927/examining-the-viability-of-planting-trees-to-help-mitigate-climate-change/

[16] Nature United, *Natural Climate Solutions* (2021). https://www.natureunited.ca/what-we-do/our-priorities/innovating-for-climate-change/natural-climate-solutions/

[17] United States Environmental Protection Agency, "Greenhouse Gas Equivalencies Calculator," November 16, 2021. https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

can contribute to both caribou conservation and nature-based climate solutions.[18]

Table 1. Potential carbon storage offered by nature-based climate solutions

| Category | Potential carbon storage in Canada per year (starting 2030)[19] | Description |
|---|---|---|
| Conservation | 30 Mt | Every time a natural landscape is disturbed, carbon is released. By protecting this natural infrastructure and preventing development of any type, carbon is not released into the atmosphere. |
| Restoration | 3.8 Mt | Restoring wetlands, peatlands, grasslands and forests is an investment in the future. While near-term carbon absorption is small, absorption capacity drastically increases as the ecosystems mature. |
| Management | 44.4 Mt | Landscapes are managed to reduce disturbance so that there is time to recover from development activities and further opportunity for regeneration. |

NBS projects are an option for companies who want to make their operations more sustainable. For example, a forestry company may choose to practice sustainable management to increase the boreal forest's potential as a carbon sink, an oil and gas company may choose to restore land, or a large tech company may opt to buy up swaths of natural land so it can remain undeveloped, leaving the stored carbon in the ground.

NBS projects are frequently considered exclusively through the lens of climate; however, by acknowledging that the co-benefits to species at risk, including boreal caribou, can be significant, the positive impacts from these projects can be doubled.

[18] C. Ronnie Drever, et al., "Natural climate solutions for Canada," *Science Advances* 7(23). https://doi.org/10.1126/sciadv.abd6034

[19] *Natural Climate Solutions.*

## 2.2 NBS conservation and caribou

Conservation projects for NBS involve the purposeful prevention of land disturbance and development in a specified area. These projects not only prevent the release of stored carbon into the atmosphere but also allow the natural infrastructure to continue to act as a carbon sink. While the climate benefits of undisturbed land are significant, the benefits do not end there. Protected habitat is essential to the recovery of declining caribou populations.[20]

Avoided development of lands is a significant benefit to climate and essential to the conservation of caribou. For example, caribou have been observed to gravitate towards peatlands when avoiding predators.[21] Stopping the disturbance of peatland from industrial activities can provide up to 10.1 Mt of carbon benefits per year by 2030.[22] This is equivalent to taking over 8,000,000 passenger vehicles off the road for a year.[23] By conserving peatlands, caribou populations will be better able to recover and Canada will have achieved a significant climate win.

Development of caribou habitat occurs regularly, even though SARA Section 33 specifies, "No person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species."[24] While technically prohibited, continued development of caribou habitat is doing significant damage to the species and the climate. If this law were properly upheld, it would not only help caribou populations recover but also prevent future release of stored carbon.

## 2.3 NBS restoration and caribou

It has long been known that habitat destruction from industrial activity is detrimental to caribou populations. Seismic lines, well pads, and roads are all

[20] Alberta Wilderness Association, "Caribou." https://albertawilderness.ca/issues/wildlife/caribou/

[21] Ontario Nature, "Why Caribou-t it?" December 3, 2015. https://ontarionature.org/why-caribou-t-it/

[22] Drever, "Natural climate solutions for Canada."

[23] "Greenhouse Gas Equivalencies Calculator."

[24] Government of Canada, *Wildlife Species Listing Process*, S-15.3. https://laws.justice.gc.ca/eng/acts/S-15.3/page-4.html#h-434769

developments that caribou avoid, effectively reducing their habitat by even more than the actual footprint of the development.[25] Seismic lines and other similar linear features pose a particular issue as they allow wolves to hunt in a more fast and effective way (using lines as "highways" to access prey habitats), lowering herd numbers much faster than what would naturally occur.[26] As such, it is essential these developments be restored if caribou herds are going to avoid extinction.

In order to regain this habitat, developments must be decommissioned and reclaimed, meaning establishing a self-sustaining ecosystem.

Restoration will also yield carbon benefits over the long term, as climate and caribou conservation are so closely tied. Carbon absorption on restored sites does not peak for years, if not decades, as trees must mature and gradually take up more carbon. By 2030, restoration in Canada will only provide 3.8 Mt of carbon benefits per year, with only 0.3 Mt coming from reforestation specifically.[27] However, by 2050, forest restoration can provide 24.9 Mt of carbon benefits annually.[28] To achieve these boosted carbon benefits in the future, action has to be taken now to restore caribou habitat. Large scale restoration projects can benefit both caribou and climate.

### Cenovus Caribou Habitat Restoration Project

Cenovus is a large oil company located in Alberta. They set out a goal of restoring 3,500 km of seismic lines, access roads and other disturbances and will be planting roughly four million seedlings between 2016 and 2026. This project is not positioned as being a climate win; however, in future decades carbon absorption capacity from this land will have significantly increased.[29]

[25] Canadian Parks and Wilderness Society, Northern Alberta Chapter, "Caribou and You," https://cpawsnab.org/caribou/

[26] Caribou Monitoring Unit, *Restoring caribou habitat: When should seismic lines be taken off the books?* https://cmu.abmi.ca/wp-content/uploads/2017/10/FactSheet-WolvesOnLinearFeatures2.pdf

[27] *Natural Climate Solutions.*

[28] Drever, "Natural climate solutions for Canada."

[29] Cenovus, *Cenovus Caribou Habitat Restoration Project* (2016). https://www.cenovus.com/news/docs/Cenovus-caribou-project-factsheet.pdf

## 2.4 NBS management and caribou

Of the NBS practices currently assessed, forest management can provide the largest carbon benefits in the near term at 44.4 Mt of carbon benefits per year in 2030.[30] Forest harvest management can also yield benefits for caribou: for example, aggregated harvest is a forestry practice that limits activity to a given space for a given period of time. Companies then move on to a new area and allow the previous one to recover, in a process that mimics wildfires.[31] This practice allows companies to maintain existing forest coverage patterns and can be beneficial to caribou herds as it may decrease habitat fragmentation and foster recovery.[32]

Economic and conservation values can be seen to be at odds because the older forests upon which boreal caribou rely are more economically valuable to the forest industry compared to forests that have been harvested before, disincentivizing maintenance of habitat. The challenge in caribou conservation is to ensure that enough of these last tracts of older forest remain intact.

To preserve the lichen-rich older forest stands for caribou and other species that depend on them, as well as maintain the carbon sink, a shift in government regulations is required. Regulatory agencies must limit or constrain how much old forest is harvested,[33] and these limits must align with the 65% undisturbed habitat threshold outlined in the federal caribou recovery strategy.[34] Timber harvest allocations within caribou ranges that exceed this threshold are not sustainable for caribou populations. Forestry companies also need more

[30] *Natural Climate Solutions*.

[31] Alberta-Pacific Forest Industries Inc., *Alberta-Pacific FMA Area 2015 Forest Management Plan* (2015). https://open.alberta.ca/dataset/35e41141-1570-4b24-95dd-912cf332ec92/resource/9420ae7d-6c4b-4a80-8f73-481e7c504e0d/download/vol-1-combined-fmp-chapters-20180625.pdf

[32] Victoria M. Donovan, Glen S. Brown, Frank F. Mallory, et al., "The Impacts of forest management strategies for woodland caribou vary across biogeographic gradients," *PLOS ONE* 12(2) (2017) e0170759. https://doi.org/10.1371/journal.pone.0170759

[33] Baburam Rijal, Luc Lebel, David L. Martell, et al., "Value-added forest management planning: A new perspective on old-growth forest conservation in the fire-prone boreal landscape of Canada," *Forest Ecology and Management* 429 (2018). https://doi.org/10.1016/j.foreco.2018.06.045.

[34] Environment and Climate Change Canada, *Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal population, in Canada* (2012). https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_caribou_boreal_caribou_0912_e1.pdf

incentives to engage in the intensive post-harvest treatments (e.g., ripping and mounding soil) necessary to encourage regeneration of forests, thus ensuring a timber supply is available from other sources than old forests.[35] Pinno et al. outlined the barriers that prevent the forest industry from engaging in intensive post-harvest treatments. Among these challenges is that regulatory agencies set the minimum standard for forest regeneration, so going above and beyond these standards is a cost borne by the forestry companies with little or no benefit to themselves. Government incentives should encourage more intensive post-harvest treatments as a means of protecting old forests into the future. These reforestation projects could contribute to nature-based climate solutions.[36]

In contrast to traditional forest management planning, ecosystem-based management attempts to apply systems thinking to natural resource management, incorporating both ecological integrity and human well-being into the planning process.[37] Human activity and ecosystem health are tightly linked in socio-environmental systems: human activity impacts the ecosystem which in turn impacts human well-being.[38] The Commission on Ecosystem Management considers such an approach as a best practice.[39] However, too often the only human well-being metric considered is economic,[40] when ecosystems provide a wide range of benefits to people beyond economic ones (so-called "ecosystem services"; e.g., food, flood management, carbon capture, recreation). In addition, while economic well-being is emphasized, Indigenous communities that live in the areas used for resource extraction are often underrepresented in the economic activities.[41]

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[35] Bradley D. Pinno, Kazi L. Hossain, Ted Gooding, "Opportunities and Challenges for Intensive Silviculture in Alberta, Canada," *Forests* 12 (2021), 791. https://doi.org/10.3390/f12060791

[36] Drever, "Natural climate solutions for Canada."

[37] Karen Price, Audrey Roburn, Andy Mackinnon, "Ecosystem-based management in the Great Bear Rainforest," *Forest Ecology and Management* 258 (2008). https://doi.org.10.1016/j.foreco.2008.10.010

[38] SESYNC, "Glossary definitions: socio-environmental systems." https://www.sesync.org/socio-environmental-systems

[39] IUCN, *Commission on Ecosystem Management Mandate 2021-2024* (2021). https://www.iucn.org/sites/dev/files/content/documents/cem_mandate.pdf

[40] Haris R. Gilani, John L. Innes, Hannah Kent, "Developing Human Well-being Domains, Metrics and Indicators in an Ecosystem-Based Management Context in Haida Gwaii, British Columbia, Canada," *Society & Natural Resources* 31(12) (2018). https://doi.org.10.1080/08941920.2018.1481548

[41] See, for example, Price, "Ecosystem-based management in the Great Bear Rainforest."

# 3. Caribou population condition and range planning

Section 46 of the Species at Risk Act (SARA) states that Canada is responsible for reporting on the implementation progress of its recovery strategy within five years after it is posted on the Public Registry. Section 63 of SARA states that Canada must report on actions and measures to protect critical habitat of species at risk. Canada is required to report every 180 days until a species' critical habitat is protected or no longer considered critical habitat.[42]

In 2012, Environment and Climate Change Canada released the *National Boreal Woodland Caribou Recovery Strategy,* which identified 51 subpopulations[43] of caribou across Canada and required the seven provinces and two territories where boreal caribou are found to complete range plans by 2017. The goal of the recovery strategy is to maintain or achieve "self-sustaining" status for each subpopulation, which is defined as the subpopulation being large enough to persist for over 50 years and projected to have a stable or increasing population trend over the next 20 years. The threshold population size for a self-sustaining subpopulation is 100 animals.[44] Progress made toward the goal of self-sustaining subpopulations is recorded every five years by assessing three key indicators: range planning (management to protect critical habitat), population condition (population trends and sizes), and habitat condition (percentage of habitat in each range that is undisturbed). The first five-year progress report was published in 2017,[45] with the second to be released in 2022.

[42] Environment and Climate Change Canada, *Policy on Critical Habitat Protection on Non-federal Lands [Proposed]. Species at Risk Act: Policies and Guidelines Series* (2016c). https://registrelep-sararegistry.gc.ca/virtual_sara/files/policies/CH_Protection_NFL_EN.pdf

[43] The term *subpopulation* refers the number of animals, while the term *range* refers to the land on which those animals live. *Recovery Strategy for the Woodland Caribou*.

[44] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[45] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

Only four provincial or territorial jurisdictions (British Columbia, Alberta, Ontario, and Quebec) released their draft range plans by the 2017 target (Table 2).

Table 2. Summary of range planning progress across jurisdictions

| Status | Jurisdictions | Notes |
|---|---|---|
| Draft range plan completed on time (2017) | • Alberta<br>• B.C.<br>• Ontario<br>• Quebec | Alberta and Quebec continuing to develop their plans<br>Ontario following a different (non-range planning based) process |
| Draft range plan completed between 2017-2021 | • Saskatchewan | No documents publicly available yet |
| Draft range plan in progress | • Northwest Territories / Yukon<br>• Manitoba<br>• Newfoundland and Labrador | Under Section 11 Conservation Agreements, NWT has committed to 2022 deadline and NL has committed to 2023 deadline<br>Yukon shares a herd with NWT |
| No range planning required | • Nova Scotia<br>• New Brunswick<br>• Nunavut | Boreal woodland caribou are absent from these areas |

Population trends were available for only 30 subpopulations. Of these, none were increasing, 10 were stable, and 20 were decreasing. Trend data were not available for any of the subpopulations in Manitoba, Newfoundland and Labrador, Northwest Territories, or Yukon.[46]

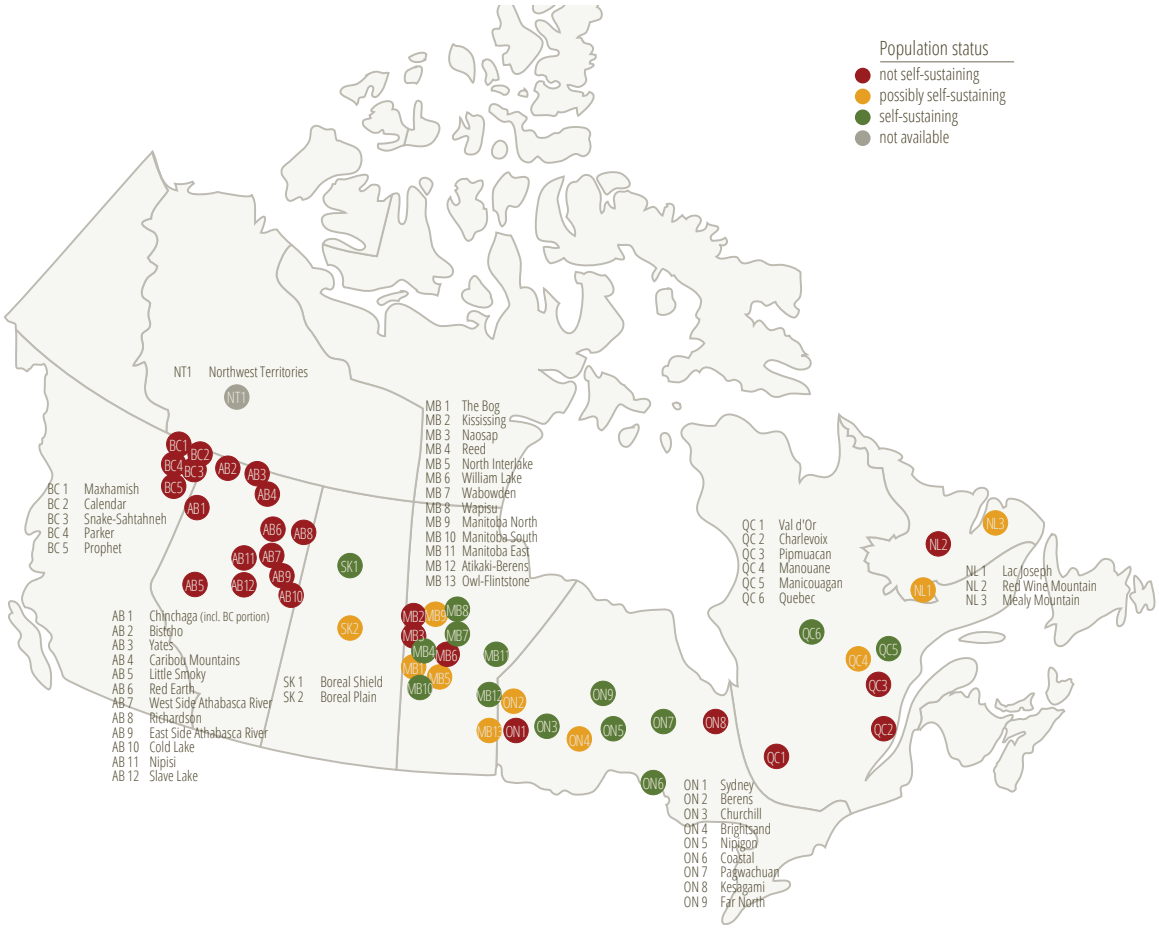
When the first federal recovery strategy was released, 14 subpopulations were found to be self-sustaining while the other 37 were unlikely to be self-sustaining.[47] Currently, 15 subpopulations are "self-sustaining", 26 are "not self-sustaining" and 10 are "as likely as not self-sustaining".[48] Although boreal caribou were present in all 51 ranges across Canada in 2017, populations

[46] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[47] *Recovery Strategy for the Woodland Caribou*.

[48] Environment and Climate Change Canada, *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)* (2020). https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/reports/Chr-MultiSpeciesOct2019-Sept2020-v00a-2020Dec-Eng.pdf

declined overall between 2012 and 2017. Figure 1 summarizes the status of the populations in Canada.




## Figure 1. Caribou population status by range

Note: Labels are placed near the centre of each range and do not correspond to size of range.
Range map source: Environment and Climate Change Canada[49]

Population condition reporting changed between 2012 and 2017: population estimates were used in the 2012 Recovery Strategy while the 100-animal threshold was used in the 2017 Progress Report. This change in reporting makes comparisons challenging and does not provide an indication of the magnitude of subpopulation declines.

[49] Environment and Climate Change Canada, "Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal population, in Canada – 2012," *Species at Risk Public Registry*. https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=33FF100B-1.

In 2019, Canada prohibited the destruction of boreal caribou critical habitat on 300 of its properties directly managed by federal government departments, agencies, and Crown corporations. These properties make up a combined area of more than 14,500 km$^2$. The 2018 federal budget committed $1.35 billion over five years for species at risk, including boreal caribou, in Canada.

The following sections summarize population condition and range planning by province or territory. Tables 3 to 9 also include recent risk assessments as to whether the subpopulations are self-sustaining.

## 3.1 British Columbia

Boreal caribou are red-listed (threatened to endangered) and are a Priority 1 species under the British Columbia Conservation Framework.[50] Five boreal caribou ranges are within British Columbia: Maxhamish, Calendar, Snake-Sahtahneh, Parker, and Prophet (Table 3). Trend data were available for all five subpopulations in 2017 compared to only one in 2012, Snake-Sahtahneh, which was declining. The 2020 surveys showed that all boreal caribou subpopulations were declining.[51]

By 2017, the Snake-Sahtahneh subpopulation had stabilized above 100 animals. Two ranges (Parker and Prophet) were declining with subpopulations less than 100 animals each. These population declines were attributed to a bacterial pathogen outbreak in 2013-2014.[52] A small-scale wolf cull project had been untaken in the Prophet range.[53] Two other ranges, Maxhamish and Calendar, had stable subpopulations with more than 100 animals. British Columbia now

[50] Government of British Columbia, "Boreal Caribou," 2021. https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/wildlife-conservation/caribou/boreal-caribou

[51] Government of British Columbia, *Population Estimates of Caribou Herds of British Columbia* (2020). https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/caribou/bc_caribou_herds_population_estimates.pdf.

[52] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[53] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

manages the Parker and Prophet subpopulations as one herd called Westside-Fort Nelson.[54]

Table 3. British Columbia boreal caribou subpopulation estimates and trends

| Range | 2012 Population | | 2017 Population | | 2020[55] Trend | Self-sustaining (2020)[56] |
|---|---|---|---|---|---|---|
| | Estimate[57] | Trend | Estimate[58] | Trend | | |
| Maxhamish (BC1) | 300 | Not available | ≥100 | Stable | Declining | No |
| Calendar (BC2) | 290 | Not available | ≥100 | Stable | Declining | No |
| Snake-Sahtahneh (BC3) | 360 | Declining | ≥100 | Stable | Declining | No |
| Parker (BC4) | 40-60 | Not available | <100 | Declining | Declining (Westside-Fort Nelson) | No |
| Prophet (BC5) | 50-100 | Not available | <100 | Declining | | |

In 2011, British Columbia published the *Boreal Caribou Implementation Plan* (BCIP) for managing boreal caribou in response to the federal government's Threatened designation for the species.[59] The BCIP predicted that without management, by 2061 each of the Parker, Prophet, and Snake-Sahtahneh subpopulations had a 95% or greater probability of extirpation, while Calendar and Maxhamish had a 68% and 8% probability of extirpation respectively. A major recommendation of the BCIP was to defer oil and gas tenure sales for five years in the Calendar and Prophet caribou ranges. A full moratorium on oil and gas exploration and development in these two ranges was predicted to reduce

[54] *Population Estimates of Caribou Herds of British Columbia*.

[55] *Population Estimates of Caribou Herds of British Columbia*.

[56] *Amended Recovery Strategy for the Woodland Caribou*.

[57] *Recovery Strategy for the Woodland Caribou*.

[58] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[59] B.C. Ministry of Environment, *Implementation plan for the ongoing management of Boreal Caribou (Rangifer tarandus caribou pop. 14) in British Columbia*. (2011). https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/species-ecosystems-at-risk/recovery-planning/boreal_caribou_implementation_plan_final_12aug2011.pdf

the probability of extirpation by 2061 to 5.5% for the Calendar herd and to 35.9% for the Prophet herd.[60]

Measurable targets within the BCIP included identification and protection of sufficient boreal caribou habitat such that all subpopulations within British Columbia could recover within 50 years, restoration of disturbed habitat, management and control of the size of the industrial footprint, management of habitat for fire protection, offsetting of industrial impacts via predator control, and continuing to monitor and assess the effectiveness of the actions taken.

The draft *Boreal Caribou Recovery Implementation Plan* (BCRIP), which revised some of the targets of the BCIP, was released in March 2017.[61] The BCRIP established long-term habitat and population recovery goals for boreal caribou. It outlined landscape-level planning (industrial development and fire management), habitat management (e.g., habitat restoration), mortality and population management (e.g., predator and alternative prey control), population monitoring (e.g., recruitment surveys and health), and Indigenous involvement. The BCRIP proposed reduction in the establishment of early seral habitat, prohibition of forest harvesting and road building in core areas, greater restrictions in untenured land in core caribou habitat, and use of conservation offsets (ratio of 4:1) to reduce future development impacts.[62] Within the three core caribou areas of the Westside-Fort Nelson herd (Prophet, Parker, and Fort Nelson core areas) a net reduction in the density of anthropogenic linear disturbances was required. The final BCRIP has not been made available through the British Columbia government website.

In April 2018, a series of workshops were held to develop restoration planning for boreal caribou habitat in British Columbia. The draft *Boreal Caribou Habitat Restoration Framework* was released in October 2018 with plans to complete the

[60] *Implementation plan for the ongoing management of Boreal Caribou in British Columbia.*

[61] British Columbia, Ministry of Environment and Ministry of Forests, Lands, and Natural Resource Operations, *Draft Boreal Caribou Recovery Implementation Plan* (2017). https://engage.gov.bc.ca/app/uploads/sites/121/2017/03/Draft-Boreal-Caribou-Recovery-Implementation-Plan-2017-2.pdf

[62] *Draft Boreal Caribou Recovery Implementation Plan*.

final version by 2019.[63] A final version has not been posted on the British Columbia government website nor has its completion been reported in the latest federal critical habitat protection report.[64] However, the Habitat Conservation Trust Foundation, which manages the Caribou Habitat Restoration Grants program in British Columbia, has uploaded a summary of the *Operational Framework for Caribou Habitat Restoration in British Columbia* to their website.[65]

## 3.2 Alberta

Boreal caribou are listed as a threatened species under the Alberta Wildlife Act.[66] In 2012, eight of Alberta's 12 boreal caribou ranges were declining, one was stable, and three had no data available (Table 4). By 2017, Alberta reported three ranges with stable subpopulations (Yates, Richardson, and Little Smoky), seven declining, and two with no trend data available. The Yates and Richardson ranges have the lowest levels of industrial development within Alberta[67,68] which may explain their stable subpopulations. In contrast, the Little Smoky range is one of the most impacted by seismic lines, with only 4% undisturbed habitat left,[69] and is highly managed with intensive predator and alternate prey control.[70] Each of the Slave Lake and Nipisi ranges had fewer than 100 caribou in

[63] Environment and Climate Change Canada, *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada* (2019). https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/critical-habitat-reports/woodland-caribou-boreal-population-protected-2019.html

[64] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[65] British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development, *Operational Restoration Framework Woodland Caribou Habitat Restoration in British Columbia* (2021). https://hctf.ca/wp-content/uploads/2021/09/Operational-Restoration-Framework_final-draft_25Aug2021.pdf

[66] Alberta Woodland Caribou Recovery Team, *Alberta woodland caribou recovery plan 2004/05-2013/14* (2014). https://open.alberta.ca/publications/0778540766

[67] D. Hervieux, M. Hebblewhite, N.J. DeCesare, et al., "Widespread declines in woodland caribou (Rangifer tarandus caribou) continue in Alberta," *Canadian Journal of Zoology* 91 (2013). https://doi.org/10.1139/cjz-2013-0123

[68] *Draft Provincial Caribou Range Plan*.

[69] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[70] Hervieux, "Widespread declines in woodland caribou (Rangifer tarandus caribou) continue in Alberta."

2017, so population trends for these two ranges were not calculated because of an insufficient sample size of radio-collared female caribou.[71] By 2020, none of the Alberta subpopulations were assessed as being self-sustaining.

Table 4. Alberta boreal caribou subpopulation estimates and trends

| Range | 2012 Population | | 2017 Population | | Self-sustaining (2020)[72] |
|---|---|---|---|---|---|
| | Estimate[73] | Trend | Estimate[74] | Trend | |
| Chinchaga (AB1) | 250 | Declining | ≥100 | Declining | No |
| Bistcho (AB2) | 195 | Declining | ≥100 | Declining | No |
| Yates (AB3) | 350 | Stable | ≥100 | Stable | No |
| Caribou Mountains (AB4) | 315-394 | Declining | ≥100 | Declining | No |
| Little Smoky (AB5) | 78 | Declining | ≥100 | Stable | No |
| Red Earth (AB6) | 172-206 | Declining | ≥100 | Declining | No |
| West Side Athabasca River (AB7) | 204-272 | Declining | ≥100 | Declining | No |
| Richardson (AB8) | 150 | Not available | ≥100 | Stable | No |
| East Side Athabasca River (AB9) | 90-150 | Declining | ≥100 | Declining | No |
| Cold Lake (AB10) | 150 | Declining | ≥100 | Declining | No |
| Nipisi (AB11) | 55 | Not available | < 100 | Not available | No |
| Slave Lake (AB12) | 65 | Not available | < 100 | Not available | No |

In the decade preceding Alberta's release of their draft range plans, the 10-year *Alberta Woodland Caribou Recovery Plan 2004/05-2013/14* was in place. The Alberta government had adopted this recovery plan except for one

[71] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[72] *Amended Recovery Strategy for the Woodland Caribou*.

[73] *Recovery Strategy for the Woodland Caribou*.

[74] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

recommendation: a moratorium on further mineral and timber lease sales within the ranges of caribou herds in immediate danger of extirpation.[75] In September 2016, the Alberta government restricted new mineral sales within all caribou ranges as a temporary measure while they developed strategies to support the recovery of boreal caribou in the province.[76]

The draft Alberta range plans were released in December 2017, but they were never finalized. The plans rely heavily on the assumption that legacy seismic lines and pipelines can be successfully restored as caribou habitat, and once restored, habitat can be classified as undisturbed by Environment and Climate Change Canada. However, given that caribou require old forests and peatlands as critical habitat, it will take decades after restoration before these disturbed lands can be considered equivalent to undisturbed. It is vital that the Alberta government does not include these lands as "undisturbed" in their habitat condition assessments immediately following restoration because this will result in an over-estimation of the habitat available to caribou, further impeding conservation efforts.

In August 2019, Alberta created several task forces to focus caribou recovery actions at local scales. The first task forces are in the process of developing recommendations for sub-regional planning in the Bistcho Lake, Cold Lake, East-Side-Athabasca, Little Smoky, and Chinchaga[77,78] will then be used to inform the sub-regional planning documents.[79] Public-facing surveys were used to gather general feedback on the Bistcho Lake and Cold Lake sub-regional plans on May 29, 2021.

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[75] *Alberta woodland caribou recovery plan 2004/05-2013/14*.

[76] Government of Alberta, *Draft Bistcho Lake Sub-regional plan* (2021). https://www.alberta.ca/bistcho-lake-sub-regional-plan-engagement.aspx.

[77] Northeast Caribou Sub-Regional Task Force, *Recommendations for the Cold Lake planning area Advice to the Government of Alberta provided by the Northeast Caribou Sub-regional Task Force* (2020). https://www.alberta.ca/assets/documents/aep-ne-caribou-subregional-task-force-cold-lake-area-recommendation-report.pdf.

[78] Northwest Caribou Sub-Regional Task Force, *Recommendations for the Bistcho Lake planning area. Advice to the Government of Alberta provided by the Northwest Caribou Sub-Regional Task Force* (2020). https://www.alberta.ca/assets/documents/aep-nw-sub-regional-task-force-bistcho-lake-area-recommendation-report.pdf.

[79] *Draft Bistcho Lake Sub-regional plan*.

## 3.3 Saskatchewan

Population estimates were unavailable for Saskatchewan's two boreal caribou ranges in 2012. In 2017, Saskatchewan estimated more than 100 caribou in each of its two ranges, with the Boreal Shield subpopulation being stable (Table 5). Environment and Climate Change Canada reported that the Boreal Shield subpopulation was estimated at greater than 5,000 individuals but had insufficient monitoring to estimate the size of the Boreal Plain subpopulation.[80] A subsequent study estimated a minimum of 4,000 individuals for the Boreal Shield range in 2019.[81] Pellet collection for mark-recapture population estimates is ongoing and will continue until 2022.[82]

Table 5. Saskatchewan boreal caribou subpopulation estimates and trends

| Range | 2012 Population | | 2017 Population | | Self-sustaining (2020)[83] |
|---|---|---|---|---|---|
| | Estimate[84] | Trend | Estimate[85] | Trend | |
| Boreal Shield (SK1) | Not available | Stable | ≥100 | Stable | Yes |
| Boreal Plain (SK2) | Not available | Not available | ≥100 | Not available | Possibly |

In 2012, the critical habitat for Saskatchewan's Boreal Shield range was unavailable. Since then, critical habitat has been delineated and Saskatchewan has completed a range plan.[86] Saskatchewan has divided the Boreal Plain range into three range planning units: Central, West, and East. Range plans have been

[80] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[81] Philip D. McLoughlin, Clara Superbie, Kathrine Stewart, et al., *Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. Final Report* (2019). http://mcloughlinlab.ca/lab/wp-content/uploads/2019/06/2013-2018-SK-Boreal-Shield-Caribou-Project-Final-Report-June-10-2019.pdf

[82] Government of Saskatchewan, *2019 Woodland Caribou Conservation Program Update*, (2019). https://www.saskatchewan.ca/business/environmental-protection-and-sustainability/wildlife-and-conservation/wildlife-species-at-risk/woodland-caribou

[83] *Amended Recovery Strategy for the Woodland Caribou*.

[84] *Recovery Strategy for the Woodland Caribou*.

[85] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[86] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

completed for the Central and West planning units and a draft range plan for the East planning unit.

As part of their range planning, Saskatchewan has a process for assessment and mitigation that uses three tiers based on the relative importance to caribou populations, habitat condition, and potential risks to caribou. Tier 1 areas have the highest importance for caribou recovery and caribou habitat retention is the main objective. Tier 2 areas are essential for caribou recovery but have high levels of habitat disturbance and therefore, habitat restoration is the priority. Tier 3 areas are important to maintain connectivity for caribou populations.[87]

## 3.4 Manitoba

Manitoba has between 1,500 to 3,100 boreal caribou within 13 ranges totaling 211,865 km$^2$ in area.[88] Population estimates and trends were available for 10 of the 13 ranges in 2012 (Table 6). However, no trend data were available in 2017. In 2017, three subpopulations (Bog, Kississing, and Wabowden) were estimated to have at least 100 caribou, three ranges had fewer than 100 animals and no data were available for the remaining seven ranges. In 2020, Environment and Climate Change Canada made an assessment that six ranges had self-sustaining subpopulations, three ranges had subpopulations that were not self-sustaining, and the other four ranges had subpopulations that were as likely to be self-sustaining as not.

[87] Government of Saskatchewan, *Range Plan for Woodland Caribou in Saskatchewan. Boreal Plain Ecozone – SK2 Central Caribou Administration Unit* (2019). https://www.saskatchewan.ca/business/environmental-protection-and-sustainability/wildlife-and-conservation/wildlife-species-at-risk/woodland-caribou

[88] Partnering to Protect Caribou, *Caribou in Manitoba facts* (2019). https://protectourcaribou.ca/caribou-in-manitoba-facts

## Table 6. Manitoba boreal caribou subpopulation estimates and trends

| Range | 2012 Population | | 2017 Population | | Self-sustaining (2020)[89] |
|---|---|---|---|---|---|
| | Estimate[90] | Trend | Estimate[91] | Trend | |
| The Bog (MB1) | 50-75 | Stable | ≥100 | Not available | Possibly |
| Kississing (MB2) | 50-75 | Stable | ≥100 | Not available | No |
| Naosap (MB3) | 100-200 | Stable | Not available | Not available | No |
| Reed (MB4) | 100-150 | Stable | Not available | Not available | Yes |
| North Interlake (MB5) | 50-75 | Stable | < 100 | Not available | Possibly |
| William Lake (MB6) | 25-40 | Stable | < 100 | Not available | No |
| Wabowden (MB7) | 200-225 | Stable | ≥100 | Not available | Yes |
| Wapisu (MB8) | 110-125 | Stable | Not available | Not available | Yes |
| Manitoba North (MB9) | Not available | Not available | Not available | Not available | Possibly |
| Manitoba South (MB10) | Not available | Not available | Not available | Not available | Yes |
| Manitoba East (MB11) | Not available | Not available | Not available | Not available | Yes |
| Atikaki-Berens (MB12) | 300-500 | Stable | Not available | Not available | Yes |
| Owl-Flintstone (MB13) | 78 | Stable | < 100 | Not available | Possibly |

In 2015, Manitoba completed a recovery strategy for boreal caribou and draft action plans for the Owl-Flintstone and Atikaki-Berens management units were completed and underwent expert and public review.[92] Manitoba is completing

[89] *Amended Recovery Strategy for the Woodland Caribou*.

[90] *Recovery Strategy for the Woodland Caribou*.

[91] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[92] Manitoba Boreal Woodland Caribou Management Committee, *Conserving a Boreal Icon, Manitoba's Boreal Woodland Caribou Recovery Strategy. Manitoba Conservation and Water Stewardship* (2015). https://gov.mb.ca/fish-wildlife/pubs/fish_wildlife/cariboustrategy_octfall2015.pdf

internal review and engagement on its caribou range plans and is preparing for engagement with Indigenous communities.[93]

## 3.5 Ontario

There are approximately 5,000 boreal caribou in nine ranges in Ontario (Table 7).[94] One of Ontario's subpopulations (Sydney) has fewer than 100 with a declining trend. In 2017, the remaining eight subpopulations were declining except for the Pagwachuan range subpopulation which was stable. Environment and Climate Change Canada has assessed the subpopulations of five ranges as self-sustaining, two as not self-sustaining, and two as likely to be self-sustaining as not.

Table 7. Ontario boreal caribou subpopulation estimates and trends

| Range | 2012 Population | | 2017 Population | | Self-sustaining (2020)[95] |
|---|---|---|---|---|---|
| | Estimate[96] | Trend | Estimate[97] | Trend | |
| Sydney (ON1) | Not available | Stable | < 100 | Declining | No |
| Berens (ON2) | Not available | Not available | ≥100 | Declining | Possibly |
| Churchill (ON3) | Not available | Not available | ≥100 | Declining | Yes |
| Brightsand (ON4) | Not available | Not available | ≥100 | Declining | Possibly |
| Nipigon (ON5) | 300 | Stable | ≥100 | Declining | Yes |
| Coastal (ON6) | 492 | Not available | ≥100 | Declining | Yes |
| Pagwachuan (ON7) | Not available | Not available | ≥100 | Stable | Yes |
| Kesagami (ON8) | 492 | Declining | ≥100 | Declining | No |
| Far North (ON9) | Not available | Not available | ≥100 | Declining | Yes |

[93] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[94] Ontario Government, "Caribou (Boreal population)" (2021). https://www.ontario.ca/page/caribou-boreal-population

[95] *Amended Recovery Strategy for the Woodland Caribou*.

[96] *Recovery Strategy for the Woodland Caribou*.

[97] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

Ontario has developed a policy framework for boreal caribou.[98] The Ontario framework includes the province's *Woodland Caribou Conservation Plan*, the *Range Management Policy in Support of Woodland Caribou Conservation and Recovery and Integrated Range Assessment Reports*, and the *General Habitat Description for the Forest-dwelling Woodland Caribou*.[99]

Ontario continues to implement its *Range Management Policy in Support of Woodland Caribou Conservation and Recovery*, including a detailed assessment of adverse effects on boreal caribou and critical habitat. The policy will include identifying opportunities for avoidance and mitigation of habitat disturbances, as well as conditions for authorizing disturbances.[100] Assessment reports have been prepared for each of Ontario's nine ranges, with the exception of the Coastal Range.[101]

## 3.6 Quebec

Quebec has six boreal caribou ranges. In 2017, two of the ranges (Val d'Or and Charlevoix) had declining subpopulations with fewer than 100 caribou, one (Pipmuacan) had a declining subpopulation of more than 100, and two ranges (Manouane and Manicouagan) had stable subpopulations of more than 100 caribou (Table 8). The final range (Québec) had more than 100 caribou but there were insufficient data to determine a subpopulation trend.

The Charlevoix population was extirpated in the 1920s and reintroduced in the 1960s via translocation of 48 boreal caribou from ranges north of the Charlevoix range. The reintroduced population increased to a high of 126 animals in 1992 before stabilizing at around 80 caribou by 2012.[102] The Manouane and

[98] "Caribou (Boreal population)."

[99] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[100] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

[101] "Caribou (Boreal population)."

[102] Martin-Hughes St-Laurent and Christian Dussault, "The reintroduction of boreal caribou as a conservation strategy: A long-term assessment at the southern range limit," *Ranifer* Special Issue No. 20 (2012). http://dx.doi.org/10.7557/2.32.2.2261

Manicouagan Ranges have stable subpopulations and predator control is occurring in the Val d'Or and Charlevoix ranges.[103]

The 2020 Environment and Climate Change risk assessment found that the Québec and Manicouagan ranges have self-sustaining subpopulations, Manouane has a subpopulation that is possibly self-sustaining, and the other three ranges have subpopulations that are not self-sustaining. Quebec completed caribou surveys in the Lower North Shore, Saguenay–Lac-Saint-Jean, Northern Quebec, and Charlevoix in winter of 2019. Radio collars were placed on individuals in the Val-d'Or subpopulation, increasing the number of boreal caribou equipped with tracking collars in Quebec from 230 to 244.[104]

Environment and Climate Change Canada reported in 2020 that Quebec was continuing to work on adapting its forest management planning to conserve and protect boreal caribou habitat.[105]

### Table 8. Quebec boreal caribou subpopulation estimates and trends

| Range | 2012 Population | | 2017 Population | | Self-sustaining (2020)[106] |
|---|---|---|---|---|---|
| | Estimate[107] | Trend | Estimate[108] | Trend | |
| Val d'Or (QC1) | 30 | Declining | < 100 | Declining | No |
| Charlevoix (QC2) - reintroduced | 75 | Stable | < 100 | Declining | No |
| Pipmuacan (QC3) | 134 | Stable | ≥100 | Declining | No |
| Manouane (QC4) | 358 | Stable | ≥100 | Stable | Possibly |
| Manicouagan (QC5) | 181 | Increasing | ≥100 | Stable | Yes |

[103] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[104] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

[105] *Amended Recovery Strategy for the Woodland Caribou*.

[106] *Amended Recovery Strategy for the Woodland Caribou*.

[107] *Recovery Strategy for the Woodland Caribou*.

[108] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

| | | | | | |
|---|---|---|---|---|---|
| Quebec (QC6) | 9000 | Stable | ≥100 | Not available | Yes |

## 3.7 Newfoundland and Labrador

Newfoundland and Labrador have three boreal caribou ranges each with more than 100 individuals. Subpopulations were declining in 2012 but trend data were not available in 2017 (Table 9). The Red Wine Mountain subpopulation was not self-sustaining whereas the Lac Joseph and Mealy Mountain subpopulations were as likely to be self-sustaining as not, based on the 2020 Environment and Climate Change Canada risk assessment.

### Table 9. Newfoundland and Labrador boreal caribou subpopulation estimates and trends

| Range | 2012 Population | | 2017 Population | | Self-sustaining (2020)[109] |
|---|---|---|---|---|---|
| | Estimate[110] | Trend | Estimate[111] | Trend | |
| Lac Joseph (NL1) | 1282 | Declining | ≥100 | Not available | Possibly |
| Red Wine Mountain (NL2) | 97 | Declining | ≥100 | Not available | No |
| Mealy Mountain (NL3) | 1604 | Declining | ≥100 | Not available | Possibly |

Newfoundland and Labrador have committed to range plans being completed by March 31, 2023.[112]

[109] *Amended Recovery Strategy for the Woodland Caribou*.

[110] *Recovery Strategy for the Woodland Caribou*.

[111] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[112] Newfoundland and Labrador and Canada, *Conservation Agreement for The Conservation of the Woodland Caribou, Boreal Population ("Boreal Caribou") in Labrador* (2019). https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/conservation-agreements/woodland-caribou-boreal-newfoundland-labrador.html

## 3.8 Northwest Territories

Northwest Territories has a single boreal caribou range (NT1) consisting of an estimated 6,000-7,000 animals, but no trend data was provided in the territory's 2017 progress update.[113]

In 2018, the Northwest Territories completed public engagement and Indigenous consultation on the territory's draft *Boreal Caribou Range Planning Framework*. In addition, the Northwest Territories continued to implement its *Healthy Land, Healthy People: GNWT Priorities for Advancement of Conservation Network Planning 2016-2021*.[114]

Northwest Territories finalized the *Northwest Territories Framework for Boreal Caribou Range Planning* in August 2019. This framework is informing the range plans, which are outlined in the Section 11 Conservation Agreement signed in 2019.[115] The Northwest Territories' framework will guide the development of five range plans. Range planning will occur in the Wek'èezhìı and Southern Northwest Territory range through 2022 and in the Sahtú, Gwich'in and Inuvialuit regions through 2023. Wek'èezhìı range plans will take a spatial approach to consider habitat importance to boreal caribou, amount of natural disturbance, and level of human disturbance. Based on the importance of habitat to boreal caribou and the disturbance level, areas within the range will be assigned a management class of basic (normal development), enhanced (careful management), or intensive (limited development and increased fire protection).[116]

[113] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[114] Government of Northwest Territories, *Healthy Land, Healthy People: GNWT Priorities for Advancement of Conservation Network Planning 2016-2021* (2021). https://www.enr.gov.nt.ca/sites/enr/files/hlhp_cnp_priorities_2016-2021.pdf

[115] Canada and Northwest Territories, *Species at Risk Act Conservation Agreement for the Conservation of the Boreal Caribou* (2019). https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/Aa-S11ConservationAgreementNwt-v01-2019Mar-Eng.pdf

[116] Government of the Northwest Territories, *A Framework for Boreal Caribou Range Planning* (2019). https://www.enr.gov.nt.ca/sites/enr/files/resources/boreal_caribou_range_planning_framework_2019_-_cadre_de_planification_de_laire_de_repartition_du_caribou_boreal_2019.pdf

## 3.9 Yukon

Boreal caribou are limited to a small northeastern area of Yukon in the Peel River watershed. The Yukon boreal caribou are part of the larger NT1 caribou range and subpopulation in Northwest Territories. The number of boreal caribou in Yukon is likely less than 100, but this number does not reflect the total subpopulation size (i.e., excludes animals primarily living in Northwest Territories.[117]

[117] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

# 4. Caribou habitat condition

Caribou critical habitat condition is described as "disturbed" if it cannot support a self-sustaining population of boreal caribou and "undisturbed" if it can. Environment and Climate Change Canada's 2020 amended recovery strategy requires that each province and territory demonstrate it will achieve 65% undisturbed caribou habitat in each range in its jurisdiction through its range plans (except for Saskatchewan's SK1 range, which has a 40% threshold). These disturbance thresholds represent minimum expectations and translate to a 60% probability (71% in SK1) of supporting a self-sustaining subpopulation.[118]

Canada has 2.4 million km$^2$ of critical caribou habitat[119] and, as of 2017, approximately 360,000 km$^2$ disturbed by human activity, as defined by Environment and Climate Change Canada. Across Canada the average anthropogenic disturbance in each boreal caribou range is about 34%, but this varies from 1% in the Far North range of Ontario to 96% in the Little Smoky range of Alberta. Nineteen of the 51 ranges exceed the maximum 35% disturbed/minimum 65% undisturbed critical caribou habitat threshold. The area of disturbed habitat within caribou ranges in Canada has increased by 14,000 km$^2$ since Environment and Climate Change Canada published its recovery strategy in 2012.[120]

The following sections are a summary of the amount of anthropogenic disturbance in each boreal caribou range across Canada. We focused on anthropogenic disturbance as opposed to natural disturbances (e.g., wildfire) because it is a better reflection on conservation measures, such as land protection and restoration, being implemented by government and others. In some cases, the amount of disturbance has declined; this is likely a result of changes in how disturbance is measured and not restoration activity, as restoration rates are too slow to have made a significant change from 2012 to 2017. Figure 2 summarizes habitat condition in each range.

[118] *Amended Recovery Strategy for the Woodland Caribou*.

[119] *Recovery Strategy for the Woodland Caribou*.

[120] *Recovery Strategy for the Woodland Caribou*.

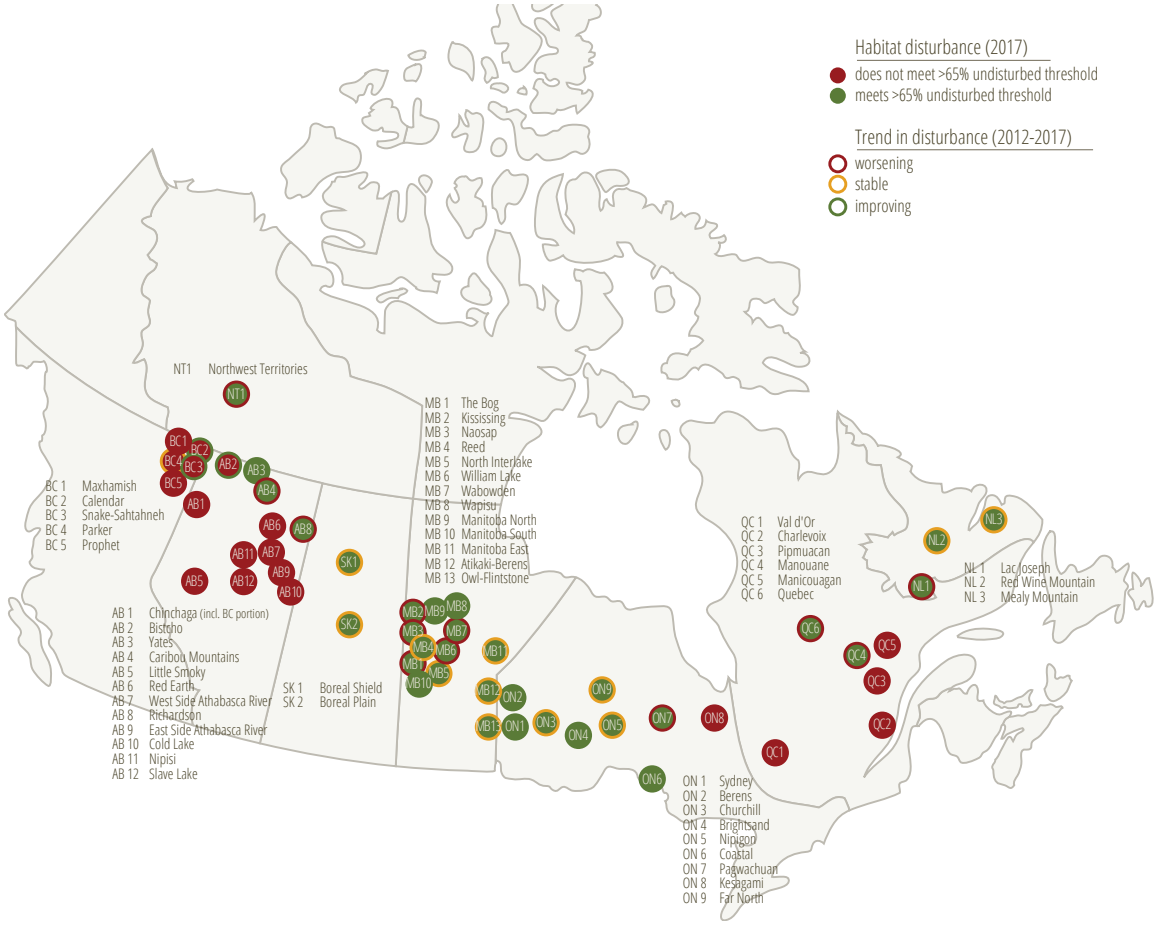


Figure 2. Caribou habitat condition by range

Note: Labels are placed near the centre of each range and do not correspond to size of range.

Range map source: Environment and Climate Change Canada[121]

## 4.1 British Columbia

For its five boreal caribou ranges, British Columbia reported that between 2012 and 2017 there was an increased amount of anthropogenic disturbance in two, a decrease in two, and no change in one (Table 10). None of the ranges have the required 65% undisturbed habitat. Overall, disturbed boreal caribou critical habitat has been reported as reduced by approximately 600 km$^2$ between 2012 and 2017.

[121] "Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal population, in Canada – 2012."

Table 10. Changes in British Columbia boreal caribou critical habitat disturbed by human activity

| Range | Total Range Area[122] (ha) | Anthropogenic Habitat Disturbance (% Undisturbed)* | | Meets Threshold (>65% Undisturbed) |
|---|---|---|---|---|
| | | 2012 | 2017[123] | |
| Maxhamish (BC1) | 710,105 | 43 | 33 | No |
| Calendar (BC2) | 496,393 | 42 | 47 | No |
| Snake-Sahtahneh (BC3) | 1,198,752 | 14 | 23 | No |
| Parker (BC4) | 75,222 | 43 | 43 | No |
| Prophet (BC5) | 119,396 | 23 | 22 | No |

* Assessments report the percentage of habitat disturbed; this is converted to percent undisturbed in this table for ease of comparison to the 65% undisturbed threshold requirement.

Restoration activities reported in British Columbia included 60 km of seismic lines in the Parker (BC4) caribou range[124] and another 8 km in the Snake-Sahtahneh (BC3) range led by the Fort Nelson First Nation.[125] Further restoration work was planned by the Blueberry River First Nation in 2019-20 which is discussed in *Section 7.1: Indigenous-led Conservation Efforts – British Columbia*.

## 4.2 Alberta

There are an estimated 250,000 km of legacy seismic lines remaining in Alberta caribou ranges (Figure 3). It is estimated that 150,000 km of these would require restoration treatments including mounding and tree planting for recovery.[126]

[122] *Recovery Strategy for the Woodland Caribou*.

[123] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[124] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[125] Winter Hawk Studios, *FNFN - Medzih Action Plan - Kotcho Restoration* (2020), video. https://vimeo.com/466414904

[126] *Draft Provincial Caribou Range Plan*.

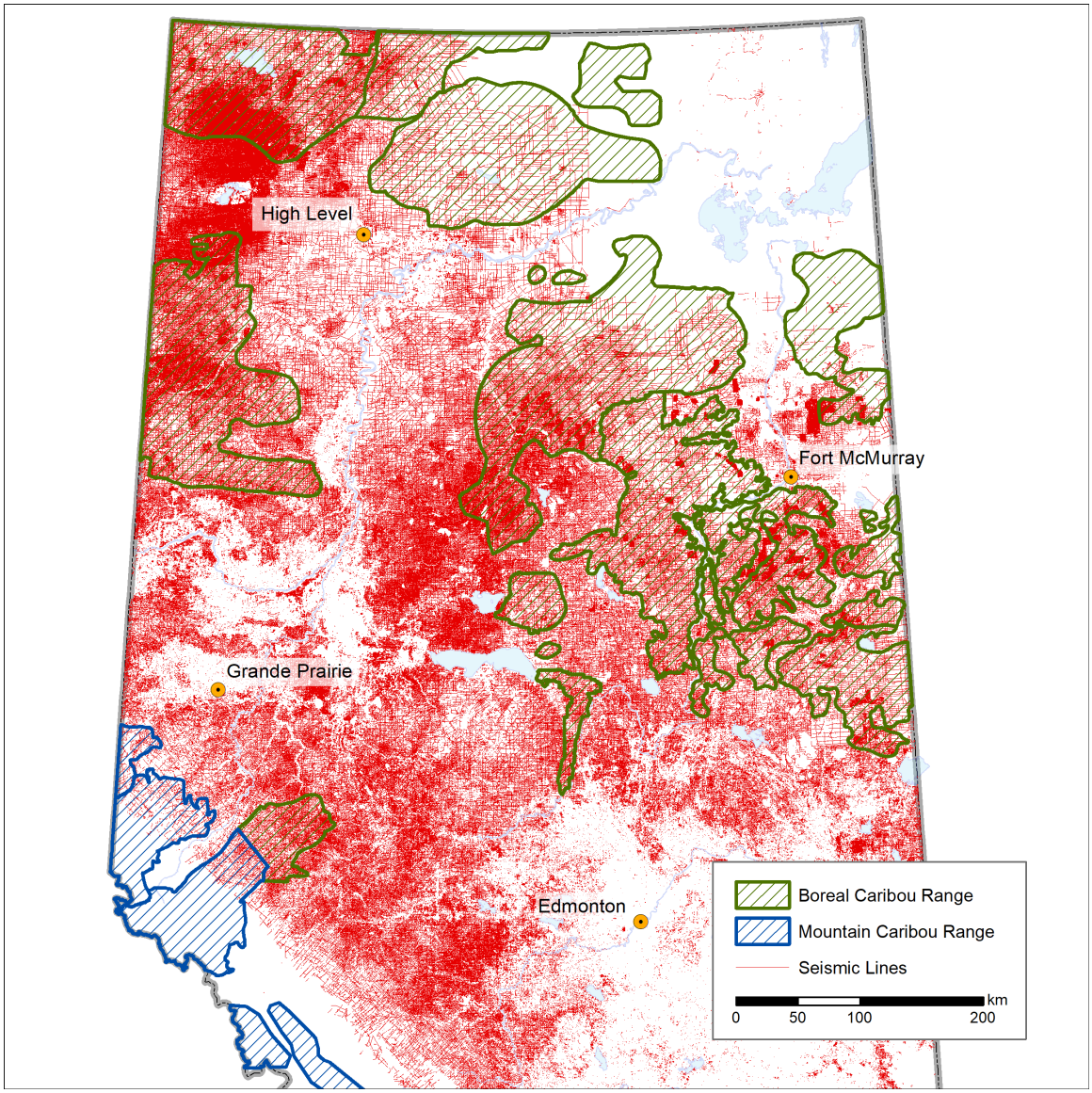


Figure 3. Extent of seismic lines in northern Alberta

Source: Canadian Parks and Wilderness Society Northern Alberta Chapter[127]

Alberta reported that between 2012 and 2017 there was an increased amount of anthropogenic disturbance in eight of its 12 boreal caribou ranges (Table 11). Decreases in estimated anthropogenic habitat disturbance occurred in the Bistcho and Yates caribou ranges.[128] The Yates, Caribou Mountains, and

[127] Canadian Parks and Wilderness Society Northern Alberta Chapter, "Caribou & You," November 10, 2021. https://cpawsnab.org/caribou/

[128] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

Richardson ranges are above the 65% critical habitat threshold required for a self-sustaining caribou population.

Alberta began caribou habitat restoration activities in 2001. Efforts have focused on developing construction methods, researching revegetation treatments, developing access control programs, and avoiding planting vegetation that can attract moose and deer.[129]

### Table 11. Changes in Alberta boreal caribou critical habitat disturbed by human activity

| Range | Total Range Area[130] (ha) | Anthropogenic Habitat Disturbance (% Undisturbed)* | | Meets Threshold (>65% Undisturbed) |
|---|---|---|---|---|
| | | 2012 | 2017[131] | |
| Chinchaga (AB1) | 3,162,612 | 26 | 21 | No |
| Bistcho (AB2) | 1,436,555 | 39 | 42 | No |
| Yates (AB3) | 523,094 | 79 | 80 | Yes |
| Caribou Mountains (AB4) | 2,069,000 | 77 | 73 | Yes |
| Little Smoky (AB5) | 308,606 | 5 | 4 | No |
| Red Earth (AB6) | 2,473,729 | 56 | 52 | No |
| West Side Athabasca River (AB7) | 1,572,652 | 32 | 30 | No |
| Richardson (AB8) | 707,350 | 78 | 77 | Yes |
| East Side Athabasca River (AB9) | 1,315,980 | 23 | 22 | No |
| Cold Lake (AB10) | 672,422 | 28 | 24 | No |
| Nipisi (AB11) | 210,771 | 34 | 25 | No |
| Slave Lake (AB12) | 151,904 | 37 | 26 | No |

* Assessments report the percentage of habitat disturbed; this is converted to percent undisturbed in this table for ease of comparison to the 65% undisturbed threshold requirement.

[129] Paula Bentham and Brian Coupal, "Habitat restoration as a key conservation lever for woodland caribou: A review of restoration programs and key learnings from Alberta," *Rangifer* 35, Special Issue No. 23 (2015). https://doi.org/10.7557/2.35.2.3646

[130] *Recovery Strategy for the Woodland Caribou*.

[131] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

The Government of Alberta partnered with the oil and gas industry in October 2016 to restore 10,000 km of legacy seismic lines in the Little Smoky caribou range, and committed to restoring an additional 10,000 km of seismic lines across caribou ranges from 2017-2021.[132] A pilot project in the Little Smoky range to deactivate 70 km of legacy seismic lines was initiated in 2017.[133]

Canada's Oil Sands Innovation Alliance (COSIA) member companies (Canadian Natural Resource Limited, Cenovus Energy, Suncor Energy) have restored approximately 1,750 km of seismic lines as of 2018.[134] In addition, Canadian Natural Resources Limited restored 203.6 km of legacy seismic lines in the Cold Lake range in 2019. In 2020, they restored an additional 178 km of seismic lines and planted approximately 170,000 seedlings, with additional restoration continuing in 2021. Cenovus Energy restored 161.5 km in 2019 with up to 150,000 additional trees anticipated to be planted in summer 2021.[135] Cenovus Energy has committed $40 million to restore 4,000 km of seismic lines in the Cold Lake region by 2030.[136]

Alberta-Pacific Forest Industries Inc., Alberta Environment and Parks, and TransCanada Pipelines Ltd. (now TC Energy) have restored 240 km of seismic lines since 2014 in the Dillon River Wildlands Provincial Park southeast of Fort McMurray.[137] Restoration of over 50 km of six-metre-wide seismic lines within Richardson Wildland Provincial Park and Marguerite River Wildland Provincial Park was completed in 2019 with additional restoration planned through 2020.[138] Approximately 60 km of seismic lines were restored in the A La Peche caribou

[132] Alberta Government, *Alberta's Caribou Action Plan* (2016). https://open.alberta.ca/dataset/846c267f-3d9a-4a8f-835a-9abc18ac5bbd/resource/125088f7-50e3-4bda-921a-ff1f6b19fe03/download/albertacaribouactionplanfs-2016.pdf

[133] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[134] COSIA, *2019 COSIA Land EPA: In Situ Research Report* (2020). https://cosia.ca/sites/default/files/attachments/COSIA%20Annual%20Report%202019_In%20Situ_FINAL_Rev_MAR21_0.pdf.

[135] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[136] COSIA, "Restoring woodland caribou habitat," May 25, 2021. https://cosia.ca/blog/restoring-woodland-caribou-habitat

[137] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[138] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

range in 2020 under a Caribou Habitat Recovery Program administered through Forest Resource Improvement Association of Alberta (FRIAA).

Three habitat restoration projects were initiated in the Cold Lake range in 2019, under the Caribou Habitat and Recovery Program through FRIAA. These projects accounted for approximately 135 km of seismic restoration between January and March 2019.[139]

Total seismic line restoration reported in Alberta (less than 3,000 km) has not dented the estimated 150,000 km of seismic line requiring active restoration in Alberta.[140] The total length of restored seismic lines achieved by 2021 is likely to be significantly less than the Alberta government's commitment to restore 10,000 km.[141]

## 4.3 Saskatchewan

Saskatchewan reported that between 2012 and 2017 there was no change in the amount of anthropogenic disturbance in either of the province's boreal caribou ranges (Table 12). Saskatchewan and Canada are developing restoration plans but no restoration activity is occurring.[142]

Table 12. Changes in Saskatchewan boreal caribou critical habitat disturbed by human activity

| Range | Total Range Area[143] (ha) | Anthropogenic Habitat Disturbance (% Undisturbed)* | | Meets Threshold (>65% Undisturbed) |
|---|---|---|---|---|
| | | 2012 | 2017[144] | |
| Boreal Shield (SK1) | 18,034,870 | 97 | 97 | Yes |
| Boreal Plain (SK2) | 10,592,463 | 80 | 80 | Yes |

* Assessments report the percentage of habitat disturbed; this is converted to percent undisturbed in this table for ease of comparison to the 65% undisturbed threshold requirement.

[139] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

[140] *Draft Provincial Caribou Range Plan*.

[141] *Alberta's Caribou Action Plan*.

[142] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[143] *Recovery Strategy for the Woodland Caribou*.

[144] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

## 4.4 Manitoba

Manitoba reported that between 2012 and 2017 there was an increased amount of anthropogenic disturbance in eight of its 13 boreal caribou ranges, a decrease in two of its ranges, and no change in the other three ranges (Table 13). All the Manitoba ranges have 65% or more undisturbed habitat. Environment and Climate Change Canada did not report any boreal caribou habitat restoration in Manitoba.[145]

### Table 13. Changes in Manitoba boreal caribou critical habitat disturbed by human activity

| Range | Total Range Area[146] (ha) | Anthropogenic Habitat Disturbance (% Undisturbed)* | | Meets Threshold (>65% Undisturbed) |
|---|---|---|---|---|
| | | 2012 | 2017[147] | |
| The Bog (MB1) | 446,383 | 88 | 86 | Yes |
| Kississing (MB2) | 317,029 | 87 | 85 | Yes |
| Naosap (MB3) | 456,977 | 74 | 72 | Yes |
| Reed (MB4) | 357,425 | 80 | 80 | Yes |
| North Interlake (MB5) | 489,680 | 86 | 86 | Yes |
| William Lake (MB6) | 488,219 | 90 | 83 | Yes |
| Wabowden (MB7) | 628,938 | 81 | 80 | Yes |
| Wapisu (MB8) | 565,044 | 86 | 87 | Yes |
| Manitoba North (MB9) | 6,205,520 | 84 | 89 | Yes |
| Manitoba South (MB10) | 1,867,255 | 87 | 88 | Yes |
| Manitoba East (MB11) | 6,612,782 | 97 | 97 | Yes |
| Atikaki-Berens (MB12) | 2,387,665 | 94 | 94 | Yes |
| Owl-Flintstone (MB13) | 363,570 | 82 | 82 | Yes |

* Assessments report the percentage of habitat disturbed; this is converted to percent undisturbed in this table for ease of comparison to the 65% undisturbed threshold requirement.

[145] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[146] *Recovery Strategy for the Woodland Caribou*.

[147] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

## 4.5 Ontario

Ontario reported that between 2012 and 2017 there was an increased amount of anthropogenic disturbance in two of its nine boreal caribou ranges, a decrease in four of its ranges, and three remained the same (Table 14). Only the Kesagami range does not achieve the 65% undisturbed critical habitat threshold. Although critical habitat levels appear good, with the exception of the Pagwachuan range all boreal caribou populations in Ontario are declining. Environment and Climate Change Canada did not report any boreal caribou habitat restoration in Ontario.[148]

### Table 14. Changes in Ontario boreal caribou critical habitat disturbed by human activity

| Range | Total Range Area[149] (ha) | Anthropogenic Habitat Disturbance (% Undisturbed)* | | Meets Threshold (>65% Undisturbed) |
|---|---|---|---|---|
| | | 2012 | 2017[150] | |
| Sydney (ON1) | 753,001 | 67 | 75 | Yes |
| Berens (ON2) | 2,794,835 | 93 | 94 | Yes |
| Churchill (ON3) | 2,150,490 | 72 | 72 | Yes |
| Brightsand (ON4) | 2,220,921 | 72 | 74 | Yes |
| Nipigon (ON5) | 3,885,026 | 75 | 75 | Yes |
| Coastal (ON6) | 376,598 | 84 | 85 | Yes |
| Pagwachuan (ON7) | 4,542,918 | 74 | 73 | Yes |
| Kesagami (ON8) | 4,766,463 | 64 | 63 | No |
| Far North (ON9) | 28,265,143 | 99 | 99 | Yes |

* Assessments report the percentage of habitat disturbed; this is converted to percent undisturbed in this table for ease of comparison to the 65% undisturbed threshold requirement.

[148] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[149] *Recovery Strategy for the Woodland Caribou*.

[150] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

## 4.6 Quebec

The habitat condition in all Quebec ranges has declined from 2012 to 2017 (Table 15). The Québec and Manouane ranges have more than 65% undisturbed boreal caribou critical habitat, while the remaining four ranges do not meet this threshold.

### Table 15. Changes in Quebec boreal caribou critical habitat disturbed by human activity

| Range | Total Range Area[151] (ha) | Anthropogenic Habitat Disturbance (% Undisturbed)* | | Meets Threshold (>65% Undisturbed) |
|---|---|---|---|---|
| | | 2012 | 2017[152] | |
| Val d'Or (QC1) | 346,861 | 40 | 35 | No |
| Charlevoix (QC2) - reintroduced | 312,803 | 23 | 20 | No |
| Pipmuacan (QC3) | 1,376,899 | 49 | 40 | No |
| Manouane (QC4) | 2,716,449 | 77 | 74 | Yes |
| Manicouagan (QC5) | 1,134,129 | 68 | 64 | No |
| Quebec (QC6) | 62,156,186 | 88 | 87 | Yes |

* Assessments report the percentage of habitat disturbed; this is converted to percent undisturbed in this table for ease of comparison to the 65% undisturbed threshold requirement.

In 2017, the Québec Ministère des Forêts, de la Faune et des Parcs (Department of Forests, Wildlife and Parks) developed a pilot project for the restoration of logging roads. The program was expanded in the summer of 2018 and Quebec began testing new forest management to reduce the impacts of logging roads. Quebec is also planning the restoration of forest roads in areas targeted for inclusion in the strategy for boreal and mountain caribou in fall of 2020. Quebec began monitoring boreal caribou population condition and dynamics and caribou habitat in 2017-2018. The monitoring results will contribute to the development of their recovery strategy in 2022.[153]

[151] *Recovery Strategy for the Woodland Caribou*.

[152] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[153] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

## 4.7 Newfoundland and Labrador

Anthropogenic disturbance increased in the Lac Joseph range by one percentage point while disturbance in the other two ranges in Newfoundland and Labrador remained stable (Table 16). Although the increase in disturbance was small, all three caribou subpopulations are declining. Environment and Climate Change Canada did not report any boreal caribou habitat restoration in Newfoundland and Labrador.[154]

Table 16. Changes in Newfoundland and Labrador boreal caribou critical habitat disturbed by human activity

| Range | Total Range Area[155] (ha) | Anthropogenic Habitat Disturbance (% Undisturbed)* | | Meets Threshold (>65% Undisturbed) |
|---|---|---|---|---|
| | | 2012 | 2017[156] | |
| Lac Joseph (NL1) | 5,802,491 | 99 | 98 | Yes |
| Red Wine Mountain (NL2) | 5,838,594 | 97 | 97 | Yes |
| Mealy Mountain (NL3) | 3,948,463 | 99 | 99 | Yes |

* Assessments report the percentage of habitat disturbed; this is converted to percent undisturbed in this table for ease of comparison to the 65% undisturbed threshold requirement.

## 4.8 Northwest and Yukon Territories

Anthropogenic disturbance increased in the Northwest Territory range by one percentage point (Table 17). The Northwest Territory range subpopulation is considered self-sustaining (2017 prediction) with an estimated population of over 6,000 boreal caribou. Environment and Climate Change Canada[157] did not report any boreal caribou habitat restoration in the Northwest and Yukon territories.

[154] *Amended Recovery Strategy for the Woodland Caribou*.

[155] *Recovery Strategy for the Woodland Caribou*.

[156] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[157] *Amended Recovery Strategy for the Woodland Caribou*.

## Table 17. Changes in Northwest and Yukon Territories boreal caribou critical habitat disturbed by human activity

| Range | Total Range Area[158] (ha) | Anthropogenic Habitat Disturbance (% Undisturbed) | | Meets Threshold (>65% Undisturbed) |
|---|---|---|---|---|
| | | 2012 | 2017[159] | |
| Northwest Territories (NT1) | 44,166,546 | 92 | 91 | Yes |

* Assessments report the percentage of habitat disturbed; this is converted to percent undisturbed in this table for ease of comparison to the 65% undisturbed threshold requirement.

[158] *Recovery Strategy for the Woodland Caribou*.

[159] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

# 5. Caribou habitat conservation legislation and protected areas

Provincial and territorial governments have the primary responsibility for managing lands, boreal caribou, and other wildlife in Canada. This section of the report lists provincial and territorial legislation that can be used to protect caribou and caribou habitat, describes recent changes to laws, and identifies weaknesses in the legislation that would allow critical caribou habitat to be developed. This section also includes a description of identified protected areas in boreal caribou critical habitat and if provinces or territories have entered Section 11 Conservation Agreements under SARA.

Section 11 Conservation Agreements are agreements between the federal government and any provincial, territorial, or Indigenous government for the benefit of a species at risk. Most provinces and territories with boreal caribou, as well as several Indigenous governments, have negotiated Section 11 Conservation Agreements outlining measures to address any gaps in protecting boreal caribou critical habitat, monitoring populations, and/or reporting. However, unlike other sections of SARA (e.g., Section 80 – Emergency Orders) Section 11 Conservation Agreements are not legally binding.[160]

## 5.1 British Columbia

British Columbia provincial laws that are applicable to critical caribou habitat protection include the Ecological Reserve Act, the Parks Act, the Forest Act, the Forest and Range Practices Act, the Land Act, the Petroleum and Natural Gas Act, the Oil and Gas Activities Act, the Water Sustainability Act, and the British Columbia Environmental Assessment Act. Although activities that destroy boreal caribou critical habitat are prohibited, habitat can be removed under authorizations and permits issued by provincial regulators. In British Columbia,

[160] Rebecca Kauffman, "Woodland caribou vs. everybody," *Environmental Law Centre*, December 16, 2019. https://elc.ab.ca/woodland-caribou-vs-everybody/

a higher level of protection occurs in Ecological Reserves that are protected under the Ecological Reserve Act. However, Ecological Reserves only protect a total of 2.38 $km^2$ of land in caribou habitat, which represents only 0.01% of British Columbia's critical caribou habitat.[161]

No species-at-risk legislation currently exists in British Columbia. In 2020, the province reported it was in the process of public engagement on new provincial species-at-risk legislation. The proposed legislation would allow species-at-risk habitat to be protected, not just the species at risk themselves. The legislation will provide a framework using conservation offsets measures for habitat protection. The new legislation has not been enacted yet.

In addition, British Columbia is updating its Environmental Mitigation Policy to allow offsetting to compensate for adverse impacts from industrial development in caribou critical habitat. The policy intention is to provide guidance for environmental assessments and the feasibility of conservation offsets.[162]

In 2018, British Columbia established Notations of Interest over 2,440,850 ha (24,408.5 $km^2$) of boreal caribou habitat, indicating these areas are important for caribou conservation. Applications for Crown land tenure and permits within these caribou habitat areas are referred to the British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development for comment and consideration. Between October 2019 and September 2020, British Columbia designated 24 Wildlife Habitat Areas (WHA) for boreal caribou.[163] These Wildlife Habitat Areas contain critical habitat for boreal caribou and the conditions of the WHA outline measures required regarding human access, tree harvesting, silviculture, and recreation. However, it should be noted that the

[161] Environment and Climate Change Canada, *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada* (2018b). https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/critical-habitat-statements/progress-protect-critical-habitat-boreal-woodland-caribou.html

[162] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[163] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

conditions of the WHA do not apply to existing permits (e.g., harvest or road-building permits) and exemptions can be issued by the Minister.[164]

In 2020, British Columbia added General Wildlife Measures to the Fort Nelson and Fort St. John timber supply areas. Since 2010, British Columbia has only protected an additional 1% of its land. Most of the added area was in the Great Bear Rainforest which is not considered boreal caribou habitat.[165]

In February 2020, British Columbia entered onto a Section 11 Conservation Agreement with the federal government to protect and manage the Southern Mountain Woodland Caribou ecotype, but the province has not negotiated a Section 11 Conservation Agreement for boreal caribou.

## 5.2 Alberta

Alberta provincial legislation that can be used to protect caribou critical habitat include the Wildlife Act, the Wilderness, Ecological Reserves, Natural Areas and Heritage Rangelands Act, the Provincial Parks Act, the Alberta Land Stewardship Act, the Forests Act, the Public Lands Act, and the Mines and Minerals Act. While each of these acts can be used to prohibit destruction of critical caribou habitat, an Environment and Climate Change Canada review found that there is discretion by provincial agencies to authorize activities that destroy habitat through permits, dispositions, licenses, agreements, or approvals. Further, some industrial activities may be allowed by Ministerial discretion or because of existing commitments.[166] Although Alberta has laws and environmental regulations that can protect critical habitat, application of these protective measures is not consistently applied.

Alberta also has legislative tools that can allow for land and habitat protection using strategic direction guided by land-use frameworks (e.g., the Lower

[164] Government of British Columbia, *Order-Wildlife Habitat Areas (#9-101), Boreal Caribou-Fort Nelson Resource District* (2014). https://www.env.gov.bc.ca/wld/documents/wha/RATA%209-101_Order.pdf

[165] Canadian Parks and Wilderness Society, *The Grades Are In: A Report Card on Canada's Progress in Protecting its Land and Ocean* (2021). https://cpaws.org/our-work/cpaws-2021-report-card/

[166] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

Athabasca Regional Plan) and applying the Alberta Land Stewardship Act. Some conservation and stewardship tools that have potential to protect wildlife habitat include conservation easements, conservation directives, conservation offsets, and transfer of development credits.[167]

In 2016, Alberta released an action plan for caribou recovery.[168] The plan indicated that an additional 1.8 million ha (180,000 km$^2$) of caribou habitat would be protected, facilitated by a restriction on mineral resource sales and a return of resource lease holdings and timber licenses to the provincial government (i.e., converting leased land to public land). Alberta indicated that this restriction would increase the permanently protected caribou habitat in Alberta to 490,000 km$^2$.[169] Since July 2017, 1,929 km$^2$ of sub-surface holdings were returned to the Crown.[170] The Alberta government's action plan also committed to the restoration of more than 10,000 km of seismic lines over five years (2017-2021) and the completion of all provincial caribou range plans.

Alberta and Canada initiated habitat restoration distributed through the Forest Resource Improvement Association of Alberta (FRIAA) and established the Caribou Habitat and Recovery Program.[171] Environment and Climate Change Canada provided $3 million to support the restoration of linear disturbances in Alberta. Under the Caribou Habitat and Recovery Program, three habitat restoration projects were initiated in the Cold Lake range in January 2019. In 2020, FRIAA began engagement with Fort McKay First Nation regarding caribou habitat restoration planning in the Red Earth and West Side Athabasca Caribou Range.

[167] Alberta Environment and Parks, "Conservation and Stewardship Tools," August 5, 2021. https://landuse.alberta.ca/ConservationStewardship/ConservationStewardshipTools/Pages/default.aspx

[168] *Alberta's Caribou Action Plan*.

[169] Deborah Jaremko, "Alberta halts sale of oil and gas rights in caribou ranges," *JWEnergy.com*, September 30, 2016. https://www.jwnenergy.com/article/2016/9/30/alberta-halts-sale-oil-and-gas-rights-caribou-rang/

[170] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou (October 2019 – September 2020)*.

[171] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou (October 2019 – September 2020)*.

The Alberta Energy Regulator (AER) has demonstrated that it can require the restoration of caribou habitat. The AER decision regarding the TransCanada White Spruce Pipeline project included conditions requiring TC Energy (formerly TransCanada Pipeline Ltd.) to offset project impacts to critical caribou habitat. TC Energy is required to restore twice as much habitat in the West Side Athabasca Range as the White Spruce project disturbed.[172]

In October 2020, Alberta entered onto a Section 11 Conservation Agreement with the federal government to protect and manage boreal caribou. The agreement requires that the sub-regional plans currently being developed achieve boreal caribou critical habitat goals outlined by Environment and Climate Change Canada's caribou range plan guide.[173] The agreement between Alberta and the federal government was signed almost two years after Ecojustice filed an application for SARA Section 80 Emergency Orders to be used to protect five boreal caribou herds within Alberta.[174] By signing a Section 11 Conservation Agreement, Alberta prevented enactment of Section 80.

## 5.3 Saskatchewan

Saskatchewan provincial laws that can be used to protect critical caribou habitat include the Wildlife Act, the Environmental Management and Protection Act, the Forest Resources Management Act, the Provincial Lands Act, the Saskatchewan Environmental Code and the Parks Act. Regulators have the ability to remove protections through approvals and authorizations.[175]

Canada and Saskatchewan finalized a conservation agreement for boreal caribou under Section 11 of SARA on June 19, 2019. The agreement commits to range

[172] Alberta Energy Regulator, *TransCanada Pipelines Limited Applications for the White Spruce Pipeline Project, Fort McKay Area*, Decision 2018 ABAER 001 (2018). https://static.aer.ca/prd/documents/decisions/2018/2018ABAER001.pdf

[173] Environment and Climate Change Canada, *Range Plan Guidance for Woodland Caribou, Boreal Population* (2016). https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/policies/Range_Plan_Guidance_EN.pdf

[174] Ecojustice, "Protecting boreal caribou in Alberta: Alberta Wilderness Association et al v Minister of Environment and Climate Change Canada," July 2, 2021. https://ecojustice.ca/case/protecting-boreal-caribou-in-alberta/

[175] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2018b).

planning, habitat restoration, caribou monitoring, and short- and long-term habitat and population goals.[176]

Saskatchewan and Canada are developing a policy consistent with their SARA Section 11 Conservation Agreement. The policy would remove project exemptions which would result in more projects requiring an environmental assessment of the development impacts to boreal caribou habitat and sensory disturbance. The new policy would improve caribou habitat avoidance in project planning and strengthen mitigation such as restoration and habitat offsetting. Habitat offsets and habitat restoration would be conditions for project approval.

Saskatchewan revised the Crown Resource Land Regulations in 2019 to reduce the footprint of provincially authorized activities, require land reclamation, and require mitigation and compliance. These regulations govern the administration of Crown land, including all boreal caribou critical habitat.[177]

To further protect critical caribou habitat, Saskatchewan has also initiated the designation of protected areas, conservation areas, and Indigenous Protected and Conserved Areas within the boreal caribou ranges. In 2018, Saskatchewan stated it was working towards the designation of four protected areas within the SK1 (Boreal Shield) boreal caribou range: the Tazin Lake area (1,118 $km^2$); the Misaw Lake area (2,392 $km^2$); the Chappius Fontaine Lakes area (2,410 $km^2$); and, with support from Environment and Climate Change Canada, the Lobstick area (972 $km^2$).[178] The province has also engaged with First Nations to identify proposed Indigenous Protected and Conserved Areas in boreal caribou critical habitat.[179]

Overall, these designation measures could add nearly 5,000 $km^2$ to protected areas in northern Saskatchewan. Environment and Climate Change Canada has

[176] Environment and Climate Change Canada, *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (April 2019 to September 2019)* (2020). https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/reports/CHR-MultiSpeciesl(AprToSep2019)-EN.pdf

[177] *Amended Recovery Strategy for the Woodland Caribou*.

[178] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

[179] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

stated that Crown mineral reserves are in place at these sites to ensure that no exploration or development occurs and avoid degradation of these areas before they are formally protected.[180]

On November 14, 2018, Canada and Saskatchewan concluded the negotiations for a draft agreement in principle under Section 11 of SARA to conserve boreal caribou in the province. Since then, Canada and Saskatchewan have published a final Section 11 Conservation Agreement on the Species at Risk Public Registry.[181]

## 5.4 Manitoba

Manitoba's provincial laws providing protection of critical caribou habitat are the Endangered Species and Ecosystems Act, the Environment Act, the Wildlife Act, the East Side Traditional Lands Planning and Special Protected Areas Act, the Provincial Parks Act, and the Ecological Reserves Act. Like other jurisdictions, the regulatory discretion to authorize activities through permits and approvals allows the destruction of critical caribou habitat.[182]

Protected or partially protected areas include provincial parks in the Bog, Naosap, North Interlake, Manitoba East, Atikaki-Berens, and Owl Flintstone caribou ranges.

Canada and Manitoba negotiated a three-year SARA Section 11 Conservation Agreement for boreal caribou. In January 2021 Manitoba issued an order in council authorizing an Agreement with Canada for the conservation and recovery of woodland (boreal) caribou.[183] An internal review/engagement process

[180] *Amended Recovery Strategy for the Woodland Caribou*.

[181] Canada and Saskatchewan, *Agreement for the Conservation of the Woodland Caribou, Boreal Population ("Woodland Caribou") in Saskatchewan* (2019). https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/Ca-SaskCaribouBoreal-v00-2019Jun-Eng.pdf

[182] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2018b).

[183] Government of Manitoba, Manitoba Order in Council No. 27/2021 (2021). http://oic.gov.mb.ca/OICDocs/2021/01/Agriculture%20and%20Resource%20Development.210113.Wildlife%20Act.272021.pdf

is ongoing on the provincial range plans and Manitoba has implemented caribou collaring and survey activities.[184]

## 5.5 Ontario

Ontario legislation to protect critical caribou habitat include the Endangered Species Act, the Provincial Parks and Conservation Reserves Act, the Fish and Wildlife Conservation Act, the Crown Forest Sustainability Act, the Far North Act, the Public Lands Act, and the Environmental Assessment Act. The Endangered Species Act provides protection for boreal caribou critical habitat on non-federal lands that are somewhat consistent with SARA. The Endangered Species Act protects boreal caribou habitat but does not specify minimum threshold values like SARA does (e.g., 65% undisturbed habitat).

Although Ontario has laws, policies, and processes with measures to address caribou conservation, in June 2019, the province provided new options for project proponents that could allow them to proceed with activities or projects that could impact species at risk. Rather than completing on-the-ground avoidance or mitigation activities, proponents would instead be able to pay into a fund. This approach has been dubbed "pay to pave".[185] Ontario also developed a new requirement to consider a species' condition across its range both inside and outside of Ontario before designating it as endangered or threatened within the province.[186] In December 2020, Ontario passed Bill 229, the Protect, Support, and Recover from Covid-19 Act. Section 8 of Bill 229 permanently exempts forestry companies licensed under the Crown Forest Sustainability Act from provisions that require them to protect and recover species-at-risk habitat. Section 6 of the bill undermines the ability of Ontario's 36 Conservation

[184] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[185] World Wildlife Fund, "Doug Ford's controversial Bill 229 endangers our environment and our communities," media release, December 8, 2020. https://wwf.ca/media-releases/doug-fords-controversial-bill-229-endangers-our-environment-and-our-communities/.

[186] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (April 2019 to September 2019)*.

Authorities to decline project proposals that will impact species at risk.[187] Both Sections 6 and 8 of Bill 229 could negatively impact boreal caribou habitat.

Canada and Ontario are negotiating a draft conservation agreement under Section 11 of SARA for boreal caribou in the province.[188]

## 5.6 Quebec

Quebec laws providing protection for boreal caribou habitat include the Act Respecting Threatened or Vulnerable Species, the Act Respecting the Conservation and Development of Wildlife, the Natural Heritage Conservation Act, the Parks Act, the Environment Quality Act, and the Sustainable Forest Development Act. In addition, the terms and conditions of the James Bay and Northern Quebec Agreement, the Northeastern Quebec Agreement provide some habitat protection. An Environment and Climate Change Canada analysis concluded that protected areas within boreal caribou habitat are very small (9.72% of total in 2017) and that project approvals and permits can still allow habitat destruction. Quebec committed to protecting 17% of caribou critical habitat by 2020.[189]

In the Manouane area, Quebec has increased the amount of protected land by 76.8 $km^2$ through interim measures.[190] The Manouane area is over 27,000 $km^2$ in area, including 7,000 $km^2$ that has been disturbed by anthropogenic activities.

In June 2019, Canada and Quebec finalized the Cooperation Agreement for the Protection and Recovery of Species at Risk in Quebec, which is specifically applied to boreal caribou in a bilateral cost-sharing agreement.[191] The agreement commits to landscape-level planning, habitat management, population monitoring and management, and creation of protected areas. The agreement

[187] "Doug Ford's controversial Bill 229 endangers our environment and our communities,"

[188] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

[189] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[190] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[191] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

also commits resources for the protection of boreal caribou by sharing of expertise, participation of working groups, participation of Indigenous Peoples, research, knowledge sharing, and landscape-scale planning.[192] Under the agreement with Canada, Quebec has maintained measures to protect boreal caribou habitat until long-term conservation measures are implemented circa 2022.[193]

## 5.7 Newfoundland and Labrador

The Endangered Species Act, the Wildlife Act, the Wilderness and Ecological Reserves Act, the Forestry Act, the Mineral Act, the Water Resources Act, the Urban and Rural Planning Act, the Lands Act, the Labrador Inuit Lands Act, the Petroleum and Natural Gas Act, the Environmental Protection Act, the Nunatsiavut Environmental Protection Act and the Nunatsiavut Exploration and Quarrying Standards Act prohibit the destruction of caribou critical habitat. However, regulators may issue permits and or approvals to destroy critical habitat.

The Wilderness and Ecological Reserves Act and the Nunatsiavut Exploration and Quarrying Standards Act provide habitat protection, but either have exemptions (Wilderness and Ecological Reserves Act) or no enforcement provisions (Nunatsiavut Exploration and Quarrying Standards Act).[194]

The Endangered Species Act provides the provincial government with the power to protect critical and recovery habitat, but as of 2018, protection for boreal caribou has not been required.[195]

Protected areas that include critical boreal caribou habitat include parts of Mealy Mountains National Park.

[192] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

[193] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[194] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2018b).

[195] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2018b).

Canada and Newfoundland and Labrador completed a draft conservation agreement for boreal caribou under Section 11 of SARA in June 2019. The final SARA Section 11 Conservation Agreement for boreal caribou was signed in 2020.[196] The agreement includes a commitment to complete range planning by 2023 and conduct population monitoring and management. The purpose of the agreement is to coordinate planning efforts, support collaboration and partnerships with Indigenous governments and other organizations, identify conservation measures to address unsanctioned caribou harvest, and protect and protect habitat.[197] Further, the conservation agreement has a target of stable (i.e., no longer declining) boreal caribou subpopulations within five years.[198]

## 5.8 Northwest Territories and Yukon

In March 2018, Northwest Territories released a proposal for regulatory amendments under the Northwest Territories Wildlife Act. Proposed regulations would require Wildlife Management and Monitoring Plans to demonstrate how proposed or existing developments would minimize impacts on boreal caribou and boreal caribou critical habitat. Development activity would be prohibited until plans are approved by the Territorial Minister of Environment and Natural Resources. The amendments allow for penalties for failure of the proponent to comply with monitoring plans. Northwest Territories conducted public engagement and Indigenous consultation on the proposed amendments until June 30, 2018. The proposed regulations were enacted in 2019 and enable the Northwest Territories to require and enforce Wildlife Management and Monitoring Plans.

In June 2019, the Northwest Territories completed a new Protected Areas Act. The legislation enables collaboration with Indigenous governments and organizations to establish and manage protected areas to protect biodiversity,

[196] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2018b).

[197] Matthew Pyper, Kate Broadley, Jesse Tigner, et al., *Restoration Innovation Roadmap Phase 2: A summary of opportunities to advance innovation for linear restoration within woodland caribou habitat* (COSIA, 2020). https://www.cclmportal.ca/resource/restoration-innovation-roadmap-phase-2

[198] *Conservation Agreement for The Conservation of the Woodland Caribou, Boreal Population ("Boreal Caribou") in Labrador*.

ecological integrity, and cultural activities. The Northwest Territories also developed guidelines to assist developers and regulators identify, avoid, minimize, and mitigate impacts to critical habitat.

In the southern Northwest Territories, until land claim negotiations and land use planning are complete under relevant acts, interim conservation measures are in place to protect boreal caribou habitat. They include a combination of surface and sub-surface land withdrawals which prevent "certain activities" (although, the specific activities implicated are not described) that could destroy critical habitat in approximately 59,404 km$^2$ of the NT1 range.

In late 2018, Yukon completed the final consultation on the Peel Watershed Regional Land Use Plan. The final Peel Watershed Land Use Plan was signed on August 22, 2019. The land agreement covers 67,431 km$^2$ and was signed by the Yukon government, Tr'ondëk Hwëch'in, the First Nation of Na-Cho Nyäk Dun, Vuntut Gwitchin First Nation, and the Gwich'in Tribal Council.[199] Three per cent of the area is dedicated specifically to boreal caribou habitat protection. Mineral staking is restricted in Wilderness Areas for Boreal Caribou.

Boreal caribou habitat that is protected or being considered for protection in the Northwest and Yukon Territories include Ka'a'gee Tu (Candidate Area), land covered by the Sahtu Land Use Plan, Nahanni and Nááts'įhch'oh National Park Reserves, Saoyú-ʔehdacho historic site, Kelly Lake within the Sahtu Settlement Region, Ts'udé Nilįné Tuyeta (proposed), Edéhzhíe, Wood Buffalo National Park, and Łue Túé Sulái.[200]

In 2019, the Government of Canada and the Government of NWT completed and published a final Section 11 Conservation Agreement for boreal caribou in the territory. For Yukon caribou recovery, a Section 11 Conservation Agreement for boreal caribou between Canada, the Yukon Government, the First Nation of Nacho Nyak Dun, and the Gwich'in Tribal Council was completed. The

[199] Government of Yukon, "Peel Watershed Regional Land Use Plan finalized," August 22, 2019. https://yukon.ca/en/news/peel-watershed-regional-land-use-plan-finalized

[200] Canadian Parks and Wilderness Society, "CPAWS 2021 Report Card,"

commitments under the agreement included surveys for boreal caribou locations and tracks. Caribou density estimates are scheduled to be completed by 2022.[201]

## 5.9 Creation of a National Boreal Caribou Knowledge Consortium and Indigenous Knowledge Circle

To provide reliable information for caribou protection and recovery, Canada formed the National Boreal Caribou Knowledge Consortium (NBCKC) in June 2018. The NBCKC provides an opportunity for federal, provincial, and territorial governments, Wildlife Management Boards, Indigenous organizations, environmental non-governmental organizations, and industry groups to share information on caribou conservation. The NBCKC meet multiple times per year and house caribou conservation information on a public web portal.[202]

Concurrent to the NBCKC the Indigenous Knowledge Circle (IKC) was formed. The IKC is a platform for Indigenous groups to share knowledge and provide input on boreal caribou conservation. The IKC meets multiple times each year.

[201] *Amended Recovery Strategy for the Woodland Caribou*.

[202] Canadian Conservation and Land Management, "Homepage", 2021. https://www.cclmportal.ca/

# 6. Caribou habitat restoration science and progress

The recovery of boreal caribou populations depends on the protection of remaining intact critical habitat and the restoration of sites that have already been disturbed. Restoration can be one of two types: ecological restoration or functional restoration.

The goal of **ecological restoration** is the replacement and creation of critical caribou habitat, specifically the older forests and peatlands that support the lichens caribou depend on. Peatland is among the most expensive habitats to restore with an estimated cost of $3750/ha.[203] Boreal forest stands more than 100 years old support the highest densities of arboreal lichen, while terrestrial lichen density is highest in forest stands 60-100 years old.[204] Because of the timelines necessary to produce the lichens caribou need, ecological restoration will take decades to accomplish. It is currently considered an unproven mitigation in the recovery of caribou because there are simply no restored sites old enough to assess its efficacy.

The goal of **functional restoration** is to re-establish the spatial separation between caribou and their predators by restoring linear disturbances such as roads, seismic lines, pipelines, and hydro lines.[205,206,207] In contrast to ecological restoration, the benefits of linear feature restoration to caribou recovery efforts

[203] Drever, "Natural climate solutions for Canada,"

[204] Catherine Boudrealt, Pierre Drapeau, Mathieu Bouchard, et al., "Contrasting response of epiphytic and terrestrial lichens to variations in forest characteristics in northern boreal ecosystems," *Canadian Journal of Forest Research* 45 (2015), (5):595-606. 10.1139/cjfr-2013-0529

[205] "Billion dollar boreal woodland caribou and the biodiversity impacts of the global oil and gas industry."

[206] Jaime Pinzon, *Evergreen Restoration Trial: Evaluation of mound size effectiveness on site conditions and biodiversity* (The Evergreen Learning and Innovation Society, 2020). https://www.evergreeninnovation.ca/wp-content/uploads/2020/07/Evergreen-restoration-trial-low.pdf

[207] Erin R. Tattersall, Joanna M. Burgar, Jason T. Fisher, A. Cole Burton, "Mammal seismic line use varies with restoration: Applying habitat restoration to species at risk conservation in a working landscape," *Biological Conservation* 241 (2019). https://doi.org/10.1016/j.biocon.2019.108295.

are more immediate, although its efficacy is still being investigated.[208,209] Costs of restoring seismic lines within Alberta are estimated between $8000 and $16,000 per kilometre.[210]

Restoration should be considered a supplement to intact habitat protection, not a replacement for it. Furthermore, restored habitat must not be reclassified as equivalent to undisturbed habitat[211] because it is not yet known if restored habitat will meet the habitat needs of caribou. Such reclassification could result in an overestimation of the habitat available to caribou. Restoration alone is inadequate to prevent further caribou population declines because habitat cannot be restored on a sufficient geographical scale and within the necessary timeframe to counter the impact of ongoing habitat loss and fragmentation. For example, between 2002 and 2012 twice as much caribou habitat was lost in British Columbia and Alberta than was gained, despite restoration efforts and protections from federal and provincial laws.[212]

Within the past decade, most restoration research and progress has focused on the functional restoration of linear features for caribou recovery, which we review in the sections below. Table 18 summarizes functional restoration projects that have been completed to date in B.C., Alberta and Quebec.

### Table 18. Summary of seismic line and road restoration completed in B.C., Alberta, and Quebec

| Caribou Range | Restoration Length |
|---|---|
| British Columbia ranges | |
| BC3: Snake-Sahtahneh herd range[a] | 8 km (seismic) |
| BC4: Parker Range Restoration Project[b] | 60 km (seismic) |
| Alberta ranges | |

[208] Tattersall, "Mammal seismic line use varies with restoration."

[209] M. Dickie, R.S. McNay, G.D. Sutherland, et al., "Multiple lines of evidence for predator and prey responses to caribou habitat restoration," *Biological Conservation* 256 (2021). https://doi.org/10.1016/j.biocon.2021.109032.

[210] *2019 COSIA Land EPA: In Situ Research Report*.

[211] *Draft Provincial Caribou Range Plan*.

[212] Nagy-Reis, "Habitat loss accelerates for the endangered woodland caribou in western Canada."

| | |
|---|---|
| AB8: Richardson Wildland and Marguerite Provincial Wildland Park[c] | 50 km (seismic) |
| AB9: East Side Athabasca River Range (Algar Historic Restoration Project)[b] | 387 km (seismic) |
| AB10: Cold Lake Range[c] | 457.6 km (seismic) |
| AB10: Cold Lake Range[c] | 203.6 km (seismic) |
| AB10: Cold Lake Range[d] | 135 km (seismic) |
| Multiple ranges in Alberta Oil Sands Area[e] | 1,750 km (seismic)<br>(note: unclear if those listed above are included in this total) |
| Quebec ranges | |
| Essipit Nitassinan Council[b] | 40 km (logging roads) |

Data sources:

a. *FNFN - Medzih Action Plan - Kotcho Restoration.*

b. *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou.*

c. *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020).*

d. *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

e. *Restoration Innovation Roadmap Phase 2.*

## 6.1 Caribou and their competitors and predators

Prey species that share common predators are said to be in apparent competition.[213] Increases in the abundance of one prey species result in greater predator density, which increases the predation pressure on the other prey species. White-tailed deer, moose, and caribou are considered to be in apparent competition.[214]

White-tailed deer are expanding their geographic range northward into the boreal forest, with an astonishing 17.5-fold increase in deer abundance in

[213] Robert D. Holt, "Predation, apparent competition, and the structure of prey communities," *Theoretical Population Biology* 12 (1977). https://doi.org/10.1016/0040-5809(77)90042-9

[214] Jonathan Frenette, Fanie Pelletier, and Martin-Hughes St-Laurent, "Linking habitat, predators and alternative prey to explain recruitment variations of an endangered caribou population," *Global Ecology and Conservation* 22 (2020). https://doi.org/10.1016/j.gecco.2020.e00920

Alberta's oilsands region between 1997 and 2005.[215] The reason for this range expansion appears to be a combination of climate change and human landscape alteration.[216] Deer are more likely to be present during the winter and spring in those locations with reduced snow accumulation[217] and populations respond negatively to winters with deeper snow cover.[218,219] Multiple years of milder winters with reduced snow cover have allowed white-tailed deer to increase in abundance and expand northward into the boreal forest, where they appear to be thriving. Although climate change is likely the primary factor for this range expansion,[220] human landscape alteration has also played a role, as deer prefer the early vegetation that emerges after anthropogenic landscape disturbances.[221] Sites in northern Alberta with 50% or more of the landscape altered by humans are more likely to have white-tailed deer present.[222]

The dramatic increase in white-tailed deer abundance in the boreal forest has attracted wolves. Like many other predators, wolves exhibit a numeric response to prey[223] in that they focus on the most abundant prey item available. One study found that within the deer-abundant boreal forests of northeastern Alberta the

[215] A. David Latham, M. Cecilia Latham, Nicole A. McCutchen, and Stan Boutin, "Invading white-tailed deer change wolf-caribou dynamics in northeastern Alberta," *Journal of Wildlife Management* 75(1) (2011). https://doi.org/10.1002/jwmg.28

[216] Maud Laurent, Melanie Dickie, Marcus Becker, et al., "Evaluating the mechanisms of landscape change on white-tailed deer populations," *Journal of Wildlife Management* 85(2) (2021). https://doi.org.10.1002/jwmg.21979

[217] Laurent, "Evaluating the mechanisms of landscape change on white-tailed deer populations."

[218] Jason T. Fisher, A. Cole Burton, Luke Nolan, and Laurence Roy, "Influences of landscape change and winter severity on invasive ungulate persistence in the Nearctic boreal forest," *Scientific Reports* 10 (2020). https://doi.org/10.1038/s41598-020-65385-3

[219] Glenn D. Del Giudice, Michael R. Riggs, Pierre Joly and Wei Pan, "Winter severity, survival, and cause-specific mortality of female white-tailed deer in north-central Minnesota," The Journal of Wildlife Management 66(3) (2002), 698–717. https://doi.org/10.2307/3803136

[220] Kimberly L. Dawe, Stan Boutin, "Climate change is the primary driver of white-tailed deer (*Odocoileus virginianus*) range expansion at the northern extent of its range; land use is secondary," *Ecology and Evolution* 6, no. 18 (2016). https://doi.org/10.1002/ece3.2316

[221] Fisher, "Influences of landscape change and winter severity on invasive ungulate persistence in the Nearctic boreal forest."

[222] Laurent, "Evaluating the mechanisms of landscape change on white-tailed deer populations."

[223] Samuel K. Wasser, Jonah L. Keim, Mark L. Taper, Subhash R. Lele, "The influence of wolf predation, habitat loss, and human activity on caribou and moose in the Alberta oil sands," *Frontiers in Ecology and Environment* 9, no. 10 (2011). https://doi.org/10.1890/100071

wolf diet was approximately 65% deer, 24% moose, and 11% boreal caribou.[224] Even though boreal caribou are a minor component of the wolf diet, the wolf population has approximately doubled in the Alberta oilsands region in conjunction with the increase of white-tailed deer,[225] inevitably creating higher predation pressure on caribou.

In fact, wolf predation on caribou has increased disproportionately faster than wolf abundance. Latham et al.[226] found that boreal caribou were 10 times more common in wolf scat in the 2000s (5%) compared the mid-1990s (0.5%), while Wasser et al.[227] found that caribou composed an even greater proportion (11%) in wolf scat collected between 2006-2009. If increased wolf abundance was the primary reason for increased predation rates, then one would expect a wolf population that has doubled in size to result in twice the predation rates, not rates 10-20 times higher. White-tailed deer are also increasingly found in peatlands[228] which may be attracting the wolves into this habitat. In contrast, the traditional prey of wolves in the boreal forest, moose, avoid peatlands, which previously resulted in low densities of both moose and wolves[229] creating a habitat refuge for caribou.

Without easy access into peatlands via seismic lines and roads, it is unlikely that the current level of wolf predation on caribou would be occurring. Too many seismic lines, not too many wolves, appears to be main driver of this increased predation on caribou. In fact, Wasser et al.[230] found that wolves in Alberta's oilsands show preference for deer over caribou, suggesting that predation on caribou is opportunistic and incidental rather than targeted.

[224] Wasser, "The influence of wolf predation, habitat loss, and human activity on caribou and moose in the Alberta oil sands."

[225] Latham, "Invading white-tailed deer change wolf-caribou dynamics in northeastern Alberta."

[226] Latham, "Invading white-tailed deer change wolf-caribou dynamics in northeastern Alberta."

[227] Wasser, "The influence of wolf predation, habitat loss, and human activity on caribou and moose in the Alberta oil sands."

[228] Latham, "Invading white-tailed deer change wolf-caribou dynamics in northeastern Alberta."

[229] Latham, "Invading white-tailed deer change wolf-caribou dynamics in northeastern Alberta."

[230] Wasser, "The influence of wolf predation, habitat loss, and human activity on caribou and moose in the Alberta oil sands."

## 6.2 Approaches to linear feature restoration and best practices

Alberta alone has more than 100,000 km of unrestored seismic lines and pipelines within caribou habitat.[231] Add to this hydroelectric transmission lines and the roads built for forestry and mining across Canada, and the extent of anthropogenic linear features impacting boreal caribou habitat is staggering. Both the extent of the problem and the high costs of restoration emphasize the need to assess the efficacy of the various restoration approaches. Because the key goal of restoring linear infrastructure is to functionally reduce predation rates on caribou, animal responses to restoration must be included in the assessment; restoration success is more than structural and cannot be measured by vegetation regrowth alone. For example, although vegetation regrowth to a height of 0.5 m has been classified as equivalent to undisturbed habitat by Alberta's Caribou Monitoring Unit, Dickie et al.[232] found that functional restoration to pre-disturbance values is not achieved until the vegetation regrowth is 4.1 m or more. Pyper et al.[233] emphasize that successful restoration must include both functional (i.e., spatial separation of caribou and wolves) and structural restoration (i.e., vegetation height).

### 6.2.1 Passive restoration

Also referred to as natural restoration, passive restoration occurs when adjacent vegetation encroaches into the linear feature and is re-established. In studying passive regeneration along legacy seismic lines in Alberta, van Rensen et al.[234] found that even 50-year-old seismic lines had failed to recover to a vegetation height of three metres in the wettest ecosites, which included fen peatlands.

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[231] *Evergreen Restoration Trial.*

[232] Melanie Dickie, Robert Serrouya, Craig DeMars, et al., "Evaluating functional recovery of habitat for threatened woodland caribou," *Ecosphere* 8, no. 9 (2017). http://dx.doi.org/10.1002/ecs2.1936

[233] Matthew Pyper, John Nishi, Lynn McNeil, *Linear Feature Restoration in Caribou Habitat: A summary of current practices and a roadmap for future programs* (COSIA, 2014). https://www.cclmportal.ca/resource/linear-feature-restoration-caribou-habitat-summary-current-practices-and-roadmap-future

[234] Cassidy K. van Rensen, Scott E. Nielsen, Barry White, et al., "Natural regeneration of forest vegetation on legacy seismic lines in boreal habitats in Alberta's oil sands region," *Biological Conservation* 184 (2015). http://dx.doi.org/10.1016/j.biocon.2015.01.020.

Others have also concluded that passive restoration is too slow to effectively reverse fragmentation and aid in the recovery of caribou. For example, St-Pierre et al.[235] examined passive regeneration along logging roads in Quebec and suggested that a combination of active road decommissioning and tree planting was necessary before these sites could contribute to caribou conservation. Finnegan et al. used LiDAR to determine vegetation height along 15,588 km of passively restored seismic lines in west-central Alberta. Although vegetation height varied between 0-15 m, 75% of the seismic lines had a mean vegetation height of one metre or less,[236] emphasizing that passive restoration is a slow process.

### 6.2.2 Active restoration

Active restoration of linear features for caribou recovery currently features a three-prong approach: obstructing access by humans and wildlife, preparing the site for revegetation, and planting trees. Monitoring vegetation regrowth and animal use following restoration are vital to assessing the efficacy of these techniques. Canada's Oil Sands Innovation Alliance does ongoing tracking of successful and unsuccessful restoration techniques. Successful techniques include using roll back of coarse woody debris and tree felling to obstruct access to the linear feature; soil mounding and decompacting (ripping) to prepare the site for revegetation; and planting trees in summer or winter.[237] Tree transplants from adjacent habitat are ineffective as a revegetation technique because of poor tree survival.[238] Tree hinging, in which trees are felled and then propped back up on the tree stump, is logistically challenging with no proven benefit over other techniques to obstruct access, and therefore this technique is not recommended.[239] Tree bending, line blocking, fencing, bar mounding, and angle

[235] Fabien St-Pierre, Pierre Drapeau, Martin-Hughes St-Laurent, "Drivers of vegetation regrowth on logging roads in the boreal forest: Implications for restoration of woodland caribou habitat," *Forest Ecology and Management* 482, no.15 (2021). https://doi.org/10.1016/j.foreco.2020.118846

[236] Laura Finnegan, Karine E. Pigeon, Jerome Cranston, et al., "Natural regeneration on seismic lines influences movement behaviour of wolves and grizzly bears," *PLOS ONE* 13, no. 4 (2018). https://doi.org/10.1371/journal.pone.0195480.

[237] *Linear Feature Restoration in Caribou Habitat.*

[238] *Linear Feature Restoration in Caribou Habitat.*

[239] *Linear Feature Restoration in Caribou Habitat.*

slicing techniques are currently being tested.[240] The techniques that have been successful are summarized in Table 19.

Table 19. Approaches and successful restoration techniques of linear infrastructure

| Phase of Restoration | Examples of Techniques | Considerations |
|---|---|---|
| 1. Obstruct movement of wildlife and humans along linear feature | • Road closure<br>• Rollback and placement of woody debris along linear feature<br>• Tree felling and placement along linear feature | • Density/quantity of woody debris used[241]<br>• Monitoring animal/human movement and access to measure functional restoration success |
| 2. Prepare site for planting | • Decompacting the soil (e.g., ripping)<br>• Mounding soil in swampy areas to aid tree growth | • Size and number of mounds<br>• Monitoring vegetation growth to measure structural restoration success |
| 3. Tree planting | • Winter planting<br>• Summer planting | • Optimum species composition and stem density for soil condition<br>• Monitoring vegetation growth to measure structural restoration success |

## 6.3 Monitoring wildlife responses to restored and decommissioned linear infrastructure

Restoration efforts should not be considered successful unless they demonstrate a return to pre-disturbance ecosystem functionality, including wildlife species interactions.[242] In the case of protecting caribou, evidence that restoration has reduced use of anthropogenic linear features by caribou predators and competitors is required for it to be deemed successful.

Using camera-trap data, Tattersall et al.[243] compared wildlife use on restored and unrestored seismic lines within the East Side Athabasca Caribou Range as part of

[240] *Linear Feature Restoration in Caribou Habitat.*

[241] Tattersall, "Mammal seismic line use varies with restoration."

[242] Tattersall, "Mammal seismic line use varies with restoration."

[243] Tattersall, "Mammal seismic line use varies with restoration."

the Algar Caribou Habitat Restoration Program. The seismic lines were monitored 3-6 years after restoration. Active restoration involved mounding to prepare the site, tree planting (400-1200 white and black spruce seedlings per hectare) and attempting to impede wildlife movements via placement of dead brush and trees across the seismic lines. Only white-tailed deer showed reduced use along restored seismic lines, but wolves and bears did not.

In contrast, Dickie et al. and Keim et al. did find evidence of reduced predator use of restored seismic lines. The difference appears to be the quantity of woody debris used during active restoration to impede predator movements.[244,245,246] A lack of available vegetation for woody debris in Tattersall et al.'s study area resulted in less effective impediments compared to the more intense treatments in Dickie et al.'s study.

Finnegan et al.'s study of naturally regenerated seismic lines further supports the need to erect barriers to impede wildlife movements.[247] Wolves moved faster along seismic lines with shorter vegetation, but contrary to Finnegan et al.'s predictions, they did not always limit their movements to the seismic lines with the shortest vegetation. Wolf movements were towards lines with the shortest vegetation (< 0.7 m) during the summer months, but towards lines with higher vegetation during the spring denning season, and towards any seismic lines regardless of height during the winter months. This emphasizes the need to impede wildlife movement along restored linear infrastructure and not rely solely on vegetation regrowth.

Alberta's Regional Industry Caribou Collaboration assigns the structural restoration threshold vegetation heights of 0.5 m and 4.1 m to define partial and full functional restoration.[248] These thresholds are based on the speed of wolf

[244] Tattersall, "Mammal seismic line use varies with restoration."

[245] Dickie, "Multiple lines of evidence for predator and prey responses to caribou habitat restoration."

[246] Jonah L. Keim, Subhash R. Lele, Phillip D. DeWitt, et al., "Estimating the intensity of use by interacting predators and prey using camera traps," *Journal of Animal Ecology* 88 (2019). https://doi.org/10.1111/1365-2656.12960

[247] Finnegan, "Natural regeneration on seismic lines influences movement behaviour of wolves and grizzly bears."

[248] Regional Industry Caribou Collaboration, *2018 Annual Report* (2018). https://cosia.ca/sites/default/files/attachments/2018_RICC-AR_v7_web_0.pdf

movement along restored seismic lines found in a study by Dickie et al.[249] When vegetation along restored seismic lines reached a height of 0.5 m, wolf movement began to slow; at a vegetation height of 4.1 m or more there was no difference in the speed of wolves on the restored seismic lines compared to undisturbed habitat.

However, Alberta's Caribou Monitoring Unit has interpreted this information to suggest that any seismic lines with 0.5 m or higher vegetation should be considered restored and equivalent to undisturbed habitat.[250] Further, they comment that by adopting this standard, time and costs can be saved in meeting the federal requirements regarding the percentage of undisturbed habitat because 13% of the seismic lines in Dickie et al.'s study were already at a height of 0.5 m through passive restoration.[251] However, this interpretation is inconsistent with Dickie et al.'s findings upon which it is based: 4.1 m, not 0.5 m, was the height at which wolf behaviour returned to pre-disturbance conditions.[252] Moreover, as van Rensen et al.'s[253] study showed, in wetter sites, passive restoration did not achieve the 4.1 m threshold even after 50 years. Finally, vegetation attributes other than height may also need to be considered when assessing whether restoration has successfully impeded wildlife access along a linear feature. For example, Lacerte et al.[254] measured lateral cover as a proxy in assessing obstruction to wildlife movements.

## 6.4 Monitoring vegetation growth

Lacerte et al. and St-Pierre et al. studied restoration of logging roads in caribou habitat in Quebec. St-Pierre et al. identified that the most important factor impeding natural vegetation regrowth was soil compaction. The study found

[249] Dickie, "Evaluating functional recovery of habitat for threatened woodland caribou."

[250] Caribou Monitoring Unit, "Reports and Publications," 2021. https://cmu.abmi.ca/?post_type=resource

[251] Caribou Monitoring Unit, "Reports and Publications."

[252] Dickie, "Evaluating functional recovery of habitat for threatened woodland caribou."

[253] van Rensen, "Natural regeneration of forest vegetation on legacy seismic lines in boreal habitats in Alberta's oil sands region."

[254] Rebecca Lacerte, Mathieu Leblond, Martin-Hughes St-Laurent, "Determinants of vegetation regeneration on forest roads following restoration treatments: implications for boreal caribou conservation," *Restoration Ecology* 29 (2021). https://doi.org/10.1111/rec.13414

that passive regeneration of logging roads was slow, and that it is important to decommission road surfaces and include tree planting in boreal caribou habitat restoration.[255] Similarly, Lacerte et al. found that a combination of road closure, decompacting the soil, and planting spruce trees was the most successful in supporting boreal caribou habitat requirements, and that greater lateral cover provided more obstruction to wildlife movements.[256]

Finnegan et al. studied undergrowth vegetation along 351 seismic lines within Alberta.[257] They found that many of the plants growing along these seismic lines were forage plants for moose, deer, black bears, and grizzly bears. Thus, the seismic lines are not only providing access corridors to caribou predators and their alternate prey, but they are also attracting them. The researchers concluded that active restoration of seismic lines and planting conifer trees would be necessary to deter wildlife use of seismic lines.

Recently, Sun et al. proposed that wildlife cameras could be used to simultaneously monitor wildlife use and vegetation phenology along seismic lines.[258] This could be another tool available to monitor vegetation recovery along linear infrastructure.

## 6.5 Improvements and emerging tools

### 6.5.1 Technologies and techniques

Pyper et al. completed a review of 17 technologies and six restoration practices that could potentially improve restoration efficiency and outcomes.[259] Emerging technologies included virtual simulator training, autonomous restoration

[255] St-Pierre, "Drivers of vegetation regrowth on logging roads in the boreal forest."

[256] Rebecca Lacerte, Mathieu Leblond, Martin-Hughes St-Laurent, "Determinants of vegetation regeneration on forest roads following restoration treatments: implications for boreal caribou conservation," *Restoration Ecology* 29 (2021). https://doi.org/10.1111/rec.13414

[257] Laura Finnegan, Doug MacNearney, Karine E. Pigeon, "Divergent patterns of understory forage growth after seismic line," *Forest Ecology and Management* 409 (2018). https://doi.org/10.1016/j.foreco.2017.12.010.

[258] Catherine Sun, Christopher Beirne, Joanna M. Burgar, et al. "Simultaneous monitoring of vegetation dynamics and wildlife activity with camera traps to assess habitat change," *Remote Sensing in Ecology and Conservation*. https://doi.org/10.1002/rse2.222

[259] *Restoration Innovation Roadmap Phase 2.*

equipment, and robotic equipment. Some of the equipment assessed included complicated multipurpose equipment to prepare sites for planting, drones and airships, and modifications to available equipment (e.g., excavator attachments) for site preparation and planting. Restoration techniques evaluated included plant breeding for desirable traits (e.g., fast growing tamarack), transplanting trees from adjacent habitat to treatment areas, and planting shrubs like birches and willow over 50 cm high to help impede predator mobility. The use of explosives for ground preparation was also explored.

The study identified several key technologies and techniques for near-term application including increased uptake of virtual simulators for training restoration personnel,[260] transplanting trees and hummocks, developing new machines to treat wetlands and uplands for restoration, planting shrubs, and adding restoration implements to available machinery (e.g., excavators).[261]

### 6.5.2 Emerging tools for monitoring habitat changes

Wildlife cameras are widely used to sample and determine wildlife species occurrence in an area[262] and they are already being deployed to assess the effectiveness of restoration in limiting or slowing the movements of predators along linear features.[263,264,265] Sun et al. used wildlife camera photographs to describe wildlife use changes along restored seismic lines and found that they also recorded local habitat condition. Photographs were used to assess vegetation condition and phenology based on plant colour and attractiveness to wildlife.[266] The study opens up the possibility that wildlife cameras can be used to monitor not only wildlife occurrence, but also plant growth along restored

[260] COSIA, "Welcome to the Restoration and Reclamation Virtual Tours and Silviculture Toolkit," 2021. https://360tours.cosia.ca

[261] *Restoration Innovation Roadmap Phase 2.*

[262] A. Cole Burton, Eric Neilson, Dario Moreira, et al., "Wildlife camera trapping: a review and recommendations for linking surveys to ecological processes," *Journal of Applied Ecology* 52 (2015) 675-685. https://doi.org/10.1111/1365-2664.12432

[263] Keim, "Estimating the intensity of use by interacting predators and prey using camera traps."

[264] Tattersall, "Mammal seismic line use varies with restoration."

[265] Dickie, "Multiple lines of evidence for predator and prey responses to caribou habitat restoration."

[266] Sun, "Simultaneous monitoring of vegetation dynamics and wildlife activity with camera traps to assess habitat change."

linear infrastructure. Wildlife cameras can be a valuable tool for understanding wildlife habitat condition and use in a changing environment, and their use is expected to increase in caribou conservation efforts.

Satellite data is also being used to measure habitat disturbance in critical caribou habitat. Recently artificial intelligence is being employed to detect and classify linear disturbances in boreal caribou habitat. The hope is that eventually artificial intelligence will improve the accuracy and speed of linear disturbance classification, help determine the condition of boreal caribou critical habitat, and aid in conservation efforts.[267]

[267] Government of Canada, *Protecting Canada's caribou by satellite* (2021). https://www.asc-csa.gc.ca/eng/blog/2021/05/21/satellite-solution-to-protect-canada-woodland-caribou.asp

# 7. Indigenous-led conservation efforts

In their 2018 progress report, Environment and Climate Change Canada concluded that there were gaps in comprehensive protection for boreal caribou critical habitat throughout the boreal caribou range and that more work was needed.[268] One recommendation was that meaningful partnerships with Indigenous Peoples were needed. The benefits of Indigenous-led conservation efforts for caribou are also likely underestimated, as these activities often unfold outside of the formal range planning process. The following section attempts to close this gap by outlining examples of Indigenous-led efforts working toward boreal caribou conservation across Canada. It should be noted that this summary is based on publicly available information searchable online; many projects and efforts are undoubtedly missed here due to lack of in-person knowledge of ongoing plans and discussions.

## 7.1 British Columbia

The Fort Nelson First Nation authored the Medzih Action Plan in 2017 to outline actions for caribou recovery in their territory.[269] In June 2018, the Fort Nelson First Nation led an initiative with multiple governments to expand caribou protection in the Hay River drainage area of northeastern British Columbia, outside of existing boreal caribou ranges. Initial steps in this process included completing an agreement with the Government of Alberta to share telemetry data for monitoring the Bistcho caribou herd, which crosses the provincial boundary into British Columbia. Fort Nelson First Nation also undertook an Indigenous Knowledge study of boreal caribou. In 2019, the British Columbia government and Fort Nelson First Nation developed caribou herd plans that

[268] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2018b).

[269] Fort Nelson First Nation, *Medzih Action Plan: Fort Nelson First Nation Boreal Caribou Recovery Plan* (2017). http://www.fortnelsonfirstnation.org/uploads/1/4/6/8/14681966/2017-sept-29_fnfn_medzih_action_plan_final_medres.pdf

include habitat management and protection. As part of the caribou herd plans, the Kotcho Lake Restoration Project pilot project was initiated. The project is a three-year restoration and monitoring program in the Snake-Sahtahneh caribou herd range.[270] This project led to over 8 km of functional restoration on 20 seismic lines, and wildlife cameras were subsequently used to document wildlife use.

The Doig River First Nation, Prophet River First Nation, Blueberry River First Nation, Dene Tha' First Nation, and the province of British Columbia are working on a Chinchaga Herd Plan. The Blueberry River First Nation and British Columbia reached an agreement regarding a three-year wolf control program in the Chinchaga herd range which was initiated in 2019. In 2020, the Doig River and Blueberry River First Nations conducted multiple community meetings to advance the Chinchaga herd range planning process. The Blueberry River First Nation has also started landscape level planning, including development of prescriptions (e.g., planned soil treatments and planting activities) in the Black Creek/Pickell Creek area for future restoration activities.[271]

In June 2021, the British Columbia Supreme Court ruled that British Columbia violated the Treaty Rights of the Blueberry River First Nations located in northeastern British Columbia (Chinchaga caribou range) and that the obligations of the Treaty must be respected, upheld, and implemented. The ruling states "The province may not continue to authorize activities that breach the promises included in the treaty … or that unjustifiably infringe Blueberry's exercise of its treaty rights."[272] The extent of development approved within the Blueberry River First Nations' traditional territory means that community members are no longer able to practice their Treaty Rights. The court indicated that the province must improve its management of the cumulative impacts of industrial development in the territory in B.C.'s northeast. The ruling may have

[270] *FNFN - Medzih Action Plan - Kotcho Restoration*.

[271] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[272] Vaughn Palmer, "Blueberry River First Nations triumphs in court over B.C. government," *Vancouver Sun*, July 2, 2021. https://vancouversun.com/opinion/columnists/vaughn-palmer-blueberry-first-nations-triumphs-in-court-over-b-c-government.

implications for Indigenous-led caribou habitat protection across Canada. British Columbia did not appeal the court decision.

## 7.2 Alberta

In 2018, the Tall Cree First Nation, Syncrude Canada Ltd, the Nature Conservancy of Canada and the Government of Alberta, in partnership with the Government of Canada, established and expanded the Richardson, Dillon River, Birch Mountains, and Birch River wildland provincial parks. This expansion added 5,865 km$^2$ of protected caribou range.[273]

In addition, Kitaskino-Nuwenëné Wildland Provincial Park was established on March 11, 2019. The park was a collaboration between Mikisew Cree First Nation, other Indigenous communities, and oil and gas companies. The park added 1,618 km$^2$ of protection to the boreal forest south of the Wood Buffalo National Park. In February 2021, a plan to almost double the area of Kitaskino-Nuwenëné Wildland Provincial Park from 1,618 km$^2$ to more than 3,000 km$^2$ was announced.[274]

Cold Lake First Nation and the Government of Canada completed a conservation agreement for boreal caribou under Section 11 of SARA in 2019. The agreement includes commitments to landscape restoration, community capacity development, predator and alternate prey management, and population monitoring.[275] The agreement commits Canada and the Cold Lake First Nation to undertake conservation measures towards achieving population and habitat objectives in the Alberta portion of the Cold Lake Weapons Range. The Cold Lake First Nation will be involved in management of the weapons range.

The Athabasca Chipewyan First Nation and Mikisew Cree First Nation posted a draft Section 11 Conservation Agreement for the conservation of boreal caribou with the Government of Canada for public comment in August 2021. The purpose of the agreement is to support the achievement of self-sustaining

[273] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2018b).

[274] "CPAWS 2021 Report Card."

[275] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

populations in the Red Earth Range, West Side Athabasca River Range, Richardson Range, and East Side Athabasca River Range. The agreement commits to the creation of stewardship areas for the protection of boreal caribou and caribou habitat that will be managed by Athabasca Chipewyan and Mikisew Cree First Nations. The agreement will continue until March 31, 2023.

In May 2021, the Dene Tha' First Nation proposed an Indigenous Protected and Conserved Area (IPCA) in the Bistcho Lake area focusing on the protection of the Bistcho Lake caribou herd because of its cultural importance. The proposed IPCA includes portions of Alberta, British Columbia, and Northwest Territories but there is no defined boundary yet. Besides protecting boreal caribou critical habitat, the IPCA would contribute to the Government of Canada's conservation goals, include adaptive co-management with the Government of Alberta, provide food security for Indigenous communities, and provide habitat protection and restoration for other wildlife species.[276]

## 7.3 Saskatchewan

The Buffalo River Dene Nation completed a written and spatial summary of boreal caribou habitat in the Boreal Plain range in Saskatchewan based on their Indigenous knowledge. The Nation's summary identifies habitat areas associated with boreal caribou life requirements including calving, rutting, overwintering, and movement corridors. The Nation's knowledge also informed a seasonal habitat rating map and identified key areas for protection in Saskatchewan's caribou ranges.[277]

The Indigenous non-profit organization Ya'thi Néné and Athabasca Dene First Nations have identified important caribou habitat for protection as IPCAs in Athabasca Dënesuliné Nuhenéné. The First Nations are working toward the creation of an IPCA to protect both the land and culture and have partnered with

[276] Dene Tha' First Nation, *Reconnection, resiliency, and refuge, the case for an indigenous protected and conserved area at Bistcho Lake* (2021). https://bistcholake.ca/wp-content/uploads/2021/05/Bistcho-Lake-IPCA-Draft-Report.pdf

[277] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

the Canadian Parks and Wilderness Society.[278] This project has received resources for the Canada Nature Fund for biodiversity protection.[279]

## 7.4 Manitoba

To help conserve boreal caribou the Wuskwi Sipihk First Nation have engaged their community members in land use planning activities, including gathering Indigenous knowledge about population size, distribution, and habitat use of the Swan Pelican and Red Deer Lake caribou herds that inhabit the Manitoba South range. This knowledge has informed the identification of important areas requiring protection for the boreal caribou in the traditional territory of the Nation.[280]

In July 2018, Pimachiowin Aki Corporation (formed by the Anishinaabe First Nations and government partners) received official World Heritage Site designation for the Pimachiowin Aki area spanning the Manitoba and Ontario borders. The designation acknowledges Pimachiowin Aki's size, intactness, and ecosystem diversity that supports boreal caribou and many other species along with predator-prey relationships between wolf, moose, and boreal caribou. Pimachiowin Aki is 29,040 km$^2$ in area and 86% of it is protected under provincial legislation.[281]

## 7.5 Ontario

The Environmental and Climate Change Canada 2018 progress report described planning activities between Ontario and 10 First Nations in the 195,494 km$^2$ Far North planning area. The intention was to develop community-based land use

[278] Ya'thi Néné Lands and Resources, *Indigenous Protected Conservation Areas. Spring Newsletter* (2020). https://static1.squarespace.com/static/5e695a9f9dbc4714741c96d5/t/5ed8254156e6511de4ea27f0/1591223646208/YNLR+SPRING+NEWSLETTER+2020.pdf

[279] "CPAWS 2021 Report Card."

[280] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

[281] Pimachiowin Aki Corporation, "Fast Facts," 2021. https://pimaki.ca/fast-facts/

plans that would include protected areas to reduce anthropogenic habitat disturbance.[282]

Matawa First Nations tribal council is conducting a two-year project focused on knowledge gathering, research, and capacity building on boreal caribou within their traditional territory. This project began in December 2018.[283]

## 7.6 Quebec

The Ungava Peninsula Caribou Aboriginal Round Table (UPCART) includes the Inuit of Nunavik, the Inuit of Nunatsiavut, the Inuit of NunatuKavut, the Naskapi Nation of Kawawachikamach, the Cree Nation Government, and all the Innu communities from the Quebec region. The UPCART has developed an agreement to manage the George River and Leaf River migratory boreal caribou herds that inhabit the Ungava Peninsula in northern Quebec to enable caribou recovery. The UPCART includes agreements that manage harvest levels of the George River and Leaf River caribou herds. Further, the UPCART has developed a management strategy that includes multiple action plans for information sharing, research, monitoring, assessing impacts, habitat management, stewardship, and education.[284]

The Innu Essipit First Nation Council completed a three-year project to monitor the use of closed forestry roads by boreal caribou, moose, bears and wolves. Human use of the closed roads was also monitored. In July 2018, the Nation installed 230 cameras and collected data for 16 weeks. In fall 2019, the number of cameras was increased to 244.[285] The study found a significant decrease in the use of the area by boreal caribou compared to 2017 and an increase in moose and bear observations.

[282] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2018b).

[283] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

[284] NunatuKavut, "Ungava Peninsula Caribou Aboriginal Round Table reaffirm their commitment towards caribou conservation," media release, December 11, 2020. https://nunatukavut.ca/article/ungava-peninsula-caribou-aboriginal-round-table-reaffirm-their-commitment-towards-caribou-conservation

[285] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

In March 2019, the Innu Essipit First Nation completed an aerial survey for boreal caribou in collaboration with Quebec. Other collaboration includes boreal caribou disturbance awareness training for snowmobilers.[286]

The Le Conseil de la Nation Huronne-Wendat has completed a five-year project on the implementation of recovery measures for boreal caribou in the Charlevoix range.[287]

## 7.7 Newfoundland and Labrador

The NunatuKavut Community Council has engaged with its community members for stewardship to be part of the "eyes on the land" program. The council developed a monitoring app to record caribou sightings. NunatuKavut guardians completed observational studies on boreal caribou foraging habits, habitat preferences, movements, general health, and interactions.[288]

In 2017, Akami-Uapishqu-KakKasuak-Mealy Mountains National Park Reserve of Canada became Canada's 46th National Park. It protects 10,700 km$^2$ of boreal forest, alpine tundra, wetlands, and coastal habitat in southern Labrador. The national park will protect 9% of the boreal caribou critical habitat in Labrador. There is a cooperative management mechanism in place to ensure Indigenous involvement in the national park management.[289]

## 7.8 Northwest Territories

On July 25, 2018, the Dehcho First Nations passed a resolution to designate approximately 14,218 km$^2$ of land in the Dehcho region as the Edéhzhíe Protected Area under the Dehcho Protected Area Law.[290] This area includes important boreal caribou habitat as well as many other values of ecological and

[286] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

[287] *Progress Report on Steps Taken to Protect Critical Habitat for the Woodland Caribou* (2019).

[288] *Progress Report on Steps Taken for Protection of Critical Habitat for Species at Risk in Canada (October 2019 – September 2020)*.

[289] *Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou*.

[290] Dehcho First Nations, *Dehcho Protected Area Law* (2018), Resolution #01, Dehcho Annual Assembly, July 24-26, 2018. https://dehcho.org/docs/REGARDINGEdehzhieDehchoAnnualAssembly2018.pdf

cultural significance. The resolution also authorized Dehcho First Nations to finalize the Edéhzhíe Establishment Agreement with the Government of Canada so that Edéhzhíe can become a National Wildlife Area under the Canada Wildlife Act.

The Government of Northwest Territories is currently working in partnership with Indigenous governments and organizations to use the proposed Protected Areas Act for the establishment of two candidate areas within the boreal caribou range: Dinàgà Wek'èhodì (approximately 790 $km^2$) and Ts'ude niline Tu'eyeta (approximately 15,000 $km^2$).

## 7.9 Yukon

The Governments of Canada and Yukon, the First Nation of Na-Cho Nyäk Dun, and the Gwich'in Tribal Council completed a final conservation agreement under Section 11 of SARA for boreal caribou in the territory on June 14, 2019. The agreement includes commitments to habitat protection and aligns with the Peel Watershed Regional Land Use Plan.

# 8. Conclusions

Boreal caribou are an indicator species of boreal forest ecosystem health. Successful conservation of this umbrella species will also conserve other species that depend on old forests and peatland complexes. Furthermore, conservation of caribou habitat has clear co-benefits for reducing Canada's greenhouse gas emissions and paving a route towards a climate-safe future.

Despite the multitude of benefits associated with boreal caribou conservation, as well as the signal that this work is an urgent national priority (i.e., federal listing of the species as Threatened under SARA), progress has been slow and only 29% of subpopulations (15 out of 51) currently meet Environment and Climate Change Canada's criteria for self-sustaining status. To achieve meaningful positive change for the status of boreal caribou in Canada, it is imperative to maintain or re-establish spatial separation between caribou and their predators (wolves) and alternate prey (deer). Provincial and territorial governments hold the primary responsibility for boreal caribou conservation, and they must ensure that unfragmented habitat remains as such and disturbed habitat is restored.

Through our review, we have identified four key barriers to caribou conservation in Canada:

1. **Regulatory bodies consistently make exceptions and authorize habitat-disturbing activities in critical habitat by issuing permits, dispositions, licenses, agreements, or approvals.** These exceptions occur even though most provinces have laws to protect caribou habitat, and have led to ongoing development and destruction of caribou habitat. These exceptions also impact Indigenous communities and may violate their inherent or Treaty Rights.
2. **A lack of precision and standardization in provincial/territorial reporting has made it impossible to assess recovery actions at a national scale.** In 2017, range subpopulation sizes were estimated as above or below 100 caribou in alignment with Environment and Climate Change Canada's determination that populations below 100 were at risk

higher risk of local extinction. However, the 100-caribou benchmark is not an accurate enough estimate for effective management of populations exceeding 1,000 caribou. This change in reporting standards has also made it impossible to assess subpopulation trends within ranges, as the 2017 numbers cannot be compared to the 2012 reporting standard. In addition, population trend data is unavailable for many range subpopulations.

3. **Delays in range planning have put off meaningful action for caribou conservation in many jurisdictions.** Only four of nine jurisdictions met the original 2017 deadline for draft range plans set by the federal government, and four are still yet to complete their range plans. In the meantime, nearly a decade has passed since the first boreal caribou recovery strategy without plans being set or implemented in these jurisdictions, and there are insufficient intermediate conservation measures to compensate for the delays. An interim range plan developed and currently being implemented by the Northwest Territories stands as a good example of how interim conservation measures can provide meaningful action for caribou while the longer formal range planning processes unfold.

4. **Overall, many jurisdictional governments and industry entities have avoided compliance with required protection of caribou habitat by negotiating alternative measures that are not proven to benefit caribou long-term.** For example, rather than protect caribou habitat, some jurisdictions continue to allow ongoing destruction provided restoration is used as a mitigation. Although restoration of legacy seismic lines, pipelines, and roads is an important component of caribou conservation, restoration is not a replacement for the protection of intact habitat; allowing restoration to substitute for protection undoubtably will lead to further declines in boreal caribou populations over the next century. Moreover, non-binding Section 11 Conservation Agreements have the potential to be used to avoid compliance rather than to promote the recovery of caribou. For example, Section 11 was used in Alberta to avoid legal enforcement of SARA.

Drawing on the above barriers, an overall conclusion of our work is that stronger legislation and enforcement measures are needed at all levels of government to ensure caribou habitat is protected, range plans are completed, and jurisdictional governments are held accountable for their implementation.

Many positive caribou conservation outcomes have been achieved because of Indigenous-led initiatives. Indigenous-led conservation measures such conservation agreements, restoration activities, project reviews, establishment of Indigenous Protected and Conserved Areas, and incorporation of Indigenous knowledge are protecting caribou habitat. It is important to note that such activities often occur outside of the range planning process formally recognized by provincial and federal governments, meaning that the contributions of such efforts are likely under-recognized in general. Indigenous-led conservation efforts are also a strong model that provincial governments and companies can follow for enacting intermediate conservation measures to compensate for range planning delays.

A British Columbia court ruling has recently concluded that the continued approval of development by the province of British Columbia violated the Treaty Rights of the Blueberry River First Nations in northeast British Columbia and that the obligations must be respected, upheld, and implemented. The court decision will make industrial development more difficult in the Blueberry River First Nation's traditional territory and Chinchaga caribou range, improve consultation practices, and strengthen wildlife mitigation like boreal caribou habitat restoration. The court decision will enable additional Indigenous-led conservation efforts in coming years, and jurisdictions should prepare to better support and engage with Indigenous communities to collaboratively reach caribou conservation targets. The decision will, hopefully, have positive implications for boreal caribou recovery in Treaty 8 lands and across Canada.

# 9. Recommendations

## 9.1 Prioritize conservation over restoration

The lichens that caribou rely on are present only in intermediate and old boreal forests and peatland complexes. Ecological restoration of these habitats is time-consuming (will take 60-100 years) and expensive. Therefore, more protected areas are required — or, at a minimum, interim conservation measures such as interim range plans. Restoration progress has been slow, and it is still unknown if this will successfully stabilize caribou populations. For these reasons, preservation of the remaining intact old forest and peatland habitat should be among the highest priorities. Restoration must not be used as an alternative to protecting the intact habitat that remains. To that end, a moratorium should be placed on future developments that impact intact old forests and peatland habitats. Such developments should not be approved based on proposed restoration because the timelines for restoration are too long and restoration is still an unproven mitigation.

By acknowledging that climate and conservation are inextricably linked, policies, practices, and projects will also yield maximum benefits for both. Peatlands and older forests rank within the top five ecosystems globally in terms of their carbon storage potential. Preventing further disturbance and loss of these habitats to exploration and development can help Canada meet its climate commitments. According to the International Energy Agency, in a net-zero compatible world, no new exploration and no new oil and gas fields are required beyond those that have already been approved for development.[291]

The Species at Risk Act should be applied more stringently to prevent further development of caribou critical habitat and release of stored carbon, and oil and gas developments should be restored in the near term to provide benefits for climate and caribou as soon as possible. Governments should consider using the

[291] International Energy Agency, *Net Zero by 2050: A Roadmap for the Global Energy Sector* (2021). https://iea.blob.core.windows.net/assets/beceb956-0dcf-4d73-89fe-1310e3046d68/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf

climate benefits from NBS projects to incentivize companies to pursue restoration projects that benefit caribou. When companies pursue such projects, they should consider co-benefits to caribou and climate and how to maximize them.

Finally, in alignment with Canada's goal to conserve 25% of terrestrial ecosystems by 2025 and 30% by 2030,[292] more protected areas should be created to conserve Canada's remaining intact older boreal forests and peatlands. Such areas are a win-win, as they will contribute to both the recovery of a culturally significant species at risk and a climate-safe future.

## 9.2 Strengthen legislation, policy, and Indigenous co-governance mechanisms to protect caribou habitat

A clear detriment to caribou is the ability of provinces to side-step legislated obligations to protect caribou habitat through regional approval and permitting processes. The legislative loopholes that allow these exceptions and promote further destruction of old-growth forests and peatlands must be closed.

Section 11 Conservation Agreements, while on their face appearing positive for caribou conservation, are not legally binding and risk being used as a mechanism to delay range planning timelines and avoid enactment of legally binding sections of SARA. Another concern with these agreements is that they may be made between the federal government and other non-provincial entities (e.g., First Nations), but these types of agreements cannot be acted upon in a meaningful way until the provincial government has signed on. For example, a new protected area may be agreed upon in a Section 11 Conservation Agreement between the federal government and a First Nation, but it cannot be created in a material way until the relevant provincial authority approves it. A potential twofold solution for addressing this issue is to (i) make Section 11 Conservation Agreements legally binding, and (ii) require all activities that will destroy critical

[292] Government of Canada, "Protecting our Nature: Canada's Story," February 15, 2021. https://www.canada.ca/en/environment-climate-change/services/nature-legacy/about.html

caribou habitat have federal review under the Canadian Environmental Assessment Act.

Canada's legislative and policy systems also currently lack any way of recognizing or penalizing the greenhouse gas emissions that are released through the destruction of carbon-dense habitats like old forests and peatlands. A price should be assigned on carbon dioxide and other greenhouse gases that are released when these habitats are disturbed that reflects the magnitude of the damage incurred. Such a policy would incentivize minimization of habitat disturbance and increased avoidance of these areas by industrial developers.

Indigenous peoples provide a unique perspective on caribou conservation that is yet to be formally recognized by federal and provincial/territorial governments in many cases. More meaningful engagement, co-management, and collaboration with Indigenous peoples is needed, and full respect for Indigenous peoples' Treaty and inherent rights should be demonstrated. For example, Indigenous communities should be provided the ability to reject projects impacting caribou critical habitat in their Traditional Territories, and Indigenous-led conservation efforts should be recognized and collaboratively incorporated into caribou range planning documents and commitments. Governments should prioritize building collaborative relationships with First Nations and Indigenous communities to protect caribou habitat together through legislated mechanisms that promote co-management between Indigenous peoples and federal/provincial governments (e.g., Indigenous Protected and Conserved Areas, Tribal Parks, and Wildland Provincial Parks).

## 9.3 Improve data collection and reporting standards

Tracking population condition (estimated numbers and trends) is essential in assessing whether conservation actions are effective in caribou recovery, but data for several caribou ranges were unavailable in the first five-year progress report published by Environment and Climate Change Canada in 2017. Measures should be taken to ensure this is corrected in the second five-year progress report due in 2022, including greater investment and effort towards collecting

field data on data-deficient subpopulations. Accurate measurements of caribou habitat restoration (e.g., kilometres of restored habitat) and habitat protection (e.g., hectares of protected areas) should also be included in these progress reports, as these are essential to understand if the on-the-ground work needed to support caribou recovery is occurring in each jurisdiction.

In addition to the challenge of gaps in data reporting, there is also a challenge in reporting consistency over time. Between 2012 and 2017, the federal government reporting standard shifted from population size estimates for each subpopulation to a simple benchmark of above or below 100 individuals for each subpopulation. This shift in reporting practice has made it impossible to assess the magnitude of population declines for many subpopulations, as well as the overall status of subpopulations that typically stand at over 1,000 individuals. We recommend that the reporting standard should be to provide a population size estimate along with other demographic parameters if available (e.g., population growth rate).

## 9.4 Allocate restoration efforts where they will have the most impact and improve restoration evaluation standards

Restoration efforts can have greater value for caribou if they are prioritized in the areas that will have the most benefit in terms of habitat value. From this lens, the highest priority for linear restoration should be the lines that access peatlands used by female caribou during the winter-spring calving season. Priority should also be given to restoration efforts that address existing and legacy habitat disturbance, rather than proposals to use restoration to mitigate future developments that impact intact habitat.

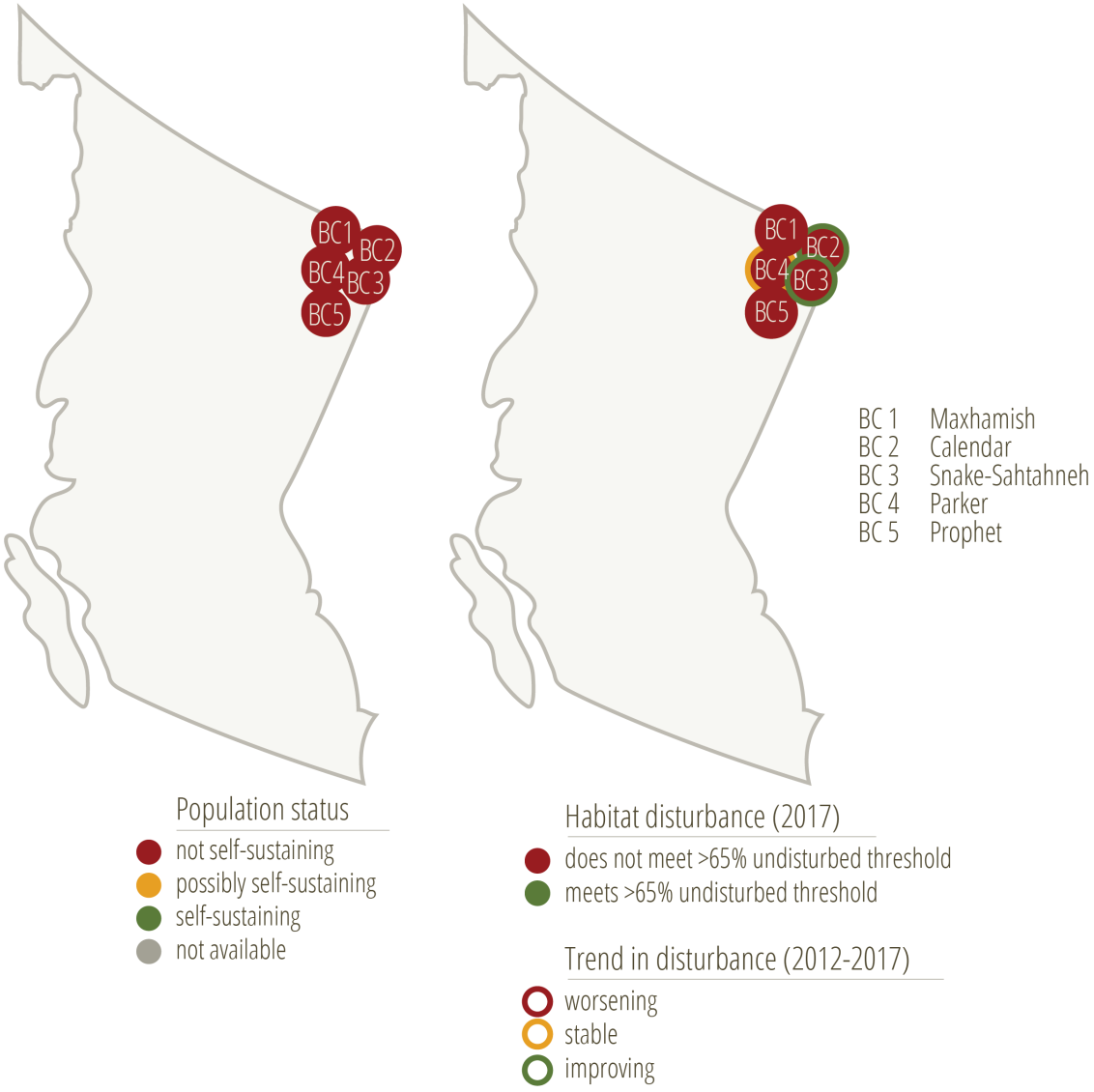
Standards for assessing restoration success must also be more stringent so that they reflect meaningful value for caribou. For example, the suggestion that habitat can be considered "undisturbed" once it is restored[293] could lead to an over-estimate of high-quality caribou habitat on the landscape, as it is still

[293] *Draft Provincial Caribou Range Plan*.

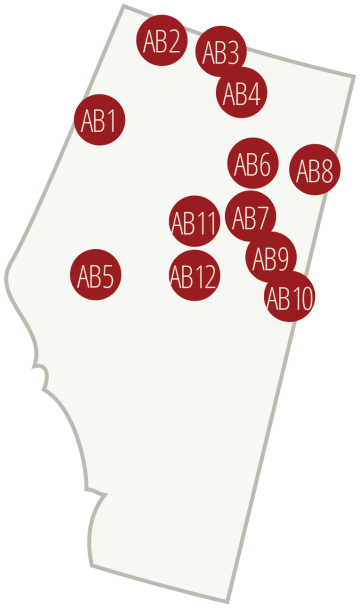
uncertain whether restored habitat provides the same value as intact habitat. Restoration should not be considered successful until both the vegetation structure and wildlife interactions have returned to pre-disturbance levels and the affected caribou population has stabilized. One study in Alberta suggests that wildlife movement along restored linear infrastructure returns to pre-disturbance levels only when vegetation has reached a minimum height of 4.1 m; however, other metrics such as lateral cover should be considered too.

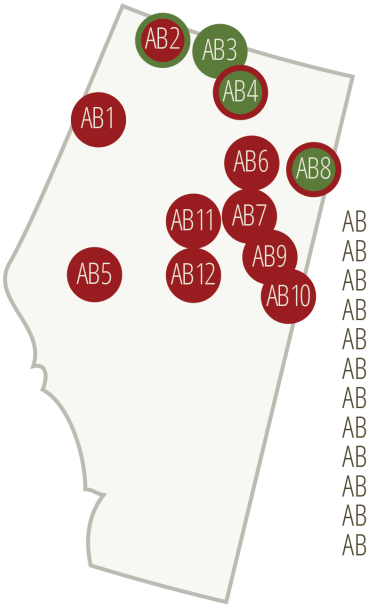
# Appendix 1. Caribou maps by province/territory

## British Columbia



## Alberta




AB 1 Chinchaga (incl. BC portion)
AB 2 Bistcho
AB 3 Yates
AB 4 Caribou Mountains
AB 5 Little Smoky
AB 6 Red Earth
AB 7 West Side Athabasca River
AB 8 Richardson
AB 9 East Side Athabasca River
AB 10 Cold Lake
AB 11 Nipisi
AB 12 Slave Lake

### Population status

- not self-sustaining
- possibly self-sustaining
- self-sustaining
- not available

### Habitat disturbance (2017)

- does not meet >65% undisturbed threshold
- meets >65% undisturbed threshold

### Trend in disturbance (2012-2017)

- worsening
- stable
- improving

## Saskatchewan



SK 1 Boreal Shield
SK 2 Boreal Plain

### Population status

- not self-sustaining
- possibly self-sustaining
- self-sustaining
- not available

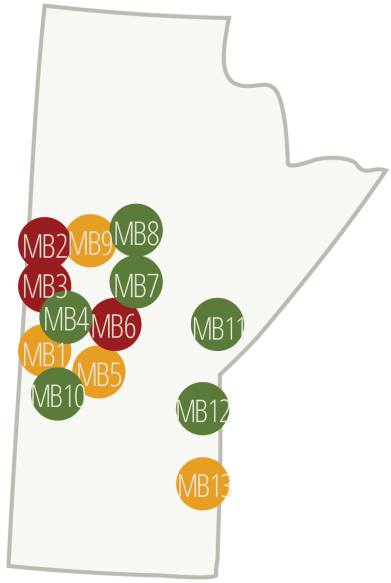
### Habitat disturbance (2017)

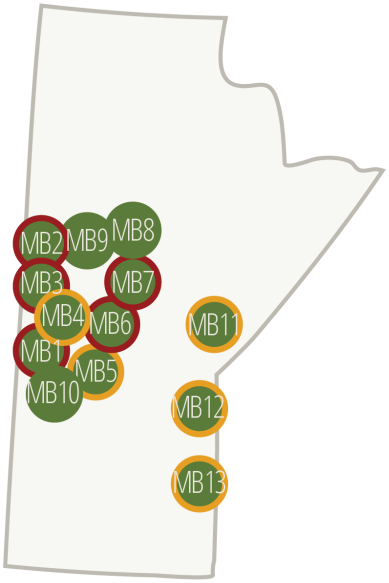
- does not meet >65% undisturbed threshold
- meets >65% undisturbed threshold

### Trend in disturbance (2012-2017)

- worsening
- stable
- improving

## Manitoba




MB 1 The Bog
MB 2 Kississing
MB 3 Naosap
MB 4 Reed
MB 5 North Interlake
MB 6 William Lake
MB 7 Wabowden
MB 8 Wapisu
MB 9 Manitoba North
MB 10 Manitoba South
MB 11 Manitoba East
MB 12 Atikaki-Berens
MB 13 Owl-Flintstone

### Population status

- not self-sustaining
- possibly self-sustaining
- self-sustaining
- not available

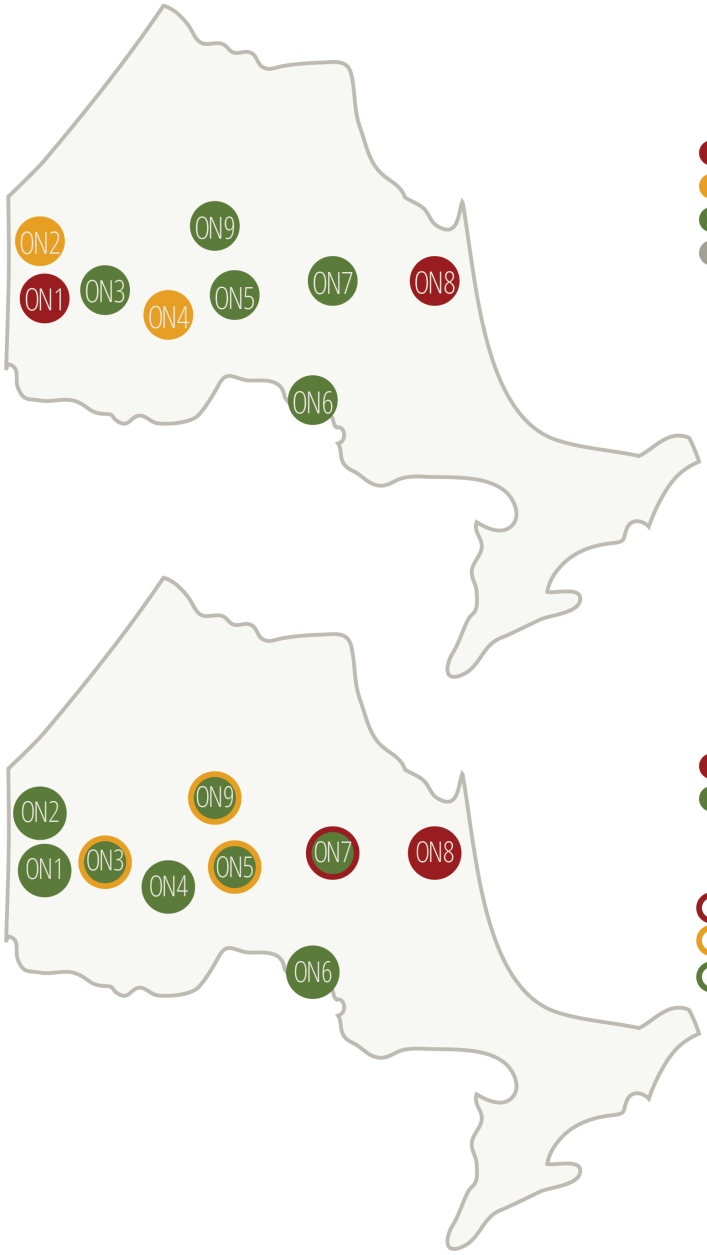
### Habitat disturbance (2017)

- does not meet >65% undisturbed threshold
- meets >65% undisturbed threshold

### Trend in disturbance (2012-2017)

- worsening
- stable
- improving

## Ontario



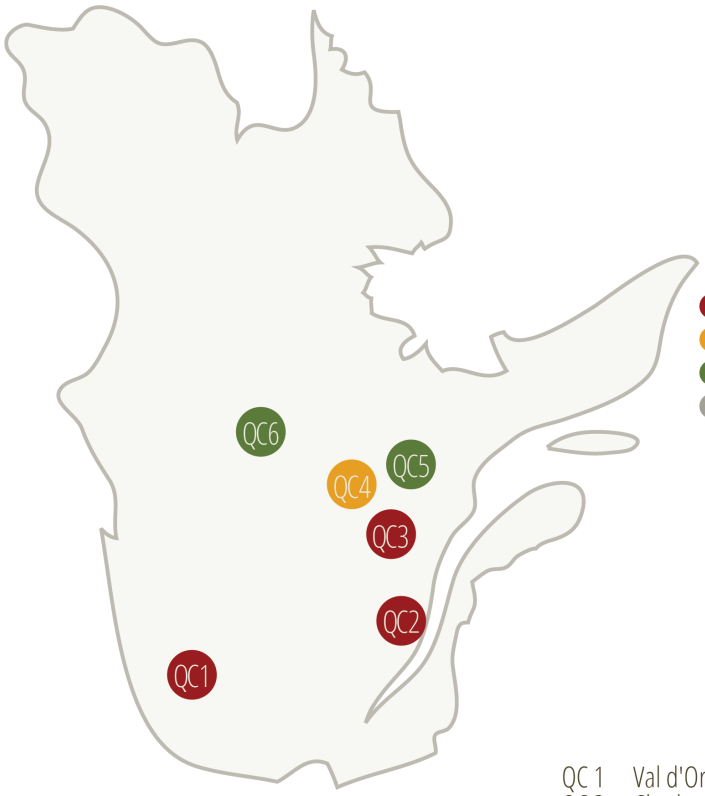

Population status
- not self-sustaining
- possibly self-sustaining
- self-sustaining
- not available

ON 1 Sydney
ON 2 Berens
ON 3 Churchill
ON 4 Brightsand
ON 5 Nipigon
ON 6 Coastal
ON 7 Pagwachuan
ON 8 Kesagami
ON 9 Far North

Habitat disturbance (2017)
- does not meet >65% undisturbed threshold
- meets >65% undisturbed threshold

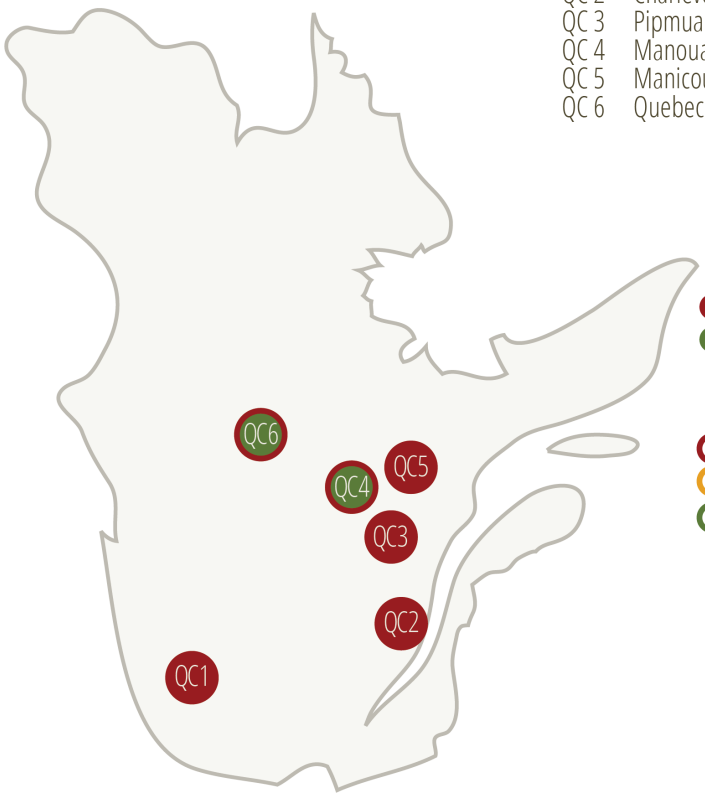
Trend in disturbance (2012-2017)
- worsening
- stable
- improving

## Quebec




Population status
- not self-sustaining
- possibly self-sustaining
- self-sustaining
- not available

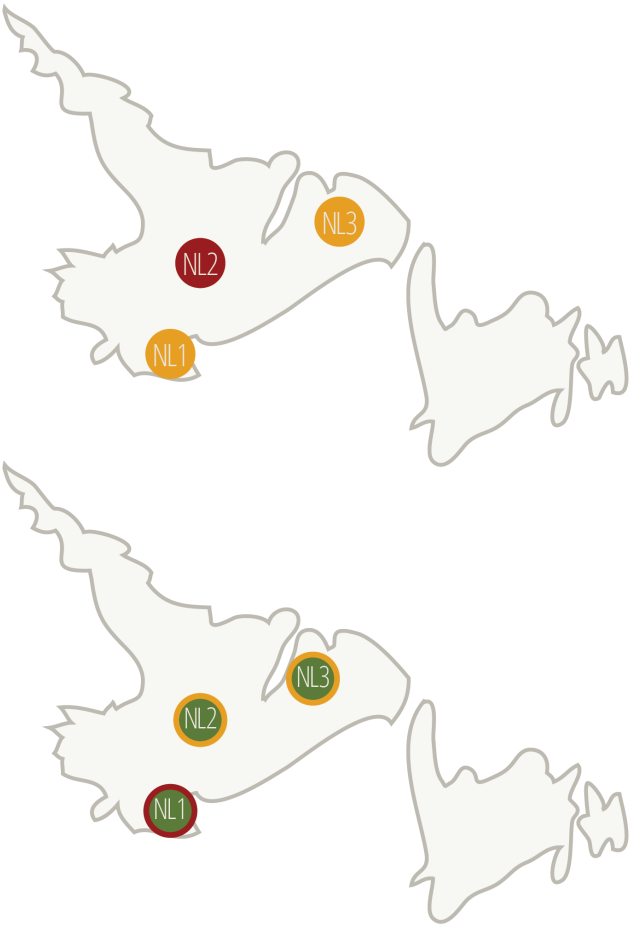
QC 1 Val d'Or
QC 2 Charlevoix
QC 3 Pipmuacan
QC 4 Manouane
QC 5 Manicouagan
QC 6 Quebec




Habitat disturbance (2017)
- does not meet >65% undisturbed threshold
- meets >65% undisturbed threshold

Trend in disturbance (2012-2017)
- worsening
- stable
- improving

## Newfoundland and Labrador




Population status
- not self-sustaining
- possibly self-sustaining
- self-sustaining
- not available

NL 1 Lac Joseph
NL 2 Red Wine Mountain
NL 3 Mealy Mountain

Habitat disturbance (2017)
- does not meet >65% undisturbed threshold
- meets >65% undisturbed threshold

Trend in disturbance (2012-2017)
- worsening
- stable
- improving

## Northwest and Yukon Territories