



Predator Management to Support Caribou Recovery: 2020-2021 Summary



BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development

Caribou Recovery Program

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Executive Summary

The reduction of predator populations has been shown to be an effective short-term action for recovering threatened caribou herds when applied in an adaptive management framework. Predator reduction programs require scientific rigour, high standards for humaneness, and ongoing monitoring and assessment. Aerial-based wolf reduction was applied to 13 of the 54 identified caribou populations in British Columbia. Of those 13 caribou populations, ground-based cougar reduction was applied in two of those herds as well. A total of 237 wolves were removed through aerial shooting and eight cougars were removed through ground-based hunting, at a cost of approximately \$1.5 million. Wolf reduction targets were achieved across most treatment herds and the efforts are expected to contribute to caribou population stabilization or growth. Targeted removal of cougars from caribou habitat is also anticipated to contribute to caribou recovery in those herds. Monitoring of the caribou population response to predator reductions will continue to occur throughout the year.

Background

Woodland caribou (*Rangifer tarandus caribou*) populations have experienced significant declines in British Columbia (BC). The Boreal ecotype is designated federally as ‘Threatened’ and is ‘Red-Listed’ provincially, the Northern Mountain ecotype is designated federally as ‘Special Concern’ and is ‘Blue-Listed’ provincially, and the Southern Mountain ecotype was recently designated by COSEWIC as ‘Endangered’ (with eight local population units under imminent threat) and is ‘Red-Listed’ provincially. Unsustainable rates of predation on caribou by wolves (*Canis lupus*) due to apparent competition – defined as an indirect interaction between two or more prey species through a shared predator – is identified as the primary proximate cause of caribou population declines (Seip 1991). The ultimate cause of this interaction is landscape modifications resulting in high proportions of early seral habitat that support primary prey populations above historic levels, due primarily to forestry (Ehlers et al. 2016). The interaction between caribou, predators, and primary prey populations can be managed to benefit caribou by managing the habitat composition in core and matrix caribou habitat to support less primary prey abundance, actively reducing primary prey populations so the landscape supports less predators, and directly reducing predator populations (Serrouya et al. 2019).

Throughout most of BC, wolves are the primary species responsible for high predation rates on caribou, however at the southern extent of caribou range cougar predation often has a larger contribution to caribou mortality (Kinley and Apps 2001, Wittmer et al. 2005). Although landscape-level habitat management is the key to achieving and supporting self-sustaining caribou populations, it may be decades before the impacts of habitat management are attained. Direct management of primary prey populations has less lag between application and realized benefits, and the direct management (i.e. reduction) of predators has the most rapid effect. The direct management of primary prey or predator populations is considered a short-term management action and will not address the ultimate cause of caribou population declines if habitat protection and restoration does not occur concurrently. If the management of predators and their primary prey is halted, and the habitat issues have not been addressed, threatened caribou populations are likely to continue to decline towards extirpation.

In order to manage towards the successful recovery of some endangered caribou populations, intensive reduction of wolf populations may be required (Seip 1992, Serrouya et al. 2019). A five-year pilot project in the South Peace region of BC has demonstrated the effectiveness of intensive wolf reduction to reverse declines in threatened caribou populations (Bridger 2019). Consistent with the Province’s Grey Wolf Management Plan (BC Ministry of Forests, Lands and Natural Resource Operations 2014) and the provincial Caribou Recovery Strategy, proactive wolf reduction was continued during this most recent winter of 2020-2021 on a subset of provincial caribou herds (Figure 1). This year’s predator reduction activities commenced in mid-February of 2021. Wolves were euthanized by aerial shooting from a helicopter, as it is deemed the most humane and effective method of reducing wolf populations across large geographical areas. The extent and topography of the areas that must be covered to effectively reduce wolf populations in core and matrix caribou habitat necessitates the use of aircraft. The combination of GPS/VHF radio-tracking collars and aerial shooting to kill wolves has been demonstrated to be an effective method of removing entire wolf packs and reducing the risk of predation to caribou populations. The federal and provincial target for wolf densities in caribou recovery areas is less than three wolves per 1000 km². To achieve that target, wolf reduction generally aims to remove greater than 80% of wolves within a treatment area. Intensive wolf reduction must occur on an annual basis to account for wolves’ high reproductive capability and ability to recolonize rapidly from adjacent areas. Wolves are tracked and lethally removed during the winter months when snow depth concentrates wolves and their primary prey in valley bottoms,

and their mobility is limited by snow. Reducing wolves during winter has an additional benefit of providing the caribou a reprieve from high wolf predation rates during calving season in the spring (a vulnerable period for caribou cows and their calves).

Due to their solitary behaviour, cougars cannot be effectively reduced using aerial-based methods. Cougars are lethally removed in caribou core and matrix habitat by surveying caribou habitat for cougar sign and tracking those specific individuals using the services of professional dog handlers.

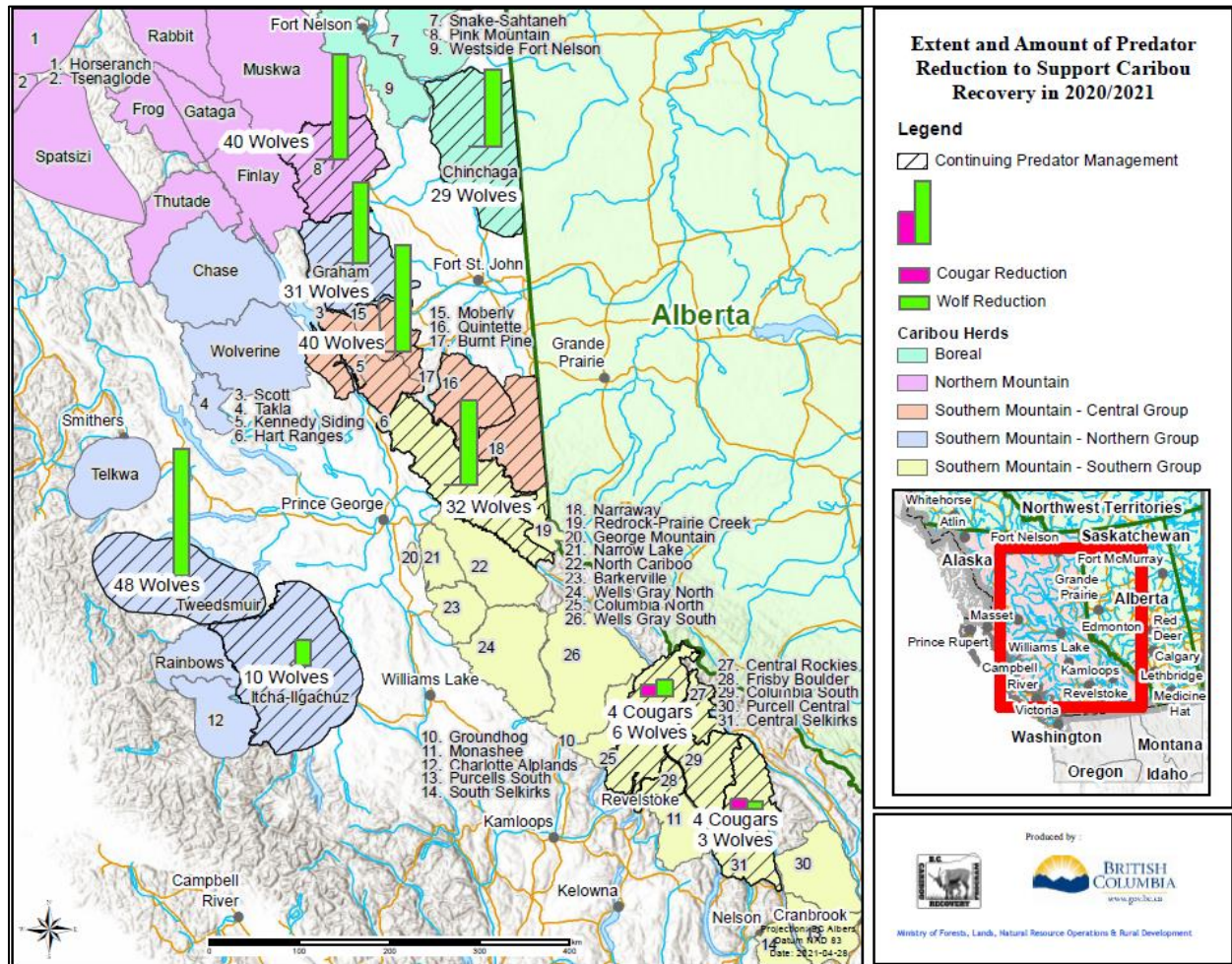


Figure 1. Distribution of predator reduction to support caribou recovery in 2020/2021.

Summary

Provincial

In total, 237 wolves were lethally removed via helicopter-based shooting (an additional two wolves were removed through a collaborative ground-based trapping program with Indigenous communities), and eight cougars were removed via ground-based hunting (Table 1). To achieve sufficient wolf reduction levels, aerial crews made multiple reduction attempts over the course of the winter across the treatment areas to reduce wolf densities below three wolves per 1000 km². Preliminary estimates suggest that target wolf densities were achieved across all wolf reduction treatment areas. The total cost of this year’s predator

management activities was \$1,553,800. The primary expense was the contracting of helicopter services to support the aerial removal of wolves, while secondary expenses included costs associated with radio collar purchases, fixed-wing aircraft support, field equipment, accommodations for crews, and the hiring of professional dog handlers (only in the cougar reduction treatment areas).

The caribou population response to the 2020-2021 predator reductions will be assessed over the following year into the winter of 2022. Early observations among several of the new caribou herds receiving predator reduction treatment show indications of population growth through increased calf recruitment and adult female survival; however, further treatment and monitoring will be required to fully assess the population-level effects. The South Peace caribou herds, which have received longer-term treatment, have combined for an estimated 81% population increase since the onset of wolf reduction in 2015.

Although the rate at which wolves recolonize the treatment areas fluctuates annually, the wolf populations have shown to be resilient, recovering in the treatment areas at rates of 30–100% by the following winter. The ability for wolf populations to expand through reproduction and dispersal reduces the risk associated with broad population-level impacts to wolves in BC. Wolf recovery and recolonization within and adjacent to the treatment areas will continue to be monitored annually.

Table 1. Predator reduction summary and associated costs per caribou herd.

Ecotype and Herd	Wolves Removed	FN Partnership Wolves Removed ¹	Cougars Removed	Cost ²
Boreal				
Chinchaga	27	2		\$116,400
Northern Mountain				
Pink Mountain	40			\$200,500
Southern Mountain - Central Group				
South Peace ³	40			\$259,000
Southern Mountain - Northern Group				
Graham	31			\$158,000
Itcha-Ilgachuz	10			\$195,000
Tweedsmuir	48			\$278,100
Southern Mountain - Southern Group				
Central Selkirks	3		4	\$78,000
Columbia North ⁴	6		4	\$112,000
Hart Ranges	32			\$156,800
Total	237	2	8	\$1,553,800

¹ Ground-based reduction in partnership with local Indigenous communities

² Costs may include helicopter services and fuel, fixed-wing aircraft services, radio-collar purchase, equipment, and accommodations.

³ South Peace includes Moberly, Scott East, Kennedy Siding, Quintette, and Narraway caribou herds

⁴ Includes portions of Columbia South and Frisby Boulder herds

Chinchaga

The Chinchaga caribou population is the only Boreal ecotype that currently receives wolf reduction treatments to support caribou recovery. The Chinchaga herd, and specifically the Milligan Core, was

selected as a recipient of wolf reduction treatments in response to sharp population declines over the past ten years, and the program was developed in collaboration with the Blueberry River First Nation. The winter of 2020-2021 was Year 3 of an initial three-year program approval. During the winter's reduction efforts, 27 wolves were removed through helicopter-based, aerial shooting from a 5,200 km² treatment area. An additional two wolves were removed through a collaborative ground-trapping program with Doig River First Nation. Weather conditions were sub-optimal through much of the winter, however the deep snow in this treatment area did facilitate relatively effective reduction efforts. The program incurred a total cost of \$116,400, primarily associated with helicopter services. Wolves were concurrently removed in Alberta where the Chinchaga herd boundary spans the BC-Alberta border. Eighty-seven wolves were removed across the Alberta portion of the Chinchaga range (17,600 km²). Approximately four wolves remained within or immediately adjacent to the BC Chinchaga treatment area, for a remaining wolf density of 0.8 wolves/1000km² and a wolf reduction rate of 87%. The rate of reduction, and the resulting wolf density, is expected to contribute positively to caribou population stability or growth.

Pink Mountain

The Pink Mountain caribou population is the only Northern ecotype that currently receives wolf reduction treatments to support caribou recovery. The Pink Mountain herd was selected as a recipient of wolf reduction treatments in response to population declines over the past decades, and the program was developed in collaboration with the Blueberry River First Nation. The winter of 2020-2021 was Year 3 of an initial three-year program approval. During the winter's reduction efforts, 40 wolves were removed through helicopter-based, aerial shooting from a 9,600 km² treatment area. Winter weather conditions were challenging for tracking and removing wolves, with extreme cold temperatures in February, followed by unseasonably warm and windy conditions and little to no snowpack in the valleys. The program incurred a total cost of \$200,500, primarily associated with helicopter services, helicopter fuel, radio collars, and accommodations. Approximately 15 wolves remained within or immediately adjacent to the Pink Mountain treatment area, for a remaining wolf density of 1.7 wolves/1000km² and a wolf reduction rate of 73%. The rate of reduction, and the resulting wolf density, is expected to contribute positively to caribou population stability or growth.

South Peace

The South Peace wolf reduction program includes the Klinse-Za (Moberly and Scott East herds), Kennedy Siding, Quintette, and South Narraway caribou herds. The South Peace herds were selected as recipients of wolf reduction treatments in response to rapid population declines over the past decades. The winter of 2020-2021 was Year 7 of aerial wolf reduction across the South Peace treatment areas. During the winter's reduction efforts, 40 wolves were removed through helicopter-based, aerial shooting from a 21,500 km² treatment area. Winter weather conditions were sub-optimal for tracking and removing wolves during February, however conditions did improve by mid-March. The program incurred a total cost of \$204,800, primarily associated with helicopter services and radio collar purchase. Approximately nine wolves remained within or immediately adjacent to the South Peace treatment area, for a remaining wolf density of 0.6 wolves/1000km² and a wolf reduction rate of 82%. The rate of reduction, and the resulting wolf density, is expected to contribute positively to caribou population stability or growth.

Graham

The Graham caribou herd previously served as the experimental control population to compare wolf reduction efforts in the South Peace to a non-treatment herd. However, it became apparent that the Graham caribou population was declining at a rapid rate in comparison to the treatment populations. Thus, wolf

reduction was initiated in 2019, and the winter of 2020-2021 was Year 2 of an initial two-year program approval. During the winter's reduction efforts, 31 wolves were removed through helicopter-based, aerial shooting from a 9,300 km² treatment area. Winter weather conditions were challenging for tracking and removing wolves, with extreme cold temperatures in February, followed by unseasonably warm and windy conditions and minimal snowpack in some valleys. The program incurred a total cost of \$158,100, primarily associated with helicopter services, helicopter fuel, radio collars, and accommodations. Approximately 11 wolves remained within or immediately adjacent to the Graham treatment area, for a remaining wolf density of 1.2 wolves/1000km² and a wolf reduction rate of 74%. The rate of reduction, and the resulting wolf density, is expected to contribute positively to caribou population stability or growth.

Itcha-Ilgachuz

The Itcha-Ilgachuz caribou population was selected as a recipient of wolf reduction treatments due to an extended period of rapid population declines, primarily attributed to unsustainable rates of wolf predation. The winter of 2020-2021 was Year 2 of an initial two-year program approval. During the winter's reduction efforts, 10 wolves were removed through helicopter-based, aerial shooting from a 25,540 km² treatment area. An additional nine wolves were removed from the treatment area by aerial crews while based out of the neighbouring Tweedsmuir treatment area. Winter weather conditions were challenging for tracking wolves, and wolves appeared to be low in abundance following successful reduction efforts during Year 1 of the program. The program incurred a total cost of \$195,000, primarily associated with helicopter services, radio collars, and accommodations. Approximately 27 wolves remained within or immediately adjacent to the Itcha-Ilgachuz treatment area, for a remaining wolf density of 1.3 wolves/1000km² and a wolf reduction rate of 41%. Although the wolf reduction rate was low, the resulting wolf density is still expected to contribute positively to caribou population stability or growth.

Tweedsmuir

The Tweedsmuir caribou population was selected as a recipient of wolf reduction treatments due to persistent annual population declines of >10% over the past five years. Unsustainable predation rates by wolves was deemed to be the primary proximate cause of the population declines. The winter of 2020-2021 was Year 2 of an initial two-year program approval. During the winter's reduction efforts, 48 wolves were removed through helicopter-based, aerial shooting from a 15,785 km² treatment area. Nine of these wolves were removed from within the neighbouring Itcha-Ilgachuz treatment area immediately to the south and were presumed to be transboundary wolf packs. Winter weather conditions were optimal for tracking, radio collaring, and removing wolves. The program incurred a total cost of \$278,100, primarily associated with helicopter services, fixed-wing services, radio collar purchase, and accommodations. Approximately nine wolves remained within or immediately adjacent to the Tweedsmuir treatment area, for a remaining wolf density of 0.57 wolves/1000km² and a wolf reduction rate of 86%. The rate of reduction, and the resulting wolf density, is expected to contribute positively to caribou population stability or growth.

Central Selkirks

The Central Selkirks caribou herd is the southernmost extant caribou population in BC. This herd is at imminent risk of becoming functionally extirpated, thus an emergency effort to reduce both wolves and cougars was implemented in 2019-2020. The winter of 2020-2021 was Year 2 of an initial two-year program approval. During the winter's reduction efforts, three wolves were removed through helicopter-based, aerial shooting from a 2,872 km² treatment area. Additionally, four cougars were removed through ground-based, targeted removal within caribou habitat. Winter weather conditions were poor for tracking wolves and cougars and created many challenges during the predator reduction efforts. Low-elevation snow

events were infrequent and usually occurred in trace amounts. By March, the valley bottoms across much of the south-southwest portions of the treatment area were bare ground. The program incurred a total cost of \$76,600, primarily associated with helicopter services and houndsmen. Approximately seven wolves remained within or immediately adjacent to the Central Selkirks treatment area, for a remaining wolf density of 1.6 wolves/1000km² and a wolf reduction rate of 30%. Despite a low wolf reduction rate, the resulting wolf density and the additional targeted removal of cougars is expected to contribute positively to caribou population stability or growth.

Columbia North

Wolf reduction has been underway for the Columbia North caribou population since 2017 as a recovery measure under the Mountain Caribou Recovery Implementation Plan and includes portions of the Columbia South and Frisby Boulder herds. Targeted, ground-based cougar reduction has been implemented more recently to further the recovery efforts. The winter of 2020-2021 was Year 5 of wolf reduction, and Year 2 of an initial two-year program approval to reduce cougars. During the winter's reduction efforts, six wolves were removed through helicopter-based, aerial shooting from a 6,911 km² treatment area. Additionally, four cougars were removed through ground-based, targeted removal within caribou habitat. Winter weather conditions were less than ideal for tracking wolves and cougars and created many challenges during the predator reduction efforts. Low-elevation snow events were infrequent and usually occurred in trace amounts. By March, the valley bottoms across much of the south-southwest portions of the treatment area were bare ground. The program incurred a total cost of \$112,000, primarily associated with helicopter services and houndsmen. Approximately three wolves remained within or immediately adjacent to the Columbia North treatment area, for a remaining wolf density of 0.4 wolves/1000km² and a wolf reduction rate of 67%. The rate of reduction, and the resulting wolf density, in addition to the targeted removal of cougars, is expected to contribute positively to caribou population stability or growth.

Hart Ranges

The Hart Ranges caribou population was selected as a recipient of wolf reduction treatments due rapid caribou population declines recorded over the past 10 years. The Hart Ranges is the largest population designated as Southern Group – Southern Mountain Caribou and is expected to yield the largest population returns in response to wolf reduction efforts. The winter of 2020-2021 was Year 2 of an initial two-year program approval. During the winter's reduction efforts, 32 wolves were removed through helicopter-based, aerial shooting from a 13,730 km² treatment area. Winter weather conditions were excellent with frequent fresh snow and frozen rivers/creeks to support tracking and removal. The program incurred a total cost of \$156,800, primarily associated with helicopter services and radio collar purchase. It is estimated that only one wolf remained within or immediately adjacent to the Hart Ranges treatment area, for a remaining wolf density of <0.1 wolves/1000km² and a wolf reduction rate of 97%. The rate of reduction, and the resulting wolf density, is expected to contribute positively to caribou population stability or growth.

Conclusion

Despite challenges due to delayed start dates and suboptimal weather conditions in some treatment areas, the predator reduction activities undertaken during the winter of 2020-21 were largely successful and are expected to contribute positively to caribou recovery. The Caribou Recovery Program will continue to assess the effectiveness of the predator reduction activities and adapt as necessary. Predator reduction in the Graham, Itcha-Ilgachuz, Hart Ranges, Pink Mountain, Chinchaga, Tweedsmuir, and Central Selkirks caribou ranges have now completed their initial 2- or 3-year preliminary program approval. These program

areas will be assessed and considered for continuation to support the ongoing recovery of caribou herds in those ranges.

Literature Cited

- B.C. Ministry of Forests, Lands and Natural Resource Operations. 2014. Management plan for the grey wolf (*Canis lupus*) in British Columbia. Government of British Columbia, Victoria, BC.
- Bridger, M. 2019. South Peace Caribou Recovery following Five Years of Experimental Wolf Reduction. BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development.
- Canada, and Environment Canada. 2014. Recovery strategy for the woodland caribou, southern mountain population (*Rangifer tarandus caribou*) in Canada.
- Ehlers, L. P., C. J. Johnson, and D. R. Seip. 2016. Evaluating the influence of anthropogenic landscape change on wolf distribution: implications for woodland caribou. *Ecosphere* 7.
- Kinley, T. A., and C. D. Apps. 2001. Mortality patterns in a subpopulation of endangered mountain caribou. *Wildlife Society Bulletin*:158–164.
- Seip, D. R. 1991. Predation and caribou populations. *Rangifer*:46–52.
- Seip, D. R. 1992. Factors limiting woodland caribou populations and their interrelationships with wolves and moose in southeastern British Columbia. *Canadian Journal of Zoology* 70:1494–1503.
- Serrouya, R., D. R. Seip, D. Hervieux, B. N. McLellan, R. S. McNay, R. Steenweg, D. C. Heard, M. Hebblewhite, M. Gillingham, and S. Boutin. 2019. Saving endangered species using adaptive management. *Proceedings of the National Academy of Sciences* 116:6181–6186.
- Wittmer, H. U., A. R. Sinclair, and B. N. McLellan. 2005. The role of predation in the decline and extirpation of woodland caribou. *Oecologia* 144:257–267.