



Boreal Caribou Protection and Recovery Plan

Province of British Columbia

Ministry of Water, Land and Resource Stewardship

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Executive Summary

Boreal caribou occur across Canada, including Northeast British Columbia (B.C.). These caribou are listed as *Threatened* in Schedule 1 of Canada's *Species at Risk Act* and are red-listed in B.C. Recent monitoring data, as well as First Nations' and local knowledge, document a long-term decline in local populations.

The Boreal Caribou Protection and Recovery Plan (BCPRP) outlines a recovery path for four of the five boreal caribou herd populations within B.C. The BCPRP was co-developed by the Province and Fort Nelson First Nation and through collaboration with the Northern Rockies Regional Municipality.

The BCPRP establishes a management goal to:

- Recover boreal caribou populations across their range to self-sustaining status and to a level capable of supporting an Indigenous sustenance harvest.

In pursuit of this goal, the BCPRP establishes the following management objectives:

- Establish a positive habitat trend within core habitat zones by maintaining condition of the best remaining habitat and improving the condition of currently degraded habitat.
- Stabilize and achieve a positive population trend across all ranges.

Management actions — informed by years of scientific research, Indigenous and local knowledge, and with consideration of socio-economic and cultural values — are proposed for implementation to achieve the plan's objectives and make progress towards the boreal caribou recovery goal. These proposed actions include managing future land-use activities within caribou habitat through protection and conditional development for identified areas of high-value natural resources that are important for building a stable regional economic future. The draft plan provides opportunities for investment in habitat restoration activities to accelerate recovery and charts a path forward to pursue additional recovery measures through a model of adaptive and collaborative management.

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Acronyms and Glossary

Adaptive Management	An iterative process whereby the response of caribou populations to management actions is monitored and actions are adjusted based on results of monitoring.
Area of Interest (AOI)	Areas outside of current provincially delineated range that have been identified by telemetry or Indigenous ecological knowledge as an area of potential core habitat.
Anthropogenic Disturbance	A human-caused change in environmental conditions that causes a pronounced change in an ecosystem.
B.C.	British Columbia
BCIP	Implementation Plan for the Ongoing Management of Boreal Caribou (<i>Rangifer tarandus caribou</i> pop.14) in British Columbia
BCPRP	Boreal Caribou Protection and Recovery Plan
BCRIP	Boreal Caribou Recovery Implementation Plan
Boreal Recovery Strategy	Recovery Strategy for the Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal population, in Canada
Conditional Development	Regulated development with a focus on mitigating and/or offsetting impacts to caribou and caribou habitat from industrial activities
Core Habitat	Core habitat (delineated as zones) represents the most important habitat within the ranges containing the biophysical attributes required by caribou to carry out life processes necessary for survival and recovery.
Critical Habitat	The habitat that is necessary for the survival or recovery of a listed wildlife species; also identified as the species' critical habitat in the recovery strategy or in an action plan for the species under the federal <i>Species at Risk Act</i> .
ECCC	Environment and Climate Change Canada
FNFN	Fort Nelson First Nation
FRPA	Forest and Range Practices Act
GWMs	General Wildlife Measures

Habitat Protection	The application of existing legislative and policy tools to restrict future tenures and industrial activities that result in habitat disturbance.
Identified Wildlife	Species at risk and/or regionally important wildlife designated as requiring special management attention under the <i>Forest and Range Practices Act</i> .
Linear Feature	A linear disturbance, such as a road, pipeline, or seismic line.
MAP	Medzih Action Plan
Matrix Habitat	Habitat possesses low periodic caribou use and is important for connectivity between suitable core habitats. Predator-prey dynamics in these areas have the potential to impact caribou populations both directly and indirectly.
NRRM	Northern Rockies Regional Municipality
PNG	Petroleum and Natural Gas
Polygonal Disturbance	A non-linear disturbance such as a forestry cutblock, or oil and gas wellsite or facility.
Population	A group of caribou occupying a defined area distinguished spatially from areas occupied by other groups of caribou. Population dynamics are driven primarily by local factors affecting birth and mortality rates, rather than immigration or emigration among groups.
Range	A geographic area occupied by a group of individuals that is subjected to the same influences affecting vital population rates over a defined time frame.
RRA	Resource Review Area
SARA	Species at Risk Act
Self-sustaining	A local population of boreal caribou that on average demonstrates stable or positive population growth over the short term and is large enough to withstand random events and persist over the long-term without the need for ongoing intensive management intervention (e.g., predator management).
Indigenous Ecological Knowledge	Traditional Ecological Knowledge or Indigenous knowledge uses the information, advice and wisdom that has evolved over centuries of living as part of the environment.
The Program	Caribou Recovery Program

The Province	The Provincial Government of British Columbia
Treaty Rights	Rights set out in either a historic or modern treaty agreement. Treaties define specific rights, benefits and obligations for the signatories that vary from treaty to treaty. Treaties and treaty rights also vary depending on the time and circumstances in which they were negotiated. These rights are recognized and affirmed by Section 35 of the Constitution Act, 1982.
Ungulate Winter Range (UWR)	Areas designated under the <i>Forest and Range Practices Act</i> and <i>Oil and Gas Activities Act</i> that contain habitat necessary to meet the winter habitat requirements of an ungulate species, including caribou.
Wildlife Habitat Area (WHA)	Areas designated under the <i>Forest and Range Practices Act</i> and <i>Oil and Gas Activities Act</i> necessary to meet the habitat requirements of an Identified Wildlife species.

Map of Boreal Caribou Ranges

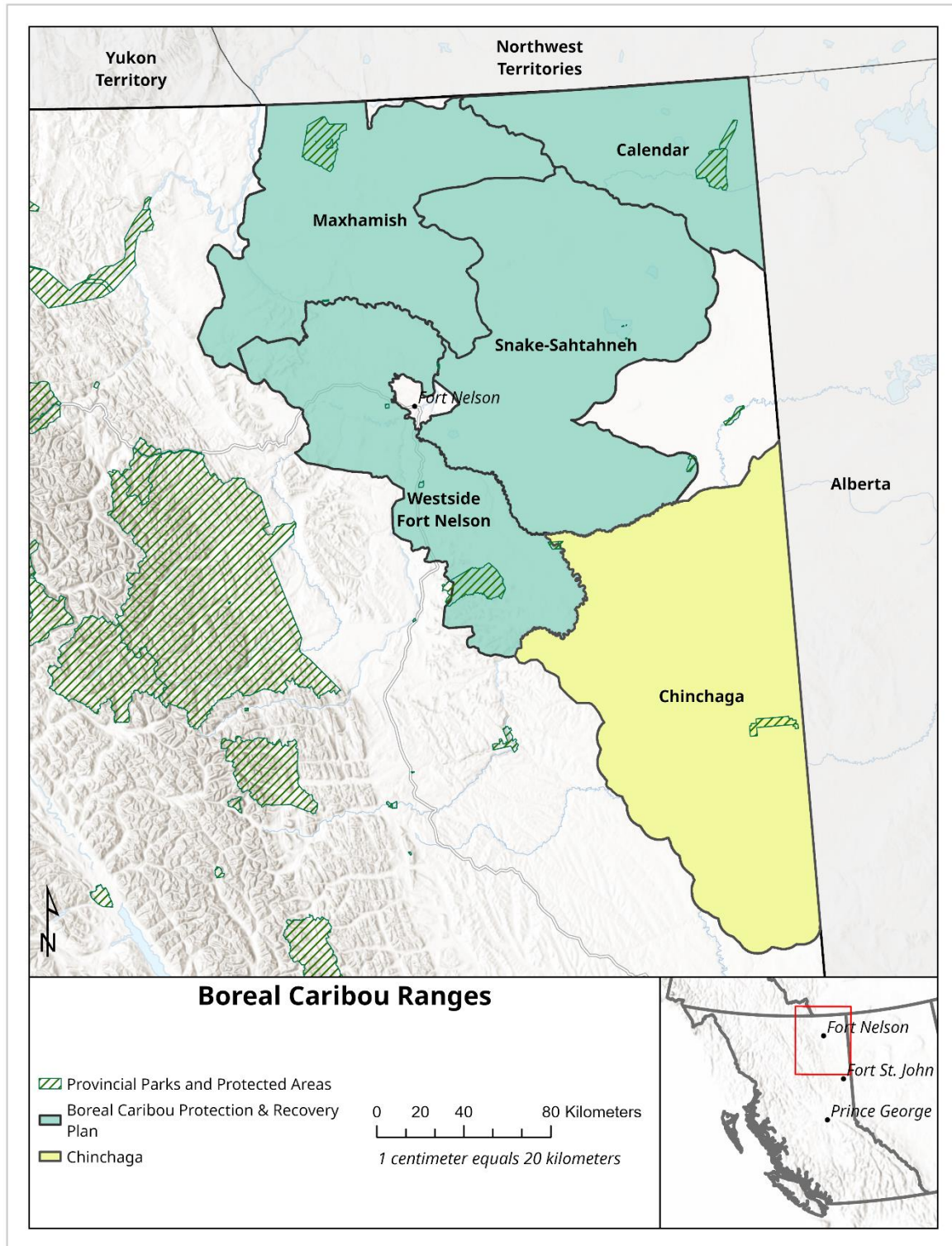


Figure 1: Map of Boreal Caribou Ranges in British Columbia included and excluded from the Boreal Caribou Protection and Recovery Plan

Introduction

Boreal caribou (*Rangifer tarandus*; woodland caribou) are present in nine provinces and territories in Canada. Many local populations are currently in decline, and these caribou are listed as “threatened” in Schedule 1 of Canada’s *Species at Risk Act* (SARA) and are “red-listed” (i.e., at risk of extirpation, endangered or threatened) in British Columbia (B.C.). Boreal caribou range covers 5% of B.C. and recent population trends from monitoring, as well as Indigenous and local knowledge, document a long-term decline in the population (Culling & Cichowski, 2017). Following years of research and regional dialogue on boreal caribou management, it was clear that a recovery plan needed to be developed in partnership with Indigenous governments.

The B.C. Government (“the Province”) partnered with Fort Nelson First Nation to co-develop the Boreal Caribou Protection and Recovery Plan (BCPRP) that meets the requirements for recovery of the species and restore the ability of Indigenous peoples to exercise Treaty rights. The parties collaborated with the Northern Rockies Regional Municipality (NRRM), which has a vested interest in conservation outcomes and brings its own unique knowledge and experience to help inform the planning process.

The BCPRP provides direction for caribou recovery for four of the five boreal caribou ranges in B.C.: Calendar, Maxhamish, Snake-Sahtahneh, and Westside Fort Nelson. These ranges predominantly fall within the Northern Rockies Regional Municipality and Fort Nelson Timber Supply Area (TSA), with minor overlaps into the Fort St. John TSA and Peace River Regional District. This plan defines a recovery goal and objectives, outlines management actions to achieve goals and objectives, and details an adaptive management framework to inform evaluation and future decisions. The BCPRP will be implemented through a co-management approach between the Province and Fort Nelson First Nation. The implementation will adhere to the goals, objectives and management guidance found within the recovery plan. This plan does not provide direction for B.C.’s fifth boreal caribou herd, Chinchaga. It is envisioned that direction for Chinchaga will be developed with interested Treaty 8 Nations as part of ongoing Land Use Planning initiatives that overlap with the Chinchaga range.

Engagement and Direction of Plan

A draft version of the BCPRP underwent public engagement in 2022, requesting feedback on the plan's objectives, proposed measures, and adaptive management framework. A summary of the engagement process and responses published in the What We Heard Report (Malatest 2022) are available at EngageBC¹. Edits have been incorporated into this document where appropriate to reflect feedback received during the engagement process. Examples of edits include:

- Spatial edits to management areas to avoid unintended impacts to private land parcels or the Community Forest Agreement area.
- Additional clarity on how this plan integrates into other Land Use Planning initiatives.
- Additional clarity on how this plan impacts the Chinchaga herd range and Fort St. John TSA.
- Updates to plan implementation timelines and mechanisms following based on current direction.

This version of the plan is considered final at time of publishing. Updates and revisions to the plan may be published intermittently to reflect changes to strategy and progress on current goals.

Structure of the Plan

The BCPRP is comprised of two sections:

- Section 1 outlines the background and context for boreal caribou recovery planning in B.C.
- Section 2 is the management action portion of the plan that details the management measures available for boreal caribou recovery and the approach for implementing those measures across boreal caribou range.

This document is designed to take the place of individual herd plans, and meet the Federal Recovery Strategy targets of setting the current context and strategic direction for all subject herd ranges.

¹ <https://engage.gov.bc.ca/caribou/boreal-caribou/>

Caribou Recovery Planning in British Columbia

Provincial Guidance on Caribou Recovery

The Province is committed to the long-term success of caribou recovery. It initiated the provincial Caribou Recovery Program (the Program) in 2017 to develop a renewed approach to recovering caribou populations in the Province. The Program identified eight strategic objectives to guide efforts throughout British Columbia:

1. Reverse the decline of woodland caribou where it is feasible to do so.
2. Achieve a “stable” to “increasing” population of identified woodland caribou herds.
3. Align science and recovery approaches with the federal government’s approaches where appropriate.
4. Incorporate Indigenous values and knowledge into caribou management decisions.
5. Demonstrate reasonable efforts to meet the *Species at Risk Act* caribou recovery strategy (ECCC 2020).
6. Provide increased certainty regarding caribou management to inform the natural resource sector in B.C.
7. Ensure that resources are efficiently allocated, coordinated, and prioritized to actions and activities that achieve demonstrable caribou recovery objectives; and
8. Ensure that caribou management actions are open, transparent, and regularly reported.

These strategic objectives have guided the management approach taken in the development of the BCPRP. Those that are particularly relevant to boreal caribou include: providing increased certainty for the natural resource sector; demonstrating reasonable efforts to meet the SARA caribou recovery strategy; incorporating Indigenous values and knowledge in caribou recovery activities; and ensuring that caribou management actions are open, transparent, and regularly reported.

History of Provincial Boreal Caribou Management

Boreal caribou have been recognized as a conservation concern by the Province since the early 2000s. An initial *Strategy for the Recovery of Boreal Caribou in British Columbia* was drafted by the Province in 2004; however, it was never approved or implemented on account of government priorities of the day. In 2010, the Province approved the *Implementation Plan for the Ongoing Management of Boreal Caribou (Rangifer tarandus caribou pop. 14) in British Columbia* (BCIP) (BC Ministry of Environment, 2011) with goals to (1) decrease the rate of decline in the Boreal Caribou populations; and (2) significantly reduce the risk of Boreal Caribou extirpation in the Calendar, Chinchaga, Maxhamish and Prophet (now incorporated into Westside Fort Nelson) ranges within 50 years.

Management actions outlined in the BCIP focused on implementing habitat protection measures including Ungulate Winter Ranges (UWR) and Wildlife Habitat Areas (WHA) under the *Forest and Range Practices Act* (FRPA) and the *Oil and Gas Activities Act* (retitled the *Energy Resource Activities Act* in 2008). Additionally, Resource Review Areas (RRA) were established under the *Petroleum and Natural Gas Act*, restricting additional oil and gas, mineral, placer, or coal tenures in these areas for a minimum of five years. To oversee implementation of the BCIP, a Research Effectiveness Monitoring Board was established to support research, monitoring, and management of boreal caribou in B.C. (BC OGRIS, 2011).

Developing a boreal caribou recovery plan was identified as a priority by the Province following the release of the federal *Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal population, in Canada* (Boreal Recovery Strategy) (Environment Canada, 2012). In 2016/17, a draft *Boreal Caribou Recovery Implementation Plan* (BCRIP) was developed to replace the existing BCIP. The document outlined additional recovery actions to achieve and maintain a positive habitat trend across boreal caribou range and to stabilize and achieve a positive population trend across boreal caribou range (Ministry of Environment and Ministry of Forests, Lands and Natural Resource Operations, 2017). The BCRIP was met with limited support from regional First Nations and stakeholders, and the Province initiated a collaborative planning process with Fort Nelson First Nation on a revised plan.

Fort Nelson First Nation Guidance on Boreal Caribou Recovery

Fort Nelson First Nation (FNFN) have lived and stewarded their territory in northeastern British Columbia since time immemorial. Their people are knowledge keepers, building on their ancestors' knowledge and modern science to balance industry and traditional economies in their territory.

FNFN members harvested caribou throughout their territory for countless generations. Historically, boreal caribou provided sustenance, clothing, tools, utensils, snowshoes, and other necessities important to their physical and cultural survival. These practices built strong Indigenous knowledge of caribou, through oral histories passed down through the millennia. Decreasing caribou populations and diminishing habitat have curtailed these practices in recent years. Elders and harvesters say that caribou are increasingly rare in the Liard River basin and that sightings of caribou have declined for many decades. Many of their sightings and experiences with harvesting and using caribou took place when they were children. FNFN's knowledge of boreal caribou declines reflects much greater population losses over a longer timeframe than can be observed from available scientific data (Fort Nelson First Nation and the Liard Basin Monitoring Initiative Team, 2019). FNFN embraces both the right and the responsibility to protect boreal caribou and to ensure that caribou remain on the landscape to support the future health and well-being of the people and the ecosystems with which they are inextricably linked.

Fort Nelson First Nation's Medzih Acton Plan

In 2017, FNFN released their *Medzih Action Plan* (MAP) for boreal caribou recovery. The MAP defined a goal to recover boreal caribou to self-sustaining levels, across a historic spatial distribution, with resilience to allow for subsistence hunting within 20 years. To achieve this goal, several key actions were defined in the MAP based on the principle that spatially identified and protected habitat is paramount to boreal caribou recovery. This included delineating restoration and habitat protection zones across boreal caribou range, each of which had distinct habitat characteristics and management intent (Fort Nelson First Nation, 2017). The MAP also identified the need to ensure sustainable industrial development for the long-term stability of FNFN and non-First Nations communities.

Federal Guidance on Boreal Caribou Recovery

The federal government shares responsibility for the recovery of boreal caribou with provinces and territories, with the federal government's authority coming from the *Species at Risk Act*. Boreal caribou herds in B.C. are listed in Schedule 1 of SARA as *Threatened*, indicating that the species is likely to become endangered if nothing is done to reverse the factors leading to their extirpation or extinction. The listing of boreal caribou as Threatened is based on an observed, estimated, inferred or suspected reduction in population size of >30% over three generations (approximately 20 years) (Environment Canada, 2012).

As part of its obligations under SARA, Environment and Climate Change Canada (ECCC) produced the Boreal Caribou Recovery Strategy in 2012. This strategy, which was amended in 2020 and outlines management requirements, including critical habitat protection, to achieve self-sustaining status for populations of boreal caribou in Canada. The Boreal Recovery Strategy states that it is unlikely to very unlikely that B.C.'s boreal caribou herds are self-sustaining, and documents that all herd ranges exceed the 35% range disturbance threshold (Environment and Climate Change Canada, 2020). The Boreal Recovery Strategy established the expectation that provinces and territories will develop range plans to outline how the jurisdictions plan to manage range to achieve 65% undisturbed habitat over time. In 2016, ECCC released the *Range Plan Guidance for Woodland Caribou, Boreal Population*, which provides general guidance on the development of range plans and an overview of desired range plan content (Environment and Climate Change Canada, 2016). The BCPRP is intended to align with this guidance and forms part of the Province's response to the Boreal Caribou Recovery Strategy.

Synopsis of Threats and Limiting Factors to Boreal Caribou

There are numerous identified threats and limiting factors that may affect caribou populations, including habitat alteration from human-caused and natural disturbance, predation, parasites and disease, hunting, and the effects of climate change. These threats act cumulatively to negatively influence caribou populations, which may not be evident when threats are examined individually (Culling & Cichowski, 2017).

Human activities within and adjacent to caribou range are considered the primary driver of declining woodland caribou populations across Canada (Environment Canada, 2008). Human activities that pose a threat to caribou include, but are not limited to: forest harvesting; linear feature (e.g., seismic lines, roads) developments; motorized and non-motorized recreational activity; agriculture; mineral exploration; oil and gas extraction; and mining. Such activities can impact caribou populations through multiple mechanisms, including direct habitat loss, displacement from preferred habitats, and alteration of predator-prey dynamics. The figure below provides a visual interpretation of the drivers of boreal caribou decline.

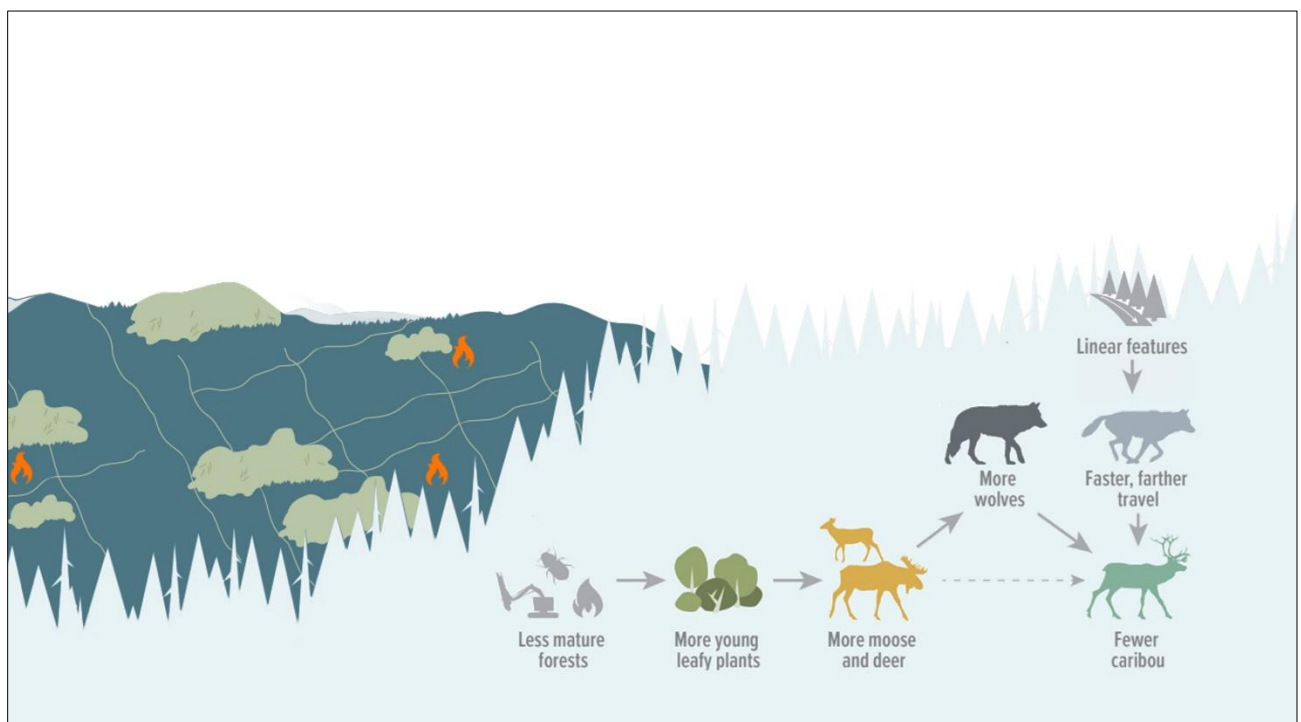


Figure 2: Infographic of the drivers of decline for boreal caribou. Illustration: Wildlife Science Centre and Fuse Consulting Ltd.

It is generally accepted that unsustainable rates of predation are the proximate cause of declining woodland caribou populations (McLoughlin, Dzus, Wynes, & Boutin, 2003). For boreal caribou in northeast B.C., wolf predation has been the leading cause of mortality among radio-collared caribou. Other predators of boreal caribou include black bears and wolverine; however, their influence on populations is variable across boreal ranges. Coupled with predation, linear features have been shown to increase predator access and hunting efficiency in caribou habitat and ultimately, increase predation rates on

caribou. Furthermore, the creation of young forests through forest harvesting and subsequent silviculture activities can increase the abundance and distribution of primary prey species (e.g., moose and deer). Heightened populations of prey has been shown to increase predator densities and subsequently to increase predation rates on caribou (Culling & Cichowski, 2017).

While predation has been documented as the leading cause of caribou mortality in northeast B.C., pathogens such as viruses, bacteria and parasites have been linked to caribou health, physical condition, and mortality. In particular, the British Columbia Boreal Caribou Health Research Program identified that pathogens may have contributed to abnormally high levels of caribou mortality and associated population declines in the past (Bondo, et al., 2019). Further, while there have been no observed cases of chronic wasting disease in caribou in B.C., transmission into caribou herds would have a potentially devastating effect on adult caribou survival and demographics.

Implications for Other Values

Cultural

Boreal caribou have long been valued as a cultural resource by First Nations in northeast B.C., yet many Nations no longer hunt caribou due to their low numbers. This has implications for the health, well-being, and cultural identity of First Nations people. Recovering populations to a place where sustenance hunting can sustainably occur has been identified as a high priority by many of the First Nations that overlap with boreal caribou range (FNFN, 2017; BRFN, 2016; DRFN, 2016). The presence of large intact landscapes has also been identified as being a priority value for the FNFN community (Fort Nelson First Nation and the Liard Basin Monitoring Initiative Team, 2019). Caribou have evolved a life history strategy that is dependent on large landscapes of intact forest-muskeg ecosystems, and population declines are seen as a signal that these ecosystems are no longer healthy. Intact forests and muskegs have inherent and intangible cultural and spiritual values and are important for the continued practice of rights for Indigenous people. Protecting and recovering caribou habitat will also support the many other rights and values that are associated with these ecosystems.

Ecological

Boreal caribou ranges in B.C. are concentrated around spruce-leading bogs and fens (also referred to as peatland complexes) containing abundant lichen, sedge, and moss which provide foraging opportunities year-round. These peatland complexes are interconnected by mature conifer-leading forests with open understories which provide thermal and security cover. Boreal caribou have also been observed using water features such as marshes, lakes, and open water muskeg for seasonal foraging opportunities and security purposes, most notably during calving season. Boreal caribou manage predation risk by dispersing widely throughout their range and by avoiding areas with high densities of primary prey species (predominantly moose). These behaviours translate into low population densities across large areas and limited use of deciduous and mixed forests in summer and fall, as well as recently disturbed or regenerating areas. As such, large tracts of contiguous undisturbed habitat are required to accommodate movement in response to changing seasons, predation pressure, and habitat alterations.

Management of boreal caribou habitat revolves around the conservation and maintenance of intact old growth forest and peatland ecosystems. Given this, boreal caribou are considered an umbrella species, as maintaining their preferred habitat qualities typically benefits other species selecting the same types of habitats. Boreal caribou range in B.C. overlaps several provincially red-listed species, including wood bison (*Bison bison athabasca*), bay-breasted warbler (*Setophaga castanea*), Nelson's sparrow (*Ammodramus nelsoni*), three species of ray-finned fishes, and two plant species. Additionally, there are six blue-listed species, two blue-listed ecosystems, and one yellow-listed plant in boreal caribou range. Management actions for boreal caribou may positively influence the recovery of these species/ecosystems. Furthermore, the large intact forests and wetland ecosystems required for caribou also provide extensive ecosystem services including climate change mitigation and biodiversity conservation (Watson, 2018).

Socio-economic

The economy of northeast B.C. is largely driven by industrial development, including petroleum and natural gas (PNG) exploration and extraction and forestry. To support planning, a baseline socio-economic assessment was completed which noted that

communities in the planning area have disproportionate unemployment and are low in the B.C. regional socio-economic index (Green Analytics and Switft Creek Consulting, 2018). Natural resource economies are commonly market driven and subject to boom-and-bust cycles, often leading to major economic swings within resource reliant communities that have associated community impacts. In particular, forestry activity in the area has declined from its peak in the early 2000s, with no active facilities in Fort Nelson at present. There has been active investment in recent years by proponents attempting to reinvigorate the local forest industry, signaling a potential increase in activity moving forward. Investment in PNG in the area has largely focused on maintaining current production rather than expanding it, and there is little certainty regarding the timeline for renewed investment within the planning area (Ministry of Energy, Mines and Petroleum Resources, 2018).

Planning for the recovery of boreal caribou under the BCPRP has been completed with regional representation and consideration of current economic realities. The BCPRP has used an approach to define management goals and objectives for boreal caribou ranges and outlines the trade-offs, risks, and consequences for caribou populations and the socio-economic and cultural values associated with achieving these goals. The proposed management actions of the BCPRP maintain access to the valuable natural resources of the region that communities rely upon while providing for increased certainty for industrial proponents. As implementation of these proposed measures progresses, updated socio-economic data will be incorporated in decision making to ensure that the economic trade-offs and risks are considered.

Boreal Caribou Protection and Recovery Plan: Management Actions

The Boreal Caribou Protection and Recovery Plan (BCPRP) provides management direction for caribou recovery for four of the five boreal herd ranges in B.C.: Calendar, Maxhamish, Snake-Sahtahneh and Westside Fort Nelson. The BCPRP integrates western science with Indigenous and local knowledge in a unique approach to defining recovery goals and objectives and the identification of supporting habitat and wildlife management actions deemed necessary to recover boreal caribou. Section 2 of the BCPRP describes the management strategy for boreal caribou including the recovery goal and objectives, habitat management and population management actions and adaptive management framework.

Boreal Caribou Recovery Goal and Management Objectives

The goal of the BCPRP is to:

- Recover boreal caribou populations across their range to self-sustaining status and to a level capable of supporting an Indigenous sustenance harvest.

The aim is to achieve this goal within a 40-year time frame. In pursuit of this goal the BCPRP establishes the following management objectives:

- Establish a positive habitat trend within core habitat zones by maintaining condition of the best remaining habitat and improving the condition of currently degraded habitat.
- Stabilize and achieve a positive population trend across all ranges.

Managing Areas to Achieve Positive Habitat Trend

Boreal caribou habitat in B.C. is highly fragmented with all herd ranges currently exceeding the disturbance threshold identified within the federal recovery strategy². To recover boreal caribou populations, areas within all the ranges must be protected, both

² See Appendix: Disturbance for provincial disturbance assessment.

to prevent further disturbance and so investments in habitat restoration can be effective over the long-term.

In identifying areas for habitat protection and recovery, a scenario planning approach was undertaken. This supports a transparent decision-making process through demonstrating potential socio-economic and cultural impacts associated with the various scenarios alongside associated risks to achieving the overarching BCPRP goal. Multiple scenarios were developed to address boreal caribou recovery in B.C. representing a range in likelihood of achieving self-sustaining caribou populations over the long-term. The Technical Methodology Appendix summarizes the planning framework and methodology employed to develop the scenarios.

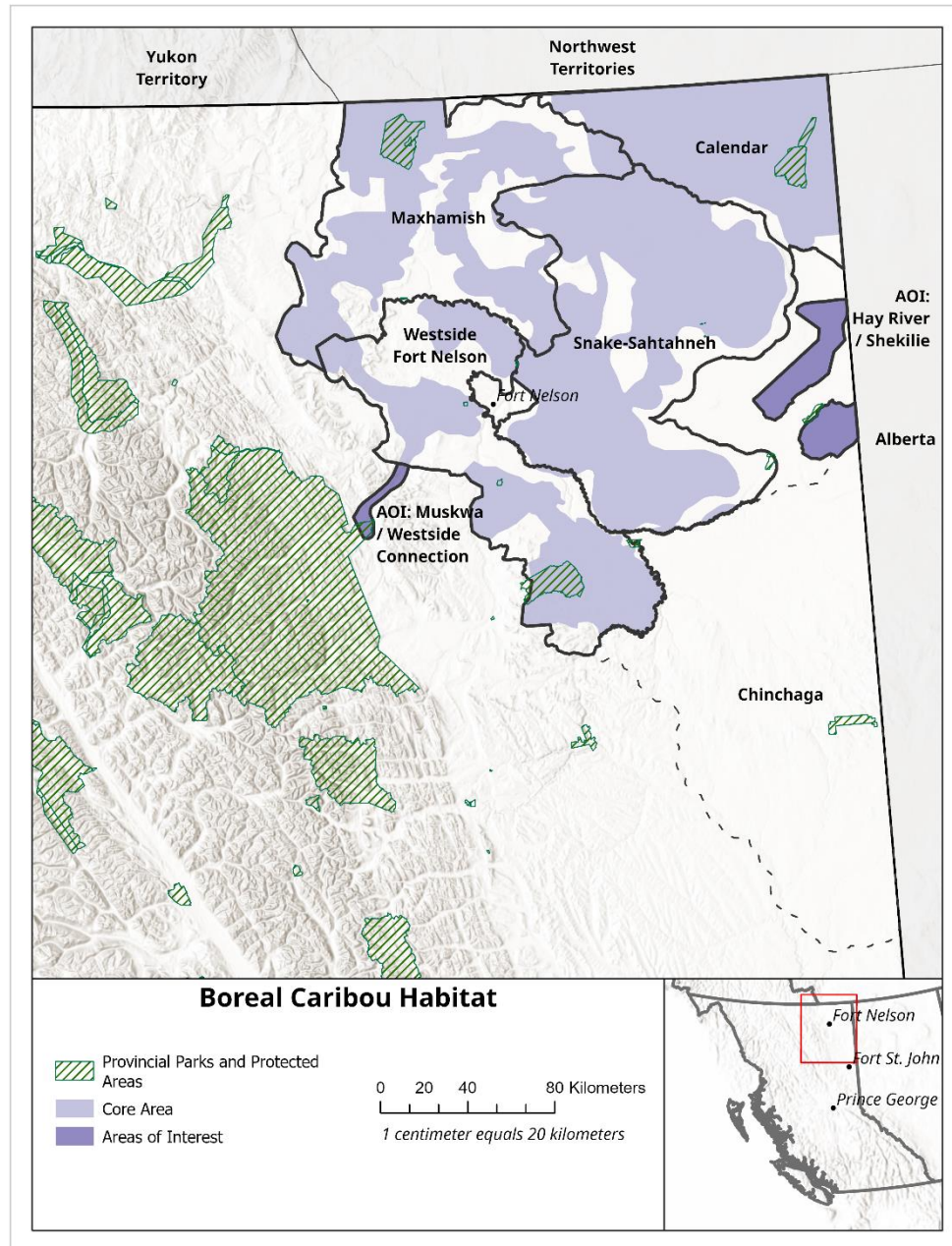
The BCPRP proposes a scenario for implementation that maintains access to required natural resources for local communities while providing for a positive long-term outlook for boreal caribou populations. Outlined in the following subsections is the approach to managing the land base within caribou ranges to achieve the habitat objectives and support achievement of the recovery goal over the long-term.

Core Habitat Zones and Areas of Interest

Core habitat zones are the foundation for the habitat management strategy within the BCPRP. Core habitat zones incorporate both scientific information (habitat suitability, telemetry data from radio collared boreal caribou) and Indigenous knowledge of caribou distribution and habitat use. Core zones represent the most important habitat within the ranges as they contain the biophysical attributes required by caribou to carry out life processes necessary for survival and recovery. Areas outside of core zones and within caribou range are classified as matrix habitat. Matrix habitat areas possess low caribou use but are important for connectivity between suitable core habitats. In addition, predator-prey dynamics in matrix habitat have the potential to significantly impact caribou populations both directly and indirectly.

Through the planning process, two additional Areas of Interest (AOIs) were identified based on Indigenous knowledge, local observations, and telemetry data: the Hay River / Shekilie AOI and the Muskwa-Westside Connection AOI (Figure 3). These areas were previously not considered in provincial management of boreal caribou habitat. More

information about caribou movement is necessary to fully understand how caribou are using these areas. Until more information is available, habitat management in these AOIs will mirror that of core habitat zones but no management actions are proposed in the areas surrounding the AOIs.



	Calendar	Maxhamish	Snake-Sahtahneh	Westside Fort Nelson
Core Area (ha)	525,388	661,580	1,045,995	516,970
Matrix (ha)	33,237	350,408	294,421	320,177
Range Total (ha)	558,625	1,011,989	1,340,416	837,147

Figure 3: Map and Size Data of Boreal Caribou Ranges, Core Habitat Zones and Areas of Interest

Habitat Management Types

The BCPRP establishes four habitat management types that will apply across caribou range (Table 1). They guide future activities to meet established objectives and make progress towards the recovery goal. The spatial application of management types considers habitat type, condition and natural resource values including PNG deposits and associated tenures, forest merchantability, and area-based tenures. Note that this plan on its own does not establish any new protections or management measures, but rather sets a direction for future implementation by describing the intended outcomes for each habitat type. These management intents could be achieved through a range of legal and policy mechanisms which are detailed further below in the plan. The table below summarizes the intent and anticipated measures associated with each Management Type. Figure 4 presents a visual map of the spatial application of the management types.

Table 1: BCPRP Management Types, Intents and Measures

Type	Management Intent	Management Measures
1	<ul style="list-style-type: none"> • Full habitat protection across all industries • Top restoration priority 	<ul style="list-style-type: none"> • No new subsurface and surface tenure disposition • No new surface disturbance • Reclamation and restoration of legacy disturbance permitted through appropriate regulatory mechanisms
2	<ul style="list-style-type: none"> • Full protection from forest harvest • Conditional petroleum and natural gas development • Secondary restoration priority 	<ul style="list-style-type: none"> • No new subsurface and surface tenure disposition • No new surface disturbance • Maintain access to petroleum and natural gas resources within existing industrial footprint
3	<ul style="list-style-type: none"> • Conditional forest harvest • Conditional petroleum and natural gas development • Lowest restoration priority 	<ul style="list-style-type: none"> • No new subsurface and surface tenure disposition • Petroleum and natural gas activities will be subject to updated Planning and Operational Measures aimed at minimizing surface disturbance • Forest harvest will be subject to updated General Wildlife Measures (GWMs) aimed at minimizing surface disturbance while allowing some forest harvest
4	<ul style="list-style-type: none"> • Conditional forest harvest • Conditional petroleum and natural gas development 	<ul style="list-style-type: none"> • Petroleum and natural gas activities will be subject to updated Planning and Operational Measures aimed at minimizing surface disturbance • Forest harvest will be subject to GWMs aimed at reducing impacts to caribou and habitat

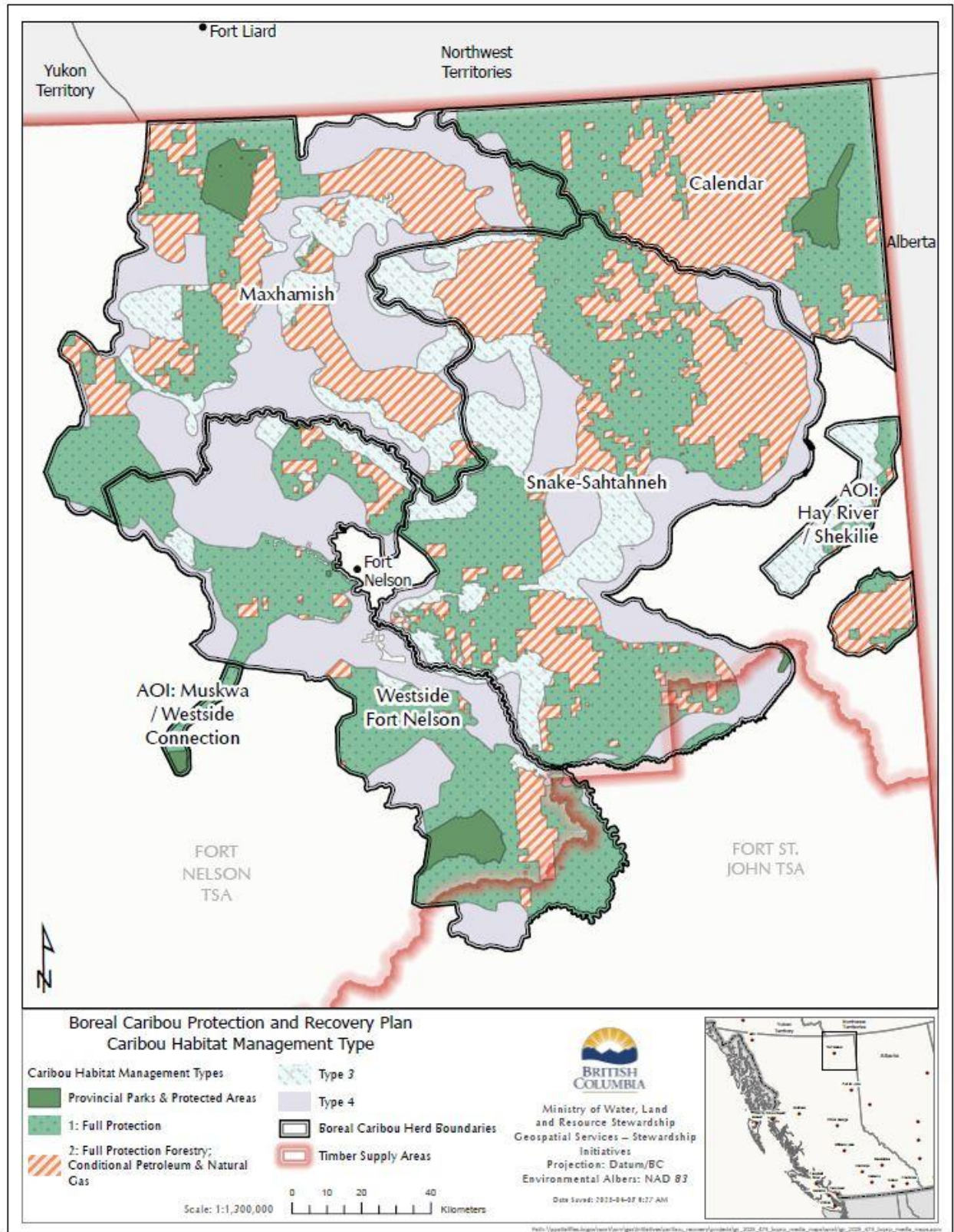


Figure 3: Boreal Caribou Protection and Recovery Plan Habitat Management Types

Habitat Management Tools for Positive Habitat Trend

Habitat Protection

Habitat protection refers to the application of legislative and policy tools to restrict future tenures and industrial activities that result in caribou habitat disturbance. Habitat protection provides safeguards for undisturbed habitat areas, allows for recovery of disturbed habitat, and ensures investments in habitat restoration can be effective over the long term. Table 2 below outlines the management measures, protection tools and enabling legislation or policy identified as potentially fitting the intent of the management measures. This is not considered a complete list, as policy and legislation are always evolving, and it will be the responsibility of the implementation team to pursue the mechanism best suited to the intent. Through implementation, the aim is to explore the range of tools available and use the strongest possible mechanisms to achieve the desired management intent of each Management Type.

Table 2: Management Measures and Related Habitat Conservation Tools and Legislation

Management Measure	Habitat Protection Tool	Enabling Legislation or Policy
No new surface disturbance	Wildlife Habitat Area and Ungulate Winter Range	Forest and Range Practices Act (s. 149) Government Action Regulation (s. 9-12) Oil and Gas Activities Act (s. 104) Environmental Protection and Management Regulation (s. 30-31)
	Wildlife Management Area	Wildlife Act (s. 4-6)
	Designate crown land for conservation of natural or heritage resources	Land Act (s.17)
	Order Respecting the Environment and Land Use	Environment and Land Use Act (s. 7)
No new subsurface and surface tenure dispositions	Resource Review Area	Provincial Policy, Petroleum and Natural Gas Act
	Withdrawal from Disposition	Petroleum and Natural Gas Act (s. 72)
	Conditional Withdrawal	Land Act (s. 17)
Maintain access to resource within existing industrial footprint.	Prescribed permit requirements	Oil and Gas Activities Act (s. 25) Environmental Protection and Management Regulation (s. 6)
All PNG activities will be subject to updated Planning and Operational Measures	Prescribed Permit Requirements	Oil and Gas Activities Act (s. 25) Environmental Protection and Management Regulation (s. 6)
Forest harvest will be subject to caribou General Wildlife Measures (GWMs) and spatial harvest planning	Wildlife Habitat Area and Ungulate Winter Range	Forest and Range Practices Act (s. 149) Government Action Regulation (s. 9-12)

Note: the updated industrial guidance (e.g., Planning and Operational Measures and General Wildlife Measures) prescribed under 'Management Measures' in tables 1 and 2 above are subject to the required regulatory consultation with industrial stakeholders and the appropriate regulators. This guidance is focussed on mitigating impacts to caribou and caribou habitat from industrial activities in-line with the intent of the respective management type. The updated guidance is expected to focus on:

- reducing industrial disturbance footprint through access management;
- aggregating disturbances where possible to maximize areas of contiguous intact caribou habitat;
- spatial and temporal caribou avoidance measures; and
- developing ecologically and culturally appropriate offsetting measures that can be adopted and enforced to ensure that impacts of new development within core management zones are offset.

This document sets the intention for future updated industrial guidance, recognizing that extensive consultation is required with industry stakeholders and regulators to develop the appropriate language and mechanism for said measures. It is envisioned that the development of updated guidance and measures will be aligned with land use planning tables of an appropriate scope, to allow for a more comprehensive view of potential impacts to industrial stakeholders.

Habitat Restoration

As highlighted, habitat protection is a crucial first step in securing habitat for caribou by slowing habitat degradation trends and allowing for natural habitat regeneration to occur over the long term. However, the time lag for natural regeneration can be very long within boreal caribou habitat, and certain disturbance types may never recover without intervention. Habitat restoration is a key tool to reduce current disturbance and to accelerate habitat regeneration within caribou range.

Fort Nelson First Nation has implemented caribou habitat restoration programs within their territory since 2017, and there have been a number of caribou habitat restoration projects carried out throughout B.C. and other jurisdictions by provincial agencies, First Nations, and industrial partners. These restoration efforts are contributing to a growing knowledge base for future habitat restoration implementation (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development, 2021).

Habitat restoration efforts can be funded through federal, provincial, or First Nations initiatives, or triggered by industry regulations (such as Environmental Assessment Certificate conditions). Given the extent of disturbance across the area covered by the BCPRP and the costs associated with restoring these features, actively restoring all disturbance features is not feasible. As such, guidance will be created that identifies priority areas for restoration investment to align efforts across initiatives.

Priority restoration areas will be delineated utilizing the following high-level criteria, which were developed as part of a series of habitat restoration workshops which included participation by government agencies, First Nations, and industrial stakeholders (Golder Associates Ltd., 2019):

- restoration efforts should focus on creating and/or expanding intact habitat areas;

- priority areas should focus on currently occupied caribou habitat and critical habitat features;
- restoration efforts should be focused in areas with little to no risk of future disturbance (i.e., Management Type 1+2); and
- restoration investment should be as efficient as possible and focus on areas where there is maximum return of intact habitat per hectare restored.

As restoration priority criteria are reliant on protection status and industrial management measures, the final guidance will be completed as part of BCPRP implementation. Additional considerations, such as restoration sequencing and access management, will be included to the extent possible in future planning documents, but will also require site-level knowledge and project engagement which is best developed on a project-by-project basis.

Habitat Offsetting

Habitat offsetting is a tool used to attempt to compensate for the impacts of habitat loss by replacing habitat that is impacted by a project or activity. Offsetting is the last resort measure of the mitigation hierarchy. Ideally predicted impacts of a development must first be avoided, then minimized using management tools and on-site restoration, and finally any remaining residual impacts are offset, as needed. Offsetting may include habitat and/or ecosystem enhancement, off-site restoration, creation or, in some cases, habitat protection and preservation both within and outside of the development area (B.C. Ministry of Environment, 2014). The focus of the BCPRP is the long-term protection and restoration of caribou habitat. In core management zones where conditional development is permitted, ecologically and culturally appropriate offsetting measures will be established through implementation to align with the BCPRP habitat objective. In some cases, habitat offsets may not be appropriate, where the residual impacts of a proposed development project are so great as to cause irreplaceable loss to habitat and to caribou populations and are therefore contrary to the BCPRP habitat objective. In these cases, earlier steps in the mitigation hierarchy, such as avoidance and minimization, should be revisited.

Wildfire Management

Wildfire is a common natural disturbance across boreal caribou ranges. Given the current state of boreal caribou habitat within B.C., large wildfires within caribou habitat could have a major impact on caribou distribution and abundance. Thus, mapped caribou habitat and protection information will be provided to the B.C. Wildfire Service on an annual basis to be incorporated into regional wildfire response plans as a valued component. The regional wildfire response plan will make recommendations on appropriate response levels to wildfire within caribou range, as well as providing guidance on access and rehabilitation considerations. Caribou values will also be included in Wildfire Risk Reduction plans that overlap identified habitat.

Wildlife Population Management Tools

The recovery of habitat to a state that supports stable, self-sustaining populations of boreal caribou may take decades to achieve. In the interim, wildlife management measures may be required to avoid further declines of boreal caribou. Within the BCPRP, the only measure currently under consideration is predator management. Maternal penning, predator exclosure, primary-prey management, conservation breeding, and supplementary feeding which are being implemented in other caribou ranges in Canada, are not being considered for this area currently. The need for additional population management tools will be continually assessed as part of the adaptive management evaluation over the life of the BCPRP.

Predator Management

Predator management consists of reducing predator populations where predation is a limiting factor for caribou populations. Wolves are a primary predator of caribou and are the leading cause of boreal caribou mortality within northeastern B.C. Currently, FNFN and the Province are monitoring wolf ecology and habitat use within the BCPRP area – including diet assessments, caribou mortality investigations, response to fire, response to available habitat types and condition, response to industrial activity and the age and condition of disturbance features, and response to habitat restoration efforts. These monitoring efforts are part of an adaptive management approach to determine if wolf management is appropriate for this area, and which approach may be best suited if it is.

Wolf reduction has been shown to be an effective tool to halt or reverse declining caribou population trends within 1-3 years of initiation (Farnell, 2009; Hervieux et al 2014; Bridger 2019; Serrouya et al. 2019). In northeast B.C., wolf reduction has been implemented to support caribou recovery within the central mountain group, the Graham and Pink Mountain northern mountain ranges and the Chinchaga boreal range more recently. Early results of these programs have demonstrated an increasing caribou population trend, decreased adult female mortality, and increased calf recruitment (Ministry of Forests, Lands, Natural Resource Operations and Rural Development – FLNRORD, 2019).

It is important to acknowledge that wolf reduction measures are costly and require sustained effort over time. Wolf populations have been observed to rebound quickly once removal efforts are stopped (Farnell, 2009), suggesting that these efforts only work if they are continued until caribou habitat is restored. Furthermore, high numbers of wolves need to be removed to see a meaningful increase in caribou calf survival (FLNRORD, 2019). The intensive nature of these efforts means that wolf reduction should only be enacted where populations are at high risk, with the preferred approach being recovery of habitat to reduce the predation risk.

In 2021, the B.C. Caribou Recovery Program established an interim aerial wolf reduction procedure to guide decisions, monitoring and reporting associated with direct reduction of wolf populations for the purpose of caribou recovery (Province of British Columbia, 2021). The provincial procedure establishes a target density of <3 wolves/1,000km² within identified caribou herd boundaries, as well as a decision path on whether a herd should be considered for predator management based on a series of factors. This builds on previous guidance to support decisions for predator management (FLNRORD, 2019). Further, work is ongoing to train FNFN members on wolf trapping techniques which could be integrated into a community-based management approach, if needed.

As part of the BCPRP implementation, each herd will be assessed against established criteria to inform decisions on whether wolf reduction is considered an appropriate tool to stabilize a herd. Should predator management be implemented in the BCPRP area, it will align with FNFN's guidance on culturally appropriate predator management. Associated impacts the abundance and distribution of other species will be monitored and potential effects may result in an alteration of the management of those.

Adaptive Management and Evaluation

Adaptive management acknowledges the uncertainty inherent in the outcomes of implementing strategies. Investments in boreal caribou research, monitoring and management from 2011-2018 have resulted in a vastly improved understanding of boreal caribou populations in B.C. (B.C. Boreal Caribou Research and Effectiveness Monitoring Board, 2018). However, as remaining knowledge gaps are addressed, the BCPRP must have the flexibility to adapt to new information and will therefore be implemented within an adaptive management framework (Dickie, et al., 2023) (DeMars, Johnson, & Melanie Dickie, 2023).

Adaptive management is an iterative process whereby the response of caribou populations to management actions is monitored and recovery actions are adjusted based on results of monitoring. Adaptive management is critical to allow managers to adjust given the uncertainty around the effectiveness of some management actions. The BCPRP proposes an adaptive management cycle for caribou recovery which includes annual monitoring requirements, and a progress review every five years, at a minimum. Additional reviews, including metric-specific reviews, will be implemented as required to ensure that changes in management are supported by the best available information at the time.

Performance Indicators

The BCPRP will be evaluated using the adaptive management framework outlined in Figure 5. To assist and direct this, performance indicators have been identified to track progress towards BCPRP objectives.

Habitat Trend

The long-term habitat goal for BCPRP caribou herds is to reduce overall disturbance to a level that supports self-sustaining caribou populations. While habitat protections provide for the natural regeneration of disturbance in core habitat areas and safeguard investments for further restoration efforts, it is recognized that habitat protection does not immediately equate to intact habitat. Given the long time-lag for natural recovery of disturbances, progress towards the disturbance targets will need to be measured consistently to gauge the need for active restoration or further measures.

Habitat disturbance across boreal caribou range will be measured on a yearly basis to assess whether a positive habitat trend is being achieved. Habitat disturbance trend will be evaluated against current disturbance and long-term (40 years) habitat recovery targets (Figure 5). Currently, habitat condition monitoring is primarily completed via desktop survey of provincial disturbance layers, which may not be fully representative of the level of disturbance on the ground. Future monitoring will aim to be consistent with, and adapt to, current and emerging methodologies, techniques, and technologies to render the process as efficient and accurate as possible. Disturbance metrics will be reported by individual herd range as well as cumulatively across all B.C. boreal herd ranges.

In addition to overall disturbance figures, the density of linear features will also be measured and reported. Given that linear features are the primary disturbance across the BCPRP area, total disturbance values will be strongly correlated, such that reduction in linear feature densities will result in lower total disturbance. The linear feature target density within core management zones is $<1\text{km}/\text{km}^2$.

The BCPRP is based on the key principle of habitat protection as a means of preventing further habitat degradation, which is why protection is focused on the most intact habitat. Although it is anticipated that disturbances within restrictive management types will naturally regenerate, active restoration efforts will be required in core management areas to ensure habitat targets are achieved over the long-term. To guide habitat restoration investments, restoration priority areas will be identified in the implementation phase.

The point at which a disturbance is sufficiently recovered to be considered undisturbed habitat is a crucial factor for monitoring habitat trend. Polygonal disturbance in the form of wildfires and cutblocks can be considered undisturbed when the disturbance reaches the age of 40 years (Environment Canada , 2011). However, timelines are not as clear for linear features, such as seismic lines and roads, where the natural recovery of vegetation varies as a result of site-specific limiting factors. As part of BCPRP implementation, the characteristics that determine undisturbed habitat will be defined and incorporated into the monitoring program. These characteristics and criteria will be refined over the course of the effectiveness monitoring program and be responsive to site-specific observations.

Figure 4: Current Buffered Cumulative Disturbance of BCPRP Caribou Range Areas and Long-Term Targets. Disturbance methodology outlined in Disturbance Appendix. Long-term targets are the percent of the range that is restricted from further human disturbance based on scenario presented within the BCPRP.

Herd Range	Percent (%) Habitat Undisturbed	
	2023	Long term (40 years)
Calendar	6	> 65
Snake-Sahtahneh	4	> 62
Westside Fort Nelson	12	> 57
Maxhamish	9	> 52
BCPRP Area	7	> 63

Caribou Population Trend

The primary performance indicator for the effectiveness of the BCPRP is boreal caribou population trend. Population “lambda” has been used as an effective and efficient measure for estimating caribou population trends within B.C. and across Canada. Population lambda (λ) refers to the rate of population growth estimated derived from adult female and calf survival. Lambda indicates whether a population is stable ($\lambda = 0.99 - 1.01$), increasing ($\lambda > 1.01$) or decreasing ($\lambda < 0.99$). To achieve BCPRP’s goal of self-sustaining boreal caribou populations that can support an indigenous sustenance harvest, lambda would have to be stable or increasing in all ranges over the short-term (five years), medium-term (≤ 20 years) and long-term (≥ 50 years; Table 7). To measure success in achieving population objectives and the BCPRP recovery goal, lambda will be estimated every five years and assessed in relation to short and long-term targets.

Figure 5: Current (2014-2024) population growth rates (lambda) and short-term (≤ 20 years) and long-term (≥ 50 years) growth rate targets for boreal caribou ranges in B.C.

Caribou Subpopulation	Mean Annual Lambda (2014-2024) ¹	Cumulative Lambda (2014-2024) ²	Short-term Target ³	Long-term Target ³
Calendar	0.934	0.374	$\lambda \geq 1.01$ (increasing)	$\lambda = 0.99 - 1.01$ (stable)
Snake-Sahtahneh	0.996	0.908	$\lambda \geq 1.01$ (increasing)	$\lambda = 0.99 - 1.01$ (stable)
Westside Fort Nelson	1.026	1.222	$\lambda \geq 1.01$ (increasing)	$\lambda = 0.99 - 1.01$ (stable)
Maxhamish	0.997	0.918	$\lambda \geq 1.01$ (increasing)	$\lambda = 0.99 - 1.01$ (stable)

¹Average annual population growth rate from 2014-2024. Expressing lambda as an average over time reduces the volatility of the observed rates year to year.
²Cumulative Lambda measures the overall population growth rate between 2014-2024, based on the annual population growth rates compounded year over year.
³Lambda will be estimated every five years and must average to a stable or increasing level over each of the time periods to meet the target.

The Province and FNFN have maintained GPS collars and performed annual surveys within all boreal caribou ranges as part of a joint monitoring program since 2014, with the population trend results summarized in Figure 7 below. Annual population growth rates have been highly variable, but the overall trend has shown a decline. The monitoring plan is designed to decrease the volatility and uncertainty in monitoring by expanding the number of collars maintained in each herd, and by summarizing data over five-year periods. Monitoring efforts prior to 2014 were less frequent and relied on minimum population counts and estimates. As such, it is difficult to estimate historic boreal caribou population numbers within the BCPRP area. However, Indigenous knowledge, local observations, and previous monitoring data all indicate that caribou populations have significantly declined from historic levels, particularly over the last several decades.

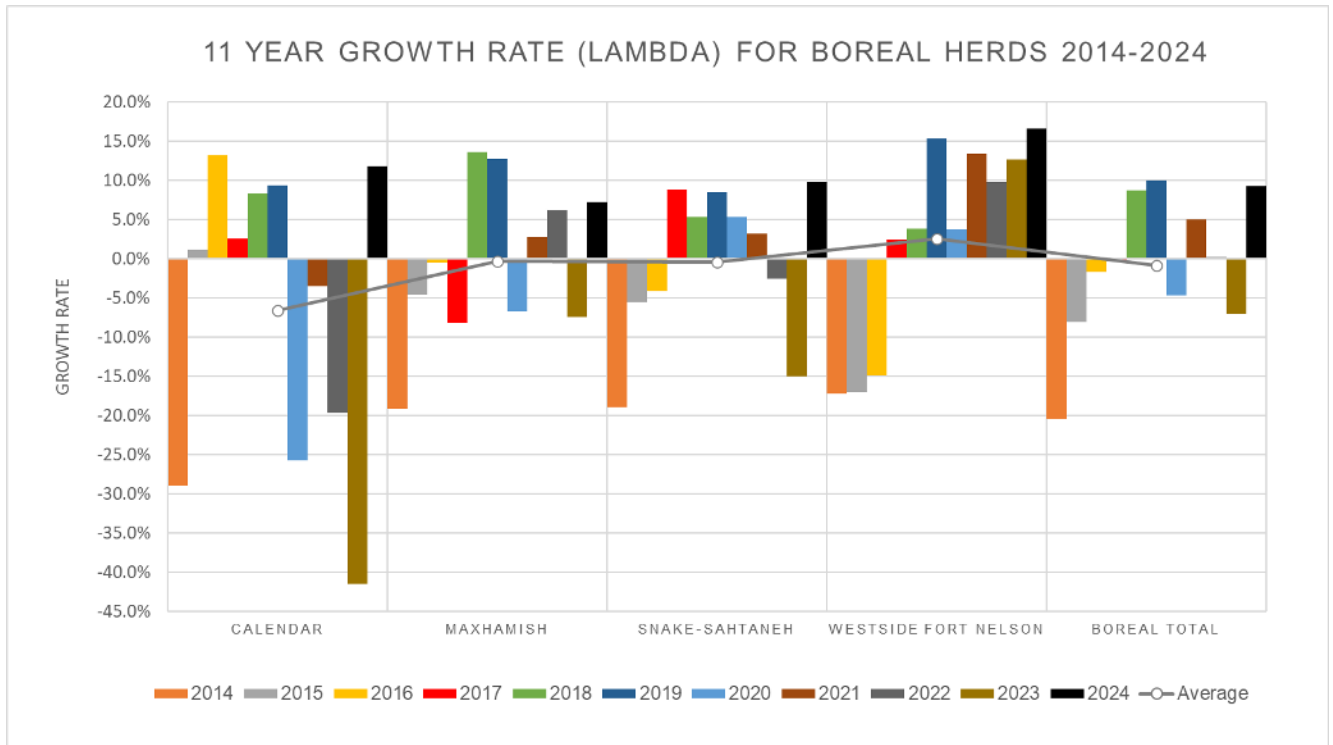


Figure 7: Estimated Annual Population Growth Rates (Lambda) for each herd range in the BCPRP area (2014-2024).

Caribou demographic information is currently measured as part of the provincial caribou recovery program, which includes GPS collaring of caribou in each range and annual aerial surveys. To ensure that sufficient data are gathered to monitor BCPRP effectiveness, the monitoring program will continue and expand to meet the following targets:

- Maintain GPS collars on 10% of estimated population, up to 30 per range, or 150 across all ranges; and
- Ongoing monitoring of caribou health metrics and mortalities; and
- Annual surveys of each range to monitor calf:cow ratios.

It is recognized that over the lifespan of the BCPRP, new monitoring techniques may emerge which can more efficiently deliver demographic information or may provide additional data. Where adaptations are required to the monitoring program due to advancements of collection techniques, or changes to operational capacity the necessary data will continue to be collected in a manner that provides accurate short- and long-term population trend monitoring.

Summary of BCPRP Implementation and Effectiveness Monitoring

Ongoing implementation and effectiveness monitoring is an important component of adaptive management. Proposed measures will take years to fully implement, and there is substantial engagement, program and capacity development required to do so. To track progress on implementing proposed measures, an implementation monitoring program will be adopted which measures progress towards the management intentions of the BCPRP.

Table 3: Factors to inform BCPRP Implementation Monitoring

Implementation Monitoring			
Objective	Factor	Target	Frequency
Habitat Trend	Amount of area protected.	Implementation of legislation, regulation and policy in accordance with the management intents	Yearly
	Up to date industry guidance	Creation and adoption of industry guidance matching the management intents	Yearly
	Habitat restoration planning	Approved restoration framework and tactical restoration plans.	Yearly
	Habitat restoration funding	Establishment of funding system for restoration, or coordination across appropriate funding programs	Yearly
Caribou Population Trend	Establishment of monitoring program	Confirmation of multi-year monitoring program which meets the data needs of the adaptive management plan	Yearly

Additionally, monitoring the effectiveness of implementation measures is important to understand progress on achieving established objectives and long-term goals. Every five years or when deemed necessary, an effectiveness review of caribou recovery measures will take place, using measures described below in Table 4, and will re-evaluate management actions as described in Figure 5. Additional management measures may be implemented based on the results of evaluation. Should additional measures be implemented, the effectiveness monitoring plan will be updated to reflect the new measures and targets.

Table 4: Factors to inform BCPRP Effectiveness Monitoring

Effectiveness Monitoring				
Objective	Measure	Target	Frequency	Method
Habitat Trend	% habitat undisturbed	Increasing undisturbed habitat across caribou range within 40 years	Yearly	Provincial tracking system in combination with remote sensing or field visit verification
	Linear feature density	Decreasing within core management zones within each range to <1 km/km ² within 40 years	Yearly	Provincial tracking system in combination with remote sensing or field visit verification
	Habitat restoration effectiveness	Restored areas on trajectory to contribute to intact caribou habitat.	Yearly	Provincial silviculture tracking system in combination with remote sensing or field visit verification
Caribou population trend	Population lambda	Increasing to stable over time	Five Years	Calculated from mortality and cow: calf ratios
	Caribou mortality rates / causes	Mortality is lower than recruitment Identification of limiting factors	Yearly	Telemetry data (30 collars / herd range) and analysis
	Cow: calf ratios	100:28 (indicates stable or increasing population)	Yearly	Annual flights in late winter
	Body condition	Healthy caribou Identification of limiting factors (i.e., nutrition, disease)	Yearly	Sampling conducted during caribou capture and collaring. Investigations into mortality causes. Observations during annual flights in late winter

Next Steps: Implementation and Research

The BCPRP will be implemented in a co-management approach between the B.C. government and FNFN. The implementation will adhere to the goals, objectives and management guidance found within the recovery document and be coordinated with any future land-use planning processes.

Implementation Priorities

Once the BCPRP is finalized and approved, implementation of habitat and population management measures will proceed. Implementation steps have been identified

throughout this document. The remainder of this section summarizes the key implementation steps. The roles, responsibilities and timelines of implementation will be informed through the development of the co-management approach and appended to the BCPRP post-engagement.

Habitat Protection

The top implementation priority is the establishment of habitat protections consistent with the BCPRP Management Types. While legislative and policy mechanisms have been identified to achieve management intents, the Province will not be limited by the mechanisms listed within this document. Multiple protection measures may be overlaid to ensure consistency across industries where necessary. As habitat protection is the top implementation priority, the establishment of effective measures is anticipated within the one year of publication (2025).

Updated Industrial Guidance

Industry-specific guidance will need to be updated or created to align with the intentions and measures of the conditional development management types. This document identifies General Wildlife Measures (forestry) and Planning and Operational Measures (PNG) as the appropriate guidance tools, though other tools may be adopted based on industry engagement. Development of industrial guidance will be aligned with land use planning tables where feasible to limit duplication of industry engagement. Industrial guidance and associated measures are likely to be iterative and evolve over the lifetime of the plan, with reviews of effectiveness occurring during the 5-year adaptive management cycle.

Habitat Restoration

To maximize habitat gains and return on restoration investment, priority restoration guidance will be developed, which will aim to identify the highest priority areas for restoration investment. In addition, tactical restoration plans will be developed for priority areas to inform restoration proponents. Coordinating and tracking restoration activities and establishing consistent reporting standards will be required. Where appropriate, systems and guidance under development at a provincial scale will be reflected in future guidance specific to boreal caribou. FNFN has led habitat restoration work since 2017. Restoration activity is expected to increase following the establishment of habitat protections, with priority guidance pieces being made available within a year.

Predator Management

Each herd captured through the BCPRP will be assessed to determine if predator management measures are required to stabilize the herd. If predator management is recommended for any BCPRP herds, an operational plan will be developed, which will include securing the appropriate approvals and funding to establish the program. There is no timeline for commencing a predator management program, as it is contingent on monitoring data and landscape conditions, which will be assessed regularly.

Monitoring and Adaptive Management

This document outlines key factors to be considered for ongoing caribou and habitat monitoring which will be a component of an adaptive management plan. Any factors not adequately captured by the current ongoing monitoring program will be identified, with operational plans created to address the data gaps. This will include securement of funding, coordination between jurisdictions, and having all necessary approvals in place.

Ongoing Research

The success of management actions identified in the BCPRP relies on the assumption that protecting and restoring habitat will lead to stable and increasing caribou populations over time. However, it is recognized that caribou population demographics are the result of a complex web of factors and conditions and thus, ongoing research is essential to inform adaptive management actions/priorities. As such, it is imperative that research go beyond the monitoring plan outlined in this document. At the time this plan was drafted, the following high-level areas were identified as research priorities:

- extent of natural regeneration of habitat disturbance;
- climate change and boreal caribou ecology;
- predator-prey relationships in boreal landscapes;
- caribou health as it relates to ecosystem productivity; and
- identifying fine-scale habitat features and movement corridors.

Note: The above priorities are not a comprehensive list of potential research avenues. Research programs should be coordinated between the provincial and federal governments, interested First Nations, industrial stakeholders, and academia to maximize available data and funding opportunities.

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Appendix: Technical Methodology Summary

Technical planning for the Boreal Caribou Protection and Recovery Plan (BCPRP) was completed by the Boreal Caribou Technical Team (BCTT), comprised of representatives from the Ministry of Forests, Lands, Natural Resource Operations, and Rural Development (FLNRORD) and Fort Nelson First Nation (The Firelight Group, Veridian Ecological Consulting and SwampDonkey (Jesse Tigner)). Planning was informed by the Fort Nelson Caribou Steering Committee (FNCSC) which is comprised of representatives from Fort Nelson First Nation, Northern Rockies Regional Municipality, FLNRORD and the Ministry of Energy Mines and Low Carbon Innovation.

The spatial planning scope of the BCPRP is limited to four boreal caribou ranges which primarily overlap with the Fort Nelson Natural Resource District: Calendar, Maxhamish, Snake-Sahtaneh and Westside Fort Nelson. The Chinchaga range was excluded as a modernized land-use planning initiative was committed to within the Peace Natural Resource District and the Fort St. John Timber Supply Area which encompasses the Chinchaga range.

Delineation of Core Caribou Habitat and Ranges

The BCTT delineated revised core caribou habitat and ranges as the first phase of the planning process. Core habitat zones incorporate both scientific information (habitat suitability mapping and telemetry data from radio-collared boreal caribou) and Indigenous knowledge of caribou distribution and habitat use. Core zones represent the most important habitat within caribou ranges containing the biophysical attributes required by caribou to carry out life processes necessary for survival and recovery. Areas outside of core zones and within caribou range are classified provincially as matrix habitat. Matrix habitat possesses low to no known periodic caribou use and is important for connectivity between suitable core habitats. These areas support primary prey and associated predators that have the potential to affect local caribou populations both directly and indirectly. Spatial analysis to map core habitat zones were performed utilizing ArcMap 10.6.1, ArcGISPro and R version 3.5.1.

The first step in delineating core habitat was the development of a caribou use layer. The caribou use layer was developed using four different datasets:

- Telemetry data from British Columbia (Mar 2011-Apr 2018)
- Telemetry data from Alberta (Mar 2007-Jun 2018)
- Local observation data gathered by Fort Nelson First Nation (Jul 2014-Mar 2016)
- Indigenous Knowledge from members of Fort Nelson First Nation.

B.C. telemetry data from all five boreal caribou herds were used by Caslys Consulting to develop visual maps representing relative use Kernel Density Estimates (KDE) by herd at the request of the FLNRORD. This analysis was based on walk lines for each boreal herd and used an average bandwidth/search radius derived from daily movement rates. The latter was calculated for each herd and each year using the *kernelUD* function in the *adeHabitatHR* package in R. Density rasters were then generated using the Kernel Density Tool in ArcGIS at cell size of 200m to ensure movement corridors were captured and processing time was minimized. Density rasters were reclassified to five values representing frequency of caribou use based on quantiles (4: highest use; 3: high use; 2: medium use; 1: low use; 0: no known use). Herd rasters were merged into a single raster and where herds overlapped, the maximum value was selected. While this output provided a good understanding of relative use by collared female caribou, it did not

provide a full picture of caribou-use.

To ensure a more holistic picture of caribou use, the BCTT then compared the KDE output with local observation data, FNFN Indigenous Knowledge, and Alberta collar location data to ensure all areas were captured in the final caribou use layer. Three Areas of Interest (AOIs) were identified based on Indigenous knowledge, local observations, and telemetry data: the Hay River AOI, the Shekilie AOI and the Muskwa-Fort Nelson AOI. For these AOIs, caribou use scores were assigned to each of the newly developed polygons based on the strength of evidence of caribou use in

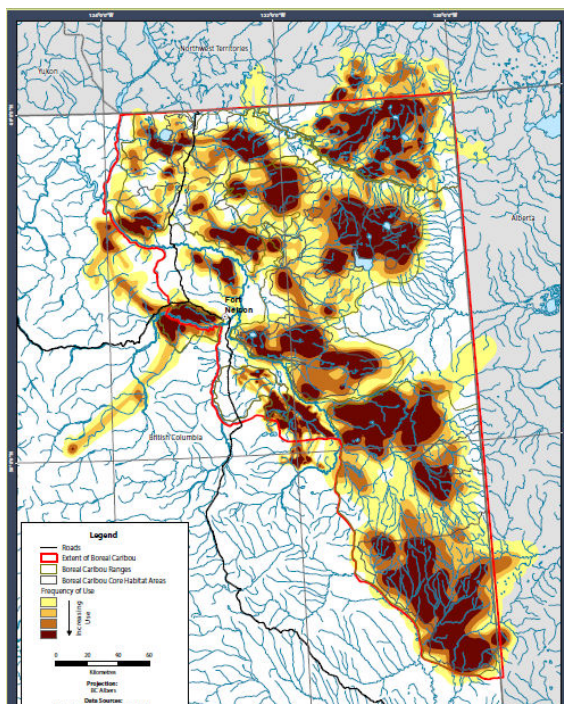


Figure 6: Boreal Caribou Relative-Use by Herd Kernel Density Output

that area. The Shekilie and Muskwa/Westside Fort Nelson polygons were scored as “medium use” based on local observation data and supporting TEK. The Hay River polygon was scored as “high use” based on Alberta telemetry data. To generate a final caribou use layer, newly developed polygons were converted to raster using the “Feature to Raster” tool and combined with the KDE layer using the “Mosaic to New Raster” tool. The final caribou use layer was converted to point format from raster using the “Raster to Point” tool. Areas identified for core delineation included all Very High, High, and Medium Caribou Use.

As a next step, the technical team assessed the Caribou Relative-Use KDE layer against Ducks Unlimited Enhanced Wetland Classification Data converted into boreal caribou habitat rating map developed by Arsenault (2014) and modified by FNFN to reflect their knowledge of B.C. boreal caribou use³. The Ducks Unlimited habitat suitability layer was converted from a raster to vector format. The habitat suitability layer was then intersected with the 1 km² fishnet grid using the “Intersect” tool. The “Select Layer by Attribute” tool and was used to identify cells that had >50% +3 and +2 habitat rankings (Treed Bog, Shrubby Bog, Treed Rich Fen, Treed Poor Fen, Tamarack Swamp, Conifer Swamp). The technical team utilized the layer to identify and delineate high-value habitat areas adjacent to known caribou use areas for inclusion into core habitat.

Following identification of core habitat, range boundaries were adjusted to better reflect current boreal caribou habitat use and were expanded to include all core habitat and were bounded against other ranges along major river systems or were clipped to provincial jurisdictional boundaries.

³ See Appendix 1 of the Medzih Action Plan. Link: http://www.fornelsonfirstnation.org/uploads/1/4/6/8/14681966/2017-sept-29_fnfn_medzih_action_plan_final_medres.pdf

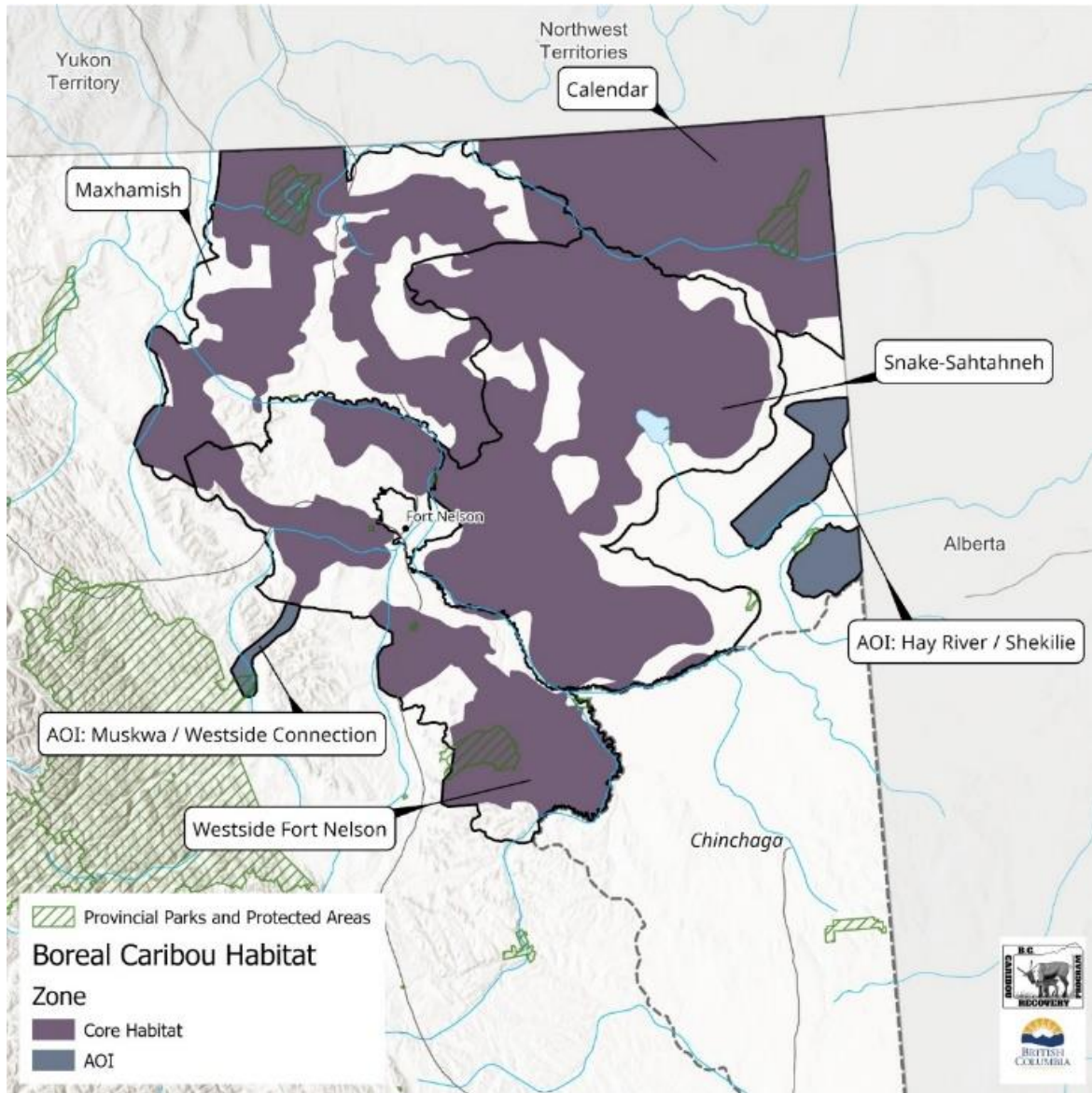


Figure 7: BCPRP Boreal Caribou Ranges, Core Habitat, and Areas of Interest

The next step after delineating core habitat was to understand the habitat condition of core habitat areas to inform management planning. The BCTT utilizing disturbance mapping developed for the Northeast Regional Strategic Environmental Assessment, a trusted information source by the parties⁴. The BCTT related density of disturbance to relative intactness using a ranking system that mimicked the ranking system for caribou

⁴ Link to RSEA Dataset: <https://catalogue.data.gov.bc.ca/dataset/regional-strategic-environmental-assessment-disturbance-layer-northeast-bc>

use (Table 4); increasing levels of disturbance corresponded to decreasing relative intactness.

Table 4. Ranking system for caribou use and disturbance layers used in the analysis to develop management zones in boreal caribou range in British Columbia.

Ranking of Habitat Intactness		Linear Feature Disturbance (km/km ²) ¹	Areal Disturbance (% of cell)
4	Very High (VH)	0 – 1	0
3	High (H)	1 - 2	0 – 5
2	Medium (M)	2 – 3	5 – 15
1	Low (L)	3 – 4	15 - 35
0	Very Low (VL)	>4	35+

The linear features layer included roads, railways, and seismic, transmission, and power lines (Figure 11). The density of linear features (km/km²) was calculated on a 1 x 1 km basis. The polygonal disturbance layer included cutblocks, well sites, infrastructure, and agriculture (Table 5) and was also developed as a 1 x 1 km grid. The linear feature and polygonal disturbance layers were combined into one disturbance layer. The lowest rank (i.e., the lowest relative intactness) of the two layers was assumed for each output cell.

Disturbance Type	Source Layer in RSEA Dataset
Linear	
Roads, railways, trails, and seismic cutlines	AnthroDisturbances_Linear_C_Merge
Power lines and transmission lines	IN_POW_B_Dissolve_Type
Pipelines	IN_OG_B_ATTRIBUTES
Polygonal	
Cutblocks	IN_FOR_B_ATTRIBUTES
Oil and gas facilities and wellsites	IN_OG_B_ATTRIBUTES
Agricultural land use areas	IN_AGRI_B_Dissolve
Mining activity	IN_MINE_B_Dissolve
All communities (includes airports and rural residential areas)	COMM_B_ATTRIBUTES
All compiled recreation facilities, such as camps or lodges	REC_B_Dissolve

Figure 8: Linear and Polygonal Disturbances within the RSEA Dataset

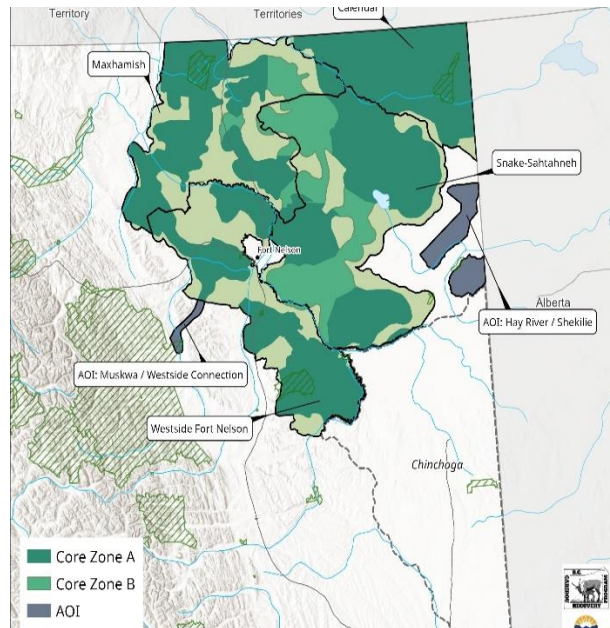
After developing the relative intactness layer, caribou use, and disturbance data were combined to develop a habitat class dataset. This dataset provided a visual reference of caribou use and habitat condition based on disturbance and could be used to inform priority areas for habitat protection. The “Join Data” tool was used to join the caribou use data to the disturbance data. The attributes describing the relative intactness and caribou use were concatenated using the “Calculate Field” tool. For example, a ‘Very Low’ intactness ranking combined with ‘Very High’ caribou use ranking would be classified as ‘VeryLowVeryHigh’. We then grouped the concatenated values (e.g., ‘VeryLowVeryHigh’) into 6 habitat classes (Table 6). Class 1 and 2 had the highest

conservation value i.e., the most intact and used habitat. While Class 3 areas had relatively high caribou use but were less intact. Class 4 and 5 areas have low to very low caribou use and are not intact. Lastly, Class 6 areas possessed high quality habitat and were relative more intact but had low caribou use.

Caribou Use	Intactness				
	VH	H	M	L	VL
Very High (VH)	1	1	2	3	3
High (H)	1	1	2	3	3
Medium (M)	2	2	3	3	3
Low (Low)	6	6*	4	4	4
VL (Very Low)	6*	6*	5	5	5

Table 6. Boreal caribou habitat classes based relative habitat use and intactness.

* Areas of high-habitat suitability



Three categories of habitat were identified to be utilized for planning purposes:

- Core Habitat Zone A: Habitat Classes 1, 2 and 6.
- Core Habitat Zone B: Habitat Classe 3.
- Matrix Habitat Zone C: Habitat Classes 4 and 5.

Range /Area of Interest	Core: Zone A (km ²)	Core: Zone B (km ²)	Total Core: (km ²)	Matrix (Km ²)	Range: (km ²)
Calendar	5,247	0	5247	339	5,586
Maxhamish	5,837	974	6,811	3,309	10,120
Snake-Sahtahneh	6,493	3,827	10,320	3,084	13,404
Westside Fort Nelson	5,570	47	5,617	2,754	8,371
AOI: Hay River / Shekilie	1,238	0	-	-	-
AOI: Muskwa / Westside Connection	189	0	-	-	-

Table 7. Total area and percent of boreal caribou range covered by Core Habitat and Matrix Management Zones

Planning Framework

Aligning with the provincial mandate for boreal caribou – to stabilize and achieve self-sustaining populations in all boreal caribou herds and to maintain a positive habitat trend across boreal caribou ranges in B.C. – the parties identified an overarching recovery goal: **to recover boreal caribou populations across their range to self-sustaining status and to a level capable of supporting an Indigenous sustenance harvest.**

A scenario planning approach was undertaken by the BCTT to support a transparent decision-making process through demonstrating potential socio-economic and cultural implications associated with the various scenarios and the risk to achieving the overarching BCPRP goal. Four initial scenarios were developed to address boreal caribou recovery in B.C. that represents a range in likelihood of achieving the self-sustaining caribou populations over time (Table 8).

Scenario	Intent	Likelihood of Achieving Goal for Each Herd Range			
		Calendar	Maxhamish	Snake-Sahtahneh	Westside Fort Nelson
1	65% undisturbed habitat target met or exceeded in all herd ranges	VH	H	H	H
2	65% undisturbed habitat target met in all herd ranges.	VH	H	H	H
3	65% average undisturbed habitat target across all herd ranges, with some ranges >65% undisturbed and others <65% undisturbed.	VH	M	H	M
4	<65% average across all herd ranges. Most herds <65% undisturbed.	VH	L	H	L

Table 8: Likelihood of achieving self-sustaining boreal caribou herds in British Columbia under the scenarios considered by the BCPRP. The BCTT evaluated each scenario using a 50-year time frame as a reasonable length of time to allow existing disturbances in protected areas of the range to recover. The evaluation follows the approach presented in ECCC 2019, Table E-1, which identified the following categories to describe the likelihood of achieving a self-sustaining population based on percent undisturbed habitat: Very high: $\geq 90\%$; High < 90 to $\geq 60\%$; Moderate < 60 to $\geq 40\%$; Low < 40 to $\geq 10\%$; Very low: $< 10\%$. For each scenario, the BCTT assumed that the percentage of the range falling into restrictive management types (1 and 2) is a reasonable proxy for the level of disturbance in 50 years.

Scenario intents were drafted prior to the initiation of subsequent petroleum and natural gas (PNG) and forestry analyses to provide benchmark guidance on the scale of habitat protections that are required at a range and landscape scale for the various likelihoods of achieving the recovery goal. In the absence of herd-specific information on the relationship between disturbance levels and caribou population dynamics, guidance from the federal *Recovery Strategy for the Woodland Caribou, Boreal population, in Canada* (ECCC 2012) was used: maintaining 65% undisturbed habitat in a range will lead to a moderate 60% chance of a self-sustaining boreal caribou population. The BCTT used it as benchmark guidance with the understanding that protection would not necessarily equate to 65% undisturbed in the immediate future but with the understanding that protecting habitat secures large contiguous areas of the land base to allow for natural regeneration of disturbance and safeguards investments in restoration, such that the 65% undisturbed target is more likely to be met over time.

Petroleum and Natural Gas Activity Analysis

The objective of this analysis was to spatialize the tenure and activity status and categorize the landscape based on the probability of meaningfully protecting habitat and the likelihood of future development. The BC Oil and Gas Commission (OGC) significantly contributed to this analysis and provided tenure and activity status data for the PNG industry.

The BCTT worked with OGC staff to categorize the different tenure types (unconventional or conventional) and activities (abandoned, active, or potential wells) based on the probability of protecting these areas and the likelihood of future development (Table 8). Unconventional tenure refers to tenure to access gas extracted from relatively impermeable, source shale, whereas conventional tenure refers to tenure to access discrete pools/accumulations of gas. While the presence of either form of tenure decreases the ability to protect habitat, unconventional tenure is more likely to be developed than conventional tenure in northeastern BC. The influence of wells in caribou habitat is dependent on the status of the well. For example, active wells are more likely to have associated PNG activity than abandoned wells.

Table 8. Categorization of PNG tenure and activity data based on probability of protection and likelihood of development.

PNG Category	Probability of Protection	Likelihood of Development	Tenure Type		Well Status		
			Conventional	Unconventional	Abandoned	Active	Potential
1	High	Low					
2	High	Low			X		
3	Medium	Medium	X		X		
4	Low	High	X	X	X	X	X

First, Categories 3 and 4 were spatially defined. This was done by classifying active and potential wells and unconventional tenure as Category 4. Minimum bounding polygons were drawn around active and potential wells in conventional tenure and these regions were also classified as Category 4. Areas with conventional tenure located outside of Category 4 areas were classified as Category 3. These Category 3 areas represent areas with conventional tenure that contain abandoned wells or no wells at all.

Next, Categories 1 and 2 were defined. Abandoned wells in areas without tenure were buffered by 1.5 km, dissolved and a unique ID was calculated for the dissolved features.

The unique ID was joined back to a layer containing abandoned wells in areas without tenure. Minimum bounding polygons were created for these abandoned wells, and areas overlapping the bounding polygons were classified as Category 2. Remaining regions that did not contain tenure and did not contain wells were classified as Category 1.

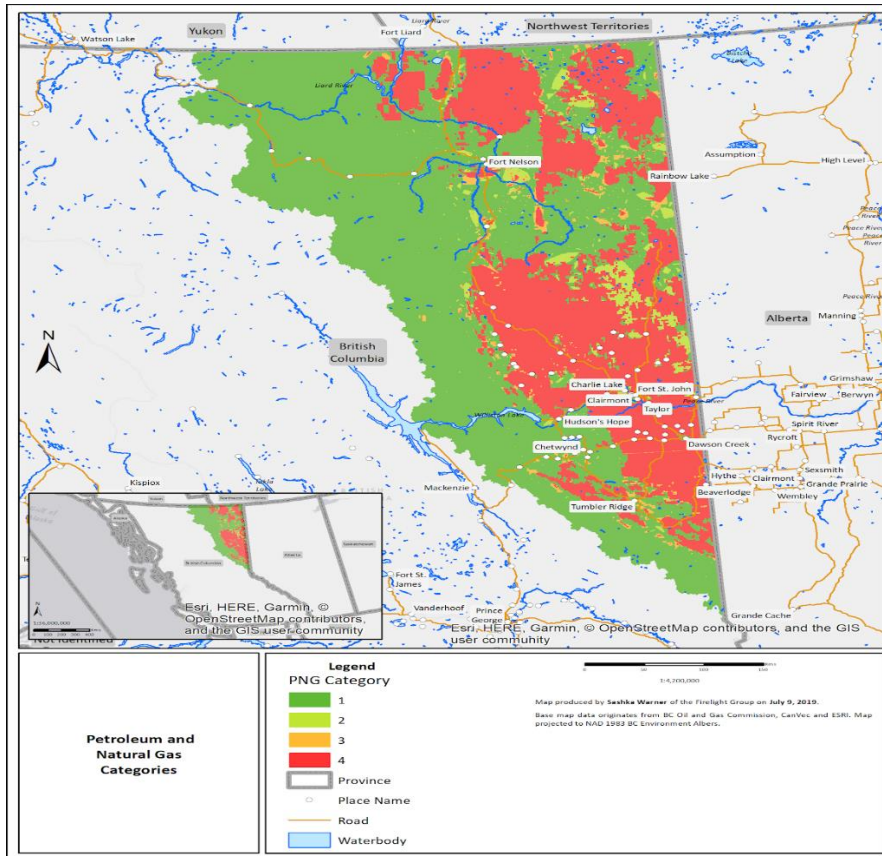


Figure 9: Petroleum and Natural Gas Categories expressing Probability of Protection across Northeast BC.

Forestry Analysis

The objective of this analysis was to develop a spatial forestry layer that could be utilized to understand potential pressures from forestry, develop a scale of probability of protection and inform potential impacts associated with habitat protection. The Timber Harvesting Land Base (THLB), the portion of the Crown Forest Land Base was used as a metric for this assessment. The BCTT worked with Industrial Forestry Service to develop a THLB layer classified by site index (SI) into three categories of merchantable timber: non-merchantable, low-volume merchantable, high-volume merchantable

(Table 9). It was assumed that the probability of protection would be lowest in areas with high volumes of merchantable timber and highest in areas with non-merchantable timber or no THLB.

Table 9. Probability of protection of core caribou habitat based on no, low, and high volume THLB.

Timber Harvesting Land Base			Probability of Protection
Non-Merch (SI < 10 or Visual Quality Objective = Retention)	Low-Volume Merch (SI 10-17)	High-Volume Merch (SI > 17)	
		X	Low
	X		Medium
X			High

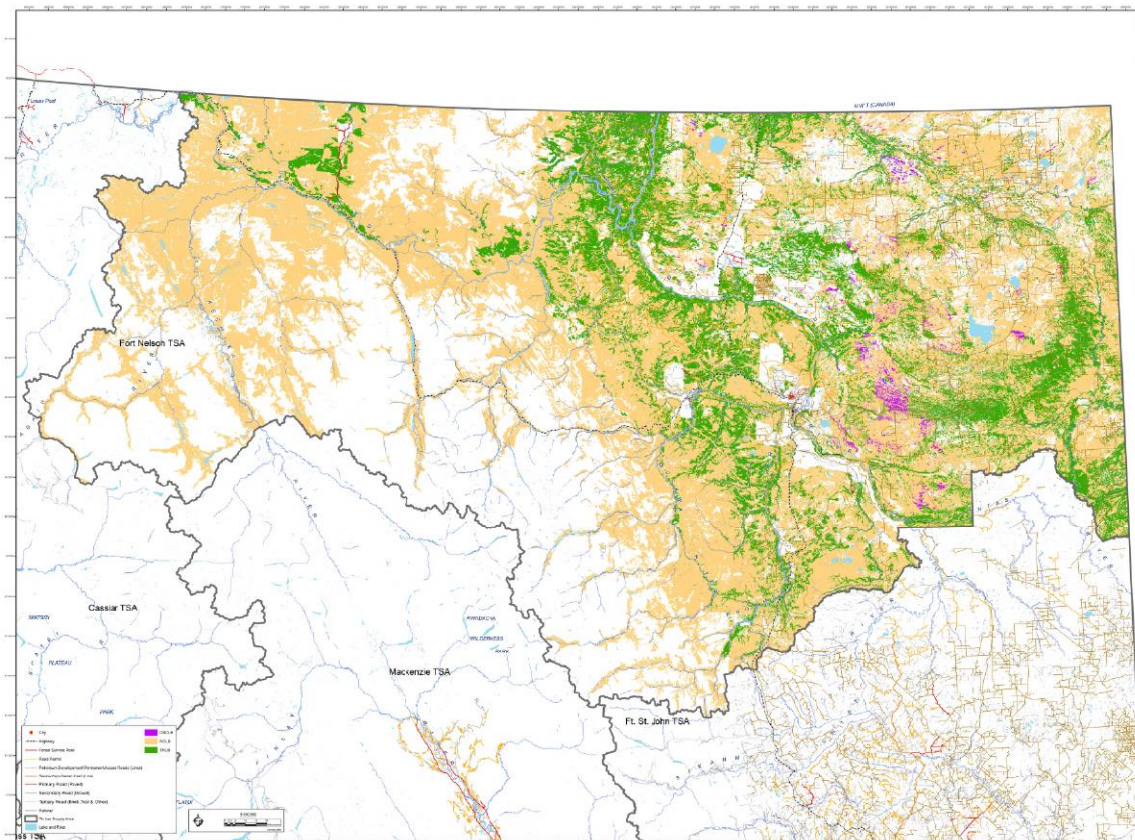


Figure 10: Timber Harvesting Land base of the Fort Nelson Timber Supply Area

Management Type Development and Scenario Building

The PNG and forestry analysis provided a better understanding of the likelihood of development and the potential for protection within boreal caribou habitat. The results of

these analyses were used to spatially define caribou habitat management types. Five management types with different management intents were developed for forestry and PNG (Figure 13).

Management Type	Management Intent: Forestry	Management Intent: Petroleum and Natural Gas
1	Full protection	Full protection
2	Full protection	Full Protection with variances for reclamation.
3	Full protection	Maintain Access; Conditional Development
4	Conditional forest harvest	Maintain Access; Conditional Development
5	Conditional forest harvest	Maintain Access; Conditional Development

Figure 11: Proposed caribou habitat management types and their associated protections from forestry and petroleum and natural gas development.

Types 1 to 4 overlap with core caribou habitat zones A and B, while Type 5 overlaps matrix management zone.⁵ Guided by the Planning Framework the BCTT developed four conservation scenarios. The primary difference between the scenarios is the extent of conversion of Management Types 1,2,3 to Type 4. Areas identified for conversion were informed primarily from a forestry perspective with merchantability and access infrastructure, current regulation (WHAs and UWRs), caribou use and habitat class, and ecological considerations including habitat contiguity and landscape connectivity. Core and Area of Interest habitat areas identified for conversion are reflected in Management Type 4 within the various scenarios in Figure 6.

The initial scenarios illustrated potential trade-offs associated with caribou recovery and implications for natural resource access. It further provided an opportunity to identify highly merchantable stands within caribou range that contribute to a targeted economic fibre supply required to support regional investment in forestry operations.

⁵ After review of original management types and measures that could support achieving management intent, Management Type 1 & 2 were combined and re-classed as Management Type 1 within external facing BCPRP document. While maintaining intents, Management Type 3 was reclassified as Management Type 2 and Management Type 4 reclassified as Management Type 3 and Management Type 5 reclassified as Management Type 4.

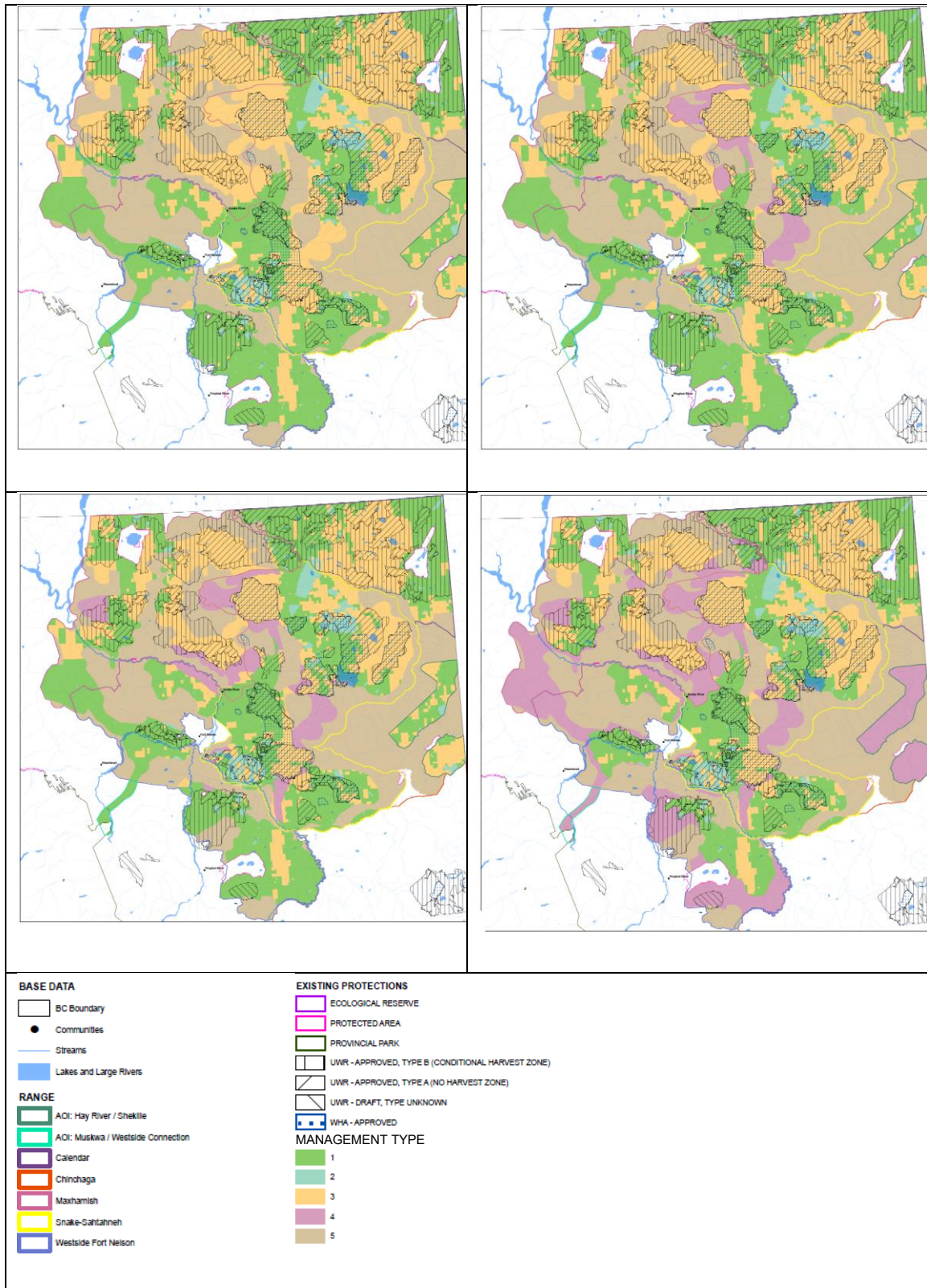


Figure 12: Initial draft BCPRP Management Scenarios: Top Left (Management Scenario 1); Top Right (Management Scenario 2); Bottom Left (Management Scenario 3); Bottom Right (Management Scenario 4).

Range Area	Calendar	Maxhamish	Snake-Sahtahneh	Westside Fort Nelson	AOI: Hay River/ Shekile	AOI: Muskwa/West side Connection
Scenario 1						
Type 1	254,105	263,055	454,549	447,407	59,237	15,401
Type 2	11,333	6,256	85,173	10,259	5,464	-
Type 3	239,565	418,491	506,202	66,639	58,973	-
Type 4	-	-	-	-	-	-
Type 5	33,237	296,522	292,874	285,447	-	-
Park/Protected Area	20,384	27,665	1,617	27,395	117	3,451
Scenario 2						
Type 1	254,105	249,111	451,002	447,407	59,237	15,401
Type 2	11,333	6,631	84,169	10,259	5,464	-
Type 3	239,565	381,797	392,966	66,639	58,973	-
Type 4	-	-	117,788	-	-	-
Type 5	33,237	346,786	292,874	285,447	-	-
Park/Protected Area	20,384	27,665	1,617	27,395	117	3,451
Scenario 3						
Type 1	254,105	247,457	451,013	406,549	59,237	15,401
Type 2	11,333	6,126	84,169	9,414	5,464	-
Type 3	239,565	326,977	373,101	57,142	58,973	-
Type 4	-	53,504	137,642	17,371	-	-
Type 5	33,237	350,260	292,874	319,276	-	-
Park/Protected Area	20,384	27,665	1,617	27,395	117	3,451
Scenario 4						
Type 1	254,105	142,546	451,013	204,114	-	-
Type 2	11,333	5,121	84,169	5,965	-	-
Type 3	239,565	262,190	373,090	50,025	-	-
Type 4	-	224,208	137,653	230,373	123,674	15,401
Type 5	33,237	350,260	292,874	319,276	-	-
Park/Protected Area	20,384	27,665	1,617	27,395	117	3,451

Values Assessment and Scenario Refinement

Under guidance by the FNCSC and to inform discussion on the range of implications of scenarios for other values and potential refinements to scenarios, assessments were completed on multiple identified values. Performance measures were identified for: caribou recovery likelihood of self-sustainability, impacts to forest-profile, access to PNG resource, other ecological considerations including implications for moose, furbearer and habitat resilience, non-indigenous trapping, recreation, implementation costs, local employment and FNFN cultural values.

After review of the performance measures, the FNCSC tasked the BCTT with revising existing Scenario Three to increase protections in Maxhamish and Westside Fort Nelson

range boundaries as well as the Hay River and Shekilie AOIs, while minimizing impacts to highly merchantable forest profile and improving alignment with FNFN cultural values. Through its Land Stewardship Plan, FNFN identified spatial cultural values to inform this task.

The BCTT revised Scenario 3 spatial linework to develop a revised scenario that optimized overlap of cultural values with Management Types 1 and 2 and identified additional areas of the THLB and area-based forest tenures from Management Type 1 and 2 for conversion to Management Type 3.

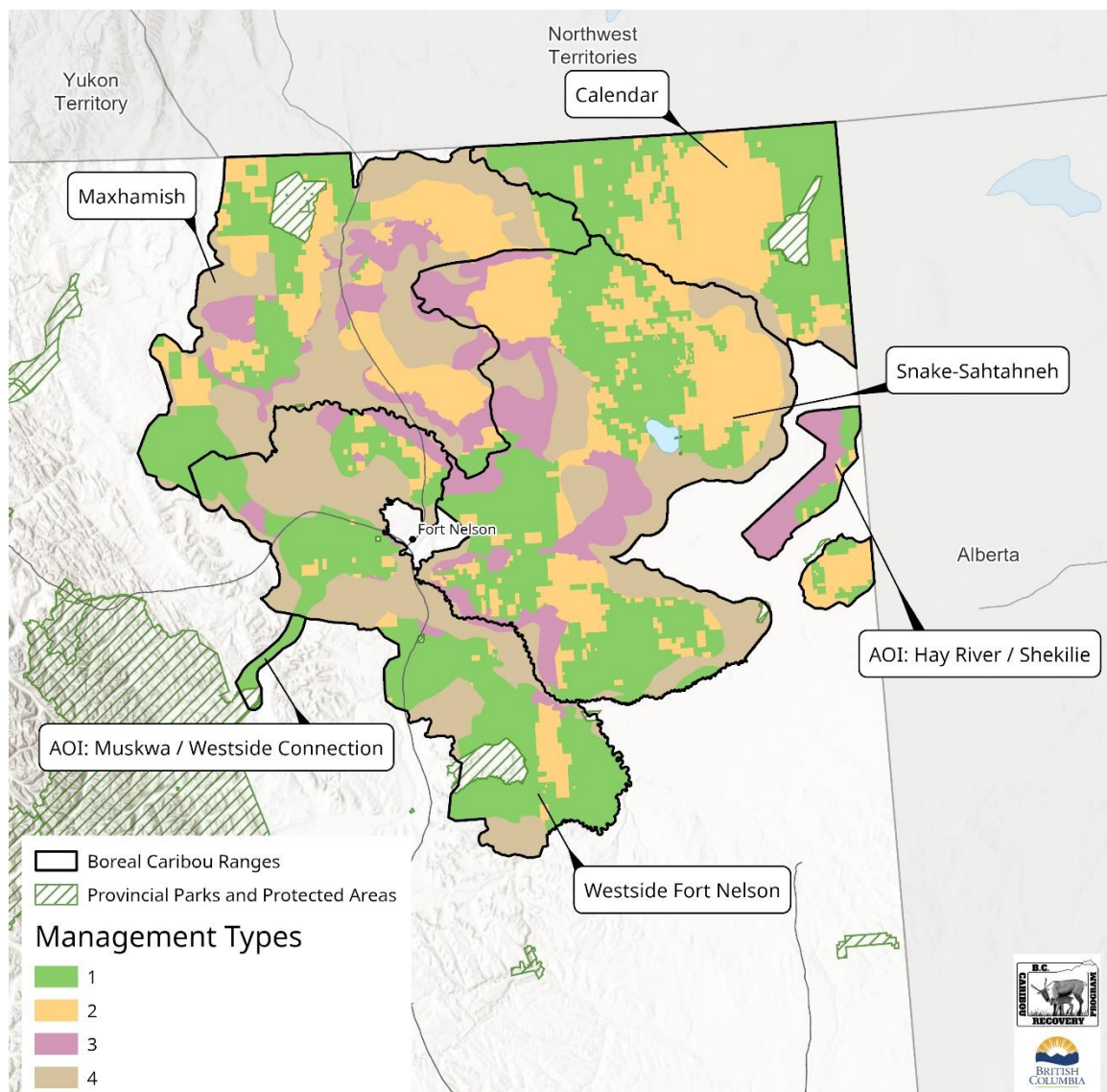


Figure 13: BCPRP Revised Scenario 3.

Appendix: Range Disturbance Summary

Outlined below are current disturbance levels of boreal caribou ranges estimated by the B.C. Government using a geographical information systems approach. Disturbance information was collated from the B.C. Geographic Warehouse and is up to date to December 2021. The source-data information is consistent with the disturbance data from the Regional Strategic Environmental Assessment. Amounts differ from Environment and Climate Change Canada's (ECCC) 2011 disturbance analysis which used remote sensing satellite imagery. When calculating cumulative disturbance, all disturbance sources (and buffers where applicable) are flattened and amalgamated to ensure that overlapping disturbances are not double counted. As such, each individual disturbance type cannot be added up to equal the cumulative disturbance based on this table alone.

There are unresolved issues relating to accuracy with both methods of disturbance assessment. The reported disturbance does not reflect potential regeneration of linear feature disturbances, and as such likely represents an overestimate of potential disturbance. Disturbance buffers of 500 m are included in disturbance assessments to account for behavioural responses of caribou to disturbance and provide for a representation of the zone of influence of a disturbance feature, consistent with ECCC analyses. BC Government estimates are reported as non-buffered and buffered.

	Herd Name	Calendar		Maxhamish		Snake-Sahtaneh		Westside Fort Nelson	
	Habitat	Herd boundary		Herd boundary		Herd boundary		Herd boundary	
	Area (ha)	558,625		1,011,989		1,345,052		832,511	
Habitat disturbances (500m buffer)	Agriculture	0.0%	(0.0%)	0.0%	(0.0%)	0.0%	(0.0%)	0.0%	(0.2%)
	Airstrip	0.0%	(0.1%)	0.0%	(0.0%)	0.0%	(0.5%)	0.0%	(0.0%)
	Mine	0.0%	(0.0%)	0.0%	(0.7%)	0.0%	(0.4%)	0.0%	(0.4%)
	Pipeline	0.1%	(3.7%)	0.1%	(4.2%)	0.1%	(9.2%)	0.1%	(3.1%)
	Rail	0.0%	(0.0%)	0.0%	(0.0%)	0.0%	(0.7%)	0.0%	(0.0%)
	Road	3.8%	(59.1%)	3.2%	(49.8%)	4.0%	(61%)	3.2%	(48.9%)
	Seismic	1.7%	(91.4%)	1.2%	(82.2%)	2.8%	(94.9%)	1.4%	(78.5%)
	Transmission Line	0.0%	(0.0%)	0.0%	(0.0%)	0.1%	(1.1%)	0.0%	(0.3%)
	Urban	0.0%	(0.4%)	0.0%	(1.6%)	0.0%	(1.6%)	0.0%	(0.5%)
	Well	0.1%	(5.5%)	0.0%	(0.9%)	0.0%	(0.8%)	0.0%	(0.2%)
	Cutblocks 1980-2020	0.0%	(0.0%)	2.4%	(11.1%)	0.6%	(3.5%)	3.3%	(16.8%)
	Wildfires 1981-2021 (no buffer)	16.1%	(16.1%)	1.3%	(1.3%)	4.0%	(4.0%)	2.7%	(2.7%)
	Cumulative Total 1981-2021 (500m buffer)	20.6%	(95.3%)	7.6%	(88%)	10.9%	(96.2%)	9.9%	(87.3%)

Appendix: Forestry and Petroleum Natural Gas Implication Summary

Outlined below is an assessment of implications associated with proposed conservation measures of the BCPRP for the forestry and petroleum and natural gas sectors. As noted in the BCPRP there are tangible and intangible co-benefits associated with proposed conservation measures including investments in habitat restoration, maintaining biodiversity, climate change mitigation, intact landscapes, restoring ability to exercise treaty rights, ecosystem health and the cultural linkages. These measures are not articulated in this summary but are recognized by the parties as important considerations for decision-makers.

Forestry

The Fort Nelson Timber Supply Area (TSA) is the second largest in British Columbia, covering an area of almost 9.9 million hectares. The forests in this area consist mainly of old and mature stands of spruce, pine, aspen, cottonwood, and birch. Aspen is the most common species within the Timber Harvesting Land Base (THLB) both in area and by volume.⁶ The current Allowable Annual Cut (AAC) for the TSA is 2,582,250 cubic metres (m³) with an additional 217,650 m³ available for harvest through the Fort Nelson Community Forest for a combined total AAC of 2,800,000 m³. Forestry and wood products manufacturing have historically been an important part of the economy of the Northern Rockies Regional Municipality (NRRM). Forest harvesting peaked around 2002, when nearly 1,500,000 m³ were harvested. The closure of local processing facilities in 2008 resulted in a rapid decline in forestry activity, with negligible levels of harvesting occurring in the region since. Revitalizing the forestry sector in the region and building the skilled labour force is a shared interest of the Province, Fort Nelson First Nation and the NRRM.

To support an understanding of the socio-economic implications of the draft BCPRP for a future forestry sector, an assessment of potential impacts was completed by the former Ministry of Forests, Lands, Natural Resource Operations and Rural

⁶https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/fort_nelson_tsa_discussion_paper_2018.pdf

Development's Forest Analysis Inventory Branch and the Economics and Trade Branch. Given current negligible harvesting levels, potential impacts on the forest sector need to be understood from the perspective of opportunity cost or foregone benefit of implementing the BCPRP, as there are no realized impacts on existing industrial operations or employment. The table below summarizes the maximum potential estimated opportunity cost impacts associated with the current proposed measures of the BCPRP.

	Volume Available for Harvest (m³)	Potential Employment	Potential Tax Revenue (\$)	Potential Crown Stumpage (\$)	Potential GDP (\$)
Current Available Volume	2,800,000	1,333	19,263,351	19,483,476	220,016,784
BCPRP Adjusted Volume	2,394,099	1,140	16,470,198	17,894,176	188,114,724
Opportunity Cost Impact	489,497	233	3,368,408	2,243,243	38,472,344

The estimates assume that the full AAC is harvested annually. Given that the full AAC volume is unrealized and under-committed it is assumed that negative impacts would be reduced. Further, the assessment utilizes impact coefficients for the Northern Interior and it is recognized that forestry activity in the Northeast Region does not conform to forestry activity of other northern areas and estimated impacts, particularly employment, are on the high side.

Petroleum and Natural Gas

Petroleum and natural gas (PNG) resource exploration, development and production in B.C. primarily occurs within the Western Canadian Sedimentary Basin (WCSB), which covers 14 million hectares of northeast B.C. Within the WCSB, PNG resources occur in conventional and unconventional plays. The most significant unconventional play trends in northeastern BC are the Montney play (tight gas/liquids/oil potential) in the central WCSB and the Liard, Horn River and Cordova Basins (shale gas potential) in the northern WCSB. Conventional plays were the main focus of PNG exploration and development activity for the past several decades but following the recent discoveries of large unconventional plays in BC, the primary focus of new PNG development activity has shifted to the extensive unconventional plays in the Montney play. The four herd

ranges of the BCPRP (Maxhamish, Snake-Sahtahneh, Calendar and Westside Fort Nelson) overlap one or more of the Liard, Horn River and Cordova Basins within the northern WCSB.⁷

The BCPRP maintains access to all existing tenured PNG resources. In recent years, owing to a lack of industry interest in further development within the northern WCSB, tenure has been reverted back to the Crown. Comparison of herd range PNG resource potential based solely on quantitative economic estimates is not advisable. There are uncertainties with the estimated economic values and there is not necessarily a direct correlation between the magnitude of the economic value estimates and the likelihood of future PNG resource development. The BCPRP maintains conditional access to existing tenured PNG resources. The table below provides an estimate of the proportion of reach range or Area of Interest tenured and the estimated potential resource volumes (conventional and non-conventional) within tenured and untenured locations.

Herd Range	Range Area (Ha)	Tenured Range Area	Untenured Range Area	Estimated Potential PNG Resource Volumes (Tcf)		
				Tenured Locations	Untenured Locations	Total
Calendar	558,625	33%	67%	4	5	9
Maxhamish	1,011,989	40%	60%	42	72	114
Snake-Sahtahneh	1,340,416	37%	63%	14	16	30
Westside Fort Nelson	837,147	10%	90%	3	32	35
AOI: Hay River / Shekilie	123,791	41%	59%	0.1	0.1	0.2
AOI: Muskwa / Westside Connection	18,852	0%	100%	-	0.03	0.0

⁷ Petroleum and Natural Gas Resource Assessment for Caribou Herd Ranges in Northeastern BC. 2018. Ministry of Energy, Mines and Petroleum Resources – Oil and Gas Division – Tenure and Geoscience Branch