



RECOVERY IMPLEMENTATION PLAN
FOR THREATENED WOODLAND CARIBOU
(*RANGIFER TARANDUS CARIBOU*)
IN THE HART AND CARIBOO MOUNTAINS
RECOVERY AREA, BRITISH COLUMBIA

August 2005

EXECUTIVE SUMMARY

The purpose of this document is to identify the steps that are most likely to lead to full recovery of threatened mountain caribou herds within the Hart and Cariboo Mountains. Full recovery is defined as:

“Maintaining a self-sustaining population of mountain caribou distributed throughout the recovery area in perpetuity.”

The major threat to mountain caribou is increased predation that appears to be related to habitat changes that increase the number and distribution of early seral ungulates and their associated predators in caribou habitat. It is also necessary to ensure that the caribou have adequate supplies of arboreal lichens, their primary winter food source. There is concern that disturbance and displacement of caribou from core winter range by snowmobiling and helicopter skiing may also be detrimental to these animals, and hinder recovery.

Key recovery actions include:

- i) Prohibit forest harvesting and all road building within core caribou habitat, except in exceptional cases that are discussed in the report;
- ii) Manage the forested land adjacent to core caribou habitat so that it will sustain natural levels of early seral ungulates and predators;
- iii) Restore the forested lands adjacent to core caribou habitat to a natural age class distribution that will sustain natural levels of early seral ungulates and predators;
- iv) Liberalise hunting to reduce early seral ungulate populations to levels that would occur in a natural forest age class distribution until habitat conditions recover;
- v) Reduce wolves and cougars in areas where caribou herds are critically endangered until the habitat has recovered;
- vi) Snowmobiling should be prohibited within most core caribou habitat, with the exception of special zones that have been identified within the report;
- vii) Helicopter skiing should be prohibited within some key portions of core caribou habitat, and operators should adopt practices that minimise disturbance in other areas of core caribou habitat.

Although there is consensus that full implementation of these recovery actions provides the best chance of achieving the objective, there remain significant concerns among some members that the objective is not biologically or socially feasible.

These concerns include:

- i) The recent increase in early seral ungulates and their associated predators within mountain caribou range may be largely a natural process or the result of human-induced climate change at the global scale. If so, habitat management will be inadequate to maintain mountain caribou without the use of ongoing predator-prey management. Some believe that we should not interfere with natural processes even if caribou continue to decline and become extirpated, whereas others believe we should use ongoing predator-prey management to maintain caribou.
- ii) The habitat management actions would have a major impact on the forest industry and some believe we should implement a combination of habitat management and ongoing predator-prey management that will maintain caribou while reducing the socio-economic impacts.
- iii) Given that predation is the primary threat to mountain caribou, some believe that the restrictions on snowmobiling and helicopter skiing are unnecessarily severe. Others believe that based on a precautionary approach, all helicopter skiing and snowmobiling within core caribou habitat should be prohibited.

PARTICIPANTS AND TERMS OF REFERENCE

The members of the Recovery Implementation Group focused on developing a plan that had the best chance of leading to full recovery of mountain caribou within the Hart and Cariboo Mountains. The group used the definition of full recovery from the RENEW recovery handbook, i.e. “restoring a species to a viable, self-sustaining population level...” (National Recovery Working Group 2004).

Members came from a variety of government ministries, industries, and public groups but did not represent or act as advocates for their organisation. All members had expertise in caribou ecology or aspects of land use that were relevant to caribou recovery.

The group received over 15 technical presentations on caribou ecology and recovery planning. Those presentations, in addition to published papers and reports, provided the scientific background for our recommendations. Traditional ecological knowledge of the Secwepemec people regarding caribou (Markey and Ross 2005) was incorporated into the recovery action plan.

Decisions were based on consensus whenever possible. Consensus was defined as all individuals believed that a decision was technically sound and supported by the best available information. When consensus could not be reached, dissenting opinions were acknowledged and reported.

The group did not thoroughly examine socio-economic trade-offs but considered allowance of some activities that did not unduly compromise caribou recovery.

The group used the precautionary principle to err on the side of caribou recovery in decisions where technical data were equivocal.

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1.0 BACKGROUND

Woodland caribou (*Rangifer tarandus caribou*) within the Southern Mountains National Ecological Area (SMNEA) were nationally listed as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in May, 2000. The SMNEA includes the southern two-thirds of British Columbia east of the Coast Mountains, and extends into the foothills of the Rocky Mountains in Alberta (Figure 1).

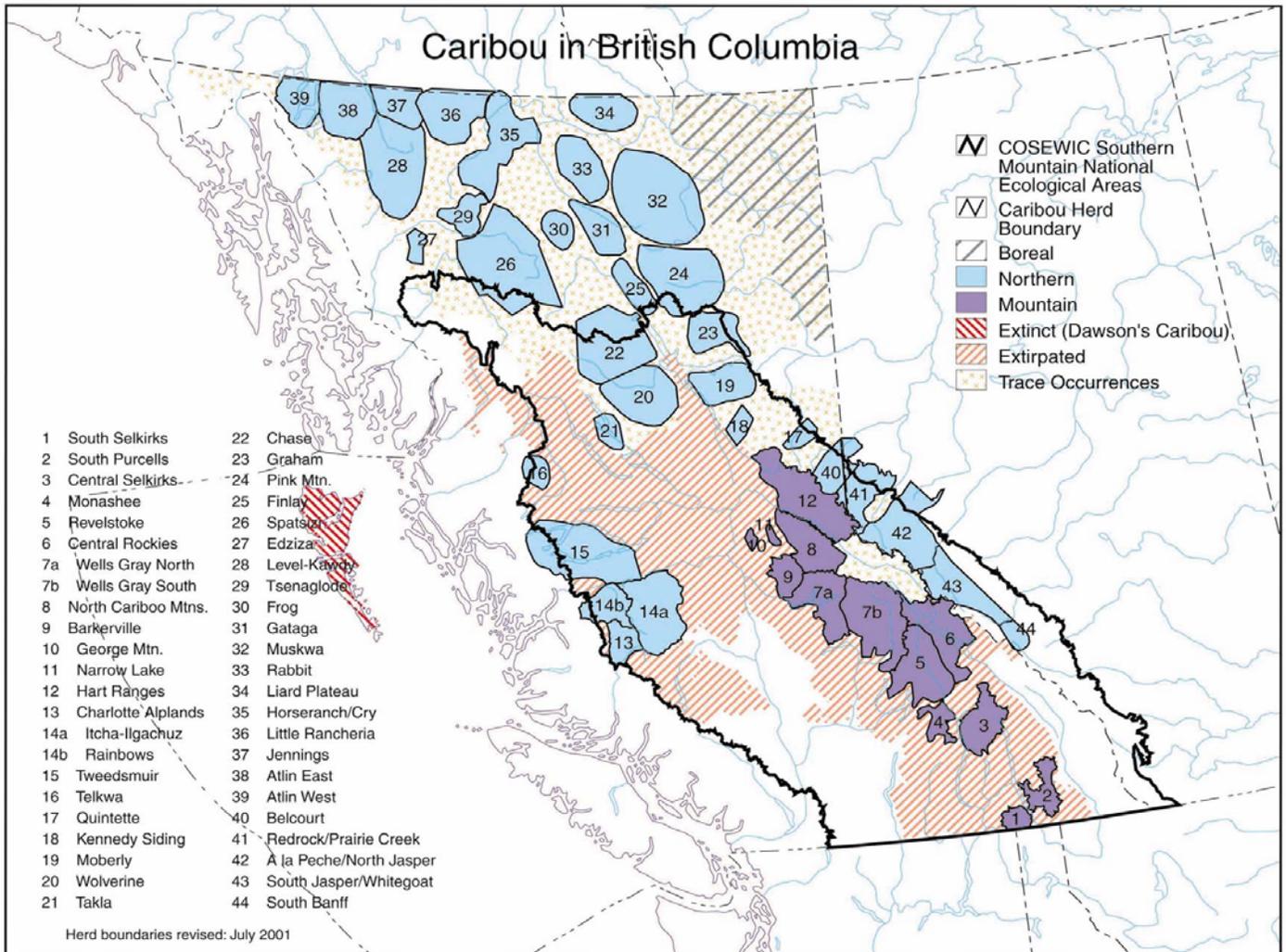


Figure 1. Distribution of woodland caribou herds in British Columbia showing the Southern Mountains National Ecological Area.

Although all of the caribou within the SMNEA belong to the woodland caribou subspecies, biologists in British Columbia recognise two different caribou ecotypes within that area, based on differences in behaviour and ecology (Stevenson and Hatler 1985).

- i) *Mountain caribou ecotype*: these caribou live in south-eastern B.C., from the mountains east of Prince George, down to the United States border. The caribou live at high elevations for most of the year. In winter, deep snow depths limit their ability to obtain forage, and so they feed primarily on arboreal lichens. These caribou are red-listed in B.C., which means that they are currently endangered or threatened.
- ii) *Northern caribou ecotype*: these caribou live in mountainous areas of west-central and northern B.C. In winter, these caribou select areas with reduced snow accumulations, such as windswept alpine or low elevation pine forests, and feed primarily on terrestrial lichens. These caribou are blue listed in B.C., which means that they are vulnerable, but not yet threatened or endangered.

Given the major differences in the ecology and current population status of these two caribou ecotypes, B.C. decided to develop separate recovery plans for mountain and northern caribou within the SMNEA (Figure 2).

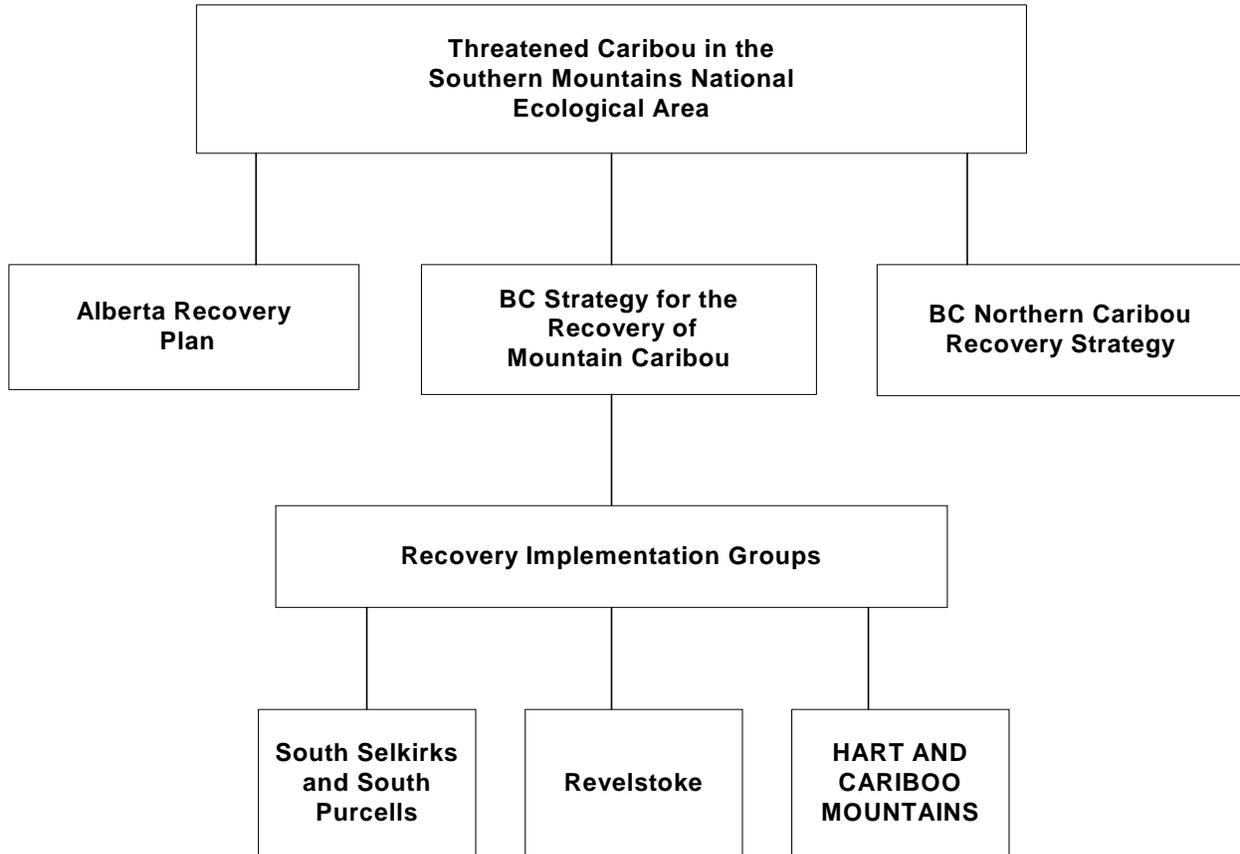


Figure 2. Relationship of the Hart and Cariboo Mountains Recovery Implementation Group to the broader recovery planning process within the Southern Mountains National Ecological Area.

“A strategy for the recovery of mountain caribou in British Columbia” was released in September 2002 (MCTAC 2002). The mountain caribou recovery strategy recommended that the mountain caribou range be further sub-divided to allow the development of more locally relevant Recovery Implementation Plans. The recommended subdivisions were:

- i) South Selkirks and South Purcell herds
- ii) Revelstoke, Central Rockies, Monashee and Central Selkirks herds, and
- iii) Northern populations of Mountain caribou.

Each of these subdivisions represents areas of different caribou ecology and current population status. This Recovery Implementation Plan is for the northern populations of mountain caribou.

1.1 Hart and Cariboo Mountains Recovery

1.1.1 Recovery Area

To avoid confusion with northern ecotype caribou, the Recovery Implementation Group decided to refer to the northern populations of mountain caribou as the Hart and Cariboo Mountains Recovery Area. The Recovery Area includes the mountain caribou populations in and adjacent to the Hart Range of the Rocky Mountains, and the Cariboo Mountains. Historically, caribou distribution was contiguous throughout the Recovery Area, but as numbers declined, populations have become somewhat fragmented and isolated.

Several different herds are recognised in the area (Figure 1) including:

- i) Hart Ranges
- ii) North Cariboo Mountains
- iii) Narrow Lake
- iv) George Mountain
- v) Barkerville
- vi) Wells Grey North
- vii) Wells Grey South

The George Mountain herd became extirpated in 2003.

Wittmer *et al.* (2005) evaluated the radio-telemetry data for all mountain caribou herds and produced an alternative list of sub-populations that have limited spatial overlap. He identified 8 sub-populations (Figure 3) within the Hart and Cariboo Mountains Recovery Area:

- i) Hart Ranges
- ii) North Cariboo Mountains
- iii) Narrow Lake
- iv) George Mountain

- v) Barkerville
- vi) Wells Gray
- vii) Allan Creek
- viii) Groundhog

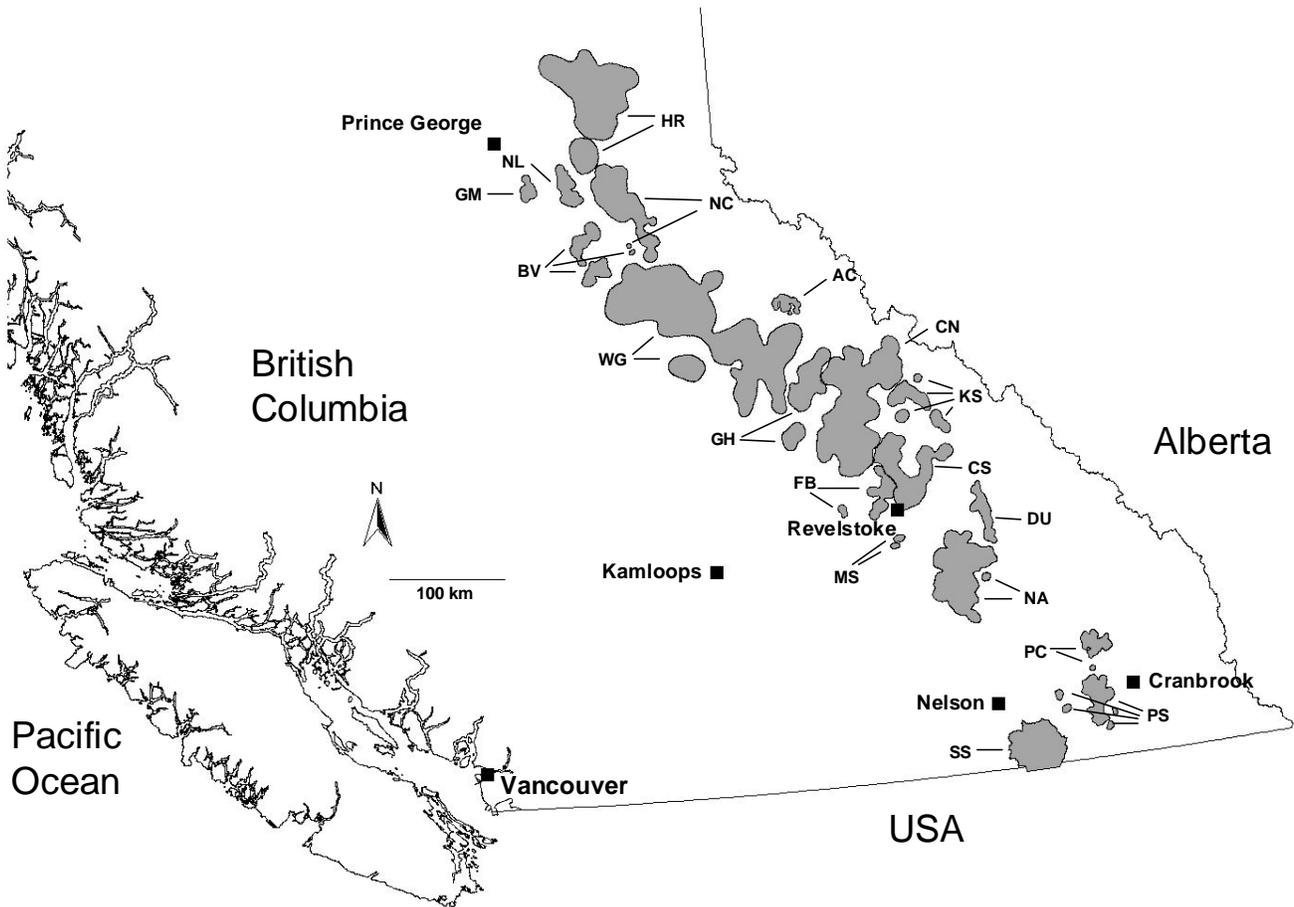


Figure 3. Map of current distribution and population delineation (from telemetry data using 95% fixed kernel utilization distributions) of identified subpopulations of mountain caribou in British Columbia: South Selkirks (SS), Purcells-South (PS), Purcells-Central (PC), Nakusp (NA), Duncan (DU), Monashee-South (MS), Columbia-South (CS), Frisby-Boulder (FB), Columbia-North (CN), Kinbasket-South (KS), Groundhog (GH), Wells Gray (WG), Allan Creek (AC), Barkerville (BV), North Cariboo Mtn. (NC), George Mtn. (GM), Narrow Lake (NL), Hart Ranges (HR). (from Wittmer et al. 2005).

The only differences between these two classifications is that Wittmer (2004) concluded that the Wells Gray North and Wells Gray South herds were not distinct, and that the Allan Creek

and Groundhog herds were isolated from the rest of the caribou in Wells Gray. However, more recent telemetry data indicate some movement between Allan Creek and the Wells Gray population.

The northern boundary of the Recovery Implementation Plan is the boundary between the Prince George and Mackenzie Forest Districts (Figure 4). There are caribou north of this line, but they are northern ecotype caribou belonging to the Kennedy Siding herd. The northeastern boundary then runs along the height of land of the Rocky Mountains. The caribou on the eastern side of the range are northern ecotype caribou, belonging to the Quintette and Belcourt herds. Some of those caribou are west of the height of land in summer, but return to the eastern side of the mountains for the winter. In the Robson Valley, the boundary moves west from the height of land and follows Cushing Creek. The mountains east of Cushing Creek do not provide habitat for mountain caribou, but do provide summer habitat for caribou from the Redrock and Prairie Creek herds that winter in Alberta. The boundary then follows the Rocky Mountain Trench to the top end of Kinbasket Reservoir where it follows the height of land between the Fraser and Columbia watersheds, down to the head of Adams Lake. There are mountain caribou east of this boundary, but they belong to the Central Rockies herd and are included in another Recovery Implementation Plan. The boundary then extends across the Fraser Plateau, south and west of the mountains and foothills back to Reynolds Creek. This boundary is somewhat arbitrary and is simply located to encompass the entire mountain caribou habitat to the north and east. There are no caribou immediately west of this boundary.

1.1.2 Current Status

In March 2002, all of the caribou range within the Recovery Implementation Area was censused and 1059 caribou were counted. When total counts were corrected to account for missed animals, the population estimate was 1414 caribou. This represented 75% of the estimated 1900 mountain caribou in B.C at that time (MCTAC 2002). Some of the herds were counted again in 2004 and reported declines since 2002 (Table 1).

Most of the herds within the Recovery Area have been declining or have been just barely stable over the past decade, and the occupied range is shrinking (Table 1). A population viability analysis has indicated that all but the Hart Range herd are likely to go extinct under current conditions (Wittmer 2004). Although the Hart Range Herd has increased over the past few years, there is still concern about its future because other mountain caribou herds that recently appeared to be stable have since undergone major declines (eg. Revelstoke, Wells Gray).

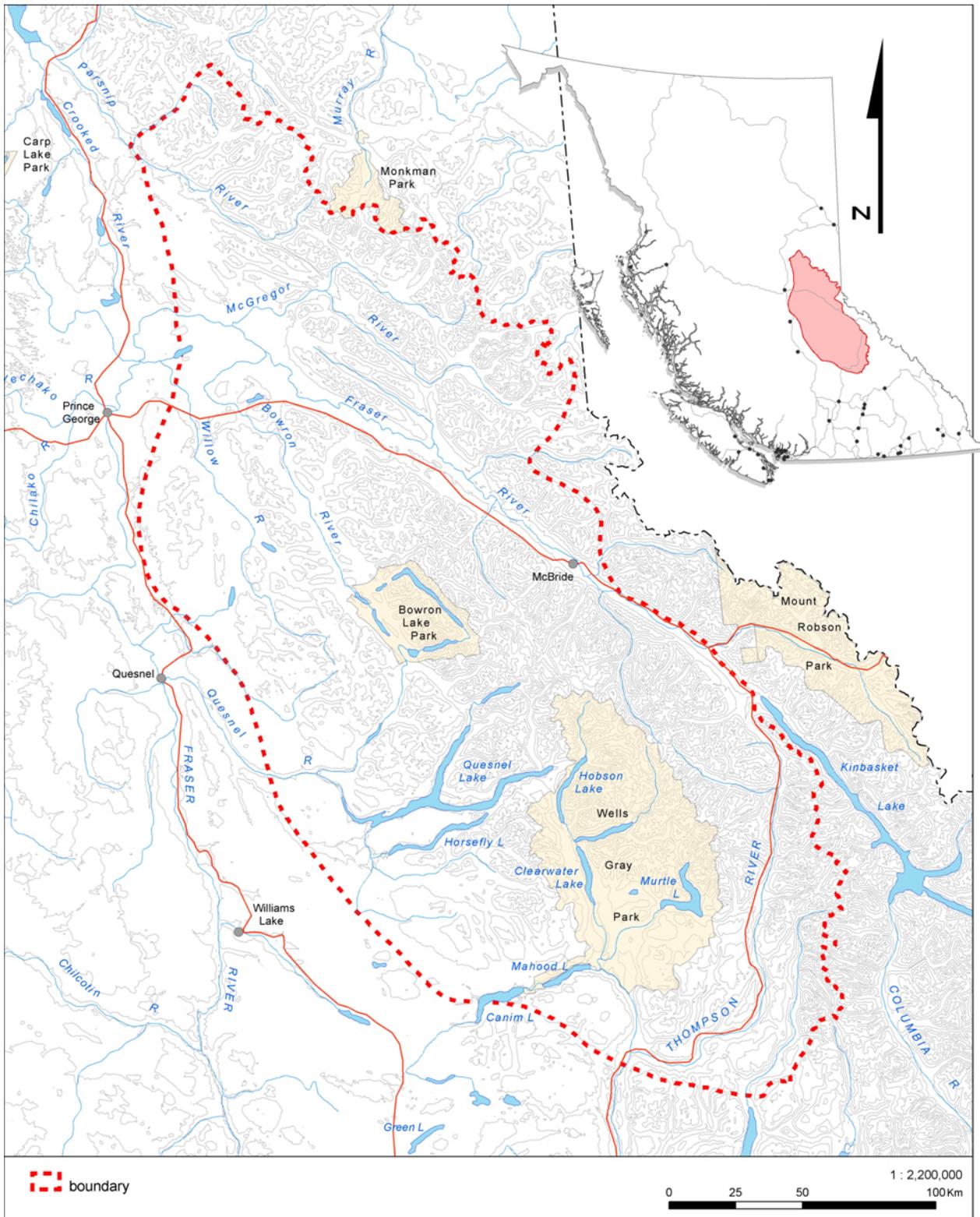


Figure 4. Boundary of the Hart and Cariboo Mountains Recovery Implementation Area.

Table 1. Size and trend of caribou herds in the Hart and Cariboo Mountains. Numbers show population estimate and year of census (updated from Wittmer *et al.* 2005).

Herd Name	1990's Population Estimates	2000's Population Estimates	Lambda¹
Hart Ranges	360 (1992)	460 (2005)	1.02
Parsnip portion of Hart Ranges	not counted	99 (2005)	?
George Mountain	23 (1992)	0 (2004)	.82
Narrow Lake	77 (1999)	41 (2005)	.90
North Cariboo Mtns.	267 (1993)	283 (2005)	1.00
Barkerville	47 (1994) ²	54 (2005)	1.01
Allan Creek	not counted	50 (2004)	?
Wells Gray	628 (1995)	307 (2004)	.92
Groundhog	43 (1995)	20 (2004)	.92
Total		1314 (2005)	

¹ Lambda is the annual population growth rate where 1 is a stable population.

² This value differs from Wittmer *et al.* (2005) because it is corrected using the average sightability rather than the sightability for the 1994 survey which was based on only 2 collared animals.

2.0 RECOVERY OBJECTIVE

The National Recovery Working Group defines full recovery as restoring a species to a viable, self-sustaining population level (National Recovery Working Group 2004). Achieving full recovery will result in the species being down-listed by COSEWIC. In cases where full recovery is not biologically possible, a goal of survival (maintaining current population size and distribution) should be established.

The objective of this plan is to maintain a viable, self-sustaining population of mountain caribou distributed throughout the Recovery Area in perpetuity. The key to achieving this recovery objective is to restore and maintain habitat conditions across the Recovery Area that will allow caribou populations to be stable and self-sustaining. Once habitat conditions have been restored, it is hoped that stable or increasing caribou numbers would become established. If populations remained stable for 3 generations (about 24 years) they would be eligible for down-listing. It is also hoped that viable caribou herds would be well distributed throughout the Recovery Area, and possibly increase their use of some currently unoccupied habitat. However, if some areas are not able to support self-sustaining populations, caribou will continue to disappear from those areas.

The Strategy for the Recovery of Mountain Caribou in British Columbia sets a population target of 2500-3000 mountain caribou in B.C. (MCTAC 2002). This objective would necessitate increasing the population in the Hart and Cariboo Mountains to more than 2000 caribou. It is not known if the MCTAC population objective could be self-sustaining and achieving that target may necessitate ongoing management of predator and prey populations. If the population target is not self-sustaining, the choice between the potentially conflicting objectives will need to be resolved in the future.

2.1 Is Recovery Feasible?

The primary cause of declining mountain caribou populations in B.C. appears to be predation by wolves, bears and cougars (Bergerud 1974, Seip 1992, Kinley and Apps 2001, Wittmer 2004, Wittmer et al. 2005). The intensity of predation is related to the abundance of other ungulate prey species such as moose, elk or deer within the range of mountain caribou. It appears that the presence of those other ungulate species attracts and supports increased predator numbers that results in increased predation on caribou (Seip 1992). Within the Hart and Cariboo Mountains Recovery Area, enhancement of the moose-wolf system appears to be the primary threat to mountain caribou, although the deer-cougar system may be becoming increasingly important.

The increased overlap between caribou and other ungulate species is the result of both natural and human-caused processes that have occurred over the past century.

- i) Moose colonised the Hart-Cariboo Mountains Recovery Area between 1910 and 1930 (Peterson 1955), possibly due to warmer temperatures following the end of the Little Ice Age in the 1800's (Luckman 2000).
- ii) Climatic warming throughout the 20th century has further enhanced the environmental conditions for early seral ungulates. Moose populations have flourished and elk and deer populations have become more widespread and abundant in many areas of mountain caribou range. That process may be related to human activities at the global scale that are beyond the scope of this local Recovery Implementation Plan.
- iii) Human settlement and forest harvesting have increased the amount of early seral habitat, roads and linear corridors within and adjacent to mountain caribou habitat. The early seral habitat can increase the abundance and distribution of moose, elk and deer within caribou habitat. Roads and linear corridors can increase the movement of other ungulates and predators into caribou habitat (James and Stuart-Smith 2000). Some members of the Secwepemc people reported that forest harvesting brings in different animals and changes the food chain within caribou habitat, resulting in an increased number of predators (Markey and Ross 2005).

Although local human-caused factors undoubtedly contribute to caribou population declines, it is unclear if mountain caribou populations would be naturally viable even in the absence of the

human-caused factors. The population decline began in the 1920's (Bergerud 1974) before there was a major impact of human activities on the landscape. Population declines have recently occurred in areas with little significant human impact on the landscape, such as Wells Gray Provincial Park. However, it may be that those declines are related to activities that are occurring outside the park.

If mountain caribou are no longer naturally viable, the only way to maintain their populations is to rely on permanent predator and prey management programs to reduce wolves, and possibly cougars. That approach is inconsistent with the objective of maintaining a “self-sustaining population”. If environmental conditions have naturally changed (or have changed due to human activities at the global scale) to create a predator-prey system where caribou can only be maintained with permanent predator and prey control programs, then it will be impossible to achieve the objective to maintain a self-sustaining caribou population. It would be necessary to decide if permanent predator and prey management programs should be used to maintain caribou, or if caribou populations should be allowed to decline and possibly disappear from natural predation.

The distinction between these two options is further complicated because hunting of moose, elk and deer and hunting and trapping of predators are commonly accepted practices throughout mountain caribou range. Continued use of those practices to maintain caribou may be acceptable to the public, whereas implementing a predator control program may not.

However, before a decision is made about permanent predator-prey management, it is first necessary to minimise the local, human-caused impacts on mountain caribou to determine if it is possible to establish a self-sustaining population over the next 30-50 years. This includes:

- i) Restoring and then maintaining critical seasonal habitats in a natural state;
- ii) Reducing and then maintaining early seral ungulates and predators at numbers at or below what would occur on a natural landscape;
- iii) Minimising disturbance of caribou in those areas.

The intent is that at least in some areas, these practices will allow caribou populations to become naturally self-sustaining. If these management practices are in place and caribou populations continue to decline, then it must be concluded that the decline is primarily a natural process and establishing a viable, self-sustaining population is not feasible. At that time, it will have to be decided if caribou should be left to decline, or maintained with ongoing predator and prey management. However, that decision should only be made after we are confident that the local human impact has been largely eliminated.

3.0 HABITAT REQUIREMENTS OF MOUNTAIN CARIBOU

The habitat use of mountain caribou within the Recovery Area has been extensively studied, and the caribou exhibit fairly similar habitat use patterns (Seip 1990, Seip 1992, Terry et al. 1996, Terry et al. 2000, Apps and Kinley 2000, Johnson et al. 2004, Markey and Ross 2005).

3.1 Late Winter (January-April)

In late winter, almost all mountain caribou in the Recovery Area use subalpine and parkland forests near treeline, and feed almost exclusively on arboreal lichens. This habitat has the following characteristics:

- i) The upper portion of the Engelmann Spruce-Subalpine Fir Biogeoclimatic Zone;
- ii) Forest cover inventory includes alpine, alpine forest, and balsam (subalpine fir) leading or major component;
- iii) Gentle slopes generally less than 45%;
- iv) Mature and old forest age classes;
- v) The elevation of this habitat type becomes progressively lower (1750 m to 1200 m) as you move from south to north within the Recovery Area and the treeline becomes lower.

The caribou feed almost exclusively on arboreal lichens while on late winter range so there is a need to maintain sufficient old forest habitat to provide forage. There is a concern that excessive backcountry recreation activities on preferred winter ranges will displace the caribou into inferior habitats. Mountain caribou are sometimes killed in avalanches on late winter ranges when they live in areas of steep terrain. Predation in late winter is usually low, but they are occasionally killed by wolverines, and there is a concern that packed roads and trails will increase the use of the late winter ranges by wolves or cougars.

3.1.1 Late Winter Habitat Management Objectives

Managing late winter habitat for mountain caribou includes the following objectives;

- i) Maintain the availability of arboreal lichens for forage.
- ii) Limit disturbance that can displace caribou to less favourable habitats or increase stress and energetic expenditures.
- iii) Limit packed or ploughed travel routes that will improve access for predators.

3.2 Spring (April-May)

In spring, caribou generally move to lower elevations to obtain new green vegetation in snow-free areas. These areas can include open avalanche chutes, cutblocks, roadsides or natural forest openings. Some caribou will move down to valley bottoms but most just move to slightly lower elevations in the ESSF forest.

Spring habitats are generally not mapped or specifically managed for caribou.

3.3 Summer (May-October)

Caribou give birth to their calves in late May and June. Most calving occurs near treeline in subalpine forests, or in the alpine. Mountain caribou remain at upper elevations throughout the summer, using both subalpine forests and alpine until October. Caribou feed on a variety of graminoids, forbs and shrubs throughout the summer but also continue to feed on lichens. Characteristics of this habitat include:

- i) The upper portion of the ESSF zone and the Alpine Tundra zone.
- ii) Forest cover inventory includes alpine, alpine forest, and balsam (subalpine fir) leading stands.

These summer habitats are similar to late winter habitats, and in some cases the caribou use the same areas in winter and summer. However, in other areas caribou use different areas in winter and summer, migrating up to 60 km between seasonal ranges (Seip 1990). Caribou are more likely to use steep and rugged terrain in summer than they are in winter (Seip 1990).

Caribou experience highest mortality due to predation during the summer period (Seip 1992, Wittmer et al. 2005). A higher vulnerability to predation appears to be associated with early seral conditions (Wittmer 2004, Kinley and Apps 2001) which increases the overlap between caribou and predators. Early seral habitat attracts other ungulate species such as deer, elk and moose, and the presence of those prey attract predators such as wolves and cougars. The presence of roads may also improve access for predators to upper elevation habitat and increase their movement rate through caribou habitat (James and Stuart-Smith 2000). In Alberta, increases in road densities and the amount of early seral habitat have been related to increased mortality and population declines of caribou (James and Stuart-Smith 2000, Alberta Woodland Caribou Recovery Team 2004, Smith 2004)

Roads to subalpine areas will also improve access for hunters, and potentially lead to caribou being killed by poachers, or accidentally shot by hunters who misidentify them (Johnson 1985). Motorised vehicles in the summer range may also displace caribou from preferred habitat areas (Dyer et al. 2002).

3.3.1 Summer Habitat Management Objectives

Managing summer habitat for mountain caribou includes the following objectives:

- i) Limit the creation of early seral habitats that will attract and support other ungulates and bears;
- ii) Limit, deactivate or control road access to upper elevation areas to reduce disturbance, predator access and human access;
- iii) Limit or control motorised recreation (particularly in identified calving areas).

3.4 Early Winter (October-January)

When snow begins to accumulate at upper elevations, mountain caribou generally move to somewhat lower elevations. Most caribou in the Recovery Area just move to slightly lower elevations within the ESSF zone. However, within the more rugged, high snowfall areas of the Recovery Area, some caribou will move into the Interior Cedar Hemlock forests in the valley bottoms. This behaviour is more common towards the southern portion of the Recovery Area. Caribou feed on arboreal lichens from trees and litter-fall, as well as shrubs and forbs during this period.

The characteristics of early winter range in the ESSF include:

- i) The lower to upper portions of the ESSF zone;
- ii) Forest cover inventory dominated by subalpine fir, but more spruce than in late winter ranges;
- iii) Gentle slopes generally <45%;
- iv) Old and mature forest age class.

The characteristics of early winter range in the ICH include:

- i) Cedar-hemlock forests;
- ii) Gentle slopes generally <45%;
- iii) Old and mature forest age classes.

3.4.1 Early Winter Habitat Management Objectives

Managing early winter habitat for mountain caribou includes the following objectives:

- i) Maintain the availability of arboreal lichens for forage;
- ii) Maintain canopy cover that will intercept snow and allow foraging on shrubs and forbs;
- iii) Limit the creation of early seral forests that will provide habitat for early seral ungulates and will encourage increased use by predators:
- iv) Limit disturbance that can displace caribou to less favourable habitats or increase stress and energetic expenditures;
- v) Limit packed or ploughed travel routes that will improve access for predators.

3.5 Movement Corridors

Some, but not all, caribou migrate between winter and summer ranges, and move through low elevation forests between those ranges during the spring and fall period. Caribou may also move through valley bottoms between different winter ranges. In some areas, caribou movement corridors have been delineated across valley bottoms to provide a linkage between upper elevation ranges. The rationale for those corridors is that caribou may be hesitant to move through young, dense forest. The management objective is to ensure that the corridor consists of forest types that are not barriers to movement. This may include old and mature stands, partial cut stands, and/or well-spaced stands.

3.6 Matrix Habitat

Matrix habitat is the habitat adjacent to core caribou habitat. Much of the low elevation habitat adjacent to mountain caribou ranges may not be regularly used by caribou, but the habitat conditions within those areas may have significant impacts on the predator-prey relationships of the caribou. Matrix habitat also serves as migration routes for caribou in areas where migration corridors are unknown or poorly defined. Enhancement of early seral ungulates in matrix habitat is likely to result in increased predators and predation risk to the caribou. Existing caribou management strategies usually did not address this concern, although some did recommend that moose enhancement should not be done in areas that were close to caribou habitat. The RIG believes that reducing and then maintaining early seral ungulates and predators at numbers that would occur within a natural forest age class distribution must be part of the recovery strategy. That objective can be accomplished using both habitat management, and predator-prey management practices.

4.0 MANAGEMENT PRACTICES PRIOR TO THE RIG

There was no previous consistent caribou management strategy within the Recovery Area because the area includes a variety of jurisdictions for different provincial resource management Ministries. Existing management practices also represented the recommendations from several different public land use planning processes that occurred in the 1990's. Nonetheless, all of the area did have some form of caribou management strategy in place in 2002 (MCTAC 2002). The Recovery Implementation Group decided to build on those existing management practices. The RIG evaluated existing management practices to determine if they were adequate, and recommended alternative practices where necessary to support caribou recovery.

Management practices that were reviewed to support caribou recovery included:

1. Habitat mapping and habitat protection;
2. Access and backcountry management;
3. Predator control;
4. Monitoring and research.

5.0 HABITAT MAPPING

Habitat for caribou has been mapped throughout the Recovery Area using a variety of techniques:

- i) Manual mapping using information on caribou distribution and habitat characteristics such as elevation, forest type and slope to delineate critical habitat.
- ii) Analysis of radio-telemetry data to develop Resource Selection Functions (RSF) that predict habitat suitability. The RSF can then be used in a GIS to map caribou habitat suitability. This approach has been applied throughout the Recovery Area (Apps and Kinley 2000, Johnson et al. 2004).
- iii) Mapping habitat in a GIS using queries based on habitat characteristics known to be important to caribou.

Each of the three regions of the Ministry of Water, Land and Air Protection within the Recovery Implementation Area presented a map of critical habitat and the associated forest management practices to the Recovery Implementation Group for evaluation. The RIG evaluated the maps and management strategies for each Region to determine if they were adequate to achieve caribou recovery.

5.1 Categories of Critical Habitat

Understanding that areas adjacent to caribou seasonal habitats are also critical to mountain caribou recovery, the RIG recommends three categories of critical habitat management:

5.1.1 Core Habitat

All seasonal habitats used by caribou. Management recommendations:

1. No timber harvesting or roads, except in exceptional situations described later in the plan;
2. Manage disturbance from back-country recreation;
3. Directly manage predator and prey populations until habitat has recovered to a natural early-seral stage distribution.

5.1.2 Matrix Habitat

Matrix habitat is defined as habitat adjacent to core caribou habitat. Matrix habitat is the source of predators that are impacting the caribou population. It may also contain migration routes used by the caribou.

5.1.2.1 Management Recommendation:

1. Maintain wolves and cougars at numbers that would occur under a natural disturbance regime through habitat management, prey management, and/or predator management.

5.1.3 Corridors

Areas through the matrix habitat that have been mapped as caribou movement corridors.

5.1.3-1 Management Recommendation:

1. Schedule the pattern of harvest and stand management over time to ensure that caribou can always move through the corridor using stands that are not a barrier to movement.

5.2 General Recommendations to Improve Mapping & Forest Management

1. Include all seasonal habitats as critical core habitat

In the past, much of the effort in habitat protection has concentrated on winter ranges. The belief that winter ranges were the most limiting for ungulates was the underlying assumption for this practice. Consequently, there have been management tools in place such as Ungulate Winter Range designations to protect winter habitat.

However, for mountain caribou, most of the mortality of both adults and calves occurs on the spring, summer and fall ranges (Seip 1992, Wittmer et al. 2005). Winter is usually the period with the highest survival rate. The major cause of mortality is predation, and caribou are relatively safe from predators during winter due to spatial separation (Seip 1992).

Consequently, the RIG believes that summer habitat is equally or more critical to caribou recovery than is winter habitat. Creation of early seral habitat and construction of linear corridors within upper elevation summer range has the greatest potential to increase mortality of mountain caribou due to predation. Therefore, all seasonal habitats including summer should be considered critical habitat.

Winter and summer habitat types are quite similar so in many cases, protection of winter ranges also protects summer ranges by default. However, in places where caribou exhibit a migration to more rugged habitat in the summer, that summer habitat may not be included in current winter range habitat areas.

The RIG recommends that all of the seasonal habitats (summer, early winter, and late winter) should be mapped as critical habitat.

2. Recognise that some areas of historic caribou habitat are no longer viable

Given the objective of maintaining self-sustaining caribou herds, without the need for permanent predator control, the RIG recognises that some areas of historic caribou habitat are no longer viable. For example, areas that are in close proximity to permanent human settlement, and non-migratory herds that lack alpine calving habitat are likely no longer viable. Settled areas provide a permanent source of early seral ungulates that will support predators in the absence of ongoing predator control. Areas without alpine habitat for calving do not provide the spatial separation from early seral ungulates and predators that is required by caribou. Caribou have already disappeared from many of these areas and it is not likely that they can be recovered (Heard and Vagt 1998). These areas should be identified, and a written rationale should be provided for areas that are considered to be no longer viable as caribou habitat.

3. Habitat reserves are the best management strategy for all seasonal habitats

Current forest management guidelines in most areas include a combination of no-harvest reserves and special management zones (Kamloops LRMP, Prince George LRMP, Cariboo- Chilcotin Land Use Plan, Mountain Caribou Strategy of 2000). The special management zones allow modified harvesting practices that will retain some lichens in the harvested stands. This approach was developed as a trade-off between caribou habitat protection and reducing economic impacts in a variety of land use planning processes. The intention was that those areas would provide winter forage for caribou, as well as sufficient useable habitat for them to space out and avoid predators.

The special management practices are undoubtedly better for caribou than conventional forest management practices, but it has not been demonstrated that they are adequate to meet caribou recovery objectives. Although silvicultural practices have been developed which maintain arboreal lichens in harvested stands (Armleder and Stevenson 1996, Coxson et al. 2003); these practices still require extensive road networks to be constructed in caribou habitat. Road networks increase the movement of wolves and risk of predation for caribou (James and Stuart-Smith 2000, Smith 2004). Roads into partial cutting blocks have also provided new access for snowmobiles into caribou winter range. Partial cutting without roads may be a satisfactory solution to consider in the future if research demonstrates that it does not lead to increased use by early seral ungulates and predators.

To date, there has been limited harvesting within these special management zones and most areas currently exist as undisturbed old forest. Despite that level of old forest availability, most mountain caribou herds are currently declining. If herds are declining when the special management areas are largely unharvested, it is unlikely that we can expect population recovery to occur if harvesting is allowed within those areas. If populations are declining under the current habitat conditions, it is not adequate to simply slow the rate of additional habitat loss, but rather the amount and quality of habitat must be increased if recovery of self-sustaining populations is to occur.

Therefore, maintaining all core seasonal habitats as Habitat Reserves (no harvest areas) is recommended as the best strategy at this time to achieve the objective of creating self-sustaining caribou populations. In the future, if research demonstrates that harvesting can occur without increasing the risk of predation, some of those areas could become available for harvest.

4. Recognise that management practices in adjacent matrix habitat are also important

Areas of caribou seasonal habitats are usually adjacent to low elevation forested areas that the caribou rarely or never use. However, those areas are usually the source of other ungulates and predators that contribute to excessive predation on caribou (Seip 1992). The RIG recommends that areas adjacent to caribou habitat should also be mapped as critical habitat, with a management objective of maintaining natural levels of ungulates and predators. The tools for achieving that objective are discussed under “Predator-prey Management” (Section 6.1).

5.3 Region-Specific RIG Habitat Mapping and Management Recommendations

5.3.1 Omineca Region

The original caribou habitat mapping was done by hand in the early 1990’s based on information about winter caribou distribution and habitat selection. The mapping was refined

over the years as new information from telemetry studies (Terry et al. 1996, Terry et al. 2000) and surveys became available (Seip 2003). An alternative map was produced in 2002 based on resource selection functions (Johnson et al. 2004). That map closely corresponded to the hand drawn map and did not indicate any need to modify the existing habitat maps.

The mapping differentiated the habitat into Caribou High, Caribou Medium and Caribou Corridor categories. Caribou High habitat was typically in the higher elevation areas whereas the Caribou Medium Zone was typically the adjacent mid-elevation habitat. Caribou High Zones were reserved from forest harvesting. Caribou medium zones allowed partial cutting systems that removed up to 1/3 of the volume every 80 years. These zones were managed as Ungulate Winter Ranges under the Forest and Range Practices Act.

5.3.1.1 Recommendations for Habitat Recovery

The RIG evaluated the Omineca habitat zones and management practices and provided the following recommendations:

1. Protection of summer range is as important as protection of winter range. The current winter habitat maps largely encompass summer ranges by default, but some additional summer habitat may need to be added.
2. Some areas of historic habitat are no longer viable. Consequently, those areas should not be mapped as critical habitat and a written justification should be provided.
3. Both the Caribou High and Caribou Medium Zones should be classified as Critical Core Habitat, and be reserved from forest harvesting and road-building. Existing roads should be rehabilitated and reforested to prevent human access, and reduce predator access.
4. A buffer area of matrix forest surrounding the caribou habitat zones should be mapped as critical habitat that will be managed to maintain natural levels of early seral ungulates and predators. That area should extend far enough to incorporate areas that are likely to significantly impact the predator-prey relationship of caribou.

The recommended mapping was completed by the RIG (Appendix A).

5.3.2 Cariboo Region

The original caribou habitat mapping was done in 1980 and delineated most of the high elevation areas as a 20 year no-harvest deferral. This deferral was recognised in all Timber Supply Reviews. The map was refined using Resource Selection Functions based on many years of radio-telemetry data (Apps and Kinley 2000) and was presented in the Cariboo-Chilcotin Land Use Plan, Mountain Caribou Strategy of 2000.

That strategy divided the winter habitat into no-harvest and modified-harvest areas. Modified-harvest areas allowed partial cutting systems that remove up to 1/3 of the volume every 80 years. Both the no-harvest and modified harvest areas were officially designated as Wildlife Habitat Areas in 2004.

5.3.2-1 Recommendations for Habitat Recovery

The RIG evaluated the Cariboo Region habitat zones and provided the following recommendations:

1. Protection of summer range is as important as protection of winter range. The habitat suitability maps for all seasons should be combined to produce a map of critical core habitat.
2. Some areas of historic habitat are no longer viable. Consequently, those areas should not be mapped as critical habitat and a written justification should be provided.
3. Critical core habitat, including the areas that were previously classed as Modified Harvest Zones, should be reserved from forest harvesting and road-building. Existing roads should be rehabilitated and reforested to prevent human access, and reduce predator access.
4. A buffer area of matrix forest surrounding the caribou habitat zones should be mapped as critical habitat that will be managed to maintain natural levels of early seral ungulates and predators. That area should extend far enough to incorporate areas that are likely to significantly impact the predator-prey relationship of caribou.

The recommended mapping was completed by the RIG (Appendix A).

5.3.3 Kamloops Region

Areas of important caribou habitat were delineated as Resource Management Zones during the Kamloops Land and Resources Management Plan process. Forest harvesting is permitted in these areas with objectives to retain some old growth attributes.

A caribou research project was initiated in 1995 as a component of the LRMP. Following directions from the LRMP, a subcommittee has revised the original guidelines, incorporating the research information. The revised guidelines more accurately delineate seasonal habitats and increase the amount of habitat that is to be maintained in suitable condition, while providing greater flexibility to the forest industry in the application of harvesting prescriptions. The guidelines rely heavily on results based objectives and on forest company commitments to meeting those objectives. Additionally, the guidelines were developed within the terms of reference of the LRMP which limit impacts to the forest industry. The issue of limiting the amount of early seral habitat is yet to be addressed by the subcommittee.

5.3.3.1 Recommendations for Habitat Recovery

The RIG evaluated the Kamloops LRMP strategy and provided the following recommendations:

1. The mapping and strategy was likely inadequate for caribou recovery. Much of the caribou habitat was available for harvesting and road building. A new map of critical core habitat should be produced that includes all seasonal habitats used by caribou within the Region.
2. Critical Core Habitat should be reserved from forest harvesting and road-building. Existing roads should be rehabilitated and reforested to prevent human access, and reduce predator access.
3. A buffer area of matrix forest surrounding the caribou habitat zones should be mapped as critical habitat that will be managed to maintain natural levels of early seral ungulates and predators. That area should extend far enough to incorporate areas that are likely to significantly impact the predator-prey relationship of caribou.

The recommended mapping was completed by the RIG (Appendix A).

6.0 GENERAL RIG RECOMMENDATIONS

6.1 Predator/Prey Management

The objective is to establish habitat conditions that allow a self-sustaining caribou population without the need for ongoing predator control. If caribou populations continue to decline due to predation, despite natural levels of other ungulates and predators, then the decline should be recognised as a natural process.

The assumed mechanism of increased mountain caribou predation resulting from human activities is detailed below in Figure 5. Predation management could occur at various steps in this process.

6.1.1 Predator Control Program

The most rapid way to reduce predation on caribou would be to directly reduce wolves and cougars with a control program. However, the RIG does not support this approach as the primary solution for several reasons:

1. It is not consistent with the objective to maintain a self-sustaining caribou population, or the principle of using an ecosystem management approach to conserve caribou (MCTAC 2002).
2. This approach would require the use of an ongoing, permanent predator control

program. If the control program was stopped, the predators would quickly increase in response to the abundant ungulate population.

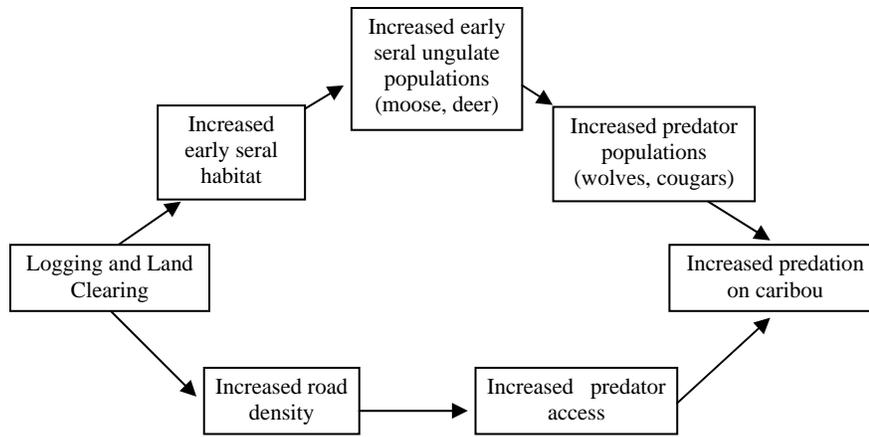


Figure 5. The mechanisms by which logging and land clearing lead to increased predation on caribou.

6.1.2 Alternate Prey Species Control Program

Reducing moose and other early seral ungulate species by hunting could be used to reduce the number of predators that are sustained in the area. The effectiveness of this strategy may be limited by the ability of hunters to reduce other ungulates to low enough numbers. Novel hunting approaches such as winter cow seasons for moose may be necessary to achieve this objective. Similar to predator control, alternate prey reduction would have to be an ongoing program. Maintaining lower populations of moose and other early seral ungulates should be addressed with a combination of hunting and habitat management. The timing and rate of alternate prey species reduction should be designed to minimise the potential for predator switching and associated detrimental impacts on caribou populations.

6.1.3 Limit Abundance of Habitat for Early Seral Ungulates:

The management strategy that is most consistent with an ecosystem management approach, and establishing a self-sustaining caribou population, is to limit the amount of habitat for early seral ungulates at levels that would occur under natural disturbance conditions. This is the primary approach recommended by the RIG. The RIG has sub-divided the Recovery Area habitat map into management units to be used to establish targets for early seral ungulate habitat, number of early seral ungulates, and the number of wolves and cougars.

- i) Use local ecological information to determine the amount of early seral ungulate habitat that would occur under the natural disturbance regime for the matrix habitat in the area. Early seral ungulates are most likely associated with the shrub/herb structural stage. Winter ranges will occur in areas that provide forage in combination with lower snow depths.

- ii) Adjust the rate of cut, and/or use silvicultural systems and silvicultural treatments to maintain early seral ungulate habitat within the matrix habitat at or below levels that would occur on the natural landscape. Because managed stands are regenerated immediately, and close canopy more quickly than natural stands, it is generally expected that a rate of harvesting that is somewhat greater than the rate of natural disturbances could occur and still provide a similar amount of shrub/herb structural stage.

Silvicultural treatments of new and existing shrub-herb stands should be used to accelerate their succession to a stage that is unattractive to early seral ungulates. Harvesting patch sizes that mimic natural disturbance patterns within the matrix habitat may reduce the abundance of early seral ungulates that flourish in fragmented habitats.

6.1.4 Interim Measures While Habitat Recovers

Many areas of matrix habitat adjacent to caribou habitat currently have high levels of early seral habitat as a result of past forest harvesting. Even if all forest harvesting was to immediately cease in these areas, it would take several decades before the amount of shrub/herb habitat declined to natural levels. In the meantime, the habitat would support high levels of early seral ungulates and predators.

Also, epidemic levels of forest pests such as mountain pine beetle and spruce bark beetle may temporarily create excessive amounts of early seral habitat within the matrix zone.

Consequently, it is necessary to implement a strategy of prey reduction and/or wolf control until the habitat conditions recover to natural levels. This is especially important if the caribou herd is small or rapidly declining.

To provide targets for predator and prey management:

- i) Estimate the number of early seral ungulates that would likely occur under natural forest conditions. Use these estimates to set a target population for those species. For example, if a management unit has twice as much moose habitat as would occur naturally, assume that it is supporting twice as many moose as would occur naturally. The target would be to reduce the number of moose by half through habitat management and/or hunting.
- ii) Wolf numbers are closely related to the abundance of ungulate prey in an area (Fuller 1989, Messier 1996). Use these relationships to estimate how many wolves would occur if the ungulates were at natural levels. The target should be to reduce the wolves to this number over time through habitat management, hunting of their prey, and wolf control if necessary.

Predator control should not be used as the primary, permanent management solution to reduce the need for appropriate habitat management. Predator control should be limited to situations where it is necessary to stop or slow a caribou population decline while efforts are being made to restore natural habitat conditions. When predator control is required, it should be implemented across the entire herd range, including parks and protected areas.

Predator control should be limited to species such as wolves and cougar that may be unnaturally abundant due to human activities. Other predators such as grizzlies and wolverine can be significant predators on mountain caribou, but that predation has always been part of the natural predator-prey system of mountain caribou. There is no reason to believe that the numbers of grizzlies or wolverines have been enhanced by human activities. If anything, their numbers have probably been reduced by human activities. Consequently, predation by grizzlies and wolverine is likely occurring at natural levels and does not justify population reduction of those species. It is possible that the number of black bears has increased due to an increase in early seral habitat so an increased black bear harvest could be considered. However, a general reduction in bear numbers is unlikely to benefit caribou, as explained in the following box.

Information Box: Bears as caribou predators

Reducing bears to benefit caribou is likely to be ineffective unless individual bears that are known to be killing caribou can be targeted. Bears are more abundant than caribou in these habitats (Mowat et al. 2005). Only a few percent of the caribou are killed by bears each year, so only a small percentage of the bears can be killing caribou. It would require a major reduction in bear numbers to produce a reasonable chance of removing one that is going to kill a caribou.

Within mountain caribou habitat:

- The density of grizzly bears is about 50/1000 km² (Mowat et al. 2005)
- The density of black bears is about 100/1000 km² (Mowat et al. 2005)
- The density of caribou is about 30/1000 km² (MCTAC 2002)

Even if 20% of the adult caribou were killed each year, and half the mortalities were due to bears, only 3 adult caribou /1000 km² would be killed by the 150 bears in that area. Unless you knew which bears were going to kill caribou, you would need to kill 50 bears on average to save one adult caribou.

For calves, if the 30 caribou produced 15 calves/1000 km², and all of them were killed by the 150 bears in the area, you would need to kill 10 bears on average to save one calf.

These assumptions are the extreme for potential bear predation, and in reality a strategy to reduce bears would likely be even less effective.

Therefore, a general reduction in bear numbers to recover caribou is not a recommended approach. However, if an individual bear has been identified as a major caribou killer, removal of that individual may be justified.

6.1.5 Immediate Response

The RIG recommends that the need for reduction of early seral ungulates should be evaluated immediately for all herds. The population objective for early seral ungulates should be based on the number that would be supported by a natural forest age class distribution. If the current population of early seral ungulates is greater than the population objective, the population should be reduced by implementing liberalised hunting.

The RIG recommends that wolf control should be implemented for all small populations (<100 caribou) and for all herds that have exhibited a significant ongoing population decline over the past decade. Cougars should be reduced by liberalised hunting in areas where they are abundant or known to be a significant caribou predator. The population objective for wolves and cougars should be the number that would be expected to occur in the area with a natural forest age class distribution.

6.2 Winter Backcountry Recreation

It is illegal under the Species at Risk Act to “kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species” (Section 32 (1)). There is concern that winter backcountry recreation has the potential to harm or harass mountain caribou. Members of the Secwepemc people reported that people moving into the mountain areas for recreational purposes affected caribou movement (Markey and Ross 2005). The following recommendations are intended to limit any harm or harassment.

The core caribou habitat map includes all seasonal habitat types. Only a portion of that total area provides winter habitat, and only a portion of the winter habitat has high intensity use by caribou. The level of winter use by caribou has to be considered when evaluating the potential impact of backcountry recreation in different areas.

6.2.1 Non-Motorised Winter Backcountry Recreation

It is unlikely that low intensity levels of backcountry skiing, snowshoeing or similar non-motorised activities pose a significant threat of disturbance to mountain caribou. However, high intensity human use in caribou winter concentration areas could lead to displacement of the caribou. Therefore, additional development of facilities that would lead to intensive non-motorised winter human use of caribou winter concentration areas should not occur.

6.2.2 Snowmobiles

The characteristics of good caribou winter habitat, such as open, subalpine parkland forests on gentle to moderate terrain, also provide ideal snowmobiling conditions. Increases in the performance of snowmobiles over the past decade have greatly increased their capacity to travel in the mountains. This leads to significant potential for conflict between snowmobiling and caribou recovery.

There is evidence that intensive snowmobiling activity can lead to the displacement of caribou from winter range areas (Kinley 2003, Seip and Johnson unpublished data). Although this does not result in any obvious direct mortality of the caribou, there are numerous potential negative impacts resulting from being disturbed on preferred habitat, including:

- i) Displacement leading to increased movement to or through avalanche prone terrain. (Note: there is anecdotal evidence that this occurs.)
- ii) Displacement to inferior foraging habitat that could lead to malnutrition and reduced calf viability.
- iii) Increased predation due to concentrating the animals or displacing them to areas with increased predation risk.
- iv) Displacement to areas that require increased energy expenditure for movement or thermoregulation.
- v) Negative physiological responses to stress.

Other potential threats posed by snowmobiling include:

- vi. Improved predator access to caribou habitat by providing packed trails.
- vii. Habituation of caribou to human activity that may increase their vulnerability to human-caused mortality (e.g. poaching, vehicle collisions).

6.2.2.1 RIG Recommendations

There is no unequivocal evidence that snowmobile activity has been a significant cause of declining caribou numbers to date, but there is evidence of displacement and harassment. If snowmobiling continues to expand to additional areas and displaces caribou from more preferred habitats the RIG anticipates that at some point it will have significant negative impacts on the potential for caribou recovery. Therefore, the primary recommendation is no further expansion of snowmobiling within caribou winter range, and an assessment of currently used areas.

Additional restrictions or closure of areas should be implemented if any of the following occur:

1. Failure to obey rules and restrictions within designated snowmobiling areas.
2. Snowmobile activity is increasing the threats outlined above through:
 - a. Displacement to areas of steep, avalanche prone terrain;
 - b. Displacement to poorer foraging areas and/or experiencing reduced nutrient intake;

- c. Displacement to areas with higher risk of predation, such as lower elevations;
 - d. Displacement to areas with greater snow sinking depth;
 - e. Caribou experiencing negative physiological responses to stress such as elevated cortisol levels;
 - f. Predators accessing caribou habitat on snowmobile trails;
 - g. Habituation resulting in human-caused caribou mortality;
 - h. Other evidence of negative effects on caribou population status.
3. Snowmobiling is occurring on a significant amount of the best available habitat for the herd.
 4. Snowmobiling is fragmenting the best habitat and limiting movement among those areas.
 5. The population within the area is very low and declining.

The RIG evaluated the existing snowmobile use areas within caribou winter habitat to determine if they were compatible with caribou recovery. Each Region evaluated these areas to determine if any of those areas should be closed based on the criteria listed above. Based on that evaluation, the RIG accepts the following snowmobiling areas within critical caribou winter habitat as being compatible with caribou recovery objectives (Appendix B):

Omineca Region:

- George Mountain
- Sande ridge in the upper Torpy
- Hedrick
- Lucille and Bell Mountain
- Kakwa
- Renshaw

Cariboo Region:

- Yanks Peak
- Groundhog/Barkerville
- Eureka
- Brew
- Tasse
- Ishpa
- Ishkloo
- Mica (partial)

Kamloops Region:

- Allan Creek
- Miledge/Chapelle Creek
- North Blue
- Blue Jewel commercial trail
- Oasis

These areas should be clearly delineated and identified as snowmobile use zones. Rules for acceptable practices within each area should be developed that may include seasonal restrictions, temporary closures, what to do if you encounter caribou, etc. These areas should be periodically reviewed and refined over time as additional information becomes available, and the effectiveness of the established criteria for restricting use is evaluated.

Recreational snowmobile use should not be allowed to expand into any additional areas of critical caribou winter habitat at this time. Within each Region there are still numerous areas that are not in critical caribou winter habitat that provide mountain snowmobiling opportunities. Establishment of new snowmobile use areas should be limited to those areas at this time. Over time, additional areas of critical caribou winter habitat could be made available for snowmobiling if scientific evidence is provided that it will not result in displacement or harassment of caribou.

Recreational snowmobiling should be prohibited by regulation in areas of critical caribou winter habitat that are not identified as snowmobile use zones. Voluntary closures have not been effective in preventing snowmobile use in critical habitat (Price 2004). Limited non-recreational use of snowmobiles for trapping, forestry etc. should be allowed.

A group (provincial government, local chamber of commerce, snowmobile club) must be responsible for managing each snowmobile use zone to ensure trail maintenance, signage, education and enforcement. Signs and information packages that provide information on mountain caribou, zone boundaries and trail rules should be developed and provided to all users. The group should be allowed to collect a trail fee to support their work. (Note: these arrangements are already in place for some of the areas). If these areas are not properly managed and overseen by a responsible group, use of these areas poses an unacceptable risk to caribou recovery.

Snowmobile use areas and management practices should be periodically reviewed and modified as needed to ensure that they are compatible with caribou recovery.

6.2.3 Helicopter Skiing and Snowboarding

Helicopter skiing also has the potential to displace and disturb mountain caribou on their winter ranges (Wilson and Hamilton 2003). Secwepemc people in the North Thompson reported that helicopter skiing was a threat to caribou and moved the caribou out of the area (Marley and Ross 2005). Helicopter skiing is generally dispersed across the caribou range, so although it may increase their movements, it is less likely than snowmobiling to cause displacement from part of their range. Helicopter skiing operations also have the potential to use good management practices (BCHSSOA 2003) to greatly reduce their impacts on caribou, if we can ensure that these practices are being rigorously followed. The helicopter skiing industry is involved in the development of these practices, and is considering a process of independent monitoring and audits.

6.2.3.1 RIG Recommendations

The RIG endorses the helicopter skiing industry's initiative to develop best management practices and the concept of independent monitoring and audits. These practices would prohibit use of runs when caribou are in the area. Implementation of best management practices, and independent monitoring and audits should become a requirement for all helicopter skiing within mountain caribou habitat.

Nonetheless, the RIG believes that there are some areas of concentrated caribou activity in winter where helicopter skiing operators are likely to encounter caribou so regularly, that these areas should be delineated and prohibited from use. The process of checking these areas for caribou activity leads to potential disturbance, and errors in detecting caribou will result in frequent encounters. Given the precarious status of mountain caribou, the RIG believes that it is prudent to ensure that there are some key areas where caribou are not subjected to the uncertain threats from helicopter skiing.

Caribou are not uniformly distributed over the critical habitat, but rather are concentrated in some key areas. This distribution should be recognised in a zoning system for helicopter skiing.

- i) Areas with low or moderate use by caribou in winter where implementation of good management practices is likely sufficient to be compatible with caribou recovery.
- ii) Areas of frequent, intensive caribou use (winter concentration areas) where helicopter skiers will often encounter caribou. These areas should be restricted from use.

Winter concentration areas were mapped by the RIG (Appendix C). New helicopter skiing tenures should not be awarded for those areas. Existing helicopter skiing tenures should be reviewed to identify any caribou concentration areas where helicopter skiing should be discontinued. These areas should be periodically reviewed and refined over time as additional information becomes available, and the effectiveness of the best

management practices is evaluated.

6.2.4 Snowcat Skiing

Snowcat skiing is not currently widespread within the RIG area and our understanding of the impacts is poor. Snowcat skiing could displace caribou from winter habitats and this would be incompatible with caribou recovery if it continues to expand within critical winter habitat. Therefore, there should be no additional expansion of snowcat skiing tenures within any critical caribou winter habitat, unless scientific evidence is provided that it will not result in displacement or harassment of caribou.

6.3 Summer Backcountry Recreation

Caribou are distributed throughout alpine and subalpine areas during the summer, and concentration areas are often not well defined. However, in some areas traditional calving sites and summer concentration areas are known. Summer recreational activities are not likely to compromise caribou recovery, unless those activities become intensive and widespread in those calving and/or concentration areas.

6.3.1 Non-Motorised Summer Backcountry Recreation

Development of facilities or trails that are likely to lead to intensive use within known calving or summer concentration areas should not occur.

6.3.2 Helicopter-Assisted Hiking, etc.

There is increasing use of helicopters to provide access for summer recreation including hiking, mountain biking etc. These operations should avoid areas of known caribou calving during the calving period. Also, the RIG endorses the ongoing development and implementation of best management practices.

If future demand reaches a point where there would be intensive activity in extensive areas of alpine and subalpine summer habitat, management practices to restrict the amount of activity will need to be considered.

6.3.3 All-Terrain Vehicles

Zoning to limit the amount of caribou summer habitat that will be subject to disturbance from recreational all terrain vehicles should be conducted as part of a broader program to protect alpine and subalpine areas.

6.4 Industrial Development

Industrial developments within critical habitat can destroy habitat, displace caribou from habitat or lead to detrimental effects from increased access by people or predators.

6.4.1 Major Developments

Any proposed major development within caribou critical core habitat should be evaluated with a comprehensive environmental assessment to ensure it is consistent with the recovery objectives.

6.4.2 Minor Developments

The consequences of habitat loss from minor developments will usually have minimal impact on caribou unless the development is occurring on a rare habitat feature such as a mineral lick. However, the cumulative effects of such developments should be addressed. The primary impact of minor developments is likely to be the development of new roads or linear corridors into caribou critical core habitat.

The goal is to have no new roads constructed into critical core habitat, and to deactivate any unnecessary roads that currently exist. Alternative access methods should be used wherever possible. If new roads or corridors are absolutely necessary, they should be designed and managed to minimise potential negative impacts on caribou.

Developments that will destroy or limit caribou use of rare special habitats such as mineral licks should be prohibited

6.4.3 Major Highways and Railways

In several areas major highways and railways go through mountain caribou habitat. Collisions have not been recorded as a recent major cause of mortality within the RIG area, but the potential for unnecessary deaths should be recognised. Significant road-kill of caribou has been reported for other areas.

A collision reduction plan should be developed for any section of highway or railway where the possibility of encountering caribou is relatively high.

6.4.4 Mining and Oil & Gas Exploration

Mining exploration should be conducted without building new roads or upgrading existing roads into critical caribou habitat. Habitat disturbance from seismic lines should be minimised by using hand cut lines etc., and the lines should be rehabilitated to reduce their use as movement corridors for people and predators.

If a mine is proven, it should be subjected to an environmental review to ensure that it is consistent with the recovery objectives.

6.5 Forest Management

6.5.1 Fire Suppression

Although fire is an important component of the natural ecosystem, many wildfires are human caused. Consequently many areas of caribou habitat currently have an unnaturally high amount of early seral habitat. Consequently, fire suppression within critical caribou core and matrix habitat should be a high priority. This should also apply within Parks until the early seral forest age class distribution for the herd has reached natural levels.

6.5.2 Forest Health

Forest health sanitation and salvage treatments should not be allowed in the no harvest zones of caribou habitat unless they will have a net benefit to caribou compared to no action.

Sanitation logging in matrix habitat may have to temporarily increase the early seral component in an effort to prevent catastrophic natural disturbance events.

7.0 MANAGEMENT OF INDIVIDUAL HERDS

Table 2. The size, recent population trend (lambda), management recommendations and probability of recovery for each mountain caribou herd within the Hart and Cariboo Mountains Recovery Area.

Herd	Size	Trend (Lambda)	Management Recommendations .					Census Freq	Recovery probability ^f	Comments
			PM ^a	PR ^b	HM ^c	BM ^d	Transplant ^e			
Hart Ranges (including Parsnip)	558	increasing (1.02)	YES	NO	YES	YES	NO	3 years	Very high	Population is the most viable mountain caribou herd in B.C. and is contiguous with viable northern ecotype caribou populations
North Cariboo Mtns	283	stable (1.00)	YES	NO	YES	YES	NO	3 years	Very high	Population is quite viable and has a significant part of its range within protected areas.
Narrow Lake	41	declining (0.90)	YES	YES	YES	YES	NO	annual	Moderate	Small isolated population surrounded by extensive early seral habitat
George Mountain	0	n/a	NO	NO	NO	NO	NO	annual	Very low	Population recently extirpated from a small isolated area surrounded by extensive early seral habitat. Not considered viable for recovery. Maintain existing habitat protection for several years to provide opportunity for natural recolonisation.
Barkerville	54	stable (1.01)	YES	YES	YES	YES	NO	annual	Moderate	Low density population with poor predator avoidance habitat. Intensive snowmobiling to be allowed on some of the best winter range.
Wells Gray	307	decreasing (0.92)	YES	YES	YES	YES	NO	annual ^g	High	Large core population with most of habitat within parks. Management practices must apply to both inside and outside the parks.
Allan Creek	50	unknown	YES	YES	YES	YES	NO	annual	Moderate	Small isolated population with limited interaction with Wells Gray population. Abundant early seral ungulates in nearby Robson Valley support abundant predator numbers.
Groundhog	20	decreasing (0.92)	YES	YES	YES	YES	NO	annual	low	Small, extremely isolated population experiencing rapid decline. Risk of both wolf and cougar predation.

a Prey management
 b Predator Reduction
 c Habitat Management
 d Backcountry Management
 e Transplant new animals into population
 f Probability of recovery if all recommendations implemented
 g annual census to monitor effect of predator control

8.0 MONITORING AND RESEARCH

8.1 Monitoring

1. There should be a co-ordinated census of all herds in the RIG area once every 3 years starting in 2006. All caribou locations should be geo-referenced to allow evaluation of sub-populations.
2. More frequent censuses (annual) may be justified for small or rapidly declining herds (Table 2), or to evaluate the effect of a management action.
3. Censuses will provide information on the population size and trend, distribution and calf recruitment that is necessary to evaluate if the recovery objectives are being achieved.
4. A monitoring process should be established to monitor the change over time in early seral forest distribution, early seral ungulate numbers, and predator numbers. This information is necessary to evaluate progress in implementing the plan.
5. Snowmobile and helicopter skiing activity and compliance with the management recommendations needs to be monitored.
6. Results of ongoing monitoring should be reported to the RIG annually.

8.2 Research

The RIG recognises that research activities can pose a threat to caribou. Caribou occasionally get injured or killed during capture programs, and experience ongoing disturbance from aircraft used to monitor them. Wittmer *et al.* (2005) reported 2 of 164 mountain caribou deaths were caused by research activities. Caribou research projects should only be implemented if the results are likely to provide a net benefit to caribou recovery, and projects should be designed to minimise threats to caribou.

8.2.1 Predator/Prey Management

There is no need to conduct a detailed research study prior to initiating a new predator or prey management program to recover small or declining herds. The RIG believes that there is sufficient existing data to indicate that predation is a major cause of most declining caribou populations. Rather, any new predator/prey management program should be designed as an adaptive management program with a monitoring component that will be adequate to document the effect of the treatment (National Academy of Science 1997). Where possible, replicate treatments and controls should be established.

Also, if a predator/prey management program is initiated, its success should not be

compromised by limiting the tools available to achieve the objective. Highly effective hunting techniques (e.g. winter cow seasons for moose) will be required to reduce early seral ungulates. Predator reduction programs should use the most efficient, humane and cost effective methods to selectively remove wolves and cougars.

Finally, there must be a long term funding commitment to these projects. Many predator control programs in other areas have failed to have a measurable impact because they were terminated too soon (National Academy of Science 1997). It is unethical and wasteful to initiate a predator control program if there is no commitment to carrying it through until the caribou have benefited.

8.2.2 Predator/Prey Ecology

There is a need for additional information on the interactions of wolves, cougars, and early seral ungulates within mountain caribou habitat. That information will help to determine the degree of spatial overlap among these species and caribou in different areas and improve the design of predator/prey management programs. Information on the sustainable harvest rate of reduced early seral ungulate populations should be collected to evaluate if reducing those species results in a lower allowable harvest over time.

8.2.3 Natural Disturbance Ecology

Better information on the frequency and pattern of natural disturbances, and the distribution of seral stages in natural landscapes, is required for the different forest types within the Recovery Area. Also, a better understanding of the relationships between natural disturbance patterns and the abundance of early seral ungulates and predators would be useful in setting management objectives.

However, the lack of this information should not delay implementation of the management recommendations. Existing information is sufficient to begin setting objectives for habitat, early seral ungulates, and predators.

8.2.4 Habitat Management

The RIG endorses the continued monitoring of existing research trials that are evaluating the use of partial cutting to maintain caribou habitat attributes. New trials should be located outside of core caribou habitat if possible. If it is necessary to locate new trials within core caribou habitat, the construction of roads should be minimised.

New studies on techniques to reduce the value of matrix habitat to early seral ungulates should also be conducted.

8.2.5 Backcountry Recreation

Research on the impacts of all forms of backcountry recreation on caribou is encouraged. New information should be used to refine the management recommendations over time.

Studies should not involve subjecting the animals to severe disturbance to evaluate the impact.

8.2.6 Mortality Studies

Studies to determine the cause of mortality should be considered for herds that are undergoing major declines, and the likely cause of mortality is unknown. The Wells Gray Park population is currently a prime candidate for a mortality study because they are rapidly declining despite spending much of the year within a protected area.

The RIG recognises the need for further scientific studies to determine the cause of calf mortality but acknowledges that studies involving capture and collaring calves are too risky. A more reasonable study would be to monitor changes in winter calf counts in response to experimental treatments.

8.2.7 Corridors

Detailed monitoring of caribou during migration periods is required if we want to more clearly define movement corridors, or evaluate their use of different habitat types for movement.

8.2.8 Habitat Selection

The basic habitat selection patterns of mountain caribou are well understood so additional habitat selection studies are a very low priority.

9.0 SOCIO-ECONOMIC IMPLICATIONS OF THE RECOVERY IMPLEMENTATION PLAN

A detailed socio-economic analysis is necessary as part of Recovery Planning, but is beyond the scope of the RIG committee. A detailed socio-economic impact assessment must be done by qualified experts in that field.

The RIG has identified some of the likely impacts to be considered.

1. Restrictions on forest harvesting in core and matrix habitat types would result in a major reduction in timber harvest rates. This would result in reduced revenue to the crown, reduced corporate income, reduced jobs and taxes, and potential compensation costs. These may in turn result in reduced community stability of timber-dependent communities.
2. Implementation of a plan that recovers mountain caribou would assist forest companies to achieve environmental certification standards, and reduce the risk of boycotts and trade actions against B.C. forest products.

3. Restrictions on snowmobile activity would reduce the options available to snowmobilers, and may reduce total snowmobile activity.
4. Restrictions on helicopter skiing activity would reduce the options available, and may reduce the income of tenure holders. In some communities where helicopter skiing is a major component of the economy, these restrictions could result in reduced revenue to the crown, reduced corporate income, reduced jobs and taxes, and potential compensation costs. Restrictions for mountain caribou would increase the complexity in dealing with other factors such as other wildlife species, other user groups, and natural hazards (i.e. avalanche terrain).
5. Backcountry practices that are compatible with caribou recovery would reduce the risk of boycotts of the helicopter ski industry.
6. Use of predator control may be controversial and result in local or international protests and boycotts. However, this is less likely if it is part of a threatened species recovery plan, and done in conjunction with improved habitat protection.
7. There may be opposition from First Nations, resident hunters, and guide outfitters to the reduction in early seral ungulates. Although the reduction would lead to a short-term increase in hunting opportunities, the impact on the long-term harvest rate is uncertain. However, it is possible that reduced populations will be able to sustain the current sustainable harvest.
8. Implementing this recovery plan would also provide protection for numerous other species that live in mountain caribou habitat. This would reduce the need for additional habitat protection for those species.
9. Reduced forest harvesting, as part of the recovery plan, would increase the amount of wilderness area available for some forms of commercial and non-commercial wilderness based recreation.
10. There is economic benefit to protecting wildlife and wildlife habitat for tourism potential and amenity migration (human migration to areas that provide lifestyle amenities).
11. There are social values to working together toward the protection of endangered species. These values may be cultural, educational, ecological, historical, spiritual or medical in nature.
12. There is a significant ongoing cost to government associated with the implementation, research and monitoring of this plan.

10.0 IMPLEMENTATION ISSUES

The RIG members generally agree that this plan lays out the strategy that has the best chance of maintaining a viable, self-sustaining mountain caribou population within the Hart and Cariboo Mountains area. However, there is a range of concerns from individual members regarding implementing the plan. These include:

1. The socio-economic costs will be so severe that the objective of maintaining a self-sustaining population is not reasonable. There should be acceptance of the need for ongoing predator/prey control in combination with habitat management rather than attempting to manage predation primarily through habitat management.
2. Recovery of mountain caribou through habitat management is not feasible due to the natural colonisation of the area by early seral ungulates, or because of ongoing climate change, so we should accept the need for ongoing predator/prey control today if caribou are to be maintained. If ongoing predator/prey control is not acceptable, we should accept that caribou will continue to decline and potentially become extirpated from the RIG planning area over time.
3. Some feel that the restrictions on motorised backcountry recreation are unnecessarily severe given that there is no direct evidence of population declines resulting from those activities. They believe that current management practices are compatible with caribou recovery. However, others believe that based on the precautionary principle, all motorised backcountry recreation should be prohibited within critical core winter habitat until the proponents are able to provide conclusive proof that those activities are not detrimental to caribou recovery.

These concerns indicate that there may be a need to consider some options during the implementation phase. These are outlined below in an implementation plan.

11.0 IMPLEMENTATION PLAN

1. Although First Nations representatives participated in the RIG, further government to government consultation with all First Nations that would be affected by this plan are required before those practices that affect their rights are implemented.
2. In all areas where early seral ungulates are at numbers that likely exceed what would occur under a natural forest age class distribution, efforts to reduce their numbers should commence immediately while habitat recovers to a natural early seral distribution. This strategy can be implemented simply by changing the hunting regulations. Moose were historically absent from mountain caribou range and today the wolf populations are sustained primarily by moose in winter. Reducing those moose populations is almost certain to reduce wolf populations.

3. Wolf control should be immediately implemented for all small herds (<100 caribou) and all herds that have demonstrated a significant ongoing decline over the past decade. Cougar reduction through liberalised hunting should be implemented in areas where they are abundant or known to be an important caribou predator. To be effective, predator control must be applied across the herd area, including parks and protected areas.
4. To establish a self-sustaining caribou population and reduce the need for ongoing predator/prey management, the habitat management recommendations for core and matrix habitat should be implemented immediately. If the government does not accept this objective, then a combination of habitat management and ongoing predator/prey management should be implemented. That approach is less likely to result in a self-sustaining caribou population and may require ongoing predator/prey management. An approach that relies less on habitat protection would reduce the socio-economic costs, but would be unacceptable to many people and would erode public support for predator control.
5. The recommendations on backcountry recreation should be implemented. There are dissenting opinions on both sides of the issue but the approach recommended in this plan represents the majority view. The restrictions should be periodically reviewed as more information becomes available on the effect of backcountry recreation on caribou.
6. Develop a public information program on the implementation plan that addresses the population status, the need for habitat management, and predator/prey management.

12.0 LITERATURE CITED

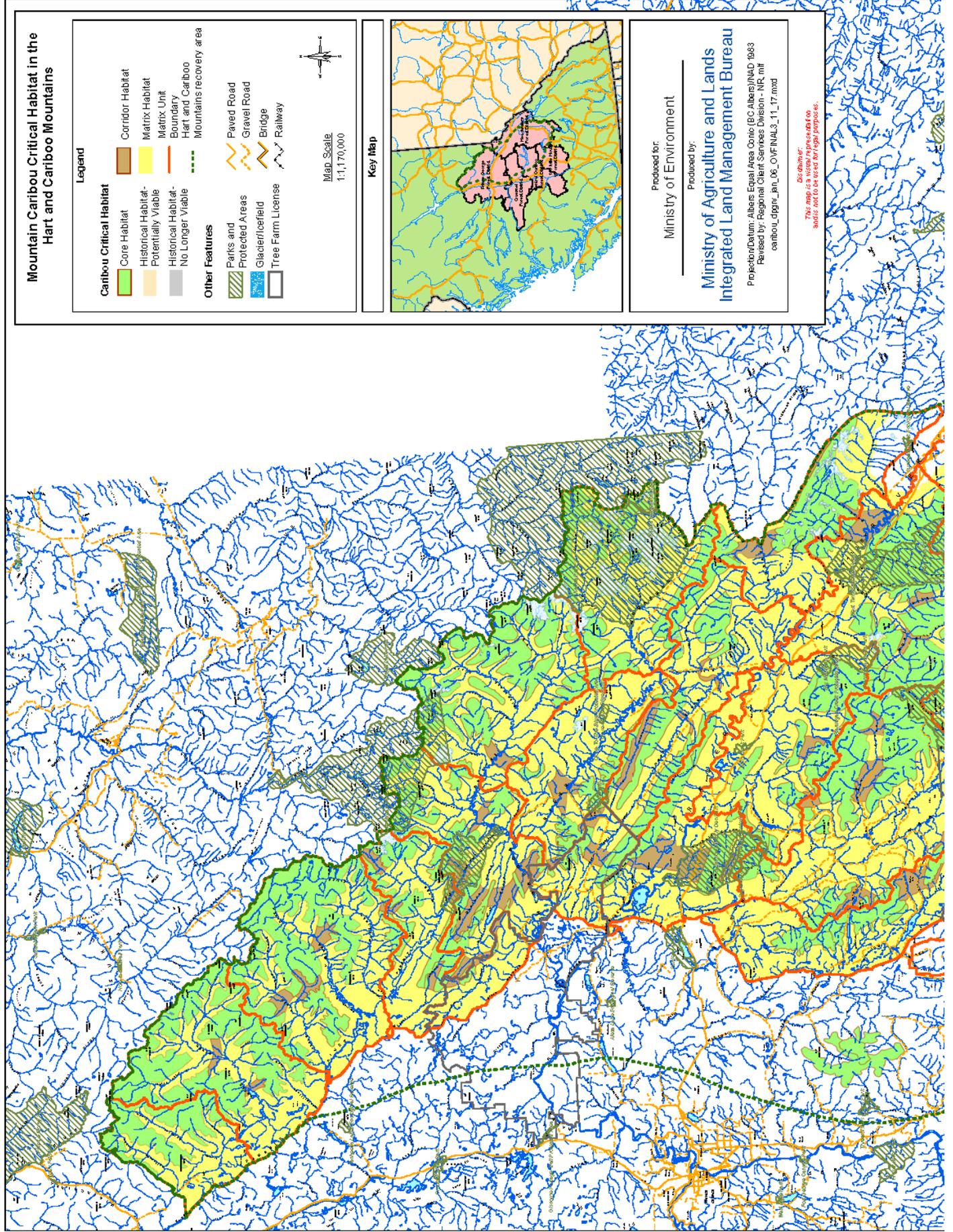
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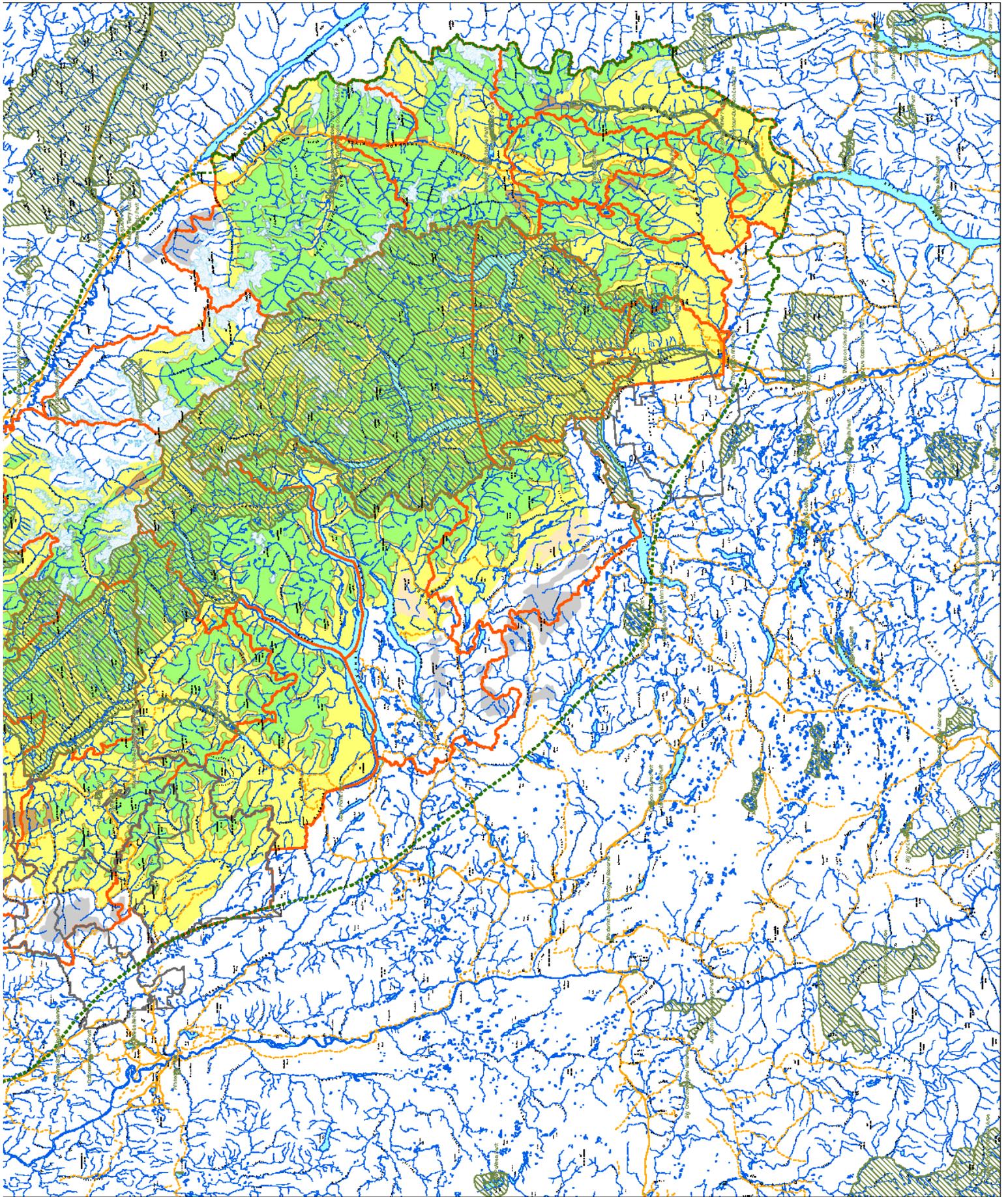
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APPENDIX A





APPENDIX B

Snowmobile Use Areas in Mountain Caribou Habitat in the Hart and Cariboo Mountains

Legend

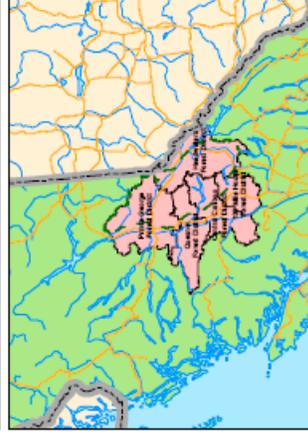
- Critical Caribou Habitat**
- Core Caribou Habitat and Corridors (Snowmobiling Not Permitted)
 - Hart and Cariboo Mountains Recovery Area
 - Areas Open to Snowmobile Use in Caribou Core Habitat
 - Areas Open to Snowmobile Use Outside Core Habitat
- Other Features**
- Parks and Protected Areas
 - Glacier/Icefield
 - Tree Farm License
 - Paved Road
 - Gravel Road
 - Bridge
 - Railway



Snowmobile Note:
 This map depicts those areas where the Recovery Implementation Plan recommends recreational snowmobiling is compatible in mountain caribou habitat. Areas of "matrix habitat", important for managing predator pressure on mountain caribou herds, are generally compatible with snowmobile use. Areas of "critical core habitat", important for forage production and predator avoidance, are generally incompatible with snowmobile use. Several managed snowmobile areas in critical core habitat have been identified for continued snowmobile use. The Cariboo and Hart Mountains Mountain Caribou Recovery Implementation Plan has a complete explanation of management of snow mobile recreation in caribou habitat.

Map Scale
 Approximately 1:1,170,000

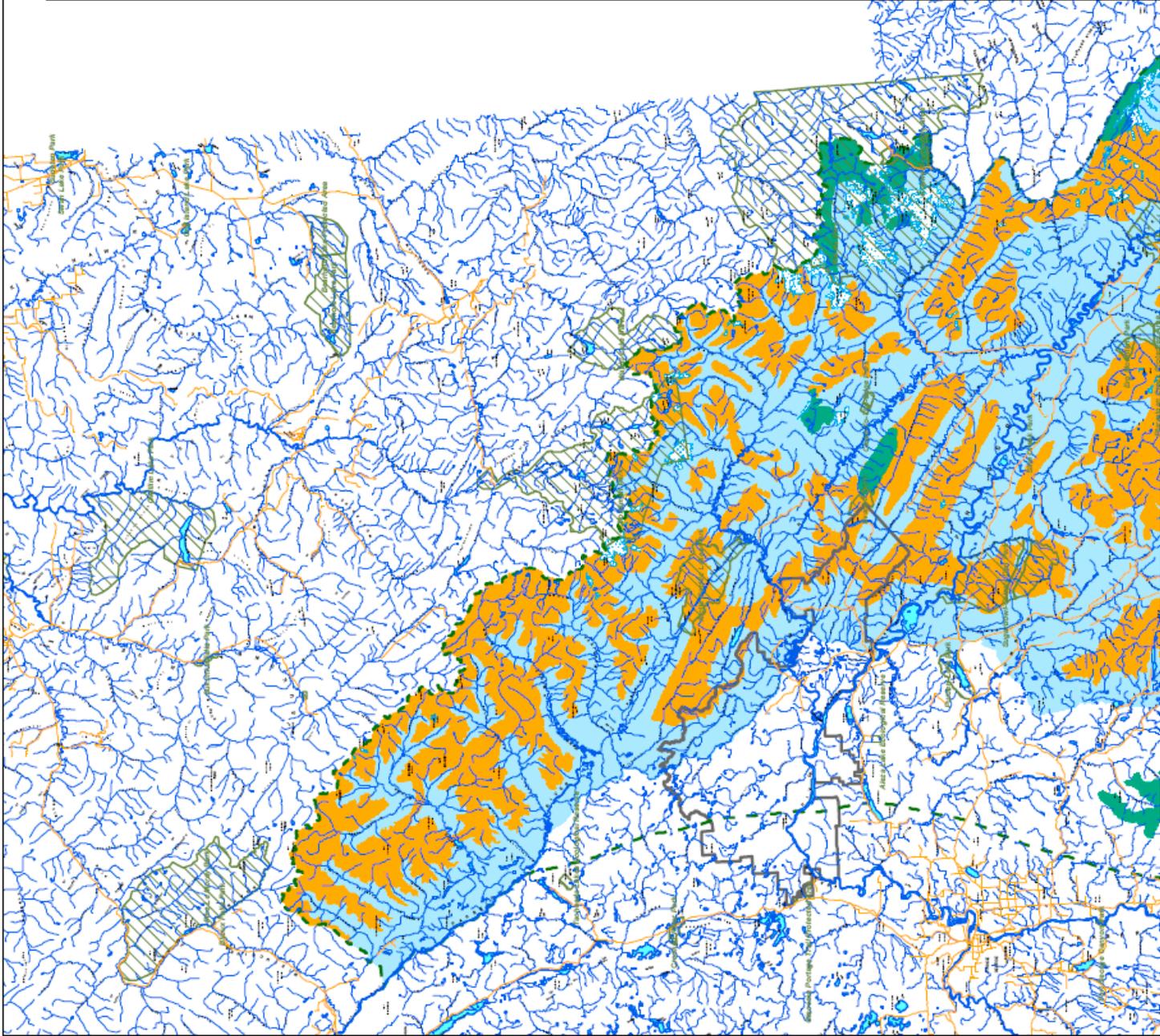
Key Map



Produced for:
Ministry of Environment

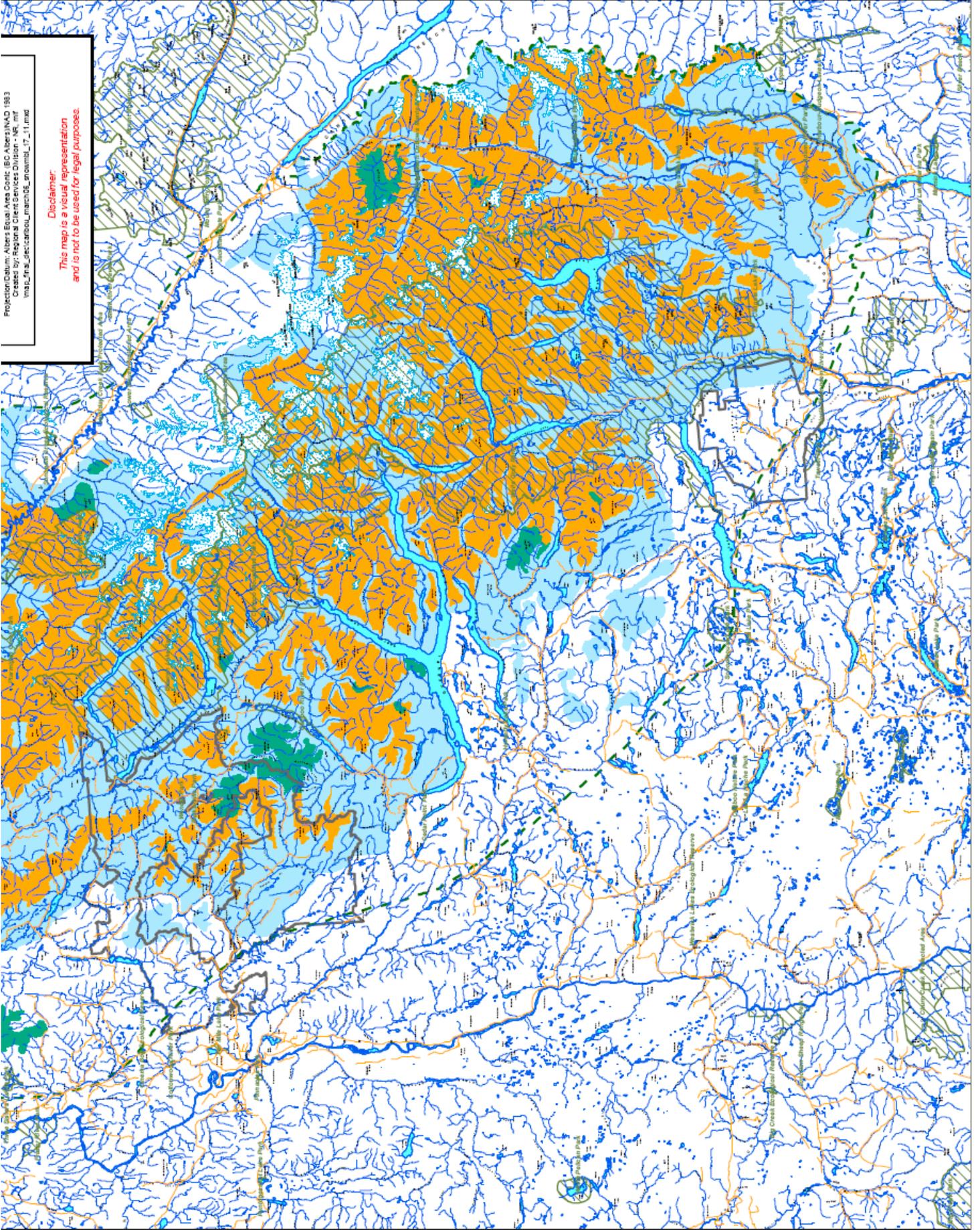


Produced by:
**Ministry of Agriculture and Lands
 Integrated Land Management Bureau**

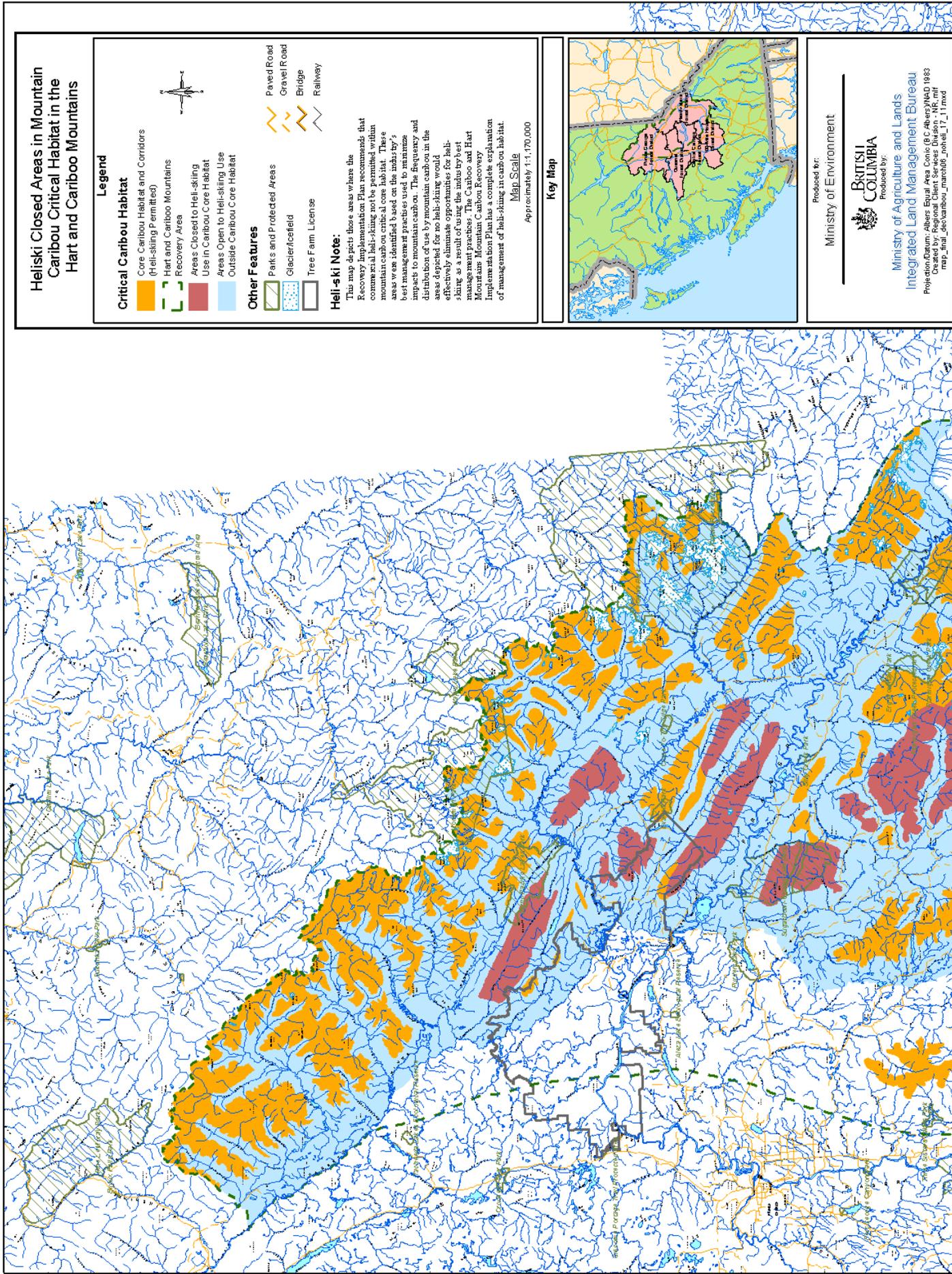


Projection: UTM, Albers Equal Area Conic, BC Albers (NAD 1983)
Created by: Regional Client Services Division - VR - m7
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Disclaimer:
This map is a visual representation
and is not to be used for legal purposes.



APPENDIX C



Heliski Closed Areas in Mountain Caribou Critical Habitat in the Hart and Cariboo Mountains

Legend

- Critical Caribou Habitat**
- Core Caribou Habitat and Corridors (Heliskiing Permitted)
 - Hart and Cariboo Mountains Recovery Area
 - Areas Closed to Heliskiing
 - Use in Caribou Core Habitat
 - Areas Open to Heliskiing Use
 - Outside Caribou Core Habitat

Other Features

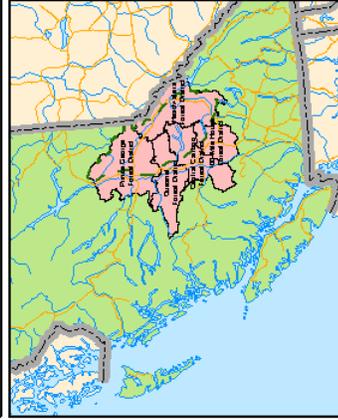
- Parks and Protected Areas
- Glacier/icefield
- Tree Farm License
- Paved Road
- Gravel Road
- Bridge
- Railway

Heliski Note:

This map depicts those areas where the Recovery Implementation Plan recommends that commercial heliskiing not be permitted within mountain caribou critical core habitat. These areas were identified based on the industry's best management practices used to minimize impact to mountain caribou. The frequency and distribution of use by mountain caribou in the areas depicted for no heliskiing would effectively eliminate opportunities for heliskiing as a result of using the industry best management practices. The Cariboo and Hart Mountain Mountain Caribou Recovery Implementation Plan has a complete explanation of management of heliskiing in caribou habitat.

Map Scale
Approximately 1:1,170,000

Key Map



Produced for:
Ministry of Environment



Produced by:
Ministry of Agriculture and Lands
Integrated Land Management Bureau
Projection: datum: Albers Equal Area Conic (BC Albers) NAD 1983
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