

Provincial Caribou Recovery Program Herd Planning Disclaimer



The following herd plans are a result of Phase One planning and are an incomplete product. Additionally, the documents are 'living' reports and will be updated regularly as Phase Two progresses.

Phase Two planning is currently underway for some herds however still at its early stages of development; many plans reflect this as they are in different stages along their scheduled project continuum.

One of the cornerstone guiding principles to the Caribou Recovery Program (the Program) is to use consistent, fact-based approaches for all woodland caribou herds in the province. The Program has refined and adopted a new format to herd planning that will effectively:

- ❖ Provide a consistent approach to managing all woodland caribou herds in BC
- ❖ Recognize the unique circumstances of each herd
- ❖ Build from current (legacy) caribou management plans
- ❖ Consider First Nations' and stakeholder interests and ideas
- ❖ Be included in larger regional plans

Completed herd plans will describe the status of each herd, and the threats faced by that particular herd. The plans will take note of previous actions, and actions that are planned to take place in the future. As we implement the herd plans, the Program will carefully monitor to which extent and magnitude the caribou respond, and modify its actions as accordingly. Herd plans will help us document our decisions and discuss issues with First Nations and with stakeholders.

Phase One consisted of:

- ✓ Status of herd or sub-population
- ✓ Identified threats
- ✓ Literature
- ✓ Previous work completed

Phase Two will consist of input from:

- Engagement with Indigenous communities
- Provincial Caribou Science Team
- Stakeholders
- Decision-support tools

WOODLAND CARIBOU PLAN

Hart Ranges Subpopulation

Hart Ranges Local Population Unit



BRITISH
COLUMBIA

Recommended Citation:

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EXECUTIVE SUMMARY

DRAFT

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1 BACKGROUND

1.1 INTRODUCTION TO THE PROGRAM

All caribou within British Columbia are Woodland Caribou (*Rangifer tarandus caribou*). The Hart Ranges caribou are a subpopulation of the Mountain caribou ecotype within the Southern Mountain National Ecological Area (SMNEA), are listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and appear on Schedule 1 of the Federal Species at Risk Act (SARA) (EC, 2014; MCTAC, 2002). These caribou herds are red listed in British Columbia and are included in the Provincial Identified Wildlife Management Strategy (IWMS) under the provincial Forest and Range Practices Act (FRPA).

In 2011, COSEWIC defined 12 designatable units (DUs) for caribou in Canada, which represent discrete and evolutionarily-significant units of caribou. Mountain ecotype caribou in BC were reorganized into the Southern Mountain Caribou DU (DU9) (COSEWIC, 2014). The Southern Mountain caribou (DU 9) were assessed as Endangered in May 2014 (COSEWIC, 2014). This recommended listing of DU9 was submitted to the Federal Minister of the Environment for consideration under SARA in fall 2014.

Environment Canada is proposing a different categorization system, one where the SMNEA is divided into three groups, the Northern, Central, and Southern Groups. The Southern Group from the EC system would be DU9, identical to the Southern Mountain caribou under the COSEWIC system (EC, 2014; COSEWIC, 2014). No decision has been made and the Hart Ranges caribou subpopulation remains listed in the only category of SMNEA caribou and Threatened under SARA.

Woodland Caribou are further divided into Local Population Units (LPU's) by Environment Canada. Within the proposed DU9 there are eleven LPU's. The Hart Ranges subpopulation is alone in the Hart Ranges LPU (EC, 2014).

Recovery plans are required for all woodland caribou populations that will be designated as threatened or endangered in Canada (ECCC, 2016). This document spans the divide between these disparate designations provincially and federally, compiling past research, knowledge and management actions into guidance for the management and recovery of the Hart Ranges caribou subpopulation.

2 POPULATION DESCRIPTION

2.1 DISTRIBUTION

The Hart Ranges caribou LPU includes approximately 14000 km² of the west side of the Rocky Mountains bounded by Colbourne Creek to the northwest, the height of land of the Rocky Mountains and further south Cushing Creek to the northeast, the community of McBride to the southeast, then follows the transition between the Rocky Mountain Trench and the Rocky Mountains back to Colbourne Creek (HCRIG, 2005; EC, 2014) (Figure 1). At its closest spot the City of Prince George is approximately 50 km to the southwest (Google Earth, 2017). The Hart Ranges caribou subpopulation is often divided further into two groups, the Hart South group and to the north the Parsnip group, the headwaters of the Parsnip River acting as the divisor.

Elevations range from 650 meters to 2400 meters above sea level (Google Earth, 2017). The Hart Ranges caribou subpopulation borders on the Kennedy siding subpopulation to the northwest; and the Quintette, Narroway, Redrock / Prairie Creek (Alberta), and A La Pêche (Alberta) to the northeast. These subpopulations are all from

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the northern ecotype, proposed as the Central Group (DU8) by Environment Canada (EC, 2014), there is some overlap in summer as these northern caribou may move southwest of the continental divide (HCRIG, 2005). The North Cariboo Mountains and Narrow Lake subpopulations of the mountain caribou ecotype are located adjacent to the Hart Ranges to the southwest, across the Rocky Mountain Trench.

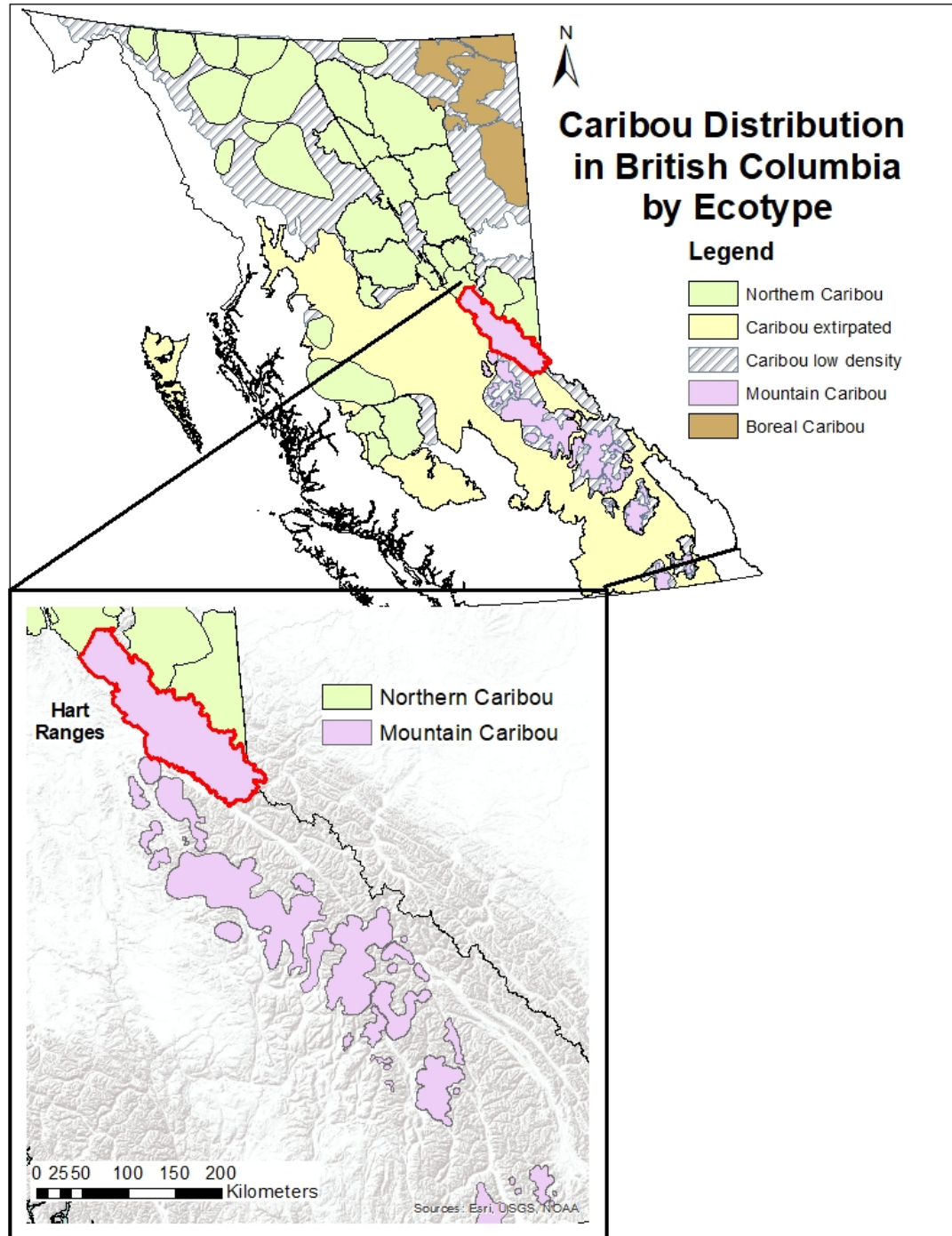


Figure 1. Caribou distribution in BC by ecotype . The Hart Ranges subpopulation is outlined in red.

2.2 HABITAT AND BEHAVIOUR

Mountain caribou live in the Interior Wet Belt that stretches from northern Idaho and Washington States to central British Columbia. In winter, mountain caribou live in the deep snowpack zone near treeline and feed almost exclusively on arboreal lichens (Young & Freeman, 2002; HCRIG, 2005). This preferred habitat type varies in elevation from approximately 1700 meters in the southern part near McBride to 1200 meters at the northern end (HCRIG, 2005).

In April these caribou tend to move to lower elevations, some to valley bottom but most move only slightly to lower elevations returning to near treeline or above in late May to calve. They generally remain at these high elevations all summer feeding on various types of new growth in addition to lichens. Often these summer habitats are in the same locations as their winter habitats, however some of these caribou may migrate horizontally up to 60 km (Seip, 1990; HCRIG, 2005; Young & Freeman, 2002).

When the initial snows return to the high elevations in the fall the Hart Ranges caribou descend, most to slightly lower elevations but some, more commonly at the south end of their range, to the cedar / hemlock forests at the valley bottoms (HCRIG, 2005). As the snowpack settles, commonly in January, they tend to move upslope to treeline again (MCTAC, 2002).

2.3 POPULATION SIZE AND TREND

The Hart Ranges caribou are the largest subpopulation of the mountain caribou ecotype (proposed Southern Group or DU 9), however as with most mountain caribou they have experienced significant declines since systematic monitoring began 20 years ago (Klaczek & Heard, 2016). The Parsnip group may have stabilized since 2012 but overall since 2006 this group has experienced a 45% decline. Meanwhile the Hart South group has experienced a more recent decline, down approximately 40% since 2012 (Klaczek & Heard, 2016). The sum of the estimates of the two groups, 375 caribou in 2016, is illustrated in Figure 2 below (Klaczek & Heard, 2016). The increasing trend depicted between 2002 and 2006 may be at least partially a result of more of the caribou being within the census area at that particular time rather than an actual increasing population (Seip, et al., 2006).

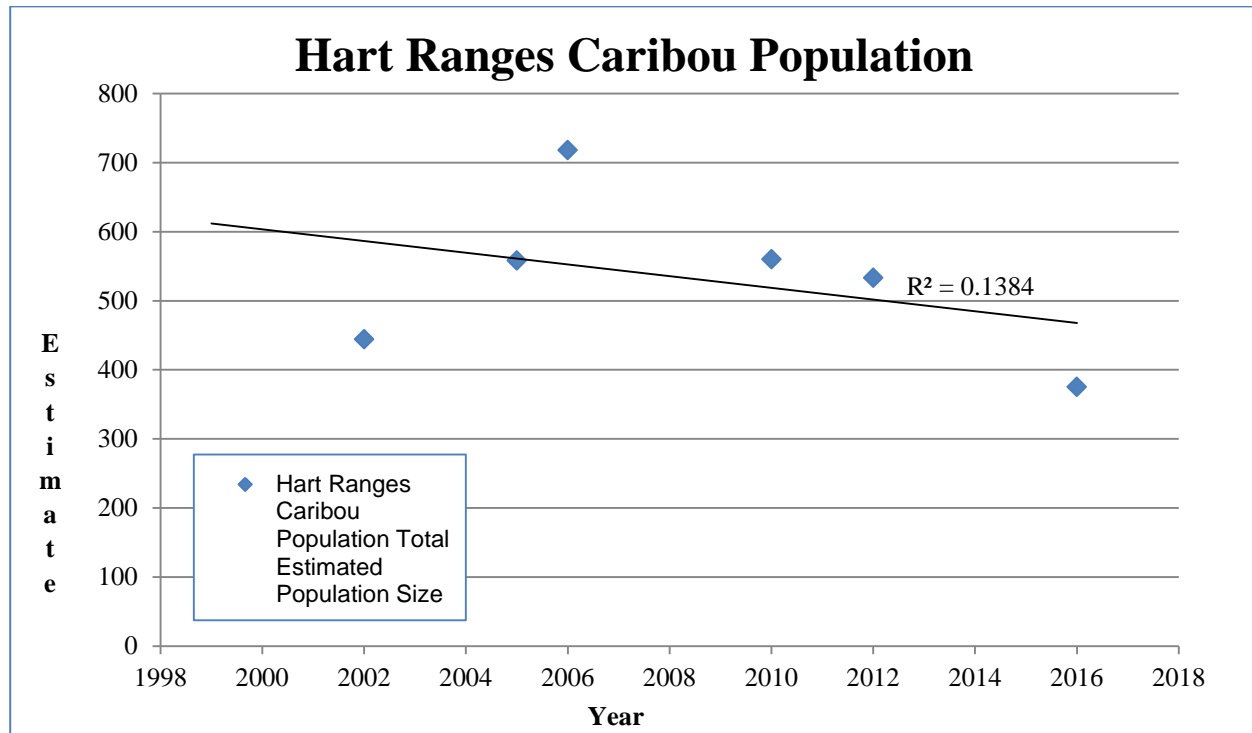


Figure 2: Hart Ranges caribou population trend based on estimated population size 2002– 2016 (Seip, et al., 2002; Seip, et al., 2005; Seip, et al., 2006; Seip, et al., 2007; Heard, et al., 2010; Heard, et al., 2015; Klaczek & Heard, 2016)

3 THREATS AND LIMITING FACTORS

Current declines in woodland caribou populations have been ultimately attributed to direct and indirect effects of human activities and climate change (Vors & Boyce, 2009; Festa-Bianchet, et al., 2011; EC, 2014). These effects have resulted in lowered rates of adult female survival and/or juvenile recruitment, two demographic rates that have high influence on caribou population dynamics (DeCesare, et al., 2012). For most populations, these effects have led to unsustainable rates of predation (McLoughlin, et al., 2003; Wittmer, et al., 2005b; Apps, et al., 2013). Compared to other ungulates, caribou are particularly vulnerable to increasing predation because they have low reproductive rates (Bergerud, 2000). To reduce predation risk, caribou generally occur at low densities and have evolved to live in low productivity habitats that spatially separate them from other ungulates and their generalist predators (Bergerud, 1992). Effects from human activities and climate change likely compromise this spacing strategy by changing the abundance and spatial distribution of these other ungulates and predators, increasing the likelihood of caribou-predator encounters and consequently increasing predation rates (Festa-Bianchet, et al., 2011).

The federal *Recovery Strategy* for SM caribou (EC, 2014) identified a number of threats potentially affecting caribou populations and their habitat. These threats, in descending order of importance, included: predation, industrial activities, roads and other linear features, recreational activities, natural disturbances (e.g. fire), hunting, climate change and parasites and diseases. This section follows a similar approach, discussing these threats – and others – though their order does not reflect their relative importance to a specific population. Note that while threats are discussed individually, they are not mutually exclusive as they may interact and their effects on caribou population dynamics are likely cumulative (Sorensen, et al., 2008; Johnson, et al., 2015).

3.1 PREDATION

Multiple GPS and radio telemetry studies throughout BC have indicated that the dominant, proximal cause of woodland caribou mortality is predation (Wittmer, et al., 2013). Woodland caribou have evolved with their predators and have persisted despite millennia of predation. Predator impact on woodland caribou populations has increased due to the result of three dominant processes: apparent competition mediated by increased alternative prey abundance (Hebblewhite, et al., 2007), apparent competition mediated by expanding alternative prey distribution (Wittmer, et al., 2007; DeCesare, et al., 2009; Latham, et al., 2011b), and enhanced predator access to woodland caribou habitat mediated by roads and other industrial developments (James & Stuart-Smith, 2000; Latham, et al., 2011a).

More generally, Bergerud (2007) calculated that wolf densities greater than 6.5 wolves/1000 km² will result in woodland caribou declines. Seven of nine collared caribou mortality investigations conducted between 2007 and 2012 within the Hart Ranges concluded in wolf predation as the cause (Heard, et al., 2013).

While not specific to the Hart Ranges caribou subpopulation, studies have demonstrated that bears negatively impact calf recruitment and may impact adult survival (Adams, et al., 1995; Wittmer, et al., 2005a). Cougars are not thought to be major predators of caribou in northern BC (Wittmer, et al., 2005a). Wolverine?

3.2 FOOD LIMITATION

Lichens form the main part of caribou's winter diet, while in the summer a variety of vegetation is consumed. A comprehensive study of mountain caribou using bone marrow fat of deceased collared caribou suggests that population declines are linked to excessive predation, not body condition (McLellan, et al., 2012). Other studies also suggest that absolute quantity and quality of food does not limit growth of Woodland Caribou populations as long as adequate range is available to deal with severe snow conditions or loss of lichen producing habitat (Schaefer & Pruitt, 1991; Bergerud, 1996). However the result of supplemental feeding on the Kennedy Siding subpopulation suggests that caribou movements to reduce predation risk may reduce food intake and therefore lower nutritional condition (Heard & Zimmerman, 2017).

3.3 HUMAN ACTIVITIES

3.3.1 INDUSTRIAL

3.3.1.1 FORESTRY

Woodland caribou are an old-growth forest dependent species (Bergerud, 2000; Theberge & Oosenbrug, 1977) hence forest management affects their distribution and populations. Although some populations live seasonally in treeless, alpine ecosystems, all spend some of the year in forests. For this reason, forestry will affect woodland caribou populations. Forestry effects include "habitat loss" that reduces the amount of old-growth forest reducing forest-based food resources and creating more, early seral forest habitat for apparent competitors such as deer and moose (Simpson & Woods, 1987; Cichowski, 1989; Seip, 1990; Stevenson, 1991). Factors such as the type of forest (Cichowski, 1989) and the size of cutblocks (Edmonds & Bloomfield, 1984) play a role in the effect of forestry practices on woodland caribou populations.

Large scale forest harvesting within the Hart Ranges LPU began in the 1940's along the western edges however it was not until the 1970's that the rate of harvest increased dramatically. Currently regenerating cutblocks of an age class less than 40 years are abundant at mid to low elevations, predominately in matrix habitat, in almost every valley within the LPU (BC Government, 2018). Forest harvesting continues at this time within the matrix habitat (Google Earth, 2017).

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3.3.1.2 MINING

Mineral exploration and mine sites deter caribou both for the activities that occur there when they are active as well as for the habitat they destroy. Mines have a 2 km ZOI when they are active, but this shrinks to the physical footprint of the mine site when mines are dormant, inactive or abandoned (Polfus, et al., 2011). This physical footprint usually includes linear features such as roads and possibly powerlines, which increase predator travel efficiency, thus increasing the predation risk to the caribou (Latham, et al., 2011a; DeMars & Boutin, 2017).

There are 65 mineral claim tenures within the Hart Ranges and some exploration activity has occurred; however, no significant mines have been developed (D. McColl, pers. comm.).

3.3.1.3 OIL AND GAS

The potential impacts on caribou of oil and gas development would likely be similar but possibly more extensive than mining. However currently oil and gas extraction related activities are non-existent in this area (D. McColl, pers. comm.).

3.3.1.4 CLEAN ENERGY

Clean energy projects could include large hydroelectric dams and reservoirs, smaller run of the river hydroelectric projects, wind farms, and solar power generating projects.

Research in southern British Columbia correlated hydroelectric development with declines in caribou populations (Simpson, 1987b). There is one micro hydro project; however, there are no large hydroelectric generating facilities or reservoirs within the Hart Ranges caribou subpopulations range. There is currently one investigative licence for a reservoir and 2 investigative licenses for run of the river hydroelectric, and no tenures for wind, or solar power generating installations or proposals in the Hart Ranges caribou subpopulation area.

3.3.1.5 OTHER

No other forms of industrial development are currently planned or underway within the Hart Ranges subpopulation area.

3.3.2 RECREATION

Recreational activities, both motorized and non-motorized, can impact caribou populations by displacing individuals into sub-optimal habitats (Seip, et al., 2007; Lesmerises, et al., 2018), increasing stress levels (Freeman, 2008) and / or facilitating predator movement into caribou habitat (Whittington, et al., 2011). Unnecessary movements can deplete critical fat reserves, potentially decreasing the likelihood of successful parturition and calf rearing the following summer and potentially decreasing the ability to avoid predators (Seip, et al., 2007). Additional winter movements may also increase the amount of exposure to steep terrain, increasing the risk of mortality due to avalanches (Simpson, 1987a; Seip, et al., 2007).

3.3.2.1 SNOWMOBILE

Parts of the Hart Ranges offer snowmobiling opportunities and are adjacent to significant human populations in the Prince George area. Within the Hart Ranges there are 2 recreational snowmobile cabins (cabins is a miss characterization as one cabin has several out buildings), and a BC Parks Cabin Lower elevations in the valleys are not protected and forest harvesting is widespread. Forestry roads constructed to access these forests also provide the access required by the snowmobilers (Seip, et al., 2007).

3.3.2.2 HELI-SKI / CAT SKI

There are two heli skiing operators within the Hart Ranges caribou subpopulation boundaries (HeliCat Canada, 2017). Their combined tenure area covers 6500 km², 46% of the subpopulation's area (BC Government, 2018).

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3.3.2.3 OTHER

Backcountry skiing, snowshoeing, ATV use, hiking, mountain biking, and other similar activities could also stress or displace caribou from preferred habitat (MFLNRO Skeena, 2017). Access for these activities is facilitated by Highway 16 between Prince George and McBride and the numerous forestry roads branching off of it. The Parsnip area is slightly more remote. There are two existing non-commercial recreation cabins (D. McColl, pers. comm.). A commercial heli-hiking tenure is adjacent to the northern edge of the LPU along the height of land and 343 km² multi-use commercial recreation tenure is located in the Table River drainage within the LPU (BC Government, 2018).

3.3.3 OTHER

3.3.3.1 AGRICULTURE

Agricultural development can impact caribou populations in several ways. These include the direct losses of habitat as forests are converted to fields and the supplementation of natural food sources for alternate prey such as elk and deer potentially increasing their populations, which in turn may support increased numbers of predators, increasing the predation risk to the caribou. In addition, domestic livestock could harbour diseases and parasites. Transmission to caribou has not been established within British Columbia (Martin, et al., 2011; Vors & Boyce, 2009).

There is some agricultural development along the southwest edge of the Hart Ranges caribou LPU near the communities of Sinclair Mills, Longworth, Penny, Crescent Spur, Loos, and near the community of McBride, elsewhere within or adjacent to the LPU agriculture is virtually non-existent (Google Earth, 2017).

3.3.3.2 ROAD CORRIDORS

Direct mortality from collisions with vehicles is the most obvious threat when highways pass through caribou habitat. Less obvious threats applicable to all roads include direct loss of habitat along road right of ways; fragmentation of habitat, especially if traffic volumes form a crossing barrier (Apps & McLellan, 2006); the maintenance of permanent early seral along road edges supporting alternate prey and therefore predators; improved travel efficiencies for predators increasing predation risk; and improving human access for recreational use.

Highway 16 is within matrix habitat that is part of the Upper Fraser LPU and adjacent to matrix habitat from the Hart Ranges LPU for approximately 100 km from the community of McBride to Purden Lake. Gravel surfaced forestry roads are abundant, located in almost every major valley.

3.3.3.3 LINEAR FEATURES

Linear features could include roads as mentioned above but could also include powerlines, pipelines, railways, and seismic lines. These features often result in direct loss of habitat, create permanent early seral conditions that benefit alternate prey and their predators, and improve travel and therefore hunting efficiency for predators (DeMars & Boutin, 2017). Avoidance by caribou may extend the area of impact well beyond the physical footprint (Vistnes & Nellemann, 2008).

There are currently no powerlines, pipelines, or seismic lines through the Hart Ranges caribou's range. There is a heavily used railway line in the Table River drainage that connects the coal mines near Tumbler Ridge to the port of Prince Rupert. In addition there is a tenure for a gas / oil pipeline through the Anzac drainage and a powerline tenure in the MacGregor drainage (BC Government, 2018). These last two projects have not been constructed (Google Earth, 2017; CGL, 2018).

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3.3.3.4 HUNTING

Excessive hunting of caribou is likely responsible for the initial declines in populations throughout the southern two thirds of the province (Spalding, 2000), including the Hart Ranges. Overhunting was likely the cause of extirpation of caribou from the Babine Mountains to the west in the 1940's (Theberge & Oosenbrug, 1977).

Moose, deer, and elk hunting continues within the Hart Ranges caribou sub-population range (BC Government, 2016a; BC Government, 2016c). While reduction in alternative prey can be beneficial to woodland caribou, active hunting on caribou winter range may also contribute to accidental death by hunters who misidentify their prey. The specific impact to the Hart Ranges caribou sub-population is unknown.

3.4 NATURAL DISTURBANCE

Caribou populations are subject to impacts from a number of natural disturbances. Being dependent on old-growth forests, caribou are impacted by forest fires. In mountain caribou habitats, it takes a minimum of 150 years for a forest to recover from a fire to become caribou habitat again. In addition the early seral habitat created post-fire may facilitate population increases in alternate prey and their predators. Although caribou are likely adapted to the natural forest fire regime within and adjacent to their ranges, effects of forest fire may act cumulatively with human-mediated disturbances to negatively impact caribou demography (Sorensen, et al., 2008). Caribou may also be affected by insect or disease outbreaks that affect forest stand condition. For mountain-dwelling caribou, avalanches constitute another type of natural disturbance that can potentially impact demography, though under normal conditions their importance as a mortality should be small unless population sizes are small (Hebblewhite, et al., 2007; Seip & Cichowski, 1996).

3.5 PARASITES AND DISEASES

Caribou can be impacted by a range of native and introduced diseases and parasites (Bergerud, et al., 2008; Schwantje, et al., 2014). Disease and parasite outbreaks can limit caribou populations by affecting survival and reproductive rates (Albon, et al., 2002; Klein, 1991) and effects of disease and parasites may interact with other limiting factors such as predation and nutrition. Threats from disease and parasites are predicted to increase with climate change (see *Section 3.6* below), particularly if spatial overlap between caribou and other ungulate species increases (Bradley, et al., 2005; Dobson, 2009; Kutz, et al., 2005). For example, increasing expansion of white-tailed deer into caribou range may increase the prevalence of meningeal worm in caribou, a parasite that is highly pathogenic to caribou and whose usual host is white-tailed deer (Anderson, 1972).

Impacts from parasites and disease on the population dynamics of the Hart Ranges caribou subpopulation are not well studied. Evidence to date from an extensive study suggests that mortality from natural causes (i.e. diseases and nutrition) is low (McLellan, et al., 2012; Apps, et al., 2013) and diseases and parasites are not thought to be a major driver of current declines in populations of southern mountain caribou (EC, 2014).

3.6 CLIMATE CHANGE

Climate change can potentially exert numerous effects on caribou population dynamics. Warmer winters may impact forage availability by increasing icing events and / or causing poor snow conditions that limit the ability of caribou to access lichens (Hansen, et al., 2011). A warming climate may also change the abundances and distribution of alternate prey and their generalist predators, potentially increasing rates of caribou predation (Latham, et al., 2011b; Dawe & Boutin, 2016). Climate change may alter the spatial and temporal distribution of insects, diseases and parasites, potentially affecting individual fitness and population dynamics (Bradley, et al., 2005). Changes to the natural disturbance regime (e.g. fire interval, fire intensity, avalanche frequency) may further impact caribou through mechanisms outlined in *Section 3.4*.

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There is no specific information on how climate change may be affecting the Hart Ranges subpopulation of caribou, although the mountain pine beetle infestation described above has likely been exuberated by warmer winters (COSEWIC, 2014).

3.7 SMALL POPULATION SIZE EFFECTS

Caribou subpopulations that are small and isolated may be subject to negative demographic effects that can occur as a result of their small size (Caughley, 1994). However with an estimated current population estimate of 375 caribou the Hart Ranges caribou may not currently fit into this category.

4 MANAGEMENT HISTORY

4.1 HABITAT

4.1.1 PROTECTION

The Hart Ranges LPU contains portions of Monkman (established 1981) and Kakwa (established 1987) Provincial Parks and all of Arctic / Pacific Lakes (established 2000), Evanoff, and Edge of the World Provincial Parks (BC Government, 2018). Of the total LPU area 126,472 ha or 9.1% is contained in these parks. This protection is weighted slightly towards core habitat as 13.2% of core habitat lies within these parks (Mahood, 2018).

In 2007 sixty-one percent of core habitat within the LPU was designated as no further harvest Ungulate Winter Range (UWR) under Government Action Regulation (GAR) orders (Mahood, 2018; BC Government, 2018). Combined with the provincial parks a total of 74.2 % of core habitat has been protected from further forest harvest.

There are also coal land reserves, mineral no registration reserves, and old growth management areas (OGMA's), fisheries sensitive watersheds, land act reserves; however, these may overlap considerably with the UWR and therefore not cumulative.

4.1.2 ENHANCEMENT AND RESTORATION

Caribou habitat enhancement and restoration relates both to recreating or improving habitats for caribou seasonal range (termed ecological restoration) as well as managing linear disturbances (roads, seismic lines, pipelines, transmission rights of way) to prevent facilitated predator access (termed functional restoration) (Alberta Woodland Caribou Recovery Team, 2005; Dickie, et al., 2017; Dickie, et al., 2016). As well, habitat enhancement and restoration must be accompanied by protection to be effective (Schneider, et al., 2010). Restoration of caribou habitat takes place naturally through succession from early seral stages to mature and old forest. Standard silviculture practices could aid this process. Further habitat enhancement and / or restoration has not taken place within the Hart Ranges caribou subpopulation area.

4.2 RECREATION AND ACCESS MANAGEMENT

From a management perspective recreational activities can be grouped into various categories including commercial / non-commercial, summer / winter, motorized / non-motorized, by specific activity such as snowmobiling / heli skiing, or a combination of these.

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In 2007 a five year moratorium on new commercial recreation tenures was enacted. This moratorium was renewed in 2013 and expired on March 31, 2018 (BC FLNRO, 2013). The boundaries mirror the caribou no harvest UWR and as such would cover 61% of core caribou habitat within the Hart Ranges LPU.

4.2.1 SNOWMOBILE

Fifty-eight percent of core caribou habitat within the Hart Ranges is closed to snowmobile use under the BC Wildlife Act (Mahood, 2018; BC Government, 2018). Provincial parks make up another 13% of core habitat, however snowmobile use is allowed in Monkman Provincial Park and in parts of Kakwa Provincial Park, and Evanoff Provincial Park (BC Parks, 1994; BC Parks, 2006). In addition agreements are in place with local snowmobile clubs that allows snowmobile use in core caribou habitat in some locations within the MacGregor drainage and in the Morkill drainage further east (BC Government, 2018). The Conservation Officer Service provides education and conducts regular compliance and enforcement patrols. Enforcement resulted in two arrests, fourteen violation tickets, and four warnings in 2013 (CO Service, 2013); eight violation tickets and four warnings in 2014 (CO Service, 2014), and 16 enforcement actions in 2018.

4.2.2 HELI SKI / CAT SKI

The helicopter and cat skiing industry, through membership with Helicat Canada, was been guided by best management practices from 2011 to 2017 (under a Memorandum of Understanding (MOU)) that stipulated minimum distances that the helicopters and skiers should avoid caribou by (BC Government, 2014) it has not been renewed. In addition there are some area closures within these tenures (HCRIG, 2005).

4.2.3 SUMMER RECREATION

Recreation within the provincial parks in the Hart Ranges LPU is focussed on non-motorized backcountry recreation (BC Parks, 2006; BC Parks, 1994). Outside of provincial parks there are no limitations on non-commercial, non-winter recreational activities.

4.3 PREDATORS

4.3.1 WOLF MANAGEMENT

The Parsnip section of the Hart Ranges has been subject to a moose reduction experiment intended to evaluate the response in wolf density as a means to reduce wolf predation on caribou (Steenweg, 2011). Between 2005 and 2012 the moose population within the study area declined from approximately 3000 moose to 1000 (Heard, et al., 2013). Moose reduction was intended to be accomplished using tools within the provincial hunting regulations (e.g, increased bull, cow and calf opportunities), because a key goal of the experiment was to determine whether hunting could be a successful tool to reduce alternate prey densities as a more socially acceptable and significantly more cost effective means to reduce wolf numbers than direct wolf control. Wolves have been surveyed six times since 2005, most recently in 2016, and wolf numbers have remained stable around 40 – 45 wolves, a density of 8 – 9 wolves / 1000 km² (Klaczek & Heard, 2017), greater than the target density of 3 wolves / 1000 km² for recovering caribou populations (EC, 2014).

In 2016 and 2017, subsequent to the 2016 wolf survey, a wolf cull in the adjacent Kennedy Siding caribou sub population has resulted in the removal of 22 wolves whose territories overlap with the Parsnip section of the Hart Ranges. Further studies are recommended to assess potential recolonization (Klaczek & Heard, 2017).

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Wolf hunting is managed as general open seasons through the provincial hunting regulations. There are no restrictions on the number of wolves harvested per person annually (annual bag limit) for the Hart Ranges caribou subpopulation area (Management Units (MUs) 7-16, 7-17, 7-18, and 7-23) (BC Government, 2016a). Wolves are also trapped by registered trappers for their fur. There is no requirement for compulsory inspection or compulsory reporting of wolves harvested in Region 7 (BC Government, 2016a).

Hunting and trapping does not usually result in the removal of complete packs, remaining pack members can reproduce and recover within one year providing food resources are available. Partial pack removal can also splinter packs, resulting in more wolves as their territorial system is compromised with an overall higher predation rate (B. McLellan, pers. comm. 2017). Complete pack removal targeting the Hart Ranges wolves, carried out from a helicopter, would likely be more effective.

4.3.2 COUGAR MANAGEMENT

The annual bag limit for cougar in MUs 7-16, 7-17, 7-18, and 7-23 is two. There is a province wide requirement for compulsory inspection of cougars (BC Government, 2016a).

4.3.3 OTHER

Bear and wolverine predation on neonates and caribou in the spring can also have a significant impact on caribou populations (Wittmer, et al., 2005a; MFLNRO Skeena, 2017). Bear and wolverine populations are likely not greater than historic levels, instead grizzly bears and wolverines themselves may be at risk in some areas (BC Conservation Data Centre, 2017). In addition, as bears are more abundant than caribou and only a small portion of the diet of any one bear would be caribou, a very large number of bears would have to be culled to have an effect (MFLNRO LNG, 2015).

4.4 PRIMARY PREY

Managing the abundance and distribution of other ungulate species (e.g. moose and deer) has been a fundamental recommendation for recovering southern mountain caribou (MCTAC, 2002; Messier, et al., 2004; MCST, 2006; EC, 2014; Boutin & Merrill, 2016).

4.4.1 MOOSE MANAGEMENT

As mentioned in Section 4.3.1 above the Parsnip section of the Hart Ranges has been subject to a moose reduction experiment since 2005 (Steenweg, 2011). Within this area the moose population has been reduced from approximately 3000 animals to 1000 (Klaczek & Heard, 2017; Walker, et al., 2006; Heard, et al., 2013). This has been accomplished through General Open Seasons (GOS) on calves and spike fork bulls and Limited Entry Hunts (LEH) on cows, calves, and bulls (BC Government, 2016a; BC Government, 2016c).

4.4.2 DEER MANAGEMENT

Both mule deer and white tail deer are present within the Hart Ranges caribou subpopulation area. There is a general open season for both white tail and mule deer bucks and for female white tail in MU 7-17 only (BC Government, 2016a; BC Government, 2016c).

4.4.3 OTHER

Elk are present within the Hart Ranges LPU and there is a GOS for bulls with 6 point antlers or greater and an LEH for cows in MU 7-17 (BC Government, 2016a; BC Government, 2016c).

4.5 POPULATION REINFORCEMENT

4.5.1 MATERNITY PENNING

Maternal penning to increase calf recruitment is a tool that has not been used with the Hart Ranges caribou subpopulation. It is not a viable tool for caribou populations over 100 animals (MFLNRO LNG, 2015). Penning requires a minimum of 60% of the female population penned and an annual female survival rate greater than 85% to be effective (DeMars, 2017). The number of females that would have to be penned to produce a significant increase to recruitment rates would be cost prohibitive.

4.5.2 CAPTIVE BREEDING

Captive breeding is defined as “keeping and selectively breeding caribou in captivity, usually at an ex-situ facility, over a relatively long period of time with the purpose of releasing individuals back into the wild” (Hayek, et al., 2016). To date captive breeding of caribou has not been implemented in BC and is not in the plans as a management tool for conserving the Hart Ranges caribou subpopulation.

4.5.3 TRANSLOCATION

Translocation refers to the movement of individuals from one population (or subpopulation) to another (Hayek, et al., 2016). Numerous translocation efforts for caribou have taken place across North America (Bergerud & Mercer, 1989; Hayek, et al., 2016).

There have been no translocations of caribou into the Hart Ranges caribou subpopulation however it has been used a source for transplants to the South Selkirk caribou population in the late 1990's when Hart Ranges populations were significantly higher and stable (Almack, 1998).

4.5.4 OTHER

Predator exclusion fencing or other forms of population reinforcement have not been implemented for the Hart Ranges caribou subpopulation.

4.6 STEWARDSHIP/OUTREACH

Stewardship Management Agreements (SMA's) are in place for many caribou subpopulation areas that also experience high recreational snowmobile use, this is not implemented in the Hart Range. The general concept is that while key areas of caribou are closed to snowmobile use, the snowmobiling community will act as stewards in implementing best management practices in other areas of caribou habitat that remain open to snowmobile use. Considerable outreach efforts at industry trade shows, snowmobile retailers, etc. may also be undertaken (CO Service, 2013; CO Service, 2014).

4.7 RESEARCH AND MONITORING

There have been decades of research into caribou biology and conservation. This body of work has informed scientists and policy makers of the key factors that contribute to caribou population dynamics, important threats and potential solutions. Key findings have been the proximate role of predation and apparent competition in caribou population fluctuations and the ultimate role of habitat destruction in caribou population declines. While these factors are well understood in a broad sense, ongoing research is necessary to fine tune caribou responses to ecological stimuli and human disturbance.

As mentioned above the Parsnip section of the Hart Ranges have been subject to one of two moose reduction trials in the province in efforts to reduce wolf densities and therefore reduce predation risk to caribou (Heard, et al., 2013; Steenweg, 2011; Klaczek & Heard, 2017).

5 IMPLICATIONS TO OTHER WILDLIFE

Management actions focused on conserving caribou will necessarily have impacts on other wildlife species. Caribou require landscapes where densities of other ungulates and predators are low; thus, management actions undertaken for caribou may result in population sizes of moose, deer, and wolf that are much lower than those currently experienced (Serrouya, et al., 2015; Serrouya, et al., 2017). Reducing the populations of these species may occur from either direct management actions (e.g. lethal control) or through environmental changes (e.g. habitat restoration for caribou) that lowers the extent of suitable habitat.

Conserving caribou will likely benefit a myriad of other species co-occurring within old-growth forests. In this context, caribou may be considered an “umbrella” species (Bichet, et al., 2016). Such species generally have large spatial requirements and are sensitive to environmental changes, both attributes associated with caribou. Meeting the habitat requirements of caribou will therefore result in the habitat needs of many other species also being met.

6 IMPLICATIONS TO OTHER VALUES

Enacting measures to conserve caribou will likely have impacts on social, political and economic values. Most woodland caribou populations occur in working landscapes managed for natural resource extraction. Conserving caribou in these landscapes will likely require limits on these activities, which will likely invoke socioeconomic costs (Schneider, et al., 2011). To effectively mitigate these impacts while conserving caribou in multi-use landscapes, conservation planning will need to incorporate both economic costs and the biological needs of caribou in a spatially-explicit modelling framework (Schneider, et al., 2011; Schneider, et al., 2012).

In many caribou ranges, reducing the current densities of other ungulate species will be fundamental to conserving caribou (Serrouya, et al., 2015). Lowered populations of big-game species such as moose will initially result in greater hunting opportunity however will result in reduced hunting opportunities in the long term. While incorporating hunters in the initial lowering of these populations can be advantageous and seen as a “win-win” (Serrouya, et al., 2015), the long-term suppression of these populations will be more successful with support from the regional hunting community.

Caribou have evolved a life history strategy that is dependent on large landscapes of intact wilderness (Bergerud, 2000). For many, such landscapes have inherent and intangible value. Intact wilderness also has economic benefits, including climate regulation, sedimentation control and nutrient cycling (Balmford, et al., 2002).

Caribou conservation can also elicit ethical issues. For many small and rapidly declining populations, management actions may include direct control of predators and other ungulates (Hervieux, et al., 2014). Such actions can elicit considerable controversy and, consequently, require substantial scientific support and justification for their implementation (Boertje, et al., 2010).

7 PARTNERS / NEIGHBOURS

Partners are groups of people, currently existing or with strong future potential, that can assist in some aspect of management, such as expertise, financial contribution, in-kind support or moral support.

Neighbours are groups of people within in the caribou subpopulation area that are currently not participating in caribou management that could be affected by caribou management, such as local governments, industry tenure holders, and recreation groups. These neighbours could potentially become future partners.

8 RECOMMENDED ACTIONS

8.1 SHORT TERM (WITHIN 6-12 MONTHS)

8.1.1 HABITAT PROTECTION

- Begin discussions on methods to increase no harvest protection of core habitat as mapped by Environment and Climate Change Canada (ECCC) to 100%.
- Begin discussions on converting the target of a wolf density of 3 per 1000 km² in matrix habitat to a system tangible to the forest industry, potentially a cap on the amount of early seral forest age classes.
- Initiate Land Act Reserves over remaining untenured areas of core habitat for major industrial uses including metal mining, placer mining, and natural gas.

8.1.2 ALTERNATE PREY MANAGEMENT

- Move towards management of moose populations to densities of < 0.3 / km² in all core and matrix caribou habitat.
- Review if changes are required to white tail deer hunting management to facilitate lower predator populations.

8.1.3 PREDATOR MANAGEMENT

- Collar 1 – 2 wolves per pack to improve current knowledge of wolf densities, movements and populations.
- Review compulsory inspection data and anecdotal reports for cougar to determine prevalence.

8.1.4 RESTORATION

- Initiate discussions with the forestry sector on decommissioning and rehabilitating roads to reduce predator travel efficiency and to limit recreational access.
- Initiate discussions with the forestry sector to begin exploring silviculture and forestry management options and prescriptions which will increase the speed at which early seral forests mature. This will include legislative options under FRPA which could support this work.

8.1.5 RECREATION

- Assess if current snowmobile restrictions are adequate to prevent the displacement of caribou from preferred habitat.
- In conjunction with the Conservation Officer Service, continue compliance monitoring and enforcement of current snowmobile restrictions.
- Update heliski industry best management practices. Experience in other mountain caribou areas suggest that the 500 meter flight and skier avoidance guideline is inadequate; suggest updating to 3 km skier and flight avoidance and / or ensure area closures are in key locations.

8.2 MEDIUM TERM (WITHIN 12-24 MONTHS)

8.2.1 HABITAT PROTECTION

- Increase no harvest protection of core habitat as mapped by Environment and Climate Change Canada (ECCC) to 100%.
- Convert the target of a wolf density of 3 per 1000 km² in matrix habitat to a system tangible to the forest industry, potentially a cap on the amount of early seral forest stages.

8.2.2 ALTERNATE PREY MANAGEMENT

- Continue management of moose populations to densities of $< 0.3 / \text{km}^2$ in all core and matrix caribou habitat.

8.2.3 PREDATOR MANAGEMENT

- Introduce a wolf cull if densities are greater than 3 wolves / 1000 km²

8.2.4 RESTORATION

- Rehabilitate forestry road segments to inhibit predator movement and prevent mechanized access.
- Initiate silviculture and forestry management options and prescriptions which will increase the speed at which early seral forests mature.

8.2.5 RECREATION

- Improve on current snowmobile restrictions to prevent the displacement of caribou from preferred habitat if necessary.
- In conjunction with the Conservation Officer Service, continue compliance monitoring and enforcement of current snowmobile restrictions.

8.2.6 POPULATION MONITORING

- Continue caribou population monitoring through annual or bi-annual aerial censuses.

8.3 LONG TERM (WITHIN 24-48 MONTHS)

8.3.1 HABITAT PROTECTION

- Monitor whether the introduction of a cap on the amount of early seral forest is producing the desired result.

8.3.2 ALTERNATE PREY MANAGEMENT

- Continue management of moose populations to densities of $< 0.3 / \text{km}^2$ in all core and matrix caribou habitat.
- Continue management of white tail deer populations if necessary.

8.3.3 PREDATOR MANAGEMENT

- Continue the wolf cull if densities are greater than 3 wolves / 1000 km²

8.3.4 RESTORATION

- Continue to rehabilitate forestry road segments to inhibit predator movement and prevent mechanized access.
- Continue with silviculture and forestry management options and prescriptions which will increase the speed at which early seral forests mature.

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8.3.5 RECREATION

- In conjunction with the Conservation Officer Service, continue compliance monitoring and enforcement of current snowmobile restrictions

8.3.6 POPULATION MONITORING

- Continue caribou population monitoring through annual or bi-annual aerial censuses.

8.3.7 OUTREACH

- Continue with a regional outreach program to foster support for management that will promote growth of the Hart Ranges caribou program.

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