

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

Edziza Subpopulation

Northern Mountain Caribou



BRITISH
COLUMBIA

Recommended Citation:

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EXECUTIVE SUMMARY

DRAFT

TABLE OF CONTENTS

Executive Summary.....	ii
1 Background.....	3
1.1 Introduction to the Program.....	3
2 Population Description	3
2.1 Distribution.....	3
2.2 Habitat and Behaviour	5
2.3 Population Size and Trend.....	6
3 Threats and Limiting Factors.....	7
3.1 Predation.....	8
3.2 Food Limitation	8
3.3 Human Activities.....	8
3.3.1 Industrial.....	8
3.3.1.1 Forestry.....	9
3.3.1.2 Mining	9
3.3.1.3 Oil and Gas	9
3.3.1.4 Clean Energy	10
3.3.1.5 Other.....	10
3.3.2 Recreation.....	10
3.3.2.1 Snowmobile.....	10
3.3.2.2 Heli-ski / Cat-ski.....	11
3.3.2.3 Other.....	11
3.3.3 Other	11
3.3.3.1 Agriculture.....	11
3.3.3.2 Major Highway Corridors	12
3.3.3.3 Linear Features	12
3.3.3.4 Hunting.....	12
3.3.3.5 Poaching	13
3.4 Natural Disturbance.....	13
3.5 Parasites and Diseases	13
3.6 Climate Change	14
3.7 Small Population Size Effects	14

Woodland Caribou Plan for the Edziza Subpopulation

4	Management History	15
4.1	Habitat	15
4.1.1	Protection.....	15
4.1.2	Enhancement and Restoration	15
4.2	Recreation and Access Management.....	16
4.2.1	Snowmobile.....	16
4.2.2	Heli-ski / Cat-ski.....	16
4.2.3	Other	16
4.3	Predators	16
4.3.1	Wolf Management	17
4.3.2	Cougar Management.....	17
4.3.3	Other	17
4.4	Primary Prey.....	17
4.4.1	Moose Management	18
4.4.2	Deer Management.....	18
4.4.3	Other	19
4.5	Population Reinforcement	19
4.5.1	Maternity Penning	19
4.5.2	Captive Breeding.....	19
4.5.3	Translocation	20
4.5.4	Other	20
4.6	Stewardship/Outreach.....	20
4.7	Research	21
4.8	Monitoring.....	21
5	Implications to Other Wildlife.....	22
6	Implications to Other Values.....	22
7	Partners / Neighbours	23
8	Recommended Actions.....	23
8.1	Short Term (Within 6–12 Months).....	23
8.2	Medium Term (Within 12–24 Months)	23
8.3	Long Term (Within 24–48 Months)	24
9	Literature Cited.....	25

1 BACKGROUND

1.1 INTRODUCTION TO THE PROGRAM

The Edziza subpopulation is the northern mountain ecotype of woodland caribou (*Rangifer tarandus caribou*), designatable unit seven (DU 7), and is within the Northern Mountain National Ecological Area (NMNEA). These herds are listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2002) and appear on Schedule 1 of the Federal Species at Risk Act (SARA). They are blue-listed in British Columbia and are included in the Provincial Identified Wildlife Management Strategy (British Columbia Ministry of Water, Land and Air Protection 2004).

Range plans are required for all woodland caribou populations that are designated as threatened or endangered in Canada (Environment and Climate Change Canada 2016). The Edziza subpopulation is blue-listed in BC, and it is unknown if the herd is in decline (Grant 2017).

This document spans the divide between these disparate designations in British Columbia and Canada, compiling past research, knowledge and management actions into guidance for the management and recovery of the Edziza Northern Mountain caribou subpopulation.

2 POPULATION DESCRIPTION

Relative to other western mountain caribou (DU 8 and 9), members of this DU are found in dry sub-boreal montane ecosystems and use pine-dominated habitats during winter. Most populations of Northern Mountain caribou are relatively small and sedentary, with individuals wintering in small groups. They generally employ the calving strategy of moving to high elevations on open sub-alpine ridges, spacing away from conspecifics and predators (COSEWIC 2011).

2.1 DISTRIBUTION

The Edziza subpopulation range area is small - roughly 2340 square kilometres – and a significant portion of it falls within Mount Edziza Park.

The northern boundary starts along the Klastline River and runs west 5 km south of and parallel to the Stikine River. The western boundary roughly follows the height of land in an arc south to the south end of Schaft Creek, through Mess Creek and the NE to Tadekho Creek. The eastern boundary swings northeast along the height of land past the headwaters of Stewbomb and Artifacts Creeks to Tsacha Creek. From there it heads north around the headwaters of Detiaten Creek, then northwest to the northernmost point.

The most recent population estimate for the Edziza subpopulation is 175 individuals, last censused in 2005. The population trend is currently unknown (Grant 2017).

Information on ecology and habitat use specific to Edziza caribou is limited. Available information indicates that seasonal movements of Edziza caribou are dependent on snow conditions, though in general, they spend the summer in high elevation alpine and subalpine habitats and move to lower elevation coniferous forests during the winter (COSEWIC 2002). Winter forage consists primarily of terrestrial lichen (Brown et al. 2007).

Woodland Caribou Plan for the Edziza Subpopulation

Four biogeoclimatic (BEC) zones (Meidinger and Pojar 1991) occur in the range area. These BEC zones are generally described as:

- Boreal Altai Fescue Alpine (BAFA) is dominated mostly by rock, ice and snow with vegetation limited to shrubs, herbs, mosses, lichens and dwarf trees.
- Engelmann Spruce – Subalpine Fir (ESSF) is a forested mid-elevation zone occurring below the BAFA. Spruce and fir are the dominant species although lodgepole pine occurs on drier sites.
- Spruce Willow Birch (SWB) occurs at mid-elevations below the BAFA. The SWB supports open forests of predominantly white spruce, subalpine fir and deciduous shrubs.
- Boreal White and Black Spruce (BWBS) zone is found in the lower elevations. Frequent fires have resulted in extensive successional forests of lodgepole pine and trembling aspen. On gentle terrain, stands of white spruce and trembling aspen are interspersed with black spruce bogs (Brumovsky and McNay 2015).

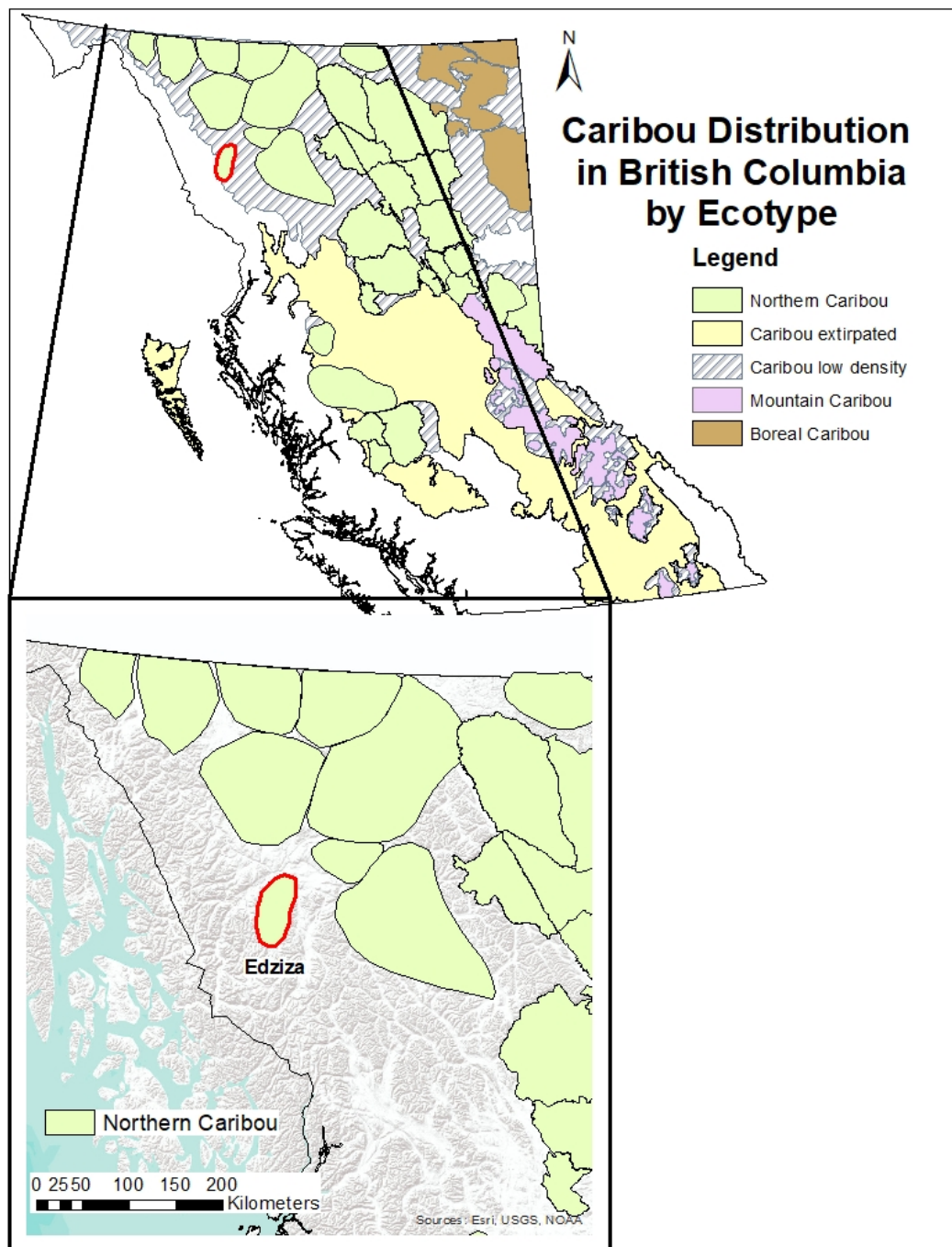


Figure 1: The location of the Edziza subpopulation of woodland caribou. The 2341 km² range (inset: red outline) is within the Skeena Region.

2.2 HABITAT AND BEHAVIOUR

A survey of the Edziza caribou subpopulation range shows that they preferentially occupy boreal alтай fescue - alpine and Englemann spruce - subalpine fir habitats, followed by boreal white and black

spruce, and spruce - willow - birch forests and occasionally sub-boreal spruce (McNay and Hamilton 2010). Because they live west of the Rocky Mountains in the western part of the Northern Mountain Natural Ecological Area (NMNEA), Edziza caribou live in deep snow habitats with abundant lichen. But the critical habitat for Edziza has not been assessed (Grant 2017). As northern caribou, they tend to select alpine habitat in summer and low-elevation, forested habitats in winter (Thiessen and Grant 2017).

2.3 POPULATION SIZE AND TREND

There have been very few formal surveys of the Edziza caribou subpopulation, but a number of minimum counts from the 1970s that provide an approximate herd size. Nevertheless, the general pattern suggests that the Edziza subpopulation has declined in recent years (Figure 2).

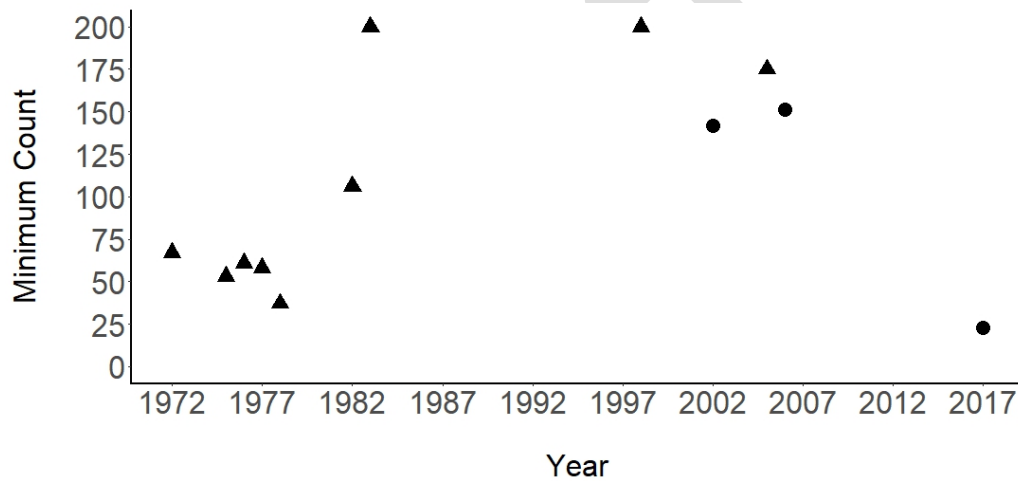


Figure 2: Caribou minimum counts for the Edziza sub-population. Circles are from systematic surveys (high reliability) and triangles are from aerial surveys using unknown methods or ground counts (lower reliability). Surveys prior to 1997 were reported by Bergerud (1978). Subsequently, Government of British Columbia staff conducted surveys, reported by Bergerud (1978), Heard and Vagt (1998), McNay and Hamilton (2010), Environment Canada (2012a), Grant (2017), Thiessen and Grant (2017).

Woodland Caribou Plan for the Edziza Subpopulation

Caribou recruitment, measured as percent of calves in the population observed during a spring census (Bergerud and Elliot 1986), has only been estimated twice for the Edziza caribou subpopulation (Figure 3). These values suggest that this herd is at, or above threshold for population growth, but has been below recruitment thresholds in the past.

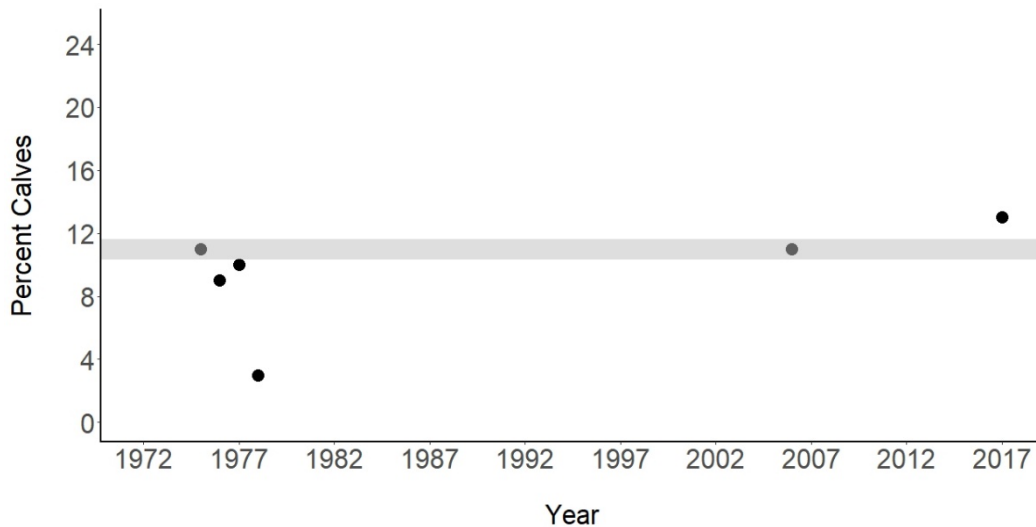


Figure 3: Caribou population recruitment measured in the Edziza caribou subpopulation range. Recruitment is defined here as the percent of the estimated population that is in the calf cohort. Recruitment lower than approximately 10 to 12% is considered below a threshold that will balance natural mortality (grey band; Bergerud and Elliot 1986). Data from Bergerud (1978), Marshall et al. (2006) and Grant and Quock (unpublished, 2018).

3 THREATS AND LIMITING FACTORS

Primary threats to caribou and their habitat have been noted by McNay et al. (2008), COSEWIC (2014) and a variety of independent studies (e.g., James et al. 2004, Wittmer et al. 2005b, Courtois et al. 2007, Seip et al. 2007, Wittmer et al. 2007). In this review, threats are treated in isolation, but this does not discount the likelihood that they interact. Cumulative effects assessment (Sorensen et al. 2008, Johnson et al. 2015) is beyond the scope of this plan, but elements such as predation, human activities, and climate change are known to affect one another. Work on boreal caribou has demonstrated the value in developing comprehensive range planning for woodland caribou that considers interacting threats (Angelstam et al. 2004, Environment Canada 2012b).

There are relatively few human-based threats due to limited access to the Edziza caribou subpopulation and its habitat protection within Mount Edziza Provincial Park. Natural stressors and its small population likely pose the greatest threats (Environment Canada 2012a).

Here, the following threats are considered:

1. Predation
2. Food limitation
3. Human activities
 - a. Industrial

- b. Recreational
 - c. Other
- 4. Natural disturbance
- 5. Parasites and diseases
- 6. Climate change
 - 7. Hunting and poaching
 - 8. Small population size effects

3.1 PREDATION

GPS collar and radio telemetry studies indicate 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 (Bergerud 1988). While the predator species killing caribou vary regionally (wolf, black bear, grizzly bear, cougar), their impact on woodland caribou populations has increased as the result of three dominant processes: apparent competition mediated by alternative prey abundance (Hebblewhite et al. 2007), apparent competition mediated by expanding alternative prey distribution (Wittmer et al. 2007, DeCesare et al. 2010b, Latham et al. 2011a, Latham et al. 2011c), and enhanced predator access to woodland caribou habitat (Hayhurst 1983, Latham et al. 2011b). More generally, Bergerud (2007) has calculated that wolf densities greater than 6.5 wolves/1000 km² will result in woodland caribou declines. More recently, the federal recovery strategy identifies 3 wolves/1000 km² as a target (Environment Canada 2014).

Mortality sources including predation rates have not been investigated in the Edziza caribou subpopulation range. Predator densities are also unknown (Grant 2017).

3.2 FOOD LIMITATION

Woodland caribou are herbivores and rare among large mammals as lichen eaters (Johnson et al. 2004). While lichen makes up the bulk of their winter diet (Johnson et al. 2000, Parker et al. 2005), it is a smaller proportion of their summer diet (Denryter et al. 2017). And although habitat selection is predominantly thought to be influenced by predator avoidance, selected habitats must also be able to satisfy an individual's nutritional needs (Newsome et al. 2000, Brown et al. 2007). Trade-offs between these two fundamental demands (avoiding predators, finding food) raises the potential for woodland caribou to be food or energy limited as they seek predator refugia (Poole et al. 2000, Gustine et al. 2006). When it has been considered, estimates of caribou food abundance typically far exceeds population needs (Courtois et al. 2007).

There have been no studies of food resource abundance or availability in the Edziza caribou population range.

3.3 HUMAN ACTIVITIES

Human activities have consequences for woodland caribou conservation throughout British Columbia. This section focusses on the consequences of human industrial, recreational and other (agriculture, highway, linear feature clearing) activities (Wolfe et al. 2000).

3.3.1 INDUSTRIAL

Industrial activities include forestry, mining, oil, gas and clean energy development. Caribou are affected by industrial activities both due to the presence of physical infrastructure as well as the resulting impacts on their habitat. A key concept to measure and understand industrial effects on caribou is the Zone of Influence (ZOI);

Polfus et al. 2011). This is the area beyond the actual footprint of an industrial development or activity that affects caribou (Dyer et al. 2001). Zones of influence vary by activity and by the presence and absence of people.

3.3.1.1 FORESTRY

Woodland caribou are an old-growth forest dependent species (Bergerud 2000). Hence, forest management affects their distribution and population dynamics. Although mountain caribou populations live seasonally in treeless, alpine ecosystems, all spend some of the year in forests. For this reason, forestry and natural disturbances will affect woodland caribou populations through habitat destruction and fragmentation (Smith et al. 2000). Forestry effects include very general habitat loss that reduces the amount of old-growth forest, to reduction in forest-based food resources to creating more, early seral forest habitat for apparent competitors (see below) such as deer and moose (Simpson and Woods 1987, Cichowski 1989, Seip 1990, Stevenson 1991, Cumming 1992). Factors, such as the type of forest regrowth (Cichowski 1989) and the size of cutblocks (Edmonds and Bloomfield 1984), play a role in the effect of forestry practices on woodland caribou populations. The ZOI of clearcuts for woodland caribou in Newfoundland was found to be 15 km beyond the actual cut block (Chubbs et al. 1993). Hence, even an array of small forest cutblocks can have a significant influence on caribou habitat availability.

There are no historical or planned cutblocks in the Edziza caribou subpopulation range. There are some forest authorizations immediately to the southeast of their range (see below).

3.3.1.2 MINING

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).

The range of the Edziza caribou subpopulation falls directly in an area referred to as British Columbia's mineral "golden triangle" (McMillan 1990, Fidler 2010). There are numerous operating mines in the golden triangle and proposals in the Edziza caribou subpopulation range (COSEWIC 2014). Proposals and exploration are concentrated in, but not restricted to, the southwestern corner of the caribou range, but also occur elsewhere. The Galore Creek project is a proposed, undeveloped, and by some reports abandoned gold and copper mine in partnership between Teck Resources and NovaGold Resources. It is just outside the southwest corner of the Edziza caribou range. The Schaft Creek is an open pit gold and copper mine (Teck Resources) also outside the southwest corner of the Edziza caribou range that is under review. The North ROK and Red Chris mines are operational open pit gold and copper mines to the east of the Edziza range. The Ball Creek project is a proposed gold and copper mine to the northwest of the Edziza caribou range and the property of Evrim Exploration. Although not a current threat to caribou within the Edziza range, mining should be considered a potential, future threat.

3.3.1.3 OIL AND GAS

Oil and gas development threatens caribou populations through habitat destruction, human activity, access, habitat fragmentation and elevated predation (Dyer et al. 2001, Boutin et al. 2012, Hervieux et al. 2013). Given the spatial scope of oil and gas developments (well sites, access roads, pipelines, seismic lines) and the range of activities that take place in caribou habitat cumulative effects of this combined with other activities (e.g. forestry, hydroelectric) also play a large role in threatening resident caribou herds (Nitschke 2008). A study of the

consequences to caribou of being disturbed by oil and gas exploration found that individuals in active plays can lose more than 15% of body mass over winter attributed to noise displacement (Bradshaw et al. 1998).

There is no oil and gas exploration or infrastructure in the Edziza caribou subpopulation range.

3.3.1.4 CLEAN ENERGY

Clean energy refers to hydroelectric dams and wind farms. Hydroelectric reservoirs in caribou range can destroy or fragment habitat and cut movement corridors. Research in southern British Columbia correlated hydroelectric development with declines in caribou populations (Simpson 1987b). Hydroelectric dams, during their construction and operation, have a ZOI that exceeds their footprint (Nellemann et al. 2003). Wind farm development can destroy caribou habitat, reduce forage availability, displace caribou and increase early-seral habitat that promotes growth of alternative prey populations (British Columbia Ministry of Environment 2014).

There is no clean energy infrastructure in the range of the Edziza caribou subpopulation. The McLymont Creek and Volcano Creek hydro projects have been constructed about 70 km south of their range.

3.3.1.5 OTHER

There is a large tenure for commercial recreation (guided mountaineering and rock climbing) that overlaps with the Edziza caribou subpopulation range. There are also several, small hunt camp and trapline cabin tenures/developments in the area. There are no other developments in the Edziza range.

3.3.2 RECREATION

Recreational use of caribou habitat refers largely to fall and winter activities, including snowmobiling, commercial heli-skiing, commercial cat-skiing and hunting. In some jurisdictions, winter tour skiing and mountaineering are also relevant recreational activities as is summer use with off highway vehicles (OHVs). Numerous studies have shown that wildlife generally and woodland caribou in particular avoid mechanized winter activities to varying degrees (Simpson 1987a, Simpson and Terry 2000, Mahoney et al. 2001, Wilson and Hamilton 2003, Borkowski et al. 2006, Seip et al. 2007, Kinley 2008, Harris et al. 2014). Despite records of displacement, no study has been able to draw a direct link between winter recreational use and woodland caribou population decline, largely because effects are chronic and be time-lagged.

3.3.2.1 SNOWMOBILE

Snowmobile use in caribou habitat can result in their displacement (Simpson 1987a, Webster 1997, Apps et al. 2001, Brade 2003, Kinley 2008). Studies in British Columbia and elsewhere have shown that caribou are far less likely to occupy winter habitats that are being used for recreational snowmobiling than equivalent habitats without snowmobile use (Mahoney et al. 2001, Seip et al. 2007). Mechanisms of displacement include caribou avoiding or fleeing snowmobiles while they are in use, or avoidance of snowmobile packed trails that facilitate access to caribou winter habitat by human hunters and natural predators (Bergerud 1988, James and Stuart-Smith 2000, Oberg 2001, Powell 2004, Polfus 2010, Whittington et al. 2011). A study of stress using hormone profiles in free-ranging caribou demonstrated that elevated fecal glucocorticoids in animals as far as 10 km from snowmobile activity, suggesting that caribou perceive snowmobiles in their habitat as a stressor (Freeman 2008).

Most of the Edziza caribou subpopulation range overlaps with Mount Edziza Provincial Park. Snowmobile use is generally not allowed in British Columbia protected areas, but there are exceptions. In the Stikine Country Protected Areas, trapline holders are allowed to use snowmobiles, and some guide-outfitters have had permission to use snowmobiles for camp maintenance. No other snowmobile access is permitted within the Stikine Country

Protected Areas (Skeena Region Environmental Stewardship Division 2003). The Tahltan First Nation has unlimited access to any parks and protected areas within Tahltan traditional territory, including the use of snowmobiles (Skeena Region Environmental Stewardship Division 2003). But recreational snowmobiling is not permitted. Due to lack of access, snowmobiling is not popular nor common in other areas of the Edziza caribou subpopulation area (outside of the provincial park).

3.3.2.2 HELI-SKI / CAT-SKI

Helicopter skiing and cat skiing are backcountry recreational activities that enable off-piste skiers to access high mountain terrain using either a helicopter or a tracked snow-cat that shuttles them to the top of ski runs. This is a commercial activity with numerous operators in British Columbia represented under one umbrella organization, HeliCat Canada (HCC). In southern British Columbia, HCC partners with the British Columbia government and non-government organizations to monitor caribou and helicat ski operations and minimize operational impacts. Concentrations of glucocorticoid stress hormones are higher in caribou that live where commercial heli-skiing operates than in areas without heli-skiing (Freeman 2008).

Management planning for Mount Edziza provincial park prohibits “...recreational day-use of helicopters involving multiple take-offs and landings, i.e.: heli-hiking,...”, and there is a ban on helicopter landings on all cinder cones in the park (Skeena Region Environmental Stewardship Division 2003). Outside of the provincial park, there are no commercial helicopter or snowcat ski tenures.

3.3.2.3 OTHER

Backcountry tour skiing and mountaineering are recreational activities that occur in caribou habitat and can have an impact on woodland caribou conservation. Backcountry skiing (a term embracing of backcountry ski touring, unsupported, off-piste skiing and snowmobile assisted off-piste skiing) and mountaineering bring their participants into alpine areas that overlap with mountain caribou populations at sensitive times of the year (rut, winter). Unexpected encounters between individuals and people who are not in a vehicle can be very stressful for caribou and they can show a very strong flight response (McKay 2007).

Backcountry use is encouraged in Mount Edziza Provincial Park including backpacking and camping the alpine, forest and valley bottom habitats (Skeena Region Environmental Stewardship Division 2003). The park also permits hunting, fishing and wildlife viewing (Skeena Region Environmental Stewardship Division 2003), however travel constraints limit all activities in the park as access roads are not maintained. There are backcountry routes for both winter and summer travel (Klastine River Trail, Buckley Lake Trail) and the Mount Edziza Traverse is a mapped, multi-day ski touring route.

3.3.3 OTHER

Other human activities occur in caribou habitat and have the potential to harm caribou and / or affect caribou populations. Agriculture, transportation corridors, electrical transmission rights-of-way, oil and gas exploration and pipelines and hunting all have known effects on caribou populations (James and Stuart-Smith 2000, Wolfe et al. 2000).

3.3.3.1 AGRICULTURE

The effects of agriculture on caribou conservation are largely the result of conversion of low-elevation habitat to crops and pasture (habitat destruction) and the food subsidy they provide for alternative prey (deer, elk, moose). Habitat conversion is functionally similar to clearcut logging in that it removes overstory vegetation and can alter landscape properties like vegetation composition and local snow depth. Growing hay and grain crops

within or adjacent to caribou range has the potential to directly increase the regional population size of deer, elk and moose that eat crops (Bowden 1985, Côté et al. 2004, Butler et al. 2008, Hatter et al. 2017) and indirectly their predators like bears and wolves. These, in turn, predate caribou, putting downward pressure on caribou populations (apparent competition).

Spread of disease and parasites from and to cattle is also a threat to woodland caribou from agricultural operations (Neiland et al. 1968, Trainer 1973, Wobeser 1976, Sifton 2001), and is discussed in section 3.5 (Parasites and Disease).

There are no farms or ranches in the Edziza caribou subpopulation range, but there are Agricultural Land Reserve tenures near Telegraph Creek to the northwest of their range. This indicates the presence of or potential for small-scale agricultural activity close by.

3.3.3.2 MAJOR HIGHWAY CORRIDORS

Where they occur in caribou habitat, highways have strong, negative effects on caribou populations (Curatolo and Murphy 1986, Apps and McLellan 2006, McFarlane et al. 2009). Vehicle activity on highways poses a movement barrier for caribou as they are either reluctant to approach a roadway or get killed trying to cross (Dyer et al. 2002, Rytwinski and Fahrig 2012). Habitat and population fragmentation results as populations are unable to move between ranges. Highways and roadways can also give people access to caribou range that increases the potential for disturbance. Linear disturbances, such as roadways have a large ZOI (Wolfe et al. 2000, Oberg 2001, Polfus et al. 2011, Whittington et al. 2011).

Although there are no major highways (or roadways) through the Edziza caribou subpopulation range, Highway 37 (Dease Lake Highway) passes about 25 kilometers to the east.

3.3.3.3 LINEAR FEATURES

Linear features are narrow land disturbances that tend to traverse entire ranges. They include seismic cut lines, pipelines, forestry roads and overhead power transmission rights-of-way. Linear features are not necessarily cleared to a roadway standard, but enable both four-wheel-drive access and ease travel for predators and alternative prey (Oberg 2001, Hebblewhite et al. 2010a). One hypothesized effect is that linear features facilitate predator movement into and within prey habitat thereby increasing predator-prey overlap (DeMars and Boutin 2018).

There are no linear features in the Edziza caribou subpopulation range.

3.3.3.4 HUNTING

The Edziza caribou subpopulation lies entirely within wildlife management unit (WMU) 6-21. There are fall seasons for moose, thinhorn sheep, mountain goats, black bears, wolves and other small predators. There is no caribou season in this WMU, but there is a limited entry hunt for 5-point caribou bulls in WMU 6-21 (Ministry of Forests, Lands and Natural Resource Operations 2017). Hunting, including for caribou, is permitted in the Mount Edziza provincial park.

Since 1976, 20 caribou have been killed by resident and non-resident hunters. In recent years, kills by resident hunters have been reduced (no caribou killed by residents from 2007–2015), but five caribou were killed by non-resident hunters in that same period.

3.3.3.5 POACHING

Caribou poaching is an unregulated, indiscriminate and largely unknown source of mortality across their range. Animals are taken in any season, of any age or sex and in any number. This kind of additive mortality can have a profound impact on caribou populations in British Columbia (Johnson 1985) and interacts with habitat management and human access (Stevenson 1990) resulting in population declines.

There are no caribou poaching records for the Edziza caribou subpopulation, but there is legal hunting in the area both for caribou and within the provincial park. Thus, it is feasible that caribou poaching occurs, but has been undetected.

3.4 NATURAL DISTURBANCE

Fire as a natural disturbance can have large-scale and long-lasting impacts on woodland caribou (Environment Canada 2014). Fire kills individuals, destroys habitat and changes predator-prey dynamics by improving habitat for alternative prey and increasing wolf-caribou spatial overlap (Robinson et al. 2012). Fire suppression, on the other hand, has increased the possibility of very large and intense fires that could alter entire range areas (Environment Canada 2012a). Mountain pine beetle infestations are also natural disturbances with large-scale and long-term effects (Cichowski and Williston 2005).

There are records of 13 wildfires from 1951 to 2017 within or crossing the boundary to the Edziza caribou subpopulation area totaling 893.2 km². Approximately 315 km² of this area is actually within their range (13% of the range area). The fires are concentrated in the north and southwest of the range.

There are no records of mountain pine beetle affected forests in this area.

3.5 PARASITES AND DISEASES

Caribou are generally susceptible to a range of native and introduced diseases and parasites found in other ungulate species. Brucellosis is a contagious disease of ruminants which can cause spontaneous abortions particularly among first time breeding females (Neiland et al. 1968). The bacteria causing brucellosis in caribou is primarily *Brucella suis* that also affects swine (Jones 2014). Caribou are highly susceptible to the meningeal worm (*Parelaphostrongylus tenuis*) that is fatal in some, but not all, deer species (Anderson 1972, Trainer 1973). Early reports of woodland caribou declines in eastern Canada attributed it to their overlap with white-tailed deer who are meant to be the primary host of *P. tenuis* (Cringan 1956). Besnoitiosis is a disease caused by infection with the protozoan parasite *Besnoitia besnoiti* and is known in wildlife and livestock around the world (Walden et al. 2014). It can cause spontaneous abortions in pregnant females and infertility in males, but it is primarily expressed as facial hair loss in infected animals. It has been found in free-ranging woodland caribou in northern Saskatchewan in 1976 (Wobeser 1976), captive caribou (Glover et al. 1990).

Caribou are also susceptible to tape worms (*Echinococcus granulosus*, *E. multilocularis*, *Taenia ovis krabbei*), bot flies (Oestrinae), warble flies (Hypodermatinae), liver flukes (*Fascioloides magna*), lumpy jaw (*Actinomyces bovis*), muscle worms (*Parelaphostrongylus andersoni*, *P. odocoilei*), and winter tick (*Dermacentor albipictus*) (Miller et al. 2014b).

There is no reported occurrence of brucellosis or tuberculosis in British Columbia in any species. Severe symptoms of Besnoitiosis have not been found in caribou in British Columbia (Miller et al. 2014a). However, many of the other parasites can be found in woodland caribou in British Columbia with affects on individuals, but no reported population-effects on the Edziza subpopulation. Chronic wasting disease, which has the potential for

strong negative effects on this subpopulation, has not been detected in British Columbia in any species (Schwantje 2015).

3.6 CLIMATE CHANGE

For species such as woodland caribou that undergo seasonal migrations, have predators with seasonal cycles, respond to plant and insect phenology and are sensitive to snow depth and season length, climate change will have direct effects (Vors and Boyce 2009). With alpine tundra habitats predicted to shrink in a warming climate, the effects of climate change on caribou may be profound (Harding and McCullum 1997, Swift and Ran 2012). Natural resource industries, such as forestry and oil and gas are both vulnerable and have a role to play in climate change mitigation (Houghton et al. 2001). How they adapt may also have consequences for caribou (Racey 2005). Climate change adds much complexity to managing caribou for long-term recovery, including how it affects the distribution of alternative prey (Seip 2008, Dawe and Boutin 2016) and available food (Parker et al. 2009).

Climate change models for British Columbia suggest that areas in the British Columbia interior will experience increased winter snow loads (Dawson et al. 2008, Griesbauer and Green 2010) that could affect food access and mobility for animals. Such a change could be positive for snow adapted, arboreal lichen eating caribou. This benefit could be negated by more frequent freeze-thaw cycles (Plummer et al. 2006) that will improve the ability to predators to move across frozen crusts as well as limit access to food for caribou (Gillett et al. 2004, Dawson et al. 2008). Predictions of forest type shifts due to climate change mediated by fires suggest that black spruce may be replaced by white spruce and lodgepole pine, affecting caribou habitat (Hebda 1997).

There is no herd-specific research on climate change effects on the Edziza caribou subpopulation.

3.7 SMALL POPULATION SIZE EFFECTS

Small population effects include several threats to caribou that are unique to small (approximately less than 50 animals) and isolated subpopulations. These include reproductive and genetic isolation (McDevitt et al. 2009), predation (Sinclair et al. 1998, Abrams 2002), Allee effects where small groups are more vulnerable to predators (McLellan et al. 2010), risk of demographic bottlenecks where single-sex or male-dominated cohorts lead to population decline and increased chance that localized natural events such as avalanches (McClung 2001), fires or floods that kill a disproportionate number or key members of a small herd (Hebblewhite et al. 2010b). Movement barriers that prevent inter-population dispersal exacerbate small population effects by preventing small or extirpated populations of rescue (Gilpin 1990). Small population effects can be a particular hazard for species with slow growth rates (Laikre et al. 1997).

The Edziza caribou subpopulation are geographically isolated, sharing no boundaries with other herds. The Spatsizi subpopulation is to the east, but there is a highway and valley bottom wetland network that act as movement barriers in some seasons. The Tsenaglade, Level Kawdy and Horseranch subpopulations range to the north of the Edziza caribou, and while distant, a protected area corridor (Stikine River Provincial Park) connects them. There are no records of the Edziza caribou subpopulation mixing with or dispersing to other caribou in the region. Nor are mortality sources known to determine if small population effects disproportionately affect this herd.

The genetic viability of caribou subpopulations is dependant upon their size and dispersal (inter-population migration) ability (Weckworth et al. 2012). Small populations are subject to genetic drift that is a simple function

of their small and unique gene pool as well as reduced gene flow (Boulet et al. 2007). Populations that are small and declining are particularly susceptible to genetic isolation (Laikre et al. 1997, Serrouya et al. 2012, Weckworth et al. 2012).

Nothing has been reported of genetic heterogeneity in the Edziza caribou subpopulation, however population counts since the 1970s suggest that they have fluctuated greatly in population size (Figure 2) providing the potential for a genetic bottleneck.

4 MANAGEMENT HISTORY

4.1 HABITAT

The relative lack of disturbance in the Edziza caribou subpopulation range means that habitat management has not been needed in this area.

Habitat management in this area is overseen by the provincial government and implemented by the forestry industry through application of their AAC (see above). Active restoration takes place in the form of cutblock replanting that accelerates seedling establishment (Cichowski 1989, 1996). For their part, forestry regulations prescribe practices to manage resource use and protect forests that are caribou habitat (Seip 1998).

In the far southwestern range of the Edziza caribou subpopulation range (Snipe Lake) there has been mineral exploration that has resulted in a network of roads and excavation platforms that would require habitat restoration all within a 6 km² area.

4.1.1 PROTECTION

Provincial park legislation does not automatically protect caribou habitat from forestry, mining and petroleum resource activities. When land is acquired for a provincial park, with it comes the mineral and coal leases as well as timber and related licences (with compensation) (1996a). Hunting is also prohibited (Government of British Columbia 1996b). Petroleum and natural gas tenures are permitted by the British Columbia Park Act (Section 33 1996a) but are not relevant in this subpopulation range.

Mount Edziza Provincial Park was established in 1973, is over 2300 km² large (Henderson 1991) and covers approximately 75% of the Edziza caribou subpopulation range. It was established to protect the unique, volcanic landscape in this area and its importance to the Tl'it'at First Nation, but it also protects caribou habitat. Hunting, and specifically caribou hunting (see above) is permitted in this park. Protections extend to preventing mechanized recreation (snowmobile, OHV, snowcat, helicopter).

Ungulate winter range (u-6-041) established to protect mountain goat habitat through modified forestry regulations also protects caribou habitat. This protected area covers 1185 km² of area within this herds range.

4.1.2 ENHANCEMENT AND RESTORATION

Large-scale habitat restoration and enhancement for caribou protection and recovery generally refers to oil and gas activities (well sites, seismic lines) rather than forestry. Habitat restoration is very expensive and rarely undertaken at a scale that is beneficial to caribou (Schneider et al. 2010, Dickie et al. 2017). Small-scale habitat restoration actions, like decommissioning roads, replanting seismic lines or installing movement and visual barriers along pipelines can be effective (MacNearney et al. 2016, Pigeon et al. 2016, DeMars and Boutin

2018). Nevertheless, it is considered an essential step for caribou recovery in the absence of protection required for natural habitat regrowth that can take tens of decades.

There is no habitat enhancement or restoration in the Edziza caribou subpopulation range.

4.2 RECREATION AND ACCESS MANAGEMENT

Road access to woodland caribou habitat elevates conservation threats including conflicts with motor vehicles, hunting pressure, habitat fragmentation and in some cases predation (James et al. 2004, Apps and McLellan 2006, Seip et al. 2007, Apps and Dodd 2017). A key element of caribou life history is to seek separation from competitors (moose, deer, elk) and their predators (Bergerud and Elliot 1986, Wittmer et al. 2007). Constructed access roads into woodland caribou habitat connects them to their threats and contributes to population declines (Dussault et al. 2012).

Recreation and access management in this area is largely regulated by Mount Edziza Provincial Park. Road access to this area is very limited and difficult. Off-road motorized access for recreational purposes is prohibited (vehicles are permitted on roads, but recreational snowmobile and OHV use is not).

4.2.1 SNOWMOBILE

There are no special areas of snowmobile access regulation in the Edziza caribou subpopulation range outside of the provincial park. Snowmobiles are permitted in Mount Edziza Provincial Park to First Nations users for hunting, fishing and trapping, but are not permitted for recreation.

4.2.2 HELI-SKI / CAT-SKI

Helicopter and snowcat skiing is not permitted in Mount Edziza Provincial Park and there are no Heli-ski / Cat-ski tenures in the mountainous areas outside of the park within the Edziza caribou subpopulation range.

See section 3.3.2.2 for general threat information.

4.2.3 OTHER

With no nearby towns or major highways running through the Edziza caribou subpopulation range and there are few other development or management issues in their range.

4.3 PREDATORS

Unsustainable predation is acknowledged as a key, proximal mechanism of woodland caribou declines across Canada (Bergerud and Elliot 1986, Bergerud 1988, Environment Canada 2012b, 2014). Woodland caribou metapopulations have persisted despite ongoing predation from wolves, bears (black and grizzly) and cougars for millennia, but the existential impact of predators on caribou is a recent phenomenon. Human changes to habitats, fragmentation, movement barriers, dynamics of alternative prey and predator access to caribou habitat have led to conditions where caribou subpopulations are permanently extirpated.

Shrinking old-growth forest caribou habitat has forced caribou into increasingly smaller ranges, making their home range potentially more predictable to predators. Seasonal migratory routes track through predator rich areas and bring them into closer proximity to alternative prey species that can sustain higher predator populations (Seip 1992, Apps et al. 2013). Road and seismic line clearing and winter trail packing makes travel for predators into caribou critical habitats more efficient, elevating predation (Dickie et al. 2016). And, finally, a shift in forest

structure towards younger age classes has favoured moose, deer and elk at densities that can support greater predator densities. Not only does this shift bring woodland caribou into closer proximity to predators, but it also promotes greater predator abundance (Hebblewhite et al. 2007).

While habitat changes facilitate unsustainable predation, habitat regrowth and restoration occurs too slowly to recover woodland caribou in the short-term. As a result, direct predator management is a caribou recovery tool to ensure that populations persist long enough to benefit from habitat restoration efforts (Wilson 2009, Brook et al. 2014, Hervieux et al. 2014).

4.3.1 WOLF MANAGEMENT

Wolves are an important, year-round caribou predator. Caribou populations in northern British Columbia were shown to decline when wolf densities were 9–10/1000km² but increased at wolf densities from 1–4/1000km² (Bergerud and Elliot 1986). For this reason, target wolf densities that would enable caribou recovery are set to 6.5/1000km². In the absence of effective habitat or alternative prey management to achieve these densities, direct wolf management must be undertaken to achieve caribou conservation goals.

There is an open hunting season for wolves in the WMU 6-21 in which the Edziza caribou subpopulation lies. Between 1976 and 2015, only 65 wolves were killed by resident and non-resident hunters. Between 1985 and 2012, only 43 wolves were reported taken by fur trappers in this WMU. There are no estimates of wolf numbers in the Edziza range, thus no information on how effective this harvest is to manage the wolf population to the benefit of caribou recovery.

4.3.2 COUGAR MANAGEMENT

Cougars may be present in the Edziza caribou subpopulation range, but they are very rare and not managed in any way.

4.3.3 OTHER

Grizzly bears, black bears and wolverines are also woodland caribou predators (Seip 1992, Wittmer et al. 2005a). However, their protection status, seasonality and / or low predation rate and dependence on caribou as food does not warrant management to benefit caribou populations. In rare cases associated with intensive caribou management programs (captive breeding, maternity penning) bear or wolverine removal may be conducted.

Grizzly bears and black bears are present in the Edziza caribou subpopulation range and are managed through hunting regulations. The grizzly bear hunt was stopped throughout British Columbia in 2017 (Bellringer 2017, McLellan et al. 2017), but prior to that on average 3.7 grizzly bears were killed by resident hunters and 2.2 killed by non-resident hunters (6 per year). For black bears, resident hunters were killing 3.6 animals per year and non-resident hunters 2.8 black bears per year.

In 2012, the grizzly bear population estimate for the Edziza - Lower Stikine was 398 animals. There is no published estimate of black bear population size in this region.

4.4 PRIMARY PREY

Moose, elk, white-tailed deer and mule deer (including black-tailed deer) share large, mammalian predators such as wolves, bears and cougars. In what is known as apparent competition (Holt 1977), an increase in one prey

population will lead to a decrease in a second prey population. It appears as if these two, prey species are competing with each other, but the decline of the second prey species is due to the boost that their shared predator population experiences because of the high density of the first prey species. Woodland caribou have avoided apparent competition by occupying habitats distant from other deer species. However, changes to their habitats, movement barriers and facilitated predator access have limited their access to continued isolation. Across their range, woodland caribou populations have been subject to apparent competition (DeCesare et al. 2010b, Wittmer et al. 2013). For this reason, managing primary prey, either directly through hunting quotas, or indirectly through habitat management, has become a caribou management action.

4.4.1 MOOSE MANAGEMENT

Throughout British Columbia, moose are a common and sustaining prey of wolves (Messier 1994). But their expanding range (Bergerud and Elliot 1986), a wolf numerical response to moose densities (Messier and Joly 2000) and apparent competition with woodland caribou mean that even moderate moose densities in or adjacent to caribou range poses a threat to caribou persistence (Seip and Cichowski 1996, Lessard et al. 2005, Serrouya et al. 2017). Moose densities respond positively to early seral forest habitat and negatively to human hunting, and moose numbers have been falling around the province in response to harvest pressure (Moose Management Technical Team 2015). Lessard et al. (2005) found that a 10% increase in the moose harvest could stabilize caribou populations.

The South Skeena Caribou Management Plan suggest that moose should be managed to a density of $< 0.3 / \text{km}^2$. The current density in Game Management Zone 6e (Stikine) is estimated to be $0.305 / \text{km}^2$ and stable or slightly decreasing (Gerald Kuzyk, unpublished data). Serrouya et al. (2017) reported for southern British Columbia that moose densities of $0.2 / \text{km}^2$ lowered caribou mortality (mediated through wolf predation), while moose densities of $0.43 / \text{km}^2$ did not. The Mount Edziza area is between these two measures and could be lowered to benefit caribou recovery. Moose are hunted in this region with an average of 20 animals reported killed by resident and non-resident hunters each year (data for between 1977 and 2015). No other actions to manage moose are being undertaken in the Edziza caribou subpopulation range.

4.4.2 DEER MANAGEMENT

Managing deer populations in support of caribou conservation is a challenge. Both mule and white-tailed deer can support predator populations that have negative effects on caribou (Latham et al. 2011c). Both can transmit diseases that could be catastrophic were they to spread to caribou populations (see above; Habib et al. 2011). Where mule deer and white-tail deer ranges overlap, mule deer tend to decline, perhaps also due to apparent competition (Robinson et al. 2002). In British Columbia, there is active management to increase mule deer populations through habitat protection (British Columbia Ministry of Environment 2017) and manage white-tailed deer populations through hunting regulations (British Columbia Ministry of Forests, Lands and Natural Resource Operations 2015). Neither are strictly regulated by either predators or food. White-tailed deer populations respond strongly to food availability as well as hunting or predation (Fryxell et al. 1991, Messier 1991, Dumont et al. 2000). Mule deer are similar, but tend to be more vulnerable to predation, food availability, severe weather and loss of native winter habitat (Pierce et al. 2012, Forrester and Wittmer 2013, Bergman et al. 2015). Indeed, regulating deer density using hunter tags must counter some difficult trends (declining number of hunters, increase prey refugia from hunters and increased use of residential areas by deer) to be successful (Brown et al. 2000). Managing deer populations to a lower density will require managing artificial food sources (hay, grain), and access to high quality habitats as well as increased hunting pressure.

Deer populations are low in the Edziza caribou subpopulation range. They are not hunted in WMU 6-21.

4.4.3 OTHER

Elk, like moose and deer, are wolf prey and could potentially facilitate apparent competition with caribou (DeCesare et al. 2010b).

Elk populations are very low in the Edziza caribou subpopulation range. They are not hunted in WMU 6-21.

4.5 POPULATION REINFORCEMENT

The International Union of Conserving Nations (IUCN) has established guidelines for reintroductions and related conservation translocations (IUCN Species Survival Commission 2012), of which population reinforcement is one tool. In this document, reinforcement is defined as an intentional movement and release of an organism into an existing population of conspecifics within its indigenous range. It differs from reintroduction in that the species has not been extirpated from that range (DeCesare et al. 2010a), but existing populations are being added to. The management tools described in this section are based on the assumption that caribou populations are being reinforced and not reintroduced.

4.5.1 MATERNITY PENNING

Maternity penning (sometimes called maternal penning) is a technique to increase calf recruitment by capturing and temporarily penning pregnant females to protect them from predators. These females are held through parturition and for up to six weeks after calves are born. By this time calves are large and strong enough to better avoid predators, improving their survival probability and population recruitment. Thus, if young-of-the-year predation is a contributing factor to unsustainable population decline, maternity penning can be an effective mitigation (Hayek et al. 2016a). Maternity penning is an *in situ* method where the pen is constructed within their home range and animals are never moved outside of their home range.

There is no maternity penning reinforcement program that will affect the Edziza caribou subpopulation.

4.5.2 CAPTIVE BREEDING

Captive breeding is a conservation method that captures both male and female animals and moves them permanently to a facility where they are bred under controlled conditions (IUCN Species Survival Commission 2012). The objective is to create a surplus of female calves in the breeding facility that can then be translocated to ranges to reinforce small populations. To be effective, recipient populations should have low adult female survival that this action can reverse. This is a *ex situ* approach that takes animals away from their home range and returns animals to ranges that may not be where they originate (Harding and McCullum 1997). A number of factors, such as source animals, animal husbandry, genetic bottlenecks, gene mixing with destination herds, status of destination herds, disease transmission, fate of male calves among others must be considered in such an effort (Dolman et al. 2015, Hayek et al. 2016a).

There is currently no captive breeding program being undertaken anywhere for woodland caribou in British Columbia or Alberta. Their recent population decline and lack of information on this subpopulation make it a poor candidate to either contribute individuals to a captive breeding program or a recipient population for reinforcement.

4.5.3 TRANSLOCATION

Translocation is the reinforcement of small populations by moving animals directly from a sustainable population (Ray et al. 2015, Hayek et al. 2016a). The goal is to rapidly increase the numbers of animals of all ages and sexes in the target population (Miller et al. 2007, DeCesare et al. 2010c). Animals are captured in their home range, transported to the target range and either soft released in a temporary pen that offers an opportunity for individuals to adjust to their new surroundings, or hard released directly into the destination habitat.

Compared with other reinforcement methods, translocation is a relatively cost-effective approach to add animals to small populations. It has been tried successfully and unsuccessfully with caribou populations in Canada and British Columbia (Compton et al. 1995, Stronen et al. 2007, Hayek et al. 2016a).

Translocation has been used as a tool several times in British Columbia (South Purcell and Telkwa), but not with the Edziza caribou subpopulation (Hayek et al. 2016b).

4.5.4 OTHER

The proximate cause of caribou population declines is predation. While predator management is a direct way to manage this threat, an alternative solution is predator exclusion fencing (Hayek et al. 2016a). In part, this approach is linked to direct predator management as any predators within an exclusion fence would be lethally removed, and it is linked to maternity penning as this is a form of small-scale, temporary predatory exclusion fencing. However, there are recent, and very large scale (thousands of hectares), proposals to erect predator exclusion fencing as a mitigation for caribou populations where habitat restoration is an unrealistic goal but the caribou population is critically low (Boutin and Merrill 2016, Cornwall 2016, Hebblewhite 2017, Proulx and Brook 2017).

To date, this conservation method has not been attempted anywhere, including in the range of the Edziza caribou subpopulation (Antoniuk et al. 2016).

4.6 STEWARDSHIP/OUTREACH

Local communities and stewards are an essential part of caribou recovery. Management actions to recover very small populations are at times expensive, controversial and require the imposition of new and restrictive regulations (Hayek et al. 2016a). Gaining the social licence to conduct management actions like predator management, translocation, captive breeding and access restrictions requires outreach. Effective outreach programs to local communities and regional populations must accompany planning for management actions (Antoniuk et al. 2015). This includes information to municipal and regional administrations, business stakeholders, recreational groups, conservation organizations, farming organizations, hunting clubs among others (see below). Outreach must be timely, targeted and inclusive to be effective (Wilkinson 2010).

Stewardship is the active participation by citizens or citizen groups in conservation and recovery programs. For caribou this can take a number of forms ranging from ambassador programs where citizen volunteers promote caribou conservation at community events, habitat protection through conservation offsets (Robichaud and Knopff 2015) to fund-raising and operating reinforcement activities such as maternity pens.

The relatively poor access to the Edziza caribou subpopulation range means that there are few opportunities for the public to engage with and learn about this herd. Mount Edziza Provincial Park is a dominant part of the Edziza caribou subpopulation range, and a natural opportunity to engage with the public over the Edziza caribou.

Use of web resources and on-site signage to increase awareness of caribou in this region is an effective means of outreach.

The Tahltan First Nation have been stewards of the Edziza region for millennia (Muckle 2011) and retain a strong attachment to the land and wildlife. Stewardship of the Edziza herd should be facilitated through the Tahltan community with provincial support and resources. This community's knowledge of the biology and distribution of Edziza caribou as well as ability to monitor and study the herd in its current state is an asset for this remote caribou subpopulation.

4.7 RESEARCH

Every caribou subpopulation in British Columbia requires some degree of management action; habitat protection or restoration, population reinforcement, alternative prey management or predator control. Yet few caribou subpopulations in British Columbia have sufficient, herd-specific information to enable confident management decisions. To fill these gaps, scientific research and traditional ecological knowledge must be gathered to fill critical gaps.

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 their interactions are broadly understood, ongoing research to fine tune caribou responses to ecological stimuli and human disturbance including habitat fragmentation and primary prey density can improve our management.

There is very little known about the Edziza caribou subpopulation and their range and so there are many research topics to investigate. Key among them would be to link to monitoring activities (below) to understand sources of mortality. Recent population data indicate that this population is declining and understanding the dominant sources of mortality will facilitate management actions to reverse this decline. As well, there has been little habitat modification from forestry in this area, some fires and no mountain pine beetle affected stands. Research that links this relatively intact habitat to population trajectories would inform provincial wide recovery efforts.

4.8 MONITORING

Ecological, population and industrial footprint monitoring is an essential activity for the conservation and recovery of woodland caribou. This work provides the information to enable the detection of conservation threats, the effectiveness of management activities and the status of target populations. Although it cannot replace conservation action, it is an essential piece of the caribou recovery program.

The North Skeena Caribou 3-year Management Plan (Grant 2017) details a schedule and proposed budget for a regional caribou monitoring program that includes the Edziza subpopulation. Highlights for the Edziza subpopulation include fall rut counts, First Nations led harvest monitoring, and critical habitat identification. Consult (Grant 2017) for the complete, prioritized list.

5 IMPLICATIONS TO OTHER WILDLIFE

Changing population trends of woodland caribou will require manipulating the environment in ways that favour caribou ecology and life history at the expense of other wildlife. More old growth forest will benefit caribou but not moose or deer. Reducing adult female and calf mortality may require lethal wolf control. Maternity penning makes calves, common spring prey for black and grizzly bears, less vulnerable to these predators. None of these management actions can or will imperil other wildlife species but will precipitate changes to their population density and/or distribution.

The current state of the habitat and wildlife populations in the Edziza caribou subpopulation range suggest that management and efforts towards their recovery should have few implications for other wildlife. Moose, stone sheep and mountain goats are the most common ungulates in this range. Moose populations are already at their target management density. Large areas of the Edziza range are already under a UWR order to protect mountain goats and protects sheep habitat as well.

The wolf population in this area has not been reported but may have to be managed to a lower density to facilitate caribou recovery (Bergerud 2007). This would directly affect wolf populations and indirectly affect moose populations.

6 IMPLICATIONS TO OTHER VALUES

The recovery and protection of woodland caribou populations will affect a range of human values and activities across caribou range (Scarfe 2006). These include recreational / commercial activities such as camping, snowmobiling and backcountry skiing, commercial resource extraction activities such as forestry, mining and oil and gas development as well as non-commercial resource uses such as hunting. Research shows that none of these activities will have to be halted to protect woodland caribou (Kruse et al. 1998, Hebblewhite et al. 2006, Hebblewhite 2017). However, changes to operations, seasonal restrictions and area closures will be required, locally affecting some recreational and commercial activities (Government of Alberta 2016).

The management and recovery of the Edziza caribou subpopulation should have few negative implications on other values, but several positive implications. Habitat protections, such as a provincial park and UWR (albeit to protect mountain goats) already restrict resource extraction in this region. Caribou hunting is permitted, but rare and were it to be prohibited would impact few hunters or guide operators. Research, monitoring and recovery efforts should greatly benefit the Tahltan First Nation and their values. Recovery of the Edziza caribou subpopulation will provide a variety of ecotourism opportunities in this remote part of British Columbia.

The Edziza caribou subpopulation range does fall within the mining “golden triangle” of British Columbia. Caribou recovery may require that new mine sites be prevented or specially regulated. This has the potential to change the economic base of the region with negative implications for some values of regional communities. Engagement with mining interests, First Nations and communities in the region would enable the scale of the impact on related values to be better understood.

7 PARTNERS / NEIGHBOURS

Partners are existing or potential groups that can contribute to woodland caribou management with expertise, funding, in-kind or moral support. Neighbours are groups within in the caribou subpopulation area that are currently not participating in caribou management but that could be affected by caribou management. They include local governments, industry tenure holders, and recreation groups. Neighbours could potentially become future partners.

Below is a list of communities in and adjacent to Edziza caribou subpopulation range, organizations that have a clear interest in how this area is managed and businesses that have a commercial interest in the area. This may not be a complete list, particularly of distant organization with an inherent interest.

Communities: **First Nations:** Tahltan Central Council, Kaska Tribal Council, Kaska Dena Council, Iskut First Nation

Local: Iskut, Telegraph Creek, Tahltan, Eddontenajon

Regional: Dease Lake

Organizations: **Recreation:** British Columbia Snowmobile Federation, Land Conservancy of British Columbia, Outdoor Recreation Council of British Columbia, Caledonia Ramblers, Alpine Lakes Air, Alpine Club of Canada

Protection: Tahltan Central Council, BC Ministry of Environment

Commercial: **Hunting and Trapping:** Kawdy Outfitters

Accommodation and Guiding: Bear Mountaineering and the Burnt Glacier Chalet, Tatogga Lake Resort, Riversong Lodge

Forestry (*Active licences to cut*): Skeena Resources Ltd., Golden Ridge Resources Ltd.

Forestry (*Woodlots*): none

Agriculture: Eight ALR boundaries adjacent to Edziza range boundary near Telegraph Creek (47922, 47920, 47921, 47919, 47918, 49129, 49128, 100322)

8 RECOMMENDED ACTIONS

Actions followed by * come from the North Skeena Caribou 3-year Management Plan (Grant 2017)

8.1 SHORT TERM (WITHIN 6–12 MONTHS)

- Fall rut count (ongoing)*
- Implement harvest monitoring program*
- Assess recreational use*

8.2 MEDIUM TERM (WITHIN 12–24 MONTHS)

- Implement caribou health program*

8.3 LONG TERM (WITHIN 24–48 MONTHS)

- Initiate consultation for Recreation Management Strategy*
- Conduct a wolf population survey
- Initiate a study to measure caribou mortality sources
- Initiate habitat and food resource study.

DRAFT

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Woodland Caribou Plan for the Edziza Subpopulation

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