IMMINENT THREAT ASSESSMENT FOR SOUTHERN MOUNTAIN CARIBOU

1. Introduction

The Minister of Environment and Climate Change (the Minister) received three petitions in 2017 asking that she recommend, and that Governor in Council make, an emergency order to protect specific local population units (LPUs) of Woodland Caribou, Southern Mountain population (southern mountain caribou; SMC). All three petitions put forth the position that the Minister should form the opinion that the species is facing imminent threats in the subject LPUs on the basis of the impacts of forest harvesting and associated activities; and, in the case of the third petition, also considering the impacts of winter recreational activities. The first and second petitions, received in April 2017, were directed at the Wells Gray-Thompson and Central Kootenay LPUs, respectively. The third, received in December 2017, was directed at 10 subpopulations or herds within the following six LPUs: Central Kootenay, Kinbasket, South Monashee, Southwest Kootenay, Southeast Kootenay, Revelstoke-Shuswap. All LPUs that are the subject of petitions are in the Southern Group of southern mountain caribou (refer to the *Recovery Strategy for Woodland Caribou, Southern Mountain population* ("the recovery strategy") for a description of the LPUs and Groups of southern mountain caribou). On May 4, 2018, the Minister's determination that southern mountain caribou is facing imminent threats to its recovery was made public. The Minister found that the species is facing threats, which are imminent in the sense that immediate intervention is required to allow for eventual recovery. The Minister also considered whether there were imminent threats to survival of the species and concluded that such threats do not exist at this time.

The Minister came to this opinion after considering this imminent threat assessment, This imminent threat assessment, based on the best information available prior to April 20, 2018, assesses the biological condition of southern mountain caribou, ongoing and expected threats, and mitigation measures, and notes a particular concern in the following ten local population units: Central Kootenay, Southwest Kootenay, Southeast Kootenay, Kinbasket, South Monashee, Quintette, Narraway, Jasper-Banff, Redrock / Prairie Creek, Telkwa. The summary of the Minister's analysis is found https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/related-information/responds-imminent-threats-recovery-caribou-sm.html.

To respond to the initial petitions and help inform the Minister's opinion as to whether imminent threats to survival or recovery of a species exist, the following four questions were considered:

1. Is the species facing threats?
2. Are the threats likely to occur?
3. a) Will the effect of the threats make the survival of the species highly unlikely or impossible and / or
   b) Will the effect of the threats make achieving the recovery objectives of the species highly unlikely or impossible?
4. Do the threats require immediate intervention?

If each of these four questions is answered in the affirmative, it is the view of the Department that imminent threats may exist. These questions are referred to below as the "imminent threat questions".

Following the receipt of the initial petitions, Environment and Climate Change Canada (ECCC) prepared an "Information to Support an Imminent Threat Assessment" report focussed on the Wells Gray-Thompson and Central Kootenay LPUs. The report was reviewed for accuracy by the Government of British Columbia and the Parks Canada Agency, who have direct management responsibility for the wildlife and land base within these two LPUs. This report was based on or considered information from the petitioners, information received from the Government of BC and others[1] directly in response to the petitions, as well as publicly available information about possible additional threats throughout the entire area of the two LPUs. Where there were discrepancies between information provided by the Government of British Columbia and the Parks Canada Agency and the information provided by the petitioners and external parties, particularly with respect to caribou, predator, and alternate prey population sizes and trends, ECCC relied upon the information provided by the government agencies. This is because the government agencies are the direct collectors of relevant data, much of which is unpublished or not publicly available. Therefore government information is more up to date and comprehensive than that of external parties who are reliant on the interpretation of published or publicly available information.

[1] The Wells Gray-Thompson petition was made publicly available by the petitioners. Unsolicited commentary on that petition was received from the National Council for Air and Stream Improvement.

Although the three petitions referenced particular activities in specific LPUs, the Department was also in possession of other information on southern mountain caribou in other LPUs (e.g. pertaining to caribou population status and trends, natural resource major projects, provincial forestry authorizations, land tenures/applications for tenure, recreational activities, habitat disturbance estimates). The information was compiled to ensure the Minister has the best available information to respond to the petitions and fulfill her obligation under section 80 of the Act. The assessment also includes information from the Committee on the Status of Endangered Wildlife in Canada and was developed in cooperation with the Parks Canada Agency.

Due to the complexity of the ecology of southern mountain caribou, four considerations were identified as specifically relevant in order to answer policy question 3 for this species. These biological considerations would not necessarily apply to other species. The additional considerations are:

a) caribou population size;
b) caribou population trend;
c) predation risk and associated effects of ongoing or new activities; and
d) mitigation measures.

The answers to the four imminent threat questions, including the four species-specific biological considerations comprising question 3, are based on the best information readily available for the species, as listed under Schedule 1 of SARA. The level of detail and certainty of information varies across LPUs, with the most detailed information being available for the Wells Gray-Thompson and Central Kootenay LPUs (the subjects of the initial petitions), and for LPUs in the Central Group of SMC in British Columbia, which were the subject of a protection study completed by ECCC and the BC Ministries of Environment and Forests, Lands and Natural Resource Operations in 2017.

There are uncertainties regarding population sizes and trends of southern mountain caribou. Highly accurate estimates of the population size of the southern mountain caribou is difficult to obtain from surveys, given challenges with seeing the animals in forested habitat. However, census data obtained from surveys does provide information of acceptable certainty to allow the size of populations to be determined relative to critically small population thresholds (e.g. approximately less than 50 or 20 animals). Population trends are based on provincial monitoring of collared caribou and their calves. These data provide a higher level of certainty when monitoring data exists for multiple years.

There is uncertainty about the precise scope and nature of ongoing and upcoming industrial, commercial, and recreational activities; the specific impact that the various industrial, commercial, and recreational activities could have on critical habitat and on caribou, predator, and alternate prey populations; and the nature and efficacy of possible mitigation strategies.

However, there is certainty regarding long term and ongoing declines of caribou, and the impact of habitat disturbance on the species, as outlined in more detail below (COSEWIC 2014, and other sources referred in next sections).

2. Imminent Threat Assessment for Southern Mountain Caribou

The following sets out the broad considerations relevant to a consideration of whether imminent threat exists for the listed species. Section 3 considers more LPU-specific details.

Imminent Threat Question 1: Is the species facing threats?

Southern mountain caribou require large areas of relatively undisturbed, interconnected habitat where they can separate themselves from predators, modify their use of the local population unit or subpopulation range in response to various natural and human-caused habitat disturbances and human activities, and access their preferred food sources.

1. The most significant immediate direct threat to southern mountain caribou is unsustainable predation. Broadly, these unsustainable levels of predation are the result of altered predator/prey dynamics caused by habitat alteration, facilitated movement of predators, and direct disturbance / displacement of individual caribou.
    a. **Ultimate threats: Widespread habitat alteration, destruction, and fragmentation** which facilitates the proximate threats of increased predation and harassment / disturbance of individual caribou (Environment Canada, 2014; Kelsall, 1984). In general, industrial activities such as forest harvesting, mining and mineral exploration and development, wind farms, hydroelectric projects, and oil and gas exploration and development can alter, remove or destroy southern mountain caribou habitat (mature and old forests) and create early seral habitats favoured by other prey species such as moose, deer, and elk. This increase in prey populations in turn supports higher numbers of wolves and other predators than would occur naturally. Predation risk is also affected by industrial service roads and other linear features such as pipelines, seismic lines, and hydro transmission lines, as well as snow-based recreational or work-related activities, all of which can facilitate predator detection of prey, predator movement, and ultimately, predator success (COSEWIC, 2014; Paquet et al, 2010; Wittington et al, 2011; Neufeld and Bisaillon, 2017). Habitat alteration is known to reduce survival of adult females as a result of apparent competition, where predators are sustained by prey other than caribou, leading to a greater likelihood of population extirpation[2] (Wittmer et al, 2007). In areas used directly by caribou, removal of large coniferous trees impedes the ability of caribou to avoid detection by predators, removes lichens and reduces forage for caribou, and results in changes to snow accumulation, which can affect caribou movements (Boutin and Merrill 2016, McNay 2011, Stevenson and Coxson 2007, Cichowski and Haeussler 2013).
    b. **Primary proximate threat: Unsustainable predation rates** resulting from historical changes to habitat, historical wildlife management practices, and facilitated predator movement (e.g. along industrial linear features and via packed snow trails) have led to long term declines in caribou population size (Seip, 1992; McLoughlin et al, 2003; Wittmer et al, 2005; Festa-Bianchet et al, 2011; Serrouya et al, 2017). Although southern mountain caribou may not be the main target prey species, caribou are taken opportunistically by predators when encountered. Wolves are the primary predator of southern mountain caribou across the range, but bears, cougars, wolverine, and other

[2] Extirpation (also known as 'local extinction') describes the situation in which a species or population no longer exists within a certain geographical location (e.g. Canada). Unlike extinction, whereby a species no longer exists anywhere, extirpation means that at least one other population of the species still persists in other areas.

predators can be locally and/or seasonally important. However, in some LPUs, there is a lack of information on whether current predation levels are unsustainable, and whether current and proposed activities / habitat alteration will have a measurable effect on predation levels, with or without mitigation.

c. **Contributing threat: Harassment / disturbance of caribou individuals** by industrial activities or backcountry users (e.g. recreationalists, hunters) resulting in bioenergetic costs and displacement from preferred habitats (functional habitat loss) and potential exposure to increased predation or other mortality risks (COSEWIC 2014, Lesmerises et al. 2018; Lesmerises et al. 2016, Freeman 2008, Reimers et al. 2003, Seip et al 2007, DeGroot 2017, Simpson and Terry 2000, Webster 1997). Industrial activities that affect caribou individuals are the same as those identified in (a) above. Disturbance of individuals can result from the presence of equipment, humans, noise, etc. Recreational activities that affect southern mountain caribou may be ad hoc and unregulated, or guided and regulated in the context of the tourism industry. Relevant activities carried out by backcountry users include: snowmobiling, heli-skiing, cat-assisted skiing, alpine/downhill skiing, backcountry skiing/snowshoeing, ATV use, and hiking.
d. **Other threats:** Licensed hunting is closed for southern mountain caribou, except in the three LPUs with the largest population sizes. Available information is limited, but there is no evidence to indicate that subsistence hunting by Indigenous peoples and unlicensed hunting by others (i.e. poaching) is a significant source of mortality in LPUs with small population sizes. Additional threats described in the recovery strategy are present to varying extents in different LPUs. They exist at a much smaller spatial extent and contribute less to the cumulative effects than those listed above. These additional threats include urban development, agriculture and ranching, water management, and disease. Climate change, forest insects, and wildfire also contribute to changes in habitat quality and distribution. The effects of these changes contribute to the cumulative effects of direct anthropogenic activities on southern mountain caribou critical habitat. At this time, there is not a strong evidentiary basis for characterizing the effects of climate change as a primary driver of southern mountain caribou declines (unlike caribou found in the Arctic). Caribou as a species exist over a very large latitudinal and longitudinal distribution and have demonstrated a capacity to adapt to very different climactic regimes and ecosystems over evolutionary timeframes. Therefore, it is most appropriate at this time to think of climate change as a source of uncertainty rather than as a driver of the conservation status of southern mountain caribou, while recognizing that climate change interacts with, and can magnify, existing threats including habitat change following anthropogenic disturbances, forest insects, and wildfire.

The relative contribution of different human activities to the ultimate and proximate threats varies across LPUs, and is discussed more thoroughly in the federal recovery strategy for the species. The petitions presented to the Minister have not identified novel threats, but draw attention to the ongoing contributions of multiple activities to the cumulative impacts on the species. Available information is presented in the LPU-specific section (Table 2 to this Annex).

Imminent Threat Question 2: Are the threats likely to occur?

2. The threats to SMC currently exist and are ongoing. In most declining subpopulations, predation is known or believed to be a primary source of mortality, and the rate of calf recruitment and/or adult survival is not sufficient to counteract the effects of predation on population size; therefore it continues to represent a proximate threat. In addition, various activities continue to contribute cumulatively to the ultimate habitat-related threats.
    a. Outside of areas with legislative restrictions on forest harvesting, a variety of forestry activities are approved, ongoing, or pending approval in various locations within the timber harvesting land base, which includes SMC critical habitat.
    b. Many LPUs, particularly in the Southern Group, also have significant levels of recreational activities such as commercial heli ski and cat ski operations, alpine ski resorts, and extensive areas used by the public for ad hoc backcountry activities such as snowmobiling and ski touring. Comprehensive data is lacking, but industry sources report recent growth in the number of commercial facilities and activity levels (HeliCat Canada 2016, HeliCat Canada 2017), visitation numbers to provincial and national parks for the purposes of backcountry recreation have increased significantly in recent years (e.g. Porteous 2013, Shaw 2017), backcountry equipment sales are strong (Porteous 2013), and anecdotal information gives an overall impression of an expanding adventure tourism and self-guided backcountry recreation sector.
    c. Some LPUs also have energy and mining activities ongoing, approved or pending approvals (Environment and Climate Change Canada, 2017a,b).

Notwithstanding the implementation of mitigation measures in some circumstances (e.g. direct caribou / primary prey / predator management; vegetation management; pilot habitat restoration projects), the cumulative effects of all activities represent current and ongoing threats to the species. More detailed information on threats within each LPU is discussed below.

Although there is uncertainty around the precise scope and nature of the effects and considerable variation in the existing landscape condition and predator-prey dynamics across LPUs, the proximate threat of predation is present at some level for all LPUs. The nature and extent of predation varies across LPUs. Detailed information is not available to confirm LPU-specific predation levels or specific predators.

Increasing/new habitat alteration, which further influences predator-prey dynamics and/or facilitates predator access, will likely increase predation risks. In some cases, functional or ecological habitat mitigation or restoration measures can be taken to reduce the suitability of altered habitat for primary prey, or to prevent predator access, although in the context of survival and recovery over the long term, the effectiveness of these site-specific measures is uncertain.

Imminent Threat Question 3: Will the effect of the threats make the survival and/ or achieving the recovery of the southern mountain caribou highly unlikely or impossible?

Context

This question is addressed separately for survival and recovery below. The critical habitat context applies to both survival and recovery.

Critical habitat for this species is identified at the landscape scale in the federal recovery strategy. Critical habitat is defined as the habitat necessary for survival or recovery; in other words, the habitat that the species needs, where and when it needs it. The recovery strategy notes that the quantity and quality of critical habitat will need to be improved for recovery to be achieved.

The recovery strategy establishes suggested target habitat disturbance levels for some categories of critical habitat. A 65% minimum undisturbed habitat target was chosen for low elevation winter range and Type 1 matrix range for the northern and central groups of southern mountain caribou. It was based on analysis conducted by the Department for the Boreal Caribou population of the Woodland Caribou. In the absence of a species-specific approach to determine habitat conditions necessary to support self-sustaining local populations for southern mountain caribou, this target, along with minimal disturbance for high elevation winter and/or summer ranges in the three groups, is considered in the recovery strategy as necessary to achieve recovery.

Although the specific habitat disturbance threshold for the southern mountain caribou (beyond which its survival or achieving the population and distribution objectives becomes *highly unlikely or impossible*) is not known, numerous studies demonstrate the relationship between increasing anthropogenic disturbance in southern mountain caribou ranges and decreasing population trends, as outlined in the discussion of Imminent Threat Question 1. Moreover, although the existing level of habitat disturbance in most LPUs has likely exceeded the threshold target in the various categories of critical habitat for each LPU (where applicable), over the long term and with ongoing management, the effects of disturbance should be reversible. The recovery strategy also states that destruction of critical habitat is determined on a case by case basis, and that mitigation measures are possible.

In light of the fact that it is not possible to identify a habitat disturbance threshold for imminent threat, the analysis focuses on more measurable and available information, such as caribou population size and trend, which reflects the overall habitat conditions within a LPU and therefore the potential implications of current and planned activities. In other words, information on caribou population size and trend, combined with information on current and reasonably foreseeable threats and any active or planned mitigation measures, is proposed as an appropriate basis for determining whether imminent threats exist to the survival or recovery of the southern mountain caribou.

Imminent Threat Question 3a: Will the effect of the threats make the survival of the species highly unlikely or impossible?

Context

A species is considered more likely to continue to survive if it possesses the characteristics outlined below. The more of the following characteristics the species possesses, the higher its likelihood of continued survival.

- *stable* or increasing over a biologically relevant time frame; and,
- *resilient***:** sufficiently large to recover from periodic disturbance and avoid demographic and genetic collapse; and,
- *widespread or has population redundancy***:** there are multiple (sub) populations or locations available to withstand catastrophic events and to facilitate rescue if necessary; and,
- *connected:* the distribution of the species in Canada is not severely and unnaturally fragmented; and,
- *protected from anthropogenic threats:* non-natural significant threats are mitigated; and / or,
- as appropriate to its specific life history and ecology in Canada, *persistence is facilitated* by connectivity with populations outside Canada (not relevant to southern mountain caribou[3]), and/or habitat intervention for species that are naturally below a survival threshold in Canada (also not relevant to southern mountain caribou[4]).

These survival considerations are taken from the *Species at Risk Policies - Policy on Survival and Recovery - 2016* [Proposed].

Currently, southern mountain caribou cannot be considered to be stable. Long-term (approximately 27 year) trends indicate that 18 of 23 LPUs are declining, trends for two may have been considered stable as of 2014, and trends are unknown for the remaining three (COSEWIC 2014, EC 2014, Tables 1a-1d of this document).

The species has the characteristics of an acceptable level of resiliency. The 2014 federal recovery strategy estimated the total population size to be approximately 5800[5] caribou. The current population is estimated to be approximately 3,800; a decline of 35%, although recent survey data is not available for all LPUs. There are currently four LPUs with population sizes larger than 300 animals (Chilcotin, Wolverine, Graham, and Hart Ranges). In general, LPUs with more than 300 animals have a reduced risk of extirpation in the short term and increased resilience to threats. In addition, there are nine LPUs with population sizes between 100 and 300 animals, which, although more vulnerable, provide increased connectivity and redundancy (Tables 1a-1d).

Historically, the distribution of southern mountain caribou in BC and Alberta was much larger and extended further south into the United States (EC 2014 and references therein). However, the species is still widespread, with population redundancy and connectivity between LPUs in Canada. The 2014 federal recovery strategy defined 24[6] LPUs across > 50,000 km^2. Currently there are considered to be 21 extant LPUs, most of which are connected.

[3] One very small LPU does range into the United States as well as Canada, but there are no populations that exist entirely outside Canada that could provide connectivity.
[4] Southern Mountain Caribou was naturally widespread and abundant prior to significant industrialization within its range.
[5] The 2014 COSEWIC status report estimated a total number of 4,837 mature individuals, which is not directly comparable to total population size estimates that include calves. Direct comparison is also challenging due to differences in timing of information collection for the COSEWIC status report and the recovery strategy.
[6] However, note that the Mount Robson LPU includes only small portions of subpopulation ranges that are captured in other LPUs.

The species is not protected from anthropogenic threats. The effects of the threats are serious, ongoing, and resulting in continuing declines in most LPUs. Currently, 11 of 21 extant LPUs demonstrate short-term declining trends. In the majority of cases where short term trends appear to be stabilizing or increasing, the trend is recent and attributed to intensive predator management, sometimes combined with maternity pens and/or management of primary prey. In the past, the cessation of such actions in the absence of appropriate ecological conditions has resulted in a continuation of caribou declines. In some cases, LPUs with large population sizes are showing continued or recent significant short-term declines (e.g. Chilcotin, Graham and Chase LPUs). Other LPUs with small population sizes continue to decline and 2 LPUs have become functionally extirpated since 2014; as of April 2018, a third may now also be functionally extirpated (Tables 1a-1d). These declines are such that, over the next 2-3 years, they will result in overall smaller population sizes and more restricted distribution of southern mountain caribou.

Question 3 Summary for Survival: the effects of the threats will make the survival of the species highly unlikely or impossible if they remain unaddressed; however, for reasons noted in the response to question four below, the threats are not considered *imminent*.

Imminent Threat Question 3b: Will the effect of the threats make achieving the recovery objectives of the species highly unlikely or impossible?

Context
To determine if the threats will render recovery of SMC highly unlikely or impossible, the Department considered the anticipated effects of ongoing and new activities on predator/prey dynamics; the type of activities likely to destroy critical habitat (as identified in the recovery strategy); and the potential of those activities to impact upon the likelihood of achieving the recovery goal and population distribution objectives in the recovery strategy for the species.

What Recovery of SMC Means:

The recovery strategy for SMC was published in 2014 (Environment Canada, 2014). The recovery goal articulated therein is to achieve self-sustaining populations in all LPUs within their current distribution. To achieve the recovery goal, the population and distribution objectives for SMC are, "to the extent possible, to:

- stop the decline in both size and distribution of all LPUs;
- maintain the current distribution within each LPU; and
- increase the size of all LPUs to self-sustaining levels and, where appropriate and attainable, to levels which can sustain a harvest with dedicated or priority access to aboriginal peoples."

Self-sustaining is defined as:

- "the LPU on average demonstrates stable or positive population growth over the short term (≤20 years), and is large enough to withstand random events and persist over the

long term (≥50 years), without the need for ongoing active management intervention; and

- there is an increase to at least 100 caribou within LPUs that currently consist of fewer than 100 caribou, and there is no reduction in the number of caribou within LPUs that currently consist of over 100 caribou."

The recovery strategy further states that, given LPUs are expected to vary considerably in their potential rate of recovery, more specific population size targets over the above timeframes at the LPU scale, including desired sizes larger than 100 animals (e.g., > 300 animals where that may be possible) should be determined.

The recovery strategy also explicitly states that "achieving the recovery goal should allow for sufficiently large LPU populations levels to sustain traditional Aboriginal harvesting activities, consistent with existing Aboriginal and treaty rights of Aboriginal peoples of Canada."

The smaller the population of SMC in a LPU, the more difficult it will be, even with active intervention, to increase recruitment or reduce mortality, to reach the minimum population goal for a self-sustaining population. Once a LPU is functionally extirpated, recovery of that LPU would likely require extraordinary measures, rendering recovery of that LPU highly unlikely or impossible. As noted earlier, under the recovery strategy, all LPUs are required to achieve recovery of the species as a whole.

The stated objective of maintaining current distribution within each LPU will be more readily attained by the maintenance of subpopulations within LPUs.

SMC-specific Biological Considerations

In recognition of the complexity of SMC ecology, species-specific considerations were reviewed to address imminent threat question 3b. The four inter-related species-specific considerations are: 1) population size; 2) population trend; 3) predation risk and associated effects of ongoing or new activities; and 4) mitigation measures. Below is an explanation of the rationale and the details of the species-specific application for each of these four considerations in turn.

Biological Consideration 1: population size

1. **Rationale:** The population size of a LPU is a strong indicator of the likelihood of extirpation and the difficulty of recovery for several reasons:
    - The boreal caribou science assessment (Environment Canada 2011) suggests that the minimum viable population size is approximately 300 animals. This size depends on the vital rates of the population. For example, if survival and recruitment are high, the minimum viable population size could be lower, and vice versa. No estimate of minimum viable population size exists for SMC. Boreal caribou are the same species as SMC, so it may be reasonable to apply this estimate to SMC in the context of longer-term viability while assessing progress towards recovery. Populations that are somewhat smaller than

300 animals may still have a reasonable possibility of increasing to a viable population size depending on the threats facing them.

- As indicated above, a key sub-component of the definition of self-sustaining populations in the SMC recovery strategy is an increase to a minimum of 100 caribou in LPUs with fewer than 100 animals.
- The boreal caribou science assessment also suggests that below 100 animals one might expect serious genetic consequences.
- The genetic effects of small population sizes are known to increase with the length of time the population size is depressed, so the longer a population remains small the more genetic diversity is lost (Lynch et al, 1995; Frankham, 2005).
- Populations tend to decline faster at low population size and density. This is particularly the case when there is high predation and high proportions of young forest (McLellan et al., 2010; Wittmer et al, 2010).
- LPUs with fewer than 50 animals are considered at greater risk of not recovering (Environment Canada, 2014) even in the absence of a declining trend (O'Grady et al. 2004).
- Small populations are more susceptible to stochastic (i.e. chance) events such as avalanches (Environment Canada, 2014).
- A population containing 8-10 mature females (or approximately 20 total animals) is considered a "point of no return" for woodland caribou below which extirpation is all but inevitable (functional extirpation), although small numbers may persist for several years because individuals are long-lived (Decesare et al, 2011; Environment Canada 2011). The ratio of males to females is also important in extremely small populations, particularly in a species like SMC where dominant males sire most of the calves in a herd.
- Although it is possible for a single activity to make achieving the population and distribution objectives of the LPU highly unlikely or impossible for a LPU larger than 100 animals, the proximate and ultimate threats to SMC are generally the result of the cumulative effects of multiple activities and landscape-level changes.
- Changes in annual distribution (i.e. where caribou occur within a LPU throughout the course of the year) happen when a population expands or contracts, and when caribou shift their use of seasonal habitat for various reasons. These changes may be temporary or longer lasting, and may only be detected if regular monitoring efforts are in place. The confirmed extirpation of one or more subpopulations within a LPU represents an obvious reduction in distribution.

Application to the species:

- In general, where the LPU numbers more than 100 animals considering all subpopulations within it, it is considered more likely that the population and distribution objectives in the recovery strategy could be achieved, even if one or more subpopulations become extirpated. However, other considerations could in extreme situations alter this likelihood (see other considerations).
- If the LPU numbers fewer than 100 animals, the likelihood increases that achieving the population and distribution objectives will become highly unlikely or impossible.

- If the LPU numbers fewer than 50 animals or 20 adult females, there is a very high likelihood that achieving the population and distribution objectives will become impossible, even if the population appears stable or slightly increasing.
- Measures that may improve the likelihood of recovery include direct predator and alternate prey control, maternity penning, translocation, captive breeding, etc. These measures are often controversial, have had mixed results, need to be implemented for multiple years, and the lower the caribou population size when measures are initiated, the lower the likelihood of successfully increasing caribou population size.
- Based on best available information, the following LPUs have population sizes between approximately 50 and 100 (Table 1c): Takla, Quintette.
- The following LPUs have population sizes between approximately 0 and 50 (considering the low end of population estimates where a range is provided -Tables 1a, 1b, 1c): Central Kootenay, Kinbasket, South Monashee, Southwest Kootenay, Southeast Kootenay, Telkwa, Narraway, Jasper-Banff.
- The following LPUs have population sizes between approximately 100 and 300 (Tables 1a, 1b, 1d) even after considering uncertainty: Wells Gray-Thompson, Revelstoke-Shuswap, Upper Fraser, Quesnel Highlands, Pine River, Redrock / Prairie Creek, A La Peche, Tweedsmuir, Chase.
- The following LPUs have population sizes larger than 300 even after considering uncertainty (Table 1d): Hart Ranges, Chilcotin, Wolverine. The current population size for Graham is estimated at 304, but there is considerable uncertainty around the estimate (range of 157-663 animals).

Biological Considerations 2: population trend

2. **Rationale: The rate of population decline** is the strongest correlate of extinction risk for any species (O'Grady et. al., 2004). Evidence of a decline, based on information from jurisdictions, combined with a population size of less than 100 animals further increases the likelihood that achieving the population and distribution objectives will become highly unlikely or impossible. Because there is high uncertainty around subtle population trends in woodland caribou, it is advised, as a preliminary approach, that the trend be based on the lower limit of the 95% confidence interval, where available (MacNearney and Leblond, pers.comm. 2017).

Application to the species: All ten LPUs that likely have current population sizes smaller than 100 were reported in the 2014 Recovery Strategy as having a decreasing long term (27 year) population trend, except Takla, for which the trend was reported as unknown. In some cases, preliminary data may indicate short term stabilizing or increasing population sizes, or a slowing rate of decline. In cases where population sizes are very small, these apparent trends are recent and attributed to intensive predator management, sometimes combined with maternity pens and /or management of primary prey. This would point to an increased likelihood that achieving the population and distribution objectives will become highly unlikely or impossible.

Long term population trends for the thirteen LPUs with current population sizes larger than 100 were reported in the recovery strategy as decreasing or unknown, except Chilcotin, which showed an increasing (but highly variable) long term trend for its largest subpopulation and

therefore the entire LPU. Short term trends for these larger LPUs indicate a mix of declining, stabilizing, and increasing population sizes. Due to the larger population sizes, in most cases even a declining trend would not indicate that achieving the population and distribution objectives will become highly unlikely or impossible in the short term. The exception is the Redrock/Prairie Creek LPU, which does not have a current population estimate but based on ongoing declining trends may fall below 100 animals in the short term.

Additional details are provided in Section 3 – LPU-specific Details and in Tables 1a, 1b, 1c, 1d.

Biological Consideration 3: predation risk and associated effects of ongoing or new activities

3. **Rationale:** The cumulative effects of numerous anthropogenic activities on landscape condition, which includes the possibility of critical habitat destruction, represent the ultimate threat to SMC as a result of the relationship with unsustainable predation. Some anthropogenic activities can also result in direct disturbance or displacement of individuals.

   Application to the species: The presence of ongoing or new anthropogenic activities has the potential to contribute to ongoing cumulative effects and to disturb or displace individuals. In LPUs with fewer than 100 animals and a declining population trend, this further increases the likelihood that achieving the population and distribution objectives will become highly unlikely or impossible.

   If there are no new or ongoing anthropogenic activities present in an LPU then the likelihood increases of achieving the population and distribution objectives for that LPU.

   - An analysis of habitat and predation-related threats has been undertaken for the two LPUs that were the subject of the initial petitions (Wells Gray-Thompson and Central Kootenay). Available information on the other LPUs is presented in the following LPU-specific section. The accuracy of the information is less certain, and less precise, for the other LPUs.
   - Although the sources of mortality are not known for all LPUs, the proximate threat of predation is presumed to be present to some degree in all extant LPUs. Whether predation rates are unsustainable depends on the size of the caribou population and the impact of predation. Where predation impacts are unknown, density of relevant predator populations can be a relevant consideration.
   - Direct disturbance of individual caribou, which increases stress and reduces the amount of functional habitat, is also a threat where it occurs.
   - Because of the mechanism by which habitat disturbance affects predator/prey dynamics, there can be a time lag between the activity and the effect on the caribou population. Depending on the nature of the activity, the effects of habitat disturbance may continue long after the activity has ended, for example as forests slowly re-grow.
   - There is no known “habitat disturbance threshold” for SMC beyond which achievement of the population and distribution objectives would become highly unlikely or impossible (see above for more detailed information on habitat disturbance).

If caribou are extirpated from a LPU, the proximate threat of predation no longer immediately exists. Although theoretical recovery techniques exist to achieve the population and distribution objectives for extirpated LPUs (e.g. reintroduction through translocation and/or captive breeding), there are significant technical challenges with such techniques. Immigration from adjacent LPUs is unlikely for isolated subpopulations. Caribou are believed to have been extirpated, or functionally extirpated, from both the Kinbasket and South Monashee LPUs for the last few years. The ranges where they used to occur are geographically isolated from adjacent subpopulations. Thus, when LPUs are extirpated, recovery of that subpopulation of LPU is difficult and uncertain, and achieving the population and distribution objectives becomes highly unlikely or impossible.

Biological Consideration 4: mitigation measures

4. **Rationale: Effective mitigation measures** that reverse the population trend in the short to medium term can buy time for longer-term measures to take hold and improve the likelihood of eventual recovery. The mitigation measures referred to in this context include active management of habitat, direct or indirect population management of predators, primary prey, or caribou.
    - In the long term (50-100 years), recovery of SMC requires habitat protection, management and restoration at a landscape scale. This is identified as an urgent priority in the 2014 federal recovery strategy (Environment Canada, 2014).
    - To ensure that caribou remain on the landscape for the time it will take to restore habitat and achieve sustainable levels of predation without ongoing intervention, the recovery strategy also identifies some direct management measures as urgent such as maternity penning, predator culls, and population management of primary prey (e.g. deer, elk, and moose). If ecological conditions are not restored, these measures are effective only for the time they are in place (e.g. Mosnier et al, 2008) and only to the degree that they are of sufficient scope and scale to reverse a decline. However, where they are in place they have the potential to mitigate the impact of predation threat on the population, to varying extents. For example, during the recent implementation of the Klinse-za program (Pine River LPU; Scott-Moberly (aka Klinse-za) subpopulation, Central Group), the caribou population has increased from 42 caribou in 2015 to approximately 61 in 2017, an average 19% annual rate of increase. This program involves a combination of predator control and maternal penning (Seip and Jones, 2016; Seip and Jones, 2017).
    - Multiple years of data are required in order to have strong evidence that caribou population size is increasing. These data, based on adults and recruited calves, need to show a trend that does not meet the COSEWIC 2002 definition for either declining or stable. Because there is high uncertainty around subtle population trends in woodland caribou, it is advised, as a preliminary approach, that the trend be based on the lower limit of the 95% confidence interval (MacNearney and Leblond, pers.comm. 2017).

Hence, the final biological consideration is to assess the presence of measures that mitigate the proximate threat of unsustainable predation risk where necessary and that address ultimate threats.

Direct population management of predators, alternate prey, or caribou is currently occurring in the following LPUs: Southwest Kootenay, Revelstoke-Shuswap, Quintette, Narraway, A La Peche, Redrock/Prairie Creek, Pine River. Preliminary short term trends in the Quintette, A La Peche and Pine River LPUs appear to show caribou population size increases, and stabilization in the case of the Southwest Kootenay and Revelstoke-Shuswap LPUs, possibly in response to these predation mitigation measures (Tables 1b and 1c). However, evidence of significant improvements to habitat condition to support these efforts over a sufficient period of time to support SMC recovery is currently lacking. Predator densities in the Jasper-Banff LPU are below the targets in the federal recovery strategy, due to habitat management activities implemented by Parks Canada to reduce alternate prey, and therefore predator, density. However, the population continues to decline. The feasibility of direct management of caribou (reinforcement of the LPU via captive breeding) is currently being assessed by Parks Canada Agency.

Reviewing all 4 Biological Considerations Together in the Context of Question 3 for Recovery

The application of the considerations to specific LPUs is presented in Section 3 below, in the discussion of imminent threat question 3.

Imminent Threat Question 4: Do the threats require immediate intervention? i.e. if immediate intervention does not occur, is survival or recovery no longer possible?

Since there are thirteen LPUs with population sizes larger than 100 which provide some resilience, redundancy, and connectivity, the survival of the species remains possible in the short term even if the threats identified are not immediately addressed. Therefore, the threats to survival do not require immediate intervention. As noted above, the declines being observed in the population sizes, if the trend continues, are such that, over the next 2-3 years, they will result in overall smaller population sizes and more restricted distribution of southern mountain caribou. Accordingly, it will be necessary to address cumulative impacts and the ongoing declines, including the declines in the larger LPUs, in order for survival to remain possible in the medium term (i.e., 5-10 years). The timing, extent, and success of such measures will influence the chances of survival.

With respect to recovery, based on the available information, it is clear that current mortality rates are unsustainable in many LPUs.

There is a lack of scientific information to support a quantified assessment of the extent to which cumulative impacts of ongoing and upcoming activities will increase the risk of predation. However, the existing and upcoming activities (summarized in Table 2) are representative of the types of activities that have contributed to cumulative effects and increased predation in the past. These activities will likely result in ongoing population declines in these LPUs, such that achieving the recovery objectives of self-sustaining populations in all local population units will no longer be possible without immediate intervention.

The immediate interventions required include habitat management measures (i.e. no further net increase in disturbance of critical habitat and restoration of disturbed habitat, such that

cumulative effects are reversed) and population management measures (e.g. predator/alternate prey management, maternity penning).

British Columbia and Canada are negotiating a conservation agreement supporting recovery of southern mountain caribou and are also working with directly affected First Nations in Central Group towards a partnership agreement, both of which would include these types of measures.

3. LPU-specific Details - Context for Imminent Threat Assessment for the Southern Mountain Caribou

3.1Wells Gray-Thompson (WGT) LPU

1. Is the species facing one or more threats?

A subset of the general threats outlined above occurs in the WGT LPU and are itemized in the following section.

2. Are the threats likely to occur?

Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 3300 ha per year (approximately 0.22% of the area of the LPU). The significance of this volume of harvest over time will vary depending on the category of critical habitat and age of forest which is harvested, along with the timing of forest recruitment from younger to older age classes in areas that have been previously disturbed. Commercial forest harvesting represents a potential indirect threat, although the effects may be mitigated.

The TransMountain Pipeline Expansion project has been approved. The project conditions require the proponent to implement a habitat restoration plan, and an offset measures plan to fully offset any residual habitat loss after avoidance, mitigation, and habitat restoration are completed.

There are applications for tenure, not currently approved, primarily associated with licenses of occupation related to commercial recreation or resorts, which cover 166,751 ha, representing 12% of the area of LPU. Although the potential tenured area is large, the amount of land on which the various activities would actually occur is much smaller, although unquantified. The likelihood and timing of approval of tenure is unknown, as is the scope of the impact they would have on the land base or on individual caribou.

There are recurring and ongoing activities within the LPU that have potential to destroy critical habitat[7], depending on where and how they occur. The largest tenured areas are licences of occupation for commercial heli-skiing, heli-hiking, and snowmobiling, which collectively overlap with over half the area of the LPU. There are also areas designated by the province of BC as open for recreational snowmobiling, which are adjacent to extensive areas in which snowmobiling is prohibited on the basis of caribou conservation. These activities are likely to occur, and represent a potential indirect threat through habitat

[7] See section 7.3 of the federal recovery strategy for description of the types of activities likely to destroy critical habitat. As set out in the recovery strategy, activities likely to destroy CH include activities that, if not sufficiently mitigated, result in displacement of caribou; or increase the likelihood of increased predator density; or facilitates predator access to and within CH

alteration and/or facilitation of predator movements and/or displacement of caribou. The possibility of direct harm or harassment exists if any human activity intersects with individual caribou in space and time; this is less likely to occur than habitat alteration.

The proximate threat of predation, most likely by wolves, is likely to occur at some level. Recent, preliminary provincial data indicates the possibility that the predator /prey dynamics are shifting such that the threat to caribou is reduced.

3. **Will the effect of the threats make the survival and / or achieving the recovery objectives of the species highly unlikely or impossible?** (considering the four species-specific biological considerations)

There is no recent population size estimate, but a partial survey in 2017 counted 164 animals. Compared to a population size estimate of 133 animals in 2013, it is possible that the population is currently stabilizing or increasing. Until recently, this LPU has experienced long term declines, including a 58% reduction in population size from the 15 years prior to 2013.

While there is uncertainty about whether the current caribou population size stabilization will continue, it corresponds with declining moose and wolf population numbers within this LPU.

As outlined in question 2, ongoing and new activities are likely to occur in the LPU. If activities result in an increase in early seral (young forest) habitat, they may positively influence the population growth of alternate prey and therefore predator (wolf) density, depending on direct or indirect mitigation measures in place. Effects are cumulative with existing habitat conditions. If activities intersect with caribou locations they may result in direct disturbance and/or displacement into less preferred or higher risk habitat and/or facilitate predator movement. The province of BC indicates that mitigation measures will be taken to reduce alternate prey populations (although specifics of how this will occur are not provided) and notes declining predator / alternate prey populations in spite of ongoing habitat alteration in last decade (ECCC 2017a).

Question 3 summary- Wells Gray-Thompson LPU

Primarily based on the population size estimates (higher than 100 animals with a possibly stabilizing trend) and ongoing reductions in predator population density, the effects of the ongoing and future anthropogenic activities do not make recovery of the Wells Grey-Thompson LPU impossible or highly unlikely at this time.

4. **Do the threats require immediate intervention? (i.e. if immediate intervention does not occur, is survival or recovery no longer possible?)**

For the reasons noted in the answer to question 3, immediate intervention is not required.

3.2 Central Kootenay LPU

1. Is the species facing one or more threats?

The discussion above regarding the general threats to the species also applies to the Central Kootenay LPU.

In this LPU, it is clear that current mortality levels are unsustainable, and it is assumed that predation, possibly from wolves, bears and cougars, is the primary source of mortality and therefore represents the proximate threat; however, there is uncertainty as, prior to 2017, there had been no studies of the sources of mortality in this LPU for over a decade. In March 2017, nine caribou were collared; as of April 2018, one of those nine has died – the source of mortality is currently unknown. As with the WGT LPU, it is unclear whether the current ongoing and proposed activities / habitat alteration will have a measurable effect on predation levels, with or without mitigation.

2. Is the threat likely to occur?

Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 1000 ha per year (approximately 0.1% of the area of the LPU). The significance of this volume of harvest over time will vary depending on the category of critical habitat and age of forest which is harvested, along with the timing of forest recruitment from younger to older age classes in areas that have been previously disturbed. Commercial forest harvesting represents a potential indirect threat, although the effects may be mitigated.

The “major projects” in this LPU comprise 4 resorts and 1 hydropower facility which are below the threshold required for initiation of the provincial EA process, and are in various stages of approval / development. The likelihood of these projects proceeding, the timelines, and whether they represent a threat is largely unknown at this time.

Applications for tenure (not approved) in this LPU cover 41,845 ha (4% of LPU). These are associated with heli-skiing (37,000 ha), cat skiing (38,000 ha), and roads (832 ha). Although the potential tenured area is large, the amount of land on which the various activities would actually occur is much smaller, although unquantified. The likelihood and timing of approval of tenure is unknown, as is the scope of the impact they would have on the land base or on individual caribou.

As with the WGT LPU, in addition to these new activities, there are recurring and ongoing activities within the LPU that have potential to destroy critical habitat or to harm or harass individual caribou, depending on where and how they occur. Tenure is approved for a variety of additional activities throughout the LPU; the largest tenured areas are licences of occupation for commercial heli-skiing, heli-hiking, and cat skiing, which collectively overlap with well over half the area of the LPU. In addition to these licences to occupy and operate on Crown land, some commercial recreation operators also hold “occupant licences to cut” which authorizes them to remove trees to facilitate their operations (e.g. creating ski runs and helicopter pads). The areas of the occupant licences to cut are much larger than the area actually harvested. There are also areas designated by the province of BC as open for

recreational snowmobiling, which are adjacent to extensive areas in which snowmobiling is prohibited on the basis of caribou conservation. These activities are likely to occur, and represent a potential indirect threat through habitat alteration and/or facilitation of predator movements and/or displacement of caribou. Winter recreational activities are known to occur within high quality, high elevation critical habitat, and are very likely continuing to displace caribou into lower quality habitat where mortality risk from avalanches or predation may be higher. The possibility of direct harm or harassment exists if any human activity intersects with individual caribou in space and time; in addition to displacement, the extra energy expended by caribou can affect their fitness and body condition over time if disturbances occur regularly.

The proximate threat of predation, most likely by wolves, cougars and bears, is likely to occur at some level. Predation is assumed to be the most likely cause of the current and ongoing population declines, but displacement into lower quality habitat and resultant mortality from avalanches and reduced fitness may also occur; this LPU has the highest levels of commercial winter recreation in the province. Predator populations are stable; the relationship between the population density of predators, other than wolves, and how these predators use the landscape in a way that affects caribou is less clear than with wolves.

3. **Will the effect of the threats make the survival and / or achieving the recovery objectives of the species highly unlikely or impossible?** (reviewing the four species-specific biological considerations)

The population size of this LPU is very small, with only 29 animals counted in 2017. The LPU has experienced long term declines, which are continuing. The estimated population size of this LPU in 2012 was 89 animals, representing a decrease of 67% in only five years. Grizzly bear, black bear, and cougar predation have been sources of caribou mortality in the past, but until 2017 there had been no recent studies of the causes of caribou mortality in this LPU, and insufficient data exists to make inferences about current sources of mortality. The population trends for bears and cougars appear stable, but it is unclear if the current population densities of these predators are related to the ongoing caribou population decline. Wolf population densities appear low, but wolf predation may still occur and be significant if wolf territories overlap with caribou locations. The population trends for other ungulates (i.e. moose, deer, elk) are stable to declining (ECCC 2017a).

As outlined in question 2, ongoing and new activities are likely to occur in the LPU. Commercial and private backcountry recreation has been identified in provincial caribou census reports as a particular and ongoing concern for this LPU. There are no direct management actions currently being taken with respect to predator or alternate prey control that have resulted in a positive caribou population response (ECCC 2017a). If forestry and other land-clearing activities result in an increase in early seral (young forest) habitat, they may increase the likelihood of increased alternate prey and therefore predator (cougar, bear) density. Linear features such as forestry roads can, depending on their location, also facilitate recreational and predator access to caribou habitat. The suitability of early seral habitat to alternate prey can be reduced with certain silvicultural practices. Other mitigation measures to ameliorate the impacts may include predator control or increased harvest of alternate prey species. The province has indicated these mitigation

measures could be taken in some areas, but specific commitments are lacking, and the effectiveness of the measures is uncertain. If activities intersect with caribou locations, it may result in displacement of caribou into less preferred or higher risk habitat and/or facilitate predator movement. Effects of all these activities are cumulative with existing habitat conditions.

The interacting threats of multiple ongoing and upcoming commercial and ad hoc recreational activities, and other commercial and industrial activities, may affect predator-prey dynamics, and may directly disturb and/or displace caribou, although there is considerable uncertainty around the scope and nature of the effects.

Question 3 summary – Central Kootenay LPU
Based on all these considerations, achieving recovery for the Central Kootenay LPU is highly unlikely and may well become impossible in the near future as a result of existing cumulative impacts, to which ongoing and anticipated anthropogenic activities may be contributing.

4. **Do the threats require immediate intervention? (i.e. if immediate intervention does not occur, is survival or recovery no longer possible?)**

Given existing information, it is clear that current mortality rates are unsustainable. Although predation is the most likely primary source of mortality, it is unclear whether the ongoing and upcoming activities that have been identified as potential threats would have the effect of increasing predation risk, particularly in the near term. Immediate intervention is required to address the mortality issue, although there is uncertainty about the sources of mortality (e.g. predation and/or other causes; if predation, which predators). Without immediate intervention, achieving the recovery objectives in this LPU will likely no longer be possible. However, there is uncertainty about which ongoing and planned activities are likely to result in an increase in predation risk, considering mitigation measures and cumulative effects.

3.3 Other LPUs

1. Is the species facing one or more threats?

The discussion above regarding the general threats to the species applies to all LPUs. There is variation between the Southern, Central, and Northern Groups of southern mountain caribou, and between individual LPUs as to the relative importance of different threats, but the overarching mechanisms are consistent across LPUs.

2. Are the threats likely to occur?

A detailed analysis of all ongoing and authorized activities has not been completed for all LPUs. However, based on a review of the same provincial databases used to gather information for the WGT and CK LPUs, information gathered during the course of the “Canada-British Columbia Southern Mountain Caribou (Central Group) Protection Study”, and information provided by the Government of Alberta, Parks Canada Agency and/or publicly available, it is clear that there are areas where the risk of critical habitat destruction occurring is high, for example as a result of

coal mining, timber harvesting, wind power, commercial recreation, industrial roads, pipelines, and other land uses.

Mitigation measures may in some cases prevent the activity from resulting in destruction of critical habitat but in other cases residual effects will still result in destruction of critical habitat. These activities have been authorized by the provincial and/or federal government under other legislation or regulations (i.e., not SARA), or do not require such authorization (e.g. ad hoc recreational activities) and are currently taking place or are likely to occur in various categories of critical habitat across the entire distribution of southern mountain caribou. Additional activities are in the application stages (e.g. applications for tenure, permits, or environmental assessment certificates), a subset of which are likely to be approved, given the proposed activities are not prohibited by other legislation. Table 2 provides a summary of some examples of activities and projects in various stages of review and approval. It should be noted that the entire Jasper-Banff LPU occurs within national parks and therefore caribou and their critical habitat are protected under the *Canada National Parks Act* and SARA.

The effects of the activities are cumulative. The interacting threats of multiple ongoing and upcoming industrial, commercial, and recreational activities may affect predator-prey dynamics, although there is considerable uncertainty around the scope and nature of the effects, and considerable variation in the existing landscape condition and predator-prey dynamics across LPUs.

Detailed information is not available, and the nature and extent of predation varies across LPUs; however it is expected that predation risk is unsustainable in most extant LPUs. Mitigation measures in the form of direct predator and/or alternate prey control, and temporary separation of individual females and calves from predators using maternity pens are currently being implemented for some LPUs, with preliminary indications of success (i.e. stabilizing or increasing caribou population sizes) in some cases. If caribou are confirmed to be extirpated from two LPUs, predation will no longer be an immediate threat. Predator-prey dynamics will continue to be important for very long term recovery efforts in those LPUs.

3. **Will the effect of the threats make the survival and / or achieving the recovery objectives of the species highly unlikely or impossible?** (reviewing the four species-specific biological considerations)

LPUs subject to SARA Section 80 petition from December 2017 (also includes Central Kootenay)

The Kinbasket and South Monashee LPUs are currently presumed extirpated, or functionally extirpated. They were still considered extant when the 2014 recovery strategy was published, and have declined since then. Although the proximate threat of predation likely no longer exists, and winter recreational activities cannot disturb caribou that are not present, ongoing forest harvesting activities have the potential to result in habitat alteration which affects the likelihood of long term recovery, although there is uncertainty about the scope and nature of the effects.

The Southwest Kootenay LPU has one subpopulation (South Selkirk) which has a decreasing long term trend and currently numbers only 11 animals. Very short term trends may be mathematically interpreted as stabilizing, but at such low population sizes the loss of even a few animals (i.e. down from 14 in 2015) is significant. The BC provincial government has implemented a wolf cull in this LPU since 2015, and a maternity pen has been built and will be implemented in 2018. Evidence of measurable improvements to habitat condition to support these mitigation measures in the longer term is lacking.

The Southeast Kootenay LPU has one extant subpopulation (Purcells South), with only 16 animals as of 2016, a decline from 19 in 2014. Trends are similar to Southwest Kootenay, with long term declines and possible short term stability. Winter recreational activities and forestry are present and ongoing to various degrees within these LPUs.

The Revelstoke-Shuswap LPU includes three subpopulations, with the larger Columbia North subpopulation primarily contributing to a population estimate of larger than 167 animals for the whole LPU. Long term, the trend for the LPU is of a declining caribou population. However, in the short term, the Columbia North subpopulation appears to be stable. Various strategies, such as predator management, reduction in moose populations and three years of maternity penning, have likely had a positive influence. The two smaller subpopulations continue to decline despite reductions in moose populations. Winter recreational activities are widespread and significant in this LPU, and forestry activities are ongoing.

In the three remaining extant LPUs subject to the December 2017 petition (Southwest Kootenay, Southeast Kootenay, Revelstoke-Shuswap), the interacting threats of multiple ongoing and upcoming industrial, commercial, and commercial & public recreational activities may affect predator-prey dynamics, and may directly disturb and/or displace caribou, although there is considerable uncertainty around the scope and nature of the effects.

Question 3 summary for LPUs that were the subject of s.80 petition submitted in Dec 2017

Primarily on the basis of very small caribou population sizes and long term declining population trends, it is likely that achieving the population and distribution objectives will become highly unlikely or impossible in the near future in the Southwest Kootenay, and Southeast Kootenay LPUs as a result of existing cumulative impacts, to which ongoing and anticipated anthropogenic activities may be contributing. Although direct predator management is taking place and a maternity pen is planned in the Southwest Kootenay LPU, evidence of measurable improvements to habitat condition to support these mitigation measures in the longer term is lacking.

As a result of cumulative effects to date, achieving the population and distribution objectives is now highly unlikely in the functionally extirpated Kinbasket and South Monashee LPUs except in the very long term. The measures necessary to re-establish populations in extirpated areas are extremely technically challenging.

In contrast, in light of the larger population size and stabilizing population trend of the Columbia North subpopulation, which influences the population information for entire LPU, the effects of

the ongoing anthropogenic activities do not appear likely to make recovery impossible for the Revelstoke-Shuswap LPU as a whole at this time.

Additional LPUs with population sizes below 50 individuals

The Telkwa, Narraway, and Jasper-Banff LPUs all have current population sizes smaller than 50 animals, and all have long term declining population trends. The short term population trend for Telkwa may be stabilizing or increasing, but at very low numbers. The province of Alberta has implemented wolf culls in a portion of the Narraway LPU since the winter of 2013/14. Due to habitat management initiatives implemented in Jasper and Banff national parks to decrease alternative prey and predator numbers, wolf population densities in Jasper-Banff LPU are below the targets in the federal recovery strategy for southern mountain caribou. Despite this, the caribou populations in the Narraway and Jasper-Banff LPUs continue to decline.

Forest harvesting, including salvage harvest of pine-beetle killed stands, mineral exploration, and both summer and winter recreational activities are current and ongoing within the Telkwa LPU. In general, forest harvesting occurs in lower elevation areas, where the impacts relate to potential increases in alternate prey and therefore predators. The impacts of recreational activities are more likely to occur if these activities disturb caribou or their habitat at higher elevation, or facilitate predator access to caribou. Snowmobile access is currently managed using voluntary closures, where the locations of radio-collared caribou are publicized and users requested to avoid those areas.

The Narraway LPU includes mountainous areas in which recreational activities are present and ongoing, and lower elevation areas in which forestry and oil and gas development are the primary ongoing activities.

In the Jasper-Banff LPU, Parks Canada Agency protects caribou and critical habitat under the *Canada National Parks Act* and SARA, and implements a number of conservation measures for the species.

The interacting threats of multiple ongoing and upcoming commercial and ad hoc recreational activities, and other commercial and industrial activities, may affect predator-prey dynamics, and may directly disturb and/or displace caribou, although there is considerable uncertainty around the scope and nature of the effects, and not all activities are present in all three LPUs.

Question 3 summary for Telkwa, Narraway, and Jasper-Banff LPUs

Primarily on the basis of very small caribou population sizes and long term declining population trends, it is possible that achieving recovery will become highly unlikely or impossible in the near future in the Telkwa, Narraway, and Jasper-Banff LPUs as a result of existing cumulative impacts, to which ongoing and anticipated anthropogenic activities may be contributing and/or because, even where ecological conditions (e.g., predation risk) are considered good (such as in the Jasper-Banff LPU), the population is too small to recover on its own.

Additional LPUs with population sizes below 100 individuals

The Takla and Quintette LPUs have current population sizes between 50 and 100. Both have experienced long term declines. In the short term, the population trend for Takla may be stabilizing; recent trends for Quintette show an increasing population, likely in response to significant predator management measures. These trends are preliminary and, in the case of Quintette, are likely dependent on the continuation of wolf culls. Evidence of measurable improvements to habitat condition to support these mitigation measures in the longer term is lacking.

There appear to be a very small amount of upcoming authorized and ongoing activities in the Takla LPU. There are a few authorized and pending cutblocks totaling less than 1000 ha, no commercial recreation tenures, and no active promotion of backcountry recreation. A limited amount of snowmobiling likely occurs as a means of transportation and by hunters and trappers. The Quintette LPU continues to be affected by operational coal mines in high elevation habitat, and additional mining operations are in various stages of review. Forestry operations are ongoing at lower elevations. Three specific areas are publicly promoted for snowmobiling, which are located adjacent to high elevation caribou winter range. These may facilitate predator access.

Question 3 Summary for Quintette LPU
This LPU has a current population size lower than 100 animals and a long term declining population trend. Although predator management efforts may be improving the short term population trend or slowing the rate of decline, evidence of measurable improvements to habitat condition on provincial lands to support these mitigation measures in the longer term is lacking. Therefore it is possible that achieving recovery will become highly unlikely or impossible in the near future in the Quintette LPU as a result of existing cumulative impacts, to which ongoing and anticipated anthropogenic activities may be contributing.

Question 3 Summary for Takla LPU
As with the LPUs discussed above, Takla also has a current population size lower than 100 animals and a long term declining population trend. However, in the short-term, the population trend may be stabilizing. Although confirmation is required, there appear to be very few ongoing and anticipated anthropogenic activities in this LPU. Achieving recovery may indeed be challenging, due to the existing cumulative impacts, but it does not appear that impacts are increasing at this time and as such, it cannot be concluded that recovery will become highly unlikely or impossible.

Additional LPUs with population sizes above 100 individuals
The Upper Fraser, Quesnel Highlands, Pine River, A La Peche, Redrock / Prairie Creek, Tweedsmuir, and Chase LPUs have current population sizes between approximately 100 and 300[8]. All have experienced long term declines. Short term population trends appear stable for Upper Fraser, although one of its two extant subpopulations has a low population size (36 caribou). Quesnel Highlands has a short term declining trend overall, but one of its two subpopulations may be stabilizing. Short term population trends for Pine River show a significant population increase following aggressive wolf control measures and implementation of a maternity pen. Short term population trends for A La Peche also show an increasing

[8] As do the Wells Gray-Thompson and Revelstoke-Shuswap LPUs discussed previously.

population size following expansion of a wolf control program. For Redrock / Prairie Creek, population trends continue to show declines, although recent expansion of a wolf control program may have slowed the rate of decline. No population size estimate is available, but recent minimum counts show at least 96 animals. For Tweedsmuir and Chase, population declines appear to be ongoing.

The Hart Ranges, Chilcotin, Wolverine, and Graham LPUs have current population sizes larger than 300. All have experienced long term declines. The short term population trend for the Hart Ranges LPU shows continued declines. The Chilcotin LPU has the largest overall population size of any LPU, but two of its three subpopulations are now estimated as smaller than 50 animals and its largest subpopulation has declined from an estimated 1346 animals in 2014 to 784 animals in 2016. The Graham LPU has similarly seen significant declines of between 50 and 57% between 2009 and 2016. The Wolverine LPU is showing a slight increase in population size between 2010 and 2016. No comprehensive predator or alternate prey management program is in place for these four LPUs.

Variable amounts of information were able to be gathered in the time available for this assessment regarding ongoing and anticipated upcoming activities. Cumulative impacts exist in all these LPUs, to which ongoing and anticipated anthropogenic activities may be contributing.

Question 3 Summary for Upper Fraser, Quesnel Highlands, Pine River, A La Peche, Tweedsmuir, Chase, Hart Ranges, Chilcotin, Wolverine, and Graham LPUs
These LPUs appear likely to remain larger than 100 animals in the short term (1-2 years), either because population sizes are sufficiently large that even in cases where current population trends show a decline, the trend does not appear steep enough to cross the 100 animal threshold in the near term; or because direct measures to mitigate the effects of predation are resulting in population increases. Achieving recovery may indeed be challenging, due to the existing cumulative impacts, but population sizes are still sufficiently large that recovery remains possible.

Question 3 Summary for Redrock / Prairie Creek
Although the current population size is estimated to be higher than 100, population trend in this LPU continues to decline, and is therefore likely to drop below 100 in the short term. Therefore it is possible that achieving recovery will become highly unlikely or impossible in the near future in the Redrock / Prairie Creek LPU as a result of existing cumulative impacts, to which ongoing and anticipated anthropogenic activities may be contributing.

4. Do the threats to the southern mountain caribou require immediate intervention? (i.e. if immediate intervention does not occur, is survival or recovery of the southern mountain caribou no longer possible?)

Since there are thirteen LPUs with population sizes larger than 100 which provide some resilience, redundancy, and connectivity, the survival of the species remains possible in the short term even if the threats identified are not immediately addressed. Therefore, the threats to survival do not require immediate intervention. As noted above, the declines being observed in the population sizes, if the trend continues, are such that, over the next 2-3 years, they will result

in overall smaller population sizes and more restricted distribution of southern mountain caribou. Accordingly, it will be necessary to address cumulative impacts and the ongoing declines, including the declines in the larger LPUs, in order for survival to remain possible in the medium term (i.e., 5-10 years). The timing, extent, and success of such measures will influence the chances of survival.

With respect to recovery, based on the available information, it is clear that current mortality rates are unsustainable in many LPUs.

There is a lack of scientific information to support a quantified assessment of the extent to which cumulative impacts of ongoing and upcoming activities will increase the risk of predation. However, the ongoing and upcoming activities (summarized in Table 2) are representative of the types of activities that have contributed to cumulative effects and increased predation in the past. These activities will likely result in ongoing population declines in these LPUs, such that achieving the recovery objectives of self-sustaining populations in all local population units will no longer be possible without immediate intervention.

The immediate interventions required include habitat management measures (i.e. no further net increase in disturbance of critical habitat and restoration of disturbed habitat, such that cumulative effects are reversed) and population management measures (e.g. predator/alternate prey management, maternity penning).

British Columbia and Canada are negotiating a conservation agreement supporting recovery of southern mountain caribou and are also working with directly affected First Nations in Central Group towards a partnership agreement, both of which would include these types of measures.

4. Overall Summary Regarding Survival of the Species

Considering all of the information available, the Department's view is that the species would continue to survive, even if threats are not addressed in the next 2-3 years, albeit at smaller population sizes and reduced distribution. This view has considered that, although threats are present, and population sizes and distribution are declining, four LPUs still have population sizes larger than 300 animals and nine LPUs have population sizes between 100 and 300 animals.

5. Overall Summary Regarding Recovery of the Species

As stated in the federal recovery strategy, the long-term recovery goal is to achieve self-sustaining populations in all local population units within their current distribution, with sufficiently large local populations to support traditional Aboriginal harvesting activities.

Based on the best available information, southern mountain caribou:

- show significant long-term declining trends, which are ongoing in the majority of local population units;
- have population sizes in 11 local population units below which achievement of self-sustaining population levels becomes increasingly unlikely; and
- are, in most local population units, believed to be facing unsustainable predation.

Given this, the effects of the threats facing the species will make achieving the recovery objectives of the species highly unlikely or impossible without immediate intervention, including both population and habitat management measures. This considers current mitigation actions underway or planned by BC and Alberta. It is the Department's view that the southern mountain caribou is facing imminent threats to its recovery.

The LPUs to which the effects of the threats are likely to make recovery of the southern mountain caribou highly unlikely or impossible are:

Southern Group

1. Central Kootenay
2. Southwest Kootenay
3. Southeast Kootenay
4. Kinbasket
5. South Monashee

Northern Group

6. Telkwa

Central Group

7. Quintette
8. Narraway
9. Jasper-Banff
10. Redrock / Prairie Creek

For clarity, the Takla LPU is not included because, based on available information, in the short term, the population trend may be stabilizing, and there are very few planned and ongoing anthropogenic activities, such that the effects of the activities appear unlikely to make recovery impossible. All remaining LPUs, including the Wells Gray-Thompson and Revelstoke-Shuswap which were included in section 80 petitions, are not included primarily because of population sizes above 100 animals, in addition to apparent stabilizing population trends for some LPUs.

Table 1a: Population Data on LPUs that were the subject of SARA Section 80 petitions received in April 2017

Local Population Unit (LPU)	Subpopulation(s)	Population Estimate from 2002 COSEWIC Status Report (SR)		Population Estimate from 2014 Recovery Strategy (RS)		Most Recent Population Estimate or Count		Long term Population Trend from 2014 RS / Difference btwn 2002 SR and RS	Other Population Trend Information	Maternal Penning, Predator, Primary Prey Management
		Estimate	Year	Estimate	Year	Estimate	Year			
Wells-Grey Thompson	Wells-Grey South, Groundhog	315	1998	133+ 13 =146	2013 2013	>148+ 19 = >167	2017 2018	Decreasing / 54% decline in 15 years (1998-2013)	Most recent minimum count indicates the possibility that the WGS subpopulation may be stabilizing or increasing.	No actions specifically documented for the purpose of caribou management, but provincial data indicate that moose and wolf populations are declining in this LPU.
Central Kootenay	Central Selkirk (Duncan/ Nakusp)	130	1997	89	2012	>29	2017	Decreasing / 32% decline in 17 years (1997-2012)	All indications are that long term declines are ongoing; 67% decline in the last 5 years.	Somewhat liberalized hunting seasons for white-tailed deer; no positive effect on caribou trend.

Table 1 a Notes: Population estimates are based on survey data unless otherwise noted and include all age classes. Long term population trend information is copied from the 2014 federal recovery strategy (Table 3), which notes that "Long-term trend based on a three generation (27 years) trend based on survey data for Southern and Northern Groups, and on population vital rates (radio-collared adult mortality, late winter calf recruitment) for Central Group and Tweedsmuir subpopulation of the Northern Group".

Wells-Grey Thompson: Information provided by the Government of BC in 2017 and April 2018 indicates that an incomplete survey in 2017 counted 123 animals for the Wells Gray South subpopulation; after sightability correction factor (0.83), estimate would be some amount larger than 148 animals. For the Groundhog subpopulation, 13 caribou were counted in 2017 and 19 were counted in 2018. Although these are minimum counts, in the case of Groundhog they are thought to represent close to an actual population estimate, as the survey area is relatively small and it is unlikely that many if any caribou are missed. Survey attempts for the Wells Gray South subpopulation in 2018 were constrained by weather. No current total population size estimate is available. Very short term trends indicate the possibility of a stable-increasing population, possibly corresponding with declining moose and wolf population numbers, but these are preliminary and short term results (ECCC 2017b).

Central Kootenay: Since 2005, the Central Selkirk caribou subpopulation has been divided into the Nakusp and Duncan blocks. However, since 2010, caribou have been consistently sighted in between the Duncan and Nakusp blocks and were not technically part of either. Thus, the BC Ministry of Forests, Lands and Natural Resource Operations returned to the convention of using the term "Central Selkirk" without further division into blocks (DeGroot 2014, DeGroot 2017). The "Central Selkirk" area is wholly within the "Central Kootenay" LPU used in the 2014 federal recovery strategy. The 2014 recovery strategy reported a population estimate of 66 for 2012; however, DeGroot and Furk 2012 report 89 for 2012. The February 2017 census represents a minimum count; i.e. 29 caribou were actually counted (DeGroot 2017) and includes caribou from within and between the Nakusp and Duncan blocks.

Table 1b: Population Data on LPUs that were the subject of SARA Section 80 petition in December 2017 (except Central Kootenay, already provided in Table 1a)

Local Population Unit (LPU)	Subpopulation(s)	Population Estimate from 2002 COSEWIC Status Report (SR)		Population Estimate from 2014 Recovery Strategy (RS)		Most Recent Population Estimate		Long term Population Trend from 2014 Recovery Strategy / Difference btwn 2002 SR and RS	Other Population Trend Information	Maternal Penning, Predator, Primary Prey Management
		Estimate	Year	Estimate	Year	Estimate	Year			
Kinbasket	Central Rockies	20	1998	3	2008	3	2008	Decreasing / 85% decline in 10 years (1998-2008)	Presumed functionally extirpated	None documented
South Monashee	Monashee	10	2000	4	2011	1	2016	Decreasing/ 60% decline in 11 years (2000-2011)	Presumed functionally extirpated	None documented
Southwest Kootenay	South Selkirk	35	2000	18	2014	3 11	2018 2017	Decreasing / 49% decline in 14 years (2000-2014) / 69% decline in 17 years (2000-2017)	As of April 2018, this LPU may now be functionally extirpated, as all three remaining animals found during census are female.	Wolf culls (2015-2017). Maternity pen to be implemented in 2018.
Southeast Kootenay	Purcells Central, Purcells South	20	2000	0+ 19 =19	2005 2014	0+ 16 = 16	2005 2017	Decreasing / 5% decline in 14 years (2000-2014)	Short term trend may be considered stable, but total population has still declined from 19 animals in 2014.	None documented
Revelstoke-Shuswap	Columbia North, Frisby-Boulder, Columbia South	210	1998	152+ 10+ 6 =168	2013 2010 2013	147+ 11+ 4 = 162	2017 2013 2016	Decreasing / 20% decline in 15 years (1998-2013)	Short term trends appear to be relatively stable, but at very low numbers for Frisby-Boulder and Columbia South.	Moose reductions via increased hunting permits reduced moose populations by 71% between 2003 and 2014; wolf populations have declined concurrently;

										Revelstoke Caribou Rearing in the Wild maternity pen (2014-2017); wolf removal in vicinity of pen implemented winter 2017

Table 1b Notes: Population estimates are based on survey data unless otherwise noted and include all age classes. Long term population trend information is copied from the 2014 federal recovery strategy (Table 3), which notes that "Long-term trend based on a three generation (27 years) trend based on survey data for Southern and Northern Groups, and on population vital rates (radio-collared adult mortality, late winter calf recruitment) for Central Group and Tweedsmuir subpopulation of the Northern Group".
Kinbasket: Includes those caribou counted directly (3) and not a calculated population estimate accounting for sightability (Legebokow and Serrouya 2013). Serrouya et al. (2014) states that this LPU may be extirpated.
South Monashee: One caribou was associated with one small caribou track network observed and survey team was confident that this was the only caribou at that site. Surveyors concluded that there was only one caribou left in the known recent range of the South Monashee herd and consider the herd to be functionally extirpated (van Oort, H. and R. Laubman 2016). Three caribou were observed in 2013 (Legebokow and Serrouya 2013).
Southwest Kootenay: The 2018 census information was provided directly by the Government of BC on April 13, 2018 (unpub data). 11 animals represents a total population count for 2017 (L. DeGroot, unpub data. 2017). The South Selkirk caribou spend most of their time in Canada with occasional movements into the US (L. DeGroot, pers. comm. 2016). Total population count was 12 animals in 2016 and 14 animals in 2015 (L. DeGroot, pers.comm. 2016). Details of wolf removal are available in Government of British Columbia 2017.
Southeast Kootenay: Current population estimate for 2017 (Purcells South - 16) was provided by Province of BC, Jan 2018. The estimate for 2016 was also 16 animals. In 2011, 15 animals were counted. Purcells Central has been considered extirpated since 2005 (DeGroot 2011).
Revelstoke-Shuswap: All three subpopulations are included in the "Revelstoke" subpopulation in COSEWIC 2002. The 2014 recovery strategy reported population estimates of 183, 13, and 7 (total of 203). The source for these data are unknown. Corrected estimates for 2013 are from Legebokow and Serrouya 2013. The current population numbers were provided by Parks Canada Agency (pers.comm. 2017) and confirmed by Government of BC, Jan 2018. Information about moose reduction experiment is from Serrouya et al. 2017. Details of wolf removal in winter 2017 are available in Government of BC 2017.

Table 1c: Population Data on additional LPUs with population sizes below 100 individuals

Local Population Unit (LPU)	Subpopulation(s)	Population Estimate from 2002 COSEWIC Status Report (SR)		Population Estimate from 2014 Recovery Strategy (RS)		Most Recent Population Estimate		Long term Population Trend from 2014 Recovery Strategy / Difference btwn 2002 SR and RS	Other Population Trend Information	Maternal Penning, Predator, Primary Prey Management
		Estimate	Year	Estimate	Year	Estimate	Year			
Telkwa	Telkwa	55	2000	19	2013	> 22 (min count)	2018	Decreasing / 65% decline in 13 years (2000-2013)	Short term trend may indicate population is stabilizing or increasing, but at low numbers.	None currently. Deer/moose control may be planned. Caribou are staying in the alpine and do not appear to be interacting with wolves. Grizzly bears, wolverines, eagles are likely main predators.
Takla	Takla (Sydney Williams, Mitchell-Blanchett)	100	2002	122	2004	70	2015	Unknown / Only 2 years difference between data in 2002 SR and 2014 RS (2002-2004).	Decline of 44% between 2004 and 2015. 70 animals were counted in both 2012 and 2015, indicating possible stabilizing short term trend. However, Sydney Williams subpopulation is estimated at less than 20 animals.	None documented
Quintette	Quintette	200	2002	106 (98-113)	2014	73	2018	Decreasing / 44-51% decline in 12 years (2002-2014)	Short term trend may indicate population is increasing in response to predator management.	Wolf culls (2015-2017)
Narraway	Narraway (Bearhole Redwillow & South Narraway)	100 (based on aerial survey, low confidence)	1999	96 (extrapolated estimate – see RS for details)	2012	<50	2017	Decreasing / Not applicable due to uncertainty in 1999 / 2012 pop estimates. As of 2017, the 10-year mean population growth is 0.88 (95%CI: 0.67-1.04)	Three year mean population growth for South Narraway (2013-14 to 2016-17) is 0.84 (95% CI: 0.59-1.07); taking the lower limit of the 95% CI, this would indicate a mean decline of 41%.	Wolf population management since 2013/14 in AB portion (South Narraway) (Government of Alberta, 2017)

Table 1c Notes: Population estimates are based on survey data unless otherwise noted and include all age classes. Long term population trend information is copied from the 2014 federal recovery strategy (Table 3), which notes that "Long-term trend based on a three generation (27 years) trend based on survey data for Southern and Northern Groups, and on population vital rates (radio-collared adult mortality, late winter calf recruitment) for Central Group and Tweedsmuir subpopulation of the Northern Group".
Telkwa: Census information indicating a minimum count of 22 animals in 2017 was provided by Province of BC, January 2018; in April 2018, the Province of BC provided updated census information indicating a minimum count of 22 animals for 2018. No sightability correction factors are applied, but given survey methodology, habitat selection strategy, and the size of the population, it is unlikely that a large number of animals were missed, so the minimum counts are likely close to the actual population size. The 2016 estimate was 18 animals; 2014 was 16 animals.
Takla : During the 2015 survey, 55 adults and 12 calves were observed, for a ratio of 22 calves/100 adults, or 18% calves in the population. The total count of 70 caribou was identical to the census in 2012 (Klohn Crippen Berger 2012), but less than the census of 125 caribou in 2004 (Wilson et al. 2004). The decline between 2004 and 2012 represents a decline of 44%, or about 7% per year. Calf recruitment for the three censuses ranged from 17-20% calves in the population (Table 2), which is usually indicative of a stable population (Seip and Cichowski 1996). It is unclear why the Takla herd appears to be declining despite reasonably high calf recruitment. (Seip 2015). Subpopulation information was provided by Province of BC, January 2018. Lack of regular surveys precludes the calculation of long term trends.
Quintette: The population estimate in 2016 was 62 animals (Seip and Jones 2016). No population estimate is provided for 2017. But the minimum population count in 2017 was 49 caribou, compared to 39 in 2016, indicating a possible population increase (Seip and Jones 2017). This is reinforced by preliminary census results for 2018 provided directly by the Government of BC (minimum count of 67; population estimate of 73). Details of wolf removal are available in Government of British Columbia 2017.
Narraway: In 2017, the minimum count (not a population estimate, but may be close to one) for Bearhole Redwillow was 9. The population estimate for South Narraway was 23 with a 95% confidence interval of 20-43. 23 was also reported as the minimum count. It was noted for both subpopulations that the minimum counts could be close to actual population sizes based on the distribution of radio-collared animals (Seip and Jones 2017). Based on Seip and Jones 2017, the total population size of Narraway LPU in 2017 may be close to the combined minimum count of 32 (range: 29-52). Government of Alberta 2017 indicates that the population size of South Narraway – AB portion only is unknown (less than 50), but recent minimum counts have documented 28 animals. The 2012 estimate (96) reported in the recovery strategy was based on a 2009 population estimate of 100 caribou, extrapolated to 2012 using annual population growth estimates. Information on wolf control provided directly by provincial staff in April 2018.

Table 1c continued: Population Data on additional LPUs with population sizes below 100 individuals

Local Population Unit (LPU)	Subpopulation(s)	Population Estimate from 2002 COSEWIC Status Report (SR)		Population Estimate from 2014 Recovery Strategy (RS)		Most Recent Population Estimate		Long term Population Trend from 2014 Recovery Strategy / Difference btwn 2002 SR and RS	Other Population Trend Information	Maternal Penning, Predator, Primary Prey Management
		Estimate	Year	Estimate	Year	Estimate	Year			
Jasper-Banff	Tonquin, Maligne, Brazeau, Banff	138+33 = 171	1998/ 1989	38 + 5+ 8+ 0 =51 (min counts) Range for Tonquin: 27-75, so 40-88 total	2013	41-71	2016	Decreasing / 63 to 83% decline in 15 years (1998-2013) (average: 73%)	All indications are that caribou population declines are ongoing.	Wolf population density has been lower than 3 wolves/1000km^2 since 2011, due to habitat management aimed at decreasing alternate prey and predator numbers, but some small packs can have disproportionate impacts on caribou when wolf territories overlap, often temporarily, with areas occupied by caribou (Neufeld and Bisaillon 2017).

Table 1c Notes:
Jasper-Banff: For the Tonquin, the recovery strategy provided a population estimate of 38 for 2013. This was a minimum count. Population estimate from scat DNA for the Tonquin was 45 (38-75, 95% CI). The visual survey population estimate for the Tonquin was 34 (27-64, 95% CI) (Neufeld and Bisaillon 2017). 2016 population estimate from scat DNA for the Tonquin was 31 (26-56, 95% CI). Minimum counts (not population estimates) are provided for Maligne (<5) and Brazeau (10-15) (Neufeld and Bisaillon 2017).

Table 1d: Population Data on additional LPUs with population sizes above 100 individuals

Local Population Unit (LPU)	Subpopulation(s)	Population Estimate from 2002 COSEWIC Status Report (SR)		Population Estimate from 2014 Recovery Strategy (RS)		Most Recent Population Estimate		Long term Population Trend from 2014 Recovery Strategy / Difference btwn 2002 SR and RS	Other Population Trend Information	Maternal Penning, Predator, Primary Prey Management
		Estimate	Year	Estimate	Year	Estimate	Year			
Chilcotin	Rainbows, Charlotte Alplands, Itcha-Ilgachuz	125+ 50+ 2000 =2175	2000 1999 2000	50+ 32+ 1594 (range: 1431-1791) =1676	2008 2001 2012	>32+ ?, likely <25+ 784 = approx. 841	2016 2016 2016	Decreasing Decreasing Increasing or Stable / 20% decline in 12 years (2000-2012)	Declines ongoing in recent years. Note a 42% decline in only two years (2014-2016) for the Itcha-Ilgachuz subpopulation	None documented
Tweedsmuir	Tweedsmuir	300	1982	300	2002	165 (range 150-180)	2016	Decreasing / Stable in 20 years (1982-2002)	40-50% decline in most recent 14 years (2002-2016).	None documented
Wolverine	Wolverine	400	1996	341	2010	362	2016	Decreasing or Stable / 15% decline in 14 years (1996-2010)	6% increase between 2010 and 2016.	None documented recently.
Chase	Chase	700	1993	475	2009	290 (range: 246-334)	2017	Unknown/ 32% decline in 16 years (1993-2009)	Decline of between 30 and 48% between 2009 and 2017 (8 years). Decline of between 52 and 65% between 1993 and 2017 (24 years).	None documented recently.
Graham	Graham	300	2002	708 (range: 311-1558)	2009	304 (range: 157-663)	2016	Unknown / 136% increase in 7 years (range: 3% to 419%;considerable uncertainty around pop'n estimates) (2002-2009)	Decline of between 50 and 57% in most recent 7 years (2009-2016). Adult female mortality was 19% between March 2016-March 2017; calf recruitment was 13%. Preliminary 2018 information: Collared adult female mortality was 40% in past year.	None. Being used as the "no wolf control" comparison for South Peace LPUs.

Table 1d Notes: Population estimates are based on survey data unless otherwise noted and include all age classes. Long term population trend information is copied from the 2014 federal recovery strategy (Table 3), which notes that "Long-term trend based on a three generation (27 years) trend based on survey data for Southern and Northern Groups, and on population vital rates (radio-collared adult mortality, late winter calf recruitment) for Central Group and Tweedsmuir subpopulation of the Northern Group".
Chilcotin: Rainbows - 32 animals in 2016 represents a minimum count. No population estimate is available. The 2008 estimate of 50 caribou was based on a fall rut survey which noted a rapid decline since 2000 (Freeman 2009). Charlotte Alplands - the most recent population survey was in 2001 (32 animals). The 2014 recovery strategy incorrectly reported a minimum count of 7 animals as a population estimate for 2012, but this was incidental data gathered during a goat survey, and only captured some high elevation caribou habitat, and no low elevation caribou habitat. The current estimate of less than 25 is reported by provincial staff. Itcha-Ilgachuz - 2012 original population estimate (1685, as noted in the 2014 recovery strategy) has a range of 1431-1791 (COSEWIC 2014). However, the 2012 estimate was revised due to data error. Revised 2012 population estimate is 1594 (Dodd 2014). Population estimate for Itcha-Ilgachuz in 2014 was 1346 animals (Dodd 2017b). Population estimates for 2016 were provided by the Government of BC, January 2018. The recovery strategy indicated an increasing long term trend for Itcha-Ilgachuz. Dodd 2017b reports the long term (20 year; 1994-2014) trend as stable, but with considerable variability.
Tweedsmuir: The following information was received from the Government of BC, Jan 2018: 2016 estimate of 165 is the midpoint between estimate of 150-180. The lower bound based on mark-recapture assessment using collars and upper bound still requiring confirmation. Estimate based on surveys in October 2015 and March 2016, and mark-capture analysis of fall 2015 survey. Minimum population count on March 16 2016 was 120 caribou (A. Roberts, pers. comm. 2016).
Wolverine: 2016 population estimate (362) based on late winter aerial inventory, corrected for sightability (Hansen and Paterson 2016). The recovery strategy indicated a decreasing long term trend, but COSEWIC 2014 reports the long term trend as stable.
Chase: 2017 population estimate (290) based on late winter aerial inventory, corrected for sightability (Anderson and Heard 2017)
Graham: 2016 population estimate (304) based on late winter aerial inventory, corrected for sightability. Range is 157-663 (Culling and Culling 2016). 2016-17 mortality and recruitment information is from Seip and Jones 2017, who note that the data suggest the Graham herd is continuing to decline in the absence of any wolf control or other population management actions.

Table 1d continued: Population Data on additional LPUs with population sizes above 100 individuals

Local Population Unit (LPU)	Subpopulation(s)	Population Estimate from 2002 COSEWIC Status Report (SR)		Population Estimate from 2014 Recovery Strategy (RS)		Most Recent Population Estimate		Long term Population Trend from 2014 Recovery Strategy / Difference btwn 2002 SR and RS	Other Population Trend Information	Maternal Penning, Predator, Primary Prey Management
		Estimate	Year	Estimate	Year	Estimate	Year			
A La Peche	A La Peche	170 (based on total count – med confidence)	1998	88 (extrapolated estimate – see RS for details)	2012	>100 (min count of 85)	2017	Decreasing / Not applicable due to uncertainty in 1998 / 2012 pop. estimates. As of 2017, the 10-year mean population growth is 0.97 (95%CI: 0.80-1.09)	Population considered stable by Government of Alberta. Short term (3 year) caribou population trend is positive (1.10; 95%CI: 0.96-1.21), linked to wolf population reduction. (Gov't of Alberta, 2017)	Wolf control in part of range since 2006, expanded 2013/14, some liberalized hunting for moose, deer, elk
Redrock/ Prairie Creek	Redrock/ Prairie Creek	312 (based on mark & resight – med confidence)	1993	127 (extrapolated estimate – see RS for details)	2012	>100 (min count of 96)	2017	Decreasing / Not applicable due to uncertainty in 1993 / 2012 pop estimates. As of 2017, the 10-year mean population growth is 0.85 (95%CI: 0.63-1.02)	Decline appears to be ongoing (3 year mean population growth is 0.85 (95%CI:0.62-1.04), but rate of decline may have slowed recently in response to expanded predator control measures.	Wolf control starting 2013/14; expanded geographic scope 2014/15; continued through 2017/18

Local Population Unit (LPU)	Subpopulation(s)	Population Estimate from 2002 COSEWIC Status Report (SR)		Population Estimate from 2014 Recovery Strategy (RS)		Most Recent Population Estimate		Long term Population Trend from 2014 Recovery Strategy	Other Population Trend Information	Maternal Penning, Predator, Primary Prey Management
Pine River	Scott/ Moberly (Klinse-za), Kennedy Siding, Burnt Pine	170+ 170 (incl in Moberly) =340	2002 2002	43+ 22+ 30+ 0 =95	2014	61+ 63+ 0 =124	2017	Unknown Decreasing Decreasing Decreasing / 72% decline in 12 years (2002-2014)	Annual estimated growth rates for 2016-17: Klinse-za: 13% Kennedy Siding: 26-33% No mortalities of collared caribou from predators reported. Average 3-year rate of increase for Klinse-za between 2013 and 2016 was 19%. Lower rate of increase for 2017 attributed to unexpected mortalities from avalanches.	Maternal penning 2014-present (Klinse-za subpop). Wolf control 2015-present. Almost all wolves removed in winter 2016. Supplemental feeding of Kennedy Siding subpop.
Hart Ranges	Hart Ranges (Hart South & Parsnip)	450	1999	404+ 129= 533	2012	246+ 129 =375	2016	Decreasing / 18% increase in 13 years (1999-2012)	30% overall decline in most recent 4 years (2012-2016); Hart South estimated at 40% decline between 2012 and 2016; Parsnip stable since 2012, but declined by approx. 45% since 2006.	None recently. Moose density reduction in Parsnip subpop between 2006-2009 resulted in wolf population declines (Steenweg 2011)
Upper Fraser	North Cariboo Mountains, George Mountain, Narrow Lake	340+ 5+ 65 =410	1999 1999 1999	222+ 0+ 47 =269	2011 2014	212+ 0+ 36 =248	2016	Decreasing Decreasing Decreasing / 34% decline in 12-15 years (1999-2011/2014)	Population trajectory appears relatively stable since 2012 for North Caribou Mountains and for Narrow Lake since 2003, but at low population size and declining distribution for Narrow Lake.	.
Quesnel Highlands	Barkerville, Wells Gray (North)	50+ 200 =250	2000 2000	90+ 265 =355	2012 2012	72+ 200 =272	2016 2015	Increasing Decreasing / 40% increase in 12 years (2000-2012)	Estimated overall 20-22% decline in most recent 2-4 years. Provincial staff indicate Barkerville might be stabilizing currently.	None documented

Table 1d continued Notes: Population estimates are based on survey data unless otherwise noted and include all age classes. Long term population trend information is copied from the 2014 federal recovery strategy (Table 3), which notes that "Long-term trend based on a three generation (27 years) trend based on survey data for Southern and Northern Groups, and on population vital rates (radio-collared adult mortality, late winter calf recruitment) for Central Group and Tweedsmuir subpopulation of the Northern Group".
A La Peche: See Government of Alberta 2017.
Redrock/ Prairie Creek: See Government of Alberta 2017. Information on wolf control provided directly by provincial staff in April 2018.
Pine River: Scott East and Moberly now considered one subpopulation (Klinze-sa). Scott West is likely extirpated / trace occurrences (Sittler and McNay 2017). Other population trend information is from Seip and Jones 2017 and McNay 2017. Details of wolf removal are available in Government of British Columbia 2017.
Hart Ranges: The recovery strategy provided an estimate of 459 in 2013. However, the 2013 survey in Hart South did not include all census blocks. 2012 was a complete survey, with an estimated 404 animals in Hart South and 129 in Parsnip. 2012 population estimate (533) and 2016 population estimate (375) based on late winter aerial inventory, corrected for sightability (Klaczek and Heard 2016). Other population trend information is also from Klaczek and Heard 2016.
Upper Fraser: North Cariboo Mountains 2016 population estimate (212) based on late winter aerial inventory, corrected for sightability, and includes an estimate for an unsurveyed area (Klaczek and Heard 2016). Population estimates for 2011 and 2014 are reflected in Courtier and Heard 2014. Other population trend information is from Klaczek and Heard 2016.
Quesnel Highlands: The 2014 Recovery Strategy reported a population estimate of 259 for 2013. This was based on a combination of counts and track estimates. The 2012 survey results (265 animals) had higher confidence (Freeman 2012), 2016 population estimate (272) based on surveys including minimum counts and tracks, corrected for sightability (subpopulation-specific correction factors) (Dodd 2017a).

Table 1a-d Summary – Southern mountain caribou population size and trend (by local population unit and subpopulation)

Prov.	Local population unit (LPU)	Subpopulation	Population estimate from 2014 recovery strategy[9]		Most recent population estimate		Population trend	
			Estimate	Year	Estimate	Year	Current	Long term (as of 2014)
Northern Group								
B.C.	Chilcotin	Rainbows	50	2008	>32 (min count)	2016	Decreasing	Decreasing
B.C.		Charlotte Alplands	32	2001	Unknown. Likely <25	2016	Decreasing	Decreasing
B.C.		Itcha-Ilgachuz	1594 (range: 1431–1791)	2012	784	2016	Decreasing	Stable (but variable)
B.C.	Tweedsmuir	Tweedsmuir	300	2002	165 (range 150–180)	2016	Decreasing	Decreasing
B.C.	Telkwa	Telkwa	19	2013	>22	2018	Possibly stabilizing / increasing	Decreasing
B.C.	Takla	Takla	122	2004	70	2015	Possibly stabilizing	Unknown
B.C.	Wolverine	Wolverine	341	2010	362	2016	Increasing	Stable
B.C.	Chase	Chase	475	2009	290 (range: 246–334)	2017	Decreasing	Unknown
B.C.	Graham	Graham	708 (range: 311–1558)	2009	304 (range: 157–663)	2016	Decreasing	Decreasing
B.C.	**Northern Group Total**		**3641** (range: 3081–4688)		**2054** (range: 1863–2457)		4 of 7 local population units are decreasing[10]	3 of 7 local population units are decreasing[11]

[9] With some corrections to the information in the recovery strategy due to revised information from jurisdictions or the 2014 COSEWIC status report. Corrections made to the following subpopulations: the Charlotte Alplands, Itcha-Ilgachuz, Tonquin, Hart Ranges, Wells Gray North, Columbia North, Frisby–Boulder, Columbia South, South Selkirk; and the associated totals.

[10] Trend data are reported by subpopulation. Rolled up, the following local population units in the Northern Group appear to show declining short term trends: the Chilcotin local population unit, the Tweedsmuir local population unit, the Chase local population unit, and the Graham local population unit. The Takla local population unit, the Telkwa local population unit, and the Wolverine local population unit may be stabilizing/increasing.

[11] Trend data are reported by subpopulation. Rolled up, the following local population units in the Northern Group appear to show declining long term trends: the Tweedsmuir local population unit, the Telkwa local population unit, the Graham local population unit, and the Wolverine local population unit may be stabilizing/increasing. The Chilcotin local population unit overall may have been considered stable; the Wolverine local population unit appears stable. Insufficient data exist to calculate long-term trends for the Takla local population unit and the Chase local population unit.

Central Group								
B.C.	Pine River	Scott	43	2014	Klinse-za: 61	2017	Increasing	Unknown
B.C.		Moberly	22	2014				
B.C.		Kennedy Siding	30	2014	63	2017	Increasing	Unknown
B.C.		Burnt Pine	0	2014			Extirpated	
B.C.	Quintette	Quintette	106 (range: 98–113)	2014	73	2018	Possibly increasing	Decreasing
B.C./ Alberta	Narraway	Narraway (Bearhole–Redwillow and South Narraway)	96	2012	<50	2017	Decreasing	Decreasing
Alberta	Redrock–Prairie Creek	Redrock–Prairie Creek	127	2012	>100	2017	Decreasing	Decreasing
Alberta	A La Peche	A La Peche	88	2012	>100	2017	Stable	Decreasing
Alberta	Jasper–Banff	Tonquin	38 (minimum count) estimate: 34 or 45 (range: 27–75)	2013	31 (range: 26–56)	2016	Decreasing	Decreasing
Alberta		Maligne	5 (minimum count)	2013	<3 (minimum count)	2016	Decreasing	Decreasing
Alberta		Brazeau	8 (minimum count)	2013	7 (minimum count)	2016	Decreasing	Decreasing
Alberta		Banff	0		0		Extirpated	
B.C./ Alberta	**Central Group Total**		**563** (range: 544–607)		**470** (range: 432–531)		3 of 6 local population units are decreasing[12]	5 of 6 local population units are decreasing[13]

[12] Trend data are reported by subpopulation. Rolled up, the following local population units in the Central Group appear to show declining short-term trends: the Narraway local population unit, the Redrock–Prairie Creek local population unit, and the Jasper–Banff local population unit. The Pine River local population unit, the Quintette local population unit, and A La Peche local population unit may be stabilizing/increasing.

[13] Trend data are reported by subpopulation. Rolled up, all but one local population unit in the Central Group show declining long-term trends. The long-term trend for the Pine River local population unit is unknown.

Southern Group								
B.C.	Hart Ranges	Hart Ranges (Hart South and Parsnip)	404 + 129 = 533	2012	246 + 129 = 375	2016	Decreasing	Decreasing
B.C.	Upper Fraser	North Cariboo Mountains	222	2011	212	2016	Stable–Decreasing	Decreasing
B.C.		George Mountain	0				Extirpated	
B.C.		Narrow Lake	47	2014	36	2016	Stable	Decreasing
B.C.	Mount Robson	Mount Robson	-		-		N/A	N/A
B.C.	Quesnel Highlands	Barkerville	90	2012	72	2016	Stable–Decreasing	Increasing
		Wells Gray North	265	2012	200	2015	Decreasing	Decreasing
B.C.	Wells Gray–Thompson	Wells Gray South	133	2013	Some number higher than 167	2017 / 2018	Possibly stable–increasing	Decreasing
		Groundhog	13	2013				Decreasing
B.C.	Revelstoke–Shuswap	Columbia North	152	2013	147	2017	Decreasing –Stable	Decreasing
B.C.		Frisby–Boulder	10	2010	11	2013	Decreasing –Stable	Decreasing
B.C.		Columbia South	6	2013	4	2016	Decreasing –Stable	Decreasing
B.C.	Kinbasket	Central Rockies	3	2008	3	2008	Decreasing/ Extirpated?	Decreasing
B.C.	South Monashee	Monashee	4	2011	1	2016	Extirpated?	
B.C.	Central Kootenay	Central Selkirk (Duncan and Nakusp)	66	2012	29	2017	Decreasing	Decreasing
B.C.	Southwest Kootenay	South Selkirk	18	2014	3	2018	Decreasing/ Extirpated?	Decreasing
B.C.	Southeast Kootenay	Purcells Central	0	2005	0	2005	Extirpated	
B.C.		Purcells South	19	2014	16	2017	Stable	Decreasing
B.C.	**Southern Group Total**		**1604**		**1240** (range: 1217–1245)		3 of 10 local population units are decreasing; 3 of 10 are likely extirpated[14]	10 of 10 local population units are decreasing

[14] Trend data are reported by subpopulation. Rolled up, the following local population units in the Southern Group appear to show declining short-term trends: the Hart Ranges local population unit, the Quesnel Highlands local population unit, the Central Kootenay local population unit. The Kinbasket local population unit, South Monashee local population unit, and Southwest Kootenay local population unit have likely been extirpated. The Upper Fraser local population unit, the Revelstoke–Shuswap local population unit, the Wells Gray–Thompson local population unit, and the Southeast Kootenay local population unit may be stable, although there is considerable uncertainty with respect to short-term trends.

All Groups Total	**5808** (range: 5229–6899)	**3764** (range: 3512–4233)	10 of 23 local population units are decreasing; 3 are likely extirpated	18 of 23 local population units are decreasing

Table 2 Background: Sources of Information on Ongoing and New Anthropogenic Activities

General information about broad threats to the species is available in the 2014 recovery strategy and 2014 COSEWIC status report. Table 2 was populated using information readily available to the Department in a timely manner. The information included in Table 2 was sourced to facilitate more spatially explicit and up to date considerations.

The sources and amount of information varies by LPU. Geographic accuracy is highly variable, estimates are generally coarse, and estimates are subject to change as the list of approved activities or new applications changes frequently, and database update frequency varies. Given the vast amount of information available and the complex nature of cumulative effects, the Department carefully considered which information to include and at what level of detail was appropriate for the Minister to consider whether southern mountain caribou face an imminent threat to their survival or recovery. In general, information related to threats ranked in the 2014 recovery strategy threat assessment (section 4.1) as "negligible" is not included.

References include the following BC provincial databases, queried for overlap with the subject LPUs using various methods, including a precise GIS analysis in ArcGIS or a coarse analysis using a provincial web-based mapping program, iMapBC (https://www2.gov.bc.ca/gov/content/data/geographic-data-services/web-based-mapping/imapbc):

- Short term projected forest harvesting activity
    - The area of forest harvested in each LPU between 2010 and 2016 was obtained by querying the BC provincial consolidated cutblock database using GIS (https://catalogue.data.gov.bc.ca/dataset/harvested-areas-of-bc-consolidated-cutblocks-). This dataset depicts actual area of forest harvested each year based on a combination of tenure applications and reporting, and from satellite imagery. Those results were averaged over the seven years to obtain the average annual hectares harvested. This relatively recent average of past harvesting activity is believed to be a reasonable representation of the likely short term forecasted harvesting activity for each LPU.
- Current *Land Act* tenures and applications for tenures (https://catalogue.data.gov.bc.ca/dataset/tantalis-crown-tenures)
    - Includes leases, licences, right-of-ways, and other forms of land tenure on provincial Crown land, which represents the vast majority of the land within southern mountain caribou LPU boundaries. Includes a variety of industrial, commercial, and recreational purposes. Note that the polygons do not represent the actual footprint of the activity, only the area within which the activity may take place. Records often overlap, as multiple tenures may be authorized for a given area. More specific information to refine the activity type was obtained in select cases from the Natural Resource Sector Online Services database: https://portal.nrs.gov.bc.ca/web/client/explore
- Snowmobile Management Areas (https://catalogue.data.gov.bc.ca/dataset/snowmobile-management-areas-access-management-areas-ama)

    - Includes areas within Southern Group LPUs designated as open for snowmobiling with no restrictions and open with conditions according to a Stewardship Management Agreement between a local snowmobile club and the Government of BC.
- Projects subject to the BC *Environmental Assessment Act*, at the pre-application, application review, and certificate issued stage (https://catalogue.data.gov.bc.ca/dataset/environmental-assessment-office-eao-points)
    - This spatial information was cross-referenced with information from the Canadian Environmental Assessment Registry (i.e. projects subject to CEAA 2012), and supplemented with information from environmental assessment reports, from the following sources:
        - http://www.ceaa.gc.ca/050/index-eng.cfm
        - https://www.neb-one.gc.ca/index-eng.html
        - https://www.projects.eao.gov.bc.ca/
- Natural resource major projects; includes additional projects not subject to the *BC Environmental Assessment Act*
    - https://catalogue.data.gov.bc.ca/dataset/natural-resource-sector-major-projects-points

Additional information was also available for some LPUs as a result of the development of the following reports:

- *Information to support an Imminent Threat Assessment for the Woodland Caribou, Southern Mountain population* (Nov 9, 2017 version). (Internal report prepared by Environment and Climate Change Canada based on information received from petitioners for SARA s.80 emergency protection orders, publicly available databases, the Government of BC, and Parks Canada Agency)
- *Information to Support a Protection Assessment for Woodland Caribou, Southern Mountain Population* (Dec 14, 2017 version, with updates to caribou population and distribution information received from the Governments of BC and Alberta and Parks Canada Agency in January / February 2017). (Internal report prepared by Environment and Climate Change Canada)
- *Canada-British Columbia Southern Mountain Caribou (Central Group) Protection Study* (June 2017) (http://registrelep-sararegistry.gc.ca/document/default_e.cfm?documentID=3106)
- *Draft Alberta Woodland Caribou Range Plan* (Dec 2017) (http://aep.alberta.ca/fish-wildlife/wildlife-management/caribou-range-planning/)

Finally, in situations where the Department was provided with provincial caribou census or other status reports and those reports identified specific activities as potential threats, the information is reflected directly in Table 2 or was used as a cue to source additional details. Parks Canada Agency also provided information directly for inclusion to Table 2.

Table 2: Information on Ongoing and New Anthropogenic Activities

Local Population Unit (LPU)	Subpopulation (s)	Activities
SARA Section 80 submissions from April 2017 (more detailed information is available for these LPUs – see ECCC 2017a)		
Wells-Grey Thompson	Wells-Grey South, Groundhog	• Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 3300 ha per year. •TMX, Harper Creek Mine, Ruddock Creek Zinc-Lead Mine at various stages of EA process Serpentine Creek & Clemina Creek Hydro Projects are below EA threshold; construction in progress, possibly complete. • The largest areas of existing tenure / ongoing activities include licences of occupation for commercial heli-skiing covering approx. 570,000 ha throughout the eastern half of the LPU; heli-hiking covering approx. 97,000 ha concentrated in the north of the LPU, and commercial snowmobiling in the McBride / Valemount / Albreda areas covering approx. 25,000 ha. •The area of applications (not approved) associated with *Land Act* tenure after accounting for overlap is 166,751 ha (12% of LPU). The largest areas are associated with applications for licences of occupation for commercial heli-hiking; many areas overlap with existing tenure for the same purpose. Fifteen areas covering approx. 24,000 ha of the LPU are designated by the province of BC as open for recreational snowmobiling, most of which are managed under a Snowmobiling Management Agreement with local clubs (i.e. Valemount and Area Recreation Development Association[15]). These areas are adjacent to large areas in which snowmobiling is prohibited through regulations under the BC Wildlife Act on the basis of caribou conservation. Concentrated snowmobiling activities occur in these specifically designated "open" areas, but there are also no legal restrictions on motorized winter recreation outside of the *Wildlife Act* closed areas.
Central Kootenay	Central Selkirk	• Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 1029 ha per year. • The largest areas of existing tenure / ongoing activities include licences of occupation for commercial heli-skiing covering approx. 640,000 ha throughout the LPU; heli-hiking covering approx. 77,000 ha concentrated in the north and east of the LPU; commercial cat skiing covering approx. 25,000 ha in six areas; two existing alpine ski resorts, with expansion plans (Kicking Horse, Revelstoke Mountain), one proposed alpine ski resort (Jumbo Glacier); and some commercial snowmobiling and multiple recreational use. • The area of applications (not approved) associated with *Land Act* tenure is 409,296 ha (39% of LPU) after accounting for overlap, but note that this includes miscellaneous uses under a land use plan, which significantly over-represents the area within which an activity would occur. However, it does include new applications for commercial heli ski and cat ski tenure (approx. 35,000 ha and 4000 ha respectively), as well as a 116,000 ha application for a temporary licence for film production. Two areas covering approx. 6500 ha of the LPU are designated by the province of BC as open for recreational snowmobiling, both of which are managed under a Snowmobiling Management Agreement with local clubs (i.e. Arrow Lakes Ridge Riders and Trout Lake Snowmobile Club). These open areas are adjacent to areas in which snowmobiling is prohibited through regulations under the BC *Wildlife Act* on the basis of caribou conservation. Concentrated snowmobiling activities occur in these specifically designated "open" areas, but there are also no legal restrictions on motorized winter recreation outside of the *Wildlife Act* closed areas.

[15] http://www.ridevalemount.com/snowmobiling/sled-areas/

Local Population Unit (LPU)	Subpopulation (s)	Activities
		The portion of the range within Glacier National Park is remote, and subject to very few human-related threats. Old growth forest is maintained. Fire is managed to reduce loss of habitat from severe wildfire. Guidelines are in place for aircraft flying over caribou habitat.
SARA Section 80 submissions from December 2017 (also includes Central Kootenay)		
Kinbasket	Central Rockies	*Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 133 ha per year *Recreation* Preliminary analysis of tenure data from the province of BC indicates that five existing licences of occupation are in place for heli-skiing, two for heli-hiking, and three for commercial recreation – multiple use; (Canadian Mountain Holidays (CMH) Adamants and other tenure) which collectively overlap very large areas of the LPU. One additional application for commercial recreation (multiple use) tenure) has been submitted but not yet approved. No information is available regarding snowmobile riding areas. *Other tenures* Existing tenures for various other purposes cover a very small area.
South Monashee	Monashee	*Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 1381 ha per year. *Recreation* Preliminary analysis of tenure data from the province of BC indicates that three existing licences of occupation are in place for heli-skiing (Eagle Pass Heliskiing; Canadian Mountain Holidays (CMH) Revelstoke & Kootenay operating areas), one for heli-hiking (Snotech Services -5234 ha), one for backcountry skiing (Blanket Glacier Chalet; 3227 ha) and three for commercial recreation – multiple use (Sol Mountain Touring; Kingfisher Heliskiing & Halcyon Heliskiing; Halcyon Hot Springs Resort). One 6600 ha licence of occupation for cat skiing is in place at Tsuius Mountain (Monashee Powder Snowcats). These licences of occupation collectively overlap very large areas of the LPU. Two commercial recreation tenures are in place for snowmobiling (Carl Kuster Mountain Park and Great Canadian Snowmobile Tours). There are no areas specifically designated by the province as open for recreational snowmobiling or managed under a Stewardship Management Agreement. The Blue Lake area is publicly promoted[16] as a snowmobile riding area. Existing tenures for various other commercial recreation purposes cover less than 126 ha. One additional application for commercial recreation (multiple use) tenure has been submitted but not yet approved. *Other Tenure* Multiple existing tenures for various other purposes cover less than 2000 ha.

[16] https://sledsicamous.com/sledding-areas/blue-lake.html

Local Population Unit (LPU)	Subpopulation (s)	Activities
Southwest Kootenay	South Selkirk	*Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 600 ha per year. *Recreation* Preliminary analysis of tenure data from the province of BC indicates that 2 existing licences of occupation are in place for commercial recreation – multiple use (includes a large tenured area for heli-skiing [Snowwater Heli-skiing] and a small tenured area for a backcountry ski touring lodge [Baldface Mountain Lodge]); 1 licence of occupation for nordic skiing which in this case is backcountry ski touring and associated lodge / helicopter access (3200 ha tenured to Kootenay Experience [Ymir Backcountry Ski Touring]); and two small licences of occupation for commercial recreation – miscellaneous, which in this case is mountain biking (BC Enduro Series – 17 ha; Retallack Mountain Biking – 65 ha). Licences of occupation are also in place associated with two alpine ski resorts; the larger Whitewater Ski hill (approx.1300 ha of tenured area) and smaller Salmo Ski Hill (approx.100 ha). No commercial recreation tenures are in place associated with snowmobiling in this LPU. At least two areas (Char Creek, Giveout Creek / Morning Mountain) are publicly promoted by snowmobile clubs, who maintain snowmobile trails and cabins on a volunteer basis[17]. *Other Tenure* Multiple existing tenures for various other purposes cover very approximately 500 ha. Applications for tenure have been submitted for less than 30 ha.
Southeast Kootenay	Purcells Central, Purcells South	*Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 2774 ha per year. *Recreation* Preliminary analysis of tenure data from the province of BC indicates that 22 existing licences of occupation are in place for commercial recreation, including heli-skiing (very approx. 35,000 ha tenured area – RK Heli-ski Panorama; and 10,000 ha Stellar Heli Skiing); backcountry ski touring (Powder Creek Lodge – 7100 ha and Intrawest (near Panorama – 200 ha)); heli-hiking (approx. 3000 ha tenured area – RK Heli-hiking); horse-assisted hiking (approx. less than 50,000 ha tenured area – A Bar Z). Licences of occupation are also in place associated with two alpine ski resorts; the larger Panorama Resort (approx. 3500 ha of tenured area) and smaller Kimberly Alpine Resort (approx. 2000 ha).

[17] http://snoriderswest.com/article/creston/creston_snowmobile_playground , http://nelsonsno-goers.webs.com/ridingareastrailfees.htm, http://snoriderswest.com/article/kootenayrockies/a_riding_season_that_almost_never_ends

Local Population Unit (LPU)	Subpopulation (s)	Activities
		Applications for commercial recreation tenure overlap entirely with existing tenured areas. No commercial recreation tenures are in place associated with snowmobiling in this LPU. The province of BC has designated 21,000 as open for snowmobile use, and an additional 75,000 ha within which snowmobile riding is permitted on roads, cutblocks, and identified travel corridors. Concentrated snowmobiling activities occur in these specifically designated "open" areas, but there are also no legal restrictions on motorized winter recreation outside of the *Wildlife Act* closed areas. *Other Tenure*Multiple existing tenures for various other purposes (e.g. agriculture, miscellaneous community purposes, quarrying) cover very approximately 2500 ha, and existing tenures for utilities such as electric power lines cover very approximately 3000 ha. Applications for tenure (various purposes) have been submitted for less than 250 ha.
Revelstoke-Shuswap	Frisby-Boulder, Columbia South, Columbia North	*Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 2000 ha per year. *Recreation* The province of BC has designated 914 ha as open for snowmobile use, and an additional 4,636 ha is open under a Stewardship Management Agreement. There are seasonal snowmobile closures in place between Jan 1 and April 15 for 218,000 ha. Over 50,000 ha are designated as provincial recreation sites or reserves for various purposes including snowmobiling, backcountry skiing, and mountain biking. Concentrated snowmobiling activities occur in these specifically designated "open" areas, but there are also no legal restrictions on motorized winter recreation outside of the *Wildlife Act* closed areas. Preliminary analysis of tenure data from the province of BC indicates that 43 existing licences of occupation are in place for commercial recreation, including at least eight heli-skiing tenures (very approx. 550,000 ha) (CMH (Monashees, Revelstoke and Gothics), Eagle Pass Heliskiing, Great Canadian Heli-skiing, Mica Heliguides, Mike Wiegele Heliguides, Selkirk Tangiers Heliskiing), three cat skiing tenures (approx. 40,000 ha) (K3 Cat Ski, Mustang Powder Lodge, Monashee Powder Snow Cats), tenures held by five commercial snowmobile operators (Great Canadian Snowmobile Tours, Golden Snowmobile Rentals, Robert Burley, Snowpeak Rentals, Grizzly Lodge), and tenures held by five operators of backcountry huts accessed by helicopter and used as a base for ski touring or hiking (Canadian Adventure Company, Sorcerer Lodge, Selkirk Mountain Experience, Golden Alpine Holidays, Selkirk Backcountry Lodge). Heli-hiking tenures overlap with some heli-ski tenures. Many commercial recreation tenures extend into adjacent LPUs. Alpine skiing (Revelstoke Mountain Resort) tenure occurs partially in this LPU as well as the adjacent Central Kootenay LPU. *Other Tenure* Multiple existing tenures for various other commercial, community, and industrial purposes cover less than 5000 ha, and existing tenures for utilities such as electric power lines also cover less than 5000 ha. *Energy* Revelstoke Generation Station Unit 6 Project - installation of a 6th turbine into an existing turbine bay. BC-only environmental assessment process (pre-application phase).

Local Population Unit (LPU)	Subpopulation (s)	Activities
		Lower Wood River Hydropower Project - Proposed; consultation and approvals stage (no EA required). Project is on hold pending an electricity purchase agreement with BC Hydro. *National Parks* The portion of the range within Glacier and Mount Revelstoke national parks is subject to some threats (e.g., recreation, Trans-Canada Highway, limited development) but at a much smaller scale than threats on adjacent provincial lands, and a number of mitigation measures have been implemented. Parks Canada has closed access to Mount Klotz from December to April, and restricts backcountry camping above 1600 m in Mount Revelstoke. Seasonal trail and road closures are implemented, and some roads are not plowed for snow. Snowmobile use is limited to critical park operations. Guidelines are in place for aircraft flying over caribou habitat. Old growth forest is maintained. Fires are managed to reduce loss of habitat from severe wildfires.
Other LPUs with populations at or below 100 individuals and that were not the subject of public petitions		
Telkwa	Telkwa	**Existing disturbances** ECCC 2017b (Annex 2) reports that 80% of the area likely considered to be low elevation winter range or type 1 matrix range categories of critical habitat is disturbed, using the definition of disturbance from the 2014 recovery strategy, which includes a 500 m buffer on anthropogenic features. This is based on analysis of satellite imagery from approximately 2011 and updated with wildfire data current to 2015. **Ongoing and new activities** Forest harvesting, including salvage harvest of pine beetle-killed stands, and mineral exploration are identified in Cichowski 2014 as the primary industrial activities affecting the Telkwa caribou population. *Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 1579 ha per year. *Mining* There is a proposal for a metallurgic coal mine which falls below the threshold for a reviewable project under the BC *Environmental Assessment Act*. Potential impacts are yet to be determined. There are widespread mineral claims throughout the LPU, which require exploration activities to maintain. *Recreation* Recreational activities identified in Cichowski 2014 as occurring within this LPU: snowmobiling activity; ATV use; hiking; backcountry skiing; horseback riding. The B.C. government and the Houston Snowmobile Club signed a stewardship management agreement in December 2017; voluntary closures have been in place for a number of years. Users are directed to avoid areas with caribou, and

Local Population Unit (LPU)	Subpopulation (s)	Activities
		locations of collared animals are regularly updated on social media. Specified areas are designated as open for snowmobile use. Existing commercial recreation tenures are for guided mountaineering / rock climbing, and guided nature viewing. *Energy* Coastal Gaslink (Pipeline) - BC Environmental Assessment certificate has been issued (following a finding of significant adverse environmental effects for caribou and greenhouse gas emissions). No federal EA decision is required. Permits and tenure are in place; project is awaiting financing, which is linked to financial decisions on whether the LNG Canada project will proceed. Pacific Northern Gas (PNG) Looping (Pipeline) - BC-only process at the pre-application phase. No EA documents have been filed since 2014. *Water Act* authorizations and Investigative Use Permits were issued by the Oil and Gas Commission in 2014.
Takla	Takla	**Existing disturbances** ECCC 2017b (Annex 2) reports that 58% of the area likely considered to be low elevation winter range or type 1 matrix range categories of critical habitat is disturbed, using the definition of disturbance from the 2014 recovery strategy, which includes a 500 m buffer on anthropogenic features. This is based on analysis of satellite imagery from approximately 2011 and updated with wildfire data current to 2015. **Ongoing and new activities** *Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 1029 ha per year *Recreation* There are no commercial recreation tenures in place or applied for in this LPU, and no provincially designated open snowmobile areas. Backcountry recreation is not actively promoted in the area. Ad hoc snowmobiling likely occurs primarily as a means of transportation and access to hunting areas.
Quintette	Quintette	**Existing disturbances** Canada and BC (2017) report that 54-58% of the area likely considered to be low elevation winter range or type 1 matrix range categories of critical habitat is disturbed, using the definition of disturbance from the 2014 recovery strategy, which includes a 500 m buffer on anthropogenic features. This is based on analysis of satellite imagery from approximately 2011. ECCC 2017b (Annex 2) notes that uncertainty exists about how disturbance in high elevation ranges should be quantified. The direct footprint of anthropogenic features visible on Landsat imagery from 2011 is estimated at 6% of the high elevation habitat in the portion of this LPU that does not overlap with Narraway. With a 500 m buffer added, the area becomes 24%. With various zones of influence depending on feature type added, the area becomes 63%. In the portion of the LPU that overlaps with Narraway, the direct footprint is 3% of the area; 9% with a 500 m buffer; and 28% with zones of influence.

Local Population Unit (LPU)	Subpopulation (s)	Activities
Quintette (con't)		**Ongoing and new activities** *Mining* 21% of high elevation habitat and 24% of non-high elevation habitat in the combined area of Quintette, Pine River, and Narraway LPUs in BC is currently tenured for coal leases or licences (Canada and BC 2017). The majority of these tenures are in the Quintette LPU. Tenure does not imply development is guaranteed to occur, and site-specific activities occur within a smaller area than tenured. However, mineral exploration activities and mine development potential is higher within tenured areas. In terms of new and likely upcoming activities, the Murray River Coal Mine Project will be an underground mine located in Type 1 matrix critical habitat. On October 7, 2016 the Minister of Environment and Climate Change Canada decided that the Murray River Coal Project is likely to cause significant adverse cumulative environmental effects to the current use of lands and resources for traditional purposes by Aboriginal Peoples, due to cumulative adverse environmental effects on the Quintette LPU of southern mountain caribou[18]. The Environmental Assessment Decision Statement was issued to the proponent on December 13, 2017 indicating that the Governor in Council decided that the likely significant adverse environmental effects are justified in the circumstances and establishing a series of conditions including 7.12 through 7.15 relating to caribou[19]. Hermann Coal Mine (an expansion of the existing Wolverine Mine) has a provincial EA certificate in place, with caribou-related conditions. It will be located in high elevation critical habitat. The deadline for a substantial start is Nov 2018[20]. Sukunka Coal Mine Project is currently undergoing EA review by both CEAA[21] and BC EAO[22] through a substituted process. Preliminary information suggests it would result in the loss of high elevation critical habitat and additional disturbance of low elevation and/ or matrix critical habitat. Additional mining projects are in the pre-application (Echo Hill Coal[23]) or exploratory (Bullmoose River Coal) phase of environmental assessment. *Energy* Most of the wind project developments in the province of BC are located in the South Peace region, which includes the Quintette LPU range. One new project is currently underway; the Moose Lake Wind Power project has an electricity purchase agreement in place with BC Hydro, an Occupant Licence to Cut has been issued for tree removal (planned block area of 260 ha), and construction started in July 2016. Three projects are unconfirmed; Sukunka Wind Energy, Wolverine Wind, and Babcock Ridge Wind Power projects all have provincially approved development plans in place (below EA threshold), but do not yet have an electricity purchase agreement with BC Hydro. Finally, Thunder Mountain Wind Park has a BC EA certificate in place, with a deadline for substantial start of Dec 2019. All permitting is in place but there is no agreement from BC Hydro to purchase power, and such an agreement is unlikely in the short term in light of Site C approval. Oil and Gas – approximately 75% of the Quintette range contains existing tenure that has already been heavily developed for conventional gas. Some of the tenure remains to be developed. However, this development is expected to be delayed while Montney

[18] http://www.ceaa.gc.ca/050/document-eng.cfm?document=115744
[19] http://www.ceaa.gc.ca/050/document-eng.cfm?document=121218
[20] https://projects.eao.gov.bc.ca/p/hermann-mine/detail
[21] http://www.ceaa-acee.gc.ca/050/details-eng.cfm?evaluation=80013
[22] https://projects.eao.gov.bc.ca/p/sukunka-coal-mine/detail
[23] https://projects.eao.gov.bc.ca/p/echo-hill-coal/detail

Local Population Unit (LPU)	Subpopulation (s)	Activities
Quintette (con't)		unconventional shale gas development occurs in other areas, and then to proceed very slowly. Little conventional development activity is expected in the next 20 to 30 years, and even then it is expected to be at a very slow pace (Canada and British Columbia 2017). A small area in the extreme northeastern part of Quintette range is within the Montney resource play area. Therefore, development is expected here, but will depend on the timing of the arrival of gas markets. If the export market for LNG proceeds in the next 5 years then development is expected in this area over the next 25 years. If LNG proceeds in the next cycle in about 15 years, Montney gas development is expected to proceed over the ensuing 25 years. Otherwise, development is dependent on domestic western Canadian markets. *Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 1712 ha per year The combined area of Quintette, Pine River, and Narraway LPUs in BC is approximately 3 million hectares. 14% of high elevation habitat and 46% of non-high elevation habitat in this combined area is inside the timber harvesting landbase. Those areas, unless otherwise constrained, are assumed to be harvested at some point in a normal forest rotation (between 80 and 100 years). Any particular stand has a low probability of being harvested in the short term, but a high probability of being harvested in the long term. (Canada and BC 2017). *Recreation* The Babcock, Bullmoose, and Wolverine areas are publicly promoted[24] as popular snowmobile and ATV riding areas and are located adjacent to high elevation caribou habitat[25], potentially facilitating predator access from low to high elevation.
Narraway	Narraway	**Existing disturbances** Canada and BC (2017) report that 45-50% of the area likely considered to be low elevation winter range or type 1 matrix range categories of critical habitat is disturbed, using the definition of disturbance from the 2014 recovery strategy, which includes a 500 m buffer on anthropogenic features. This is based on analysis of satellite imagery from approximately 2011. Government of Alberta (2017) indicates that 84% of the Alberta portion of the LPU is disturbed, primarily attributed to seismic lines and forest harvesting (including a 500 m buffer). ECCC 2017b (Annex 2) notes that uncertainty exists about how disturbance in high elevation ranges should be quantified. The direct footprint of anthropogenic features visible on Landsat imagery from 2011 is estimated at 2% of the high elevation habitat in the portion of this LPU that does not overlap with Quintette. With a 500 m buffer added, the area becomes 4%. With various zones of influence depending on feature type added, the area becomes 16%. In the portion of the LPU that overlaps with Quintette, the direct footprint is 3% of the area; 9% with a 500 m buffer; and 28% with zones of influence. **Ongoing and new activities**

[24] http://snoriderswest.com/article/tumbler_ridge/where_to_ride_around_tumbler_ridge
[25] http://tumblerridgenews.com/no-closers-for-tr-riders-yetbut-maybe-never/

Local Population Unit (LPU)	Subpopulation (s)	Activities
Narraway (con't)		Forestry and oil & gas remain the main industrial land uses in the Alberta portion of the LPU; one Forest Management Agreement covers 100% of the Alberta portion of the range, and 88% is subject to leases or permits for petroleum and natural gas. 9% is associated with leases or permits for metallic and industrial minerals (Government of Alberta 2017). The combined area of Quintette, Pine River, and Narraway LPUs in BC is approximately 3 million hectares. 14% of high elevation habitat and 46% of non-high elevation habitat in this combined area is inside the timber harvesting landbase. Those areas, unless otherwise constrained, are assumed to be harvested at some point in a normal forest rotation (between 80 and 100 years). Any particular stand has a low probability of being harvested in the short term, but a high probability of being harvested in the long term (Canada and BC 2017). Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for the BC portion of this LPU is approximately 583 ha per year. Queries of provincial (BC) databases indicate that Bearpaw Heli-Skiing Ltd has a 451,011 ha Licence of Occupation for commercial recreation, approximately half of which overlaps with the Narraway LPU. Crescent Spur Heli Holidays has an active forestry Occupant Licence to Cut with a planned harvest date of 2011 but no indication that disturbance has started. The Gleason, Sande Burn, Lower Torpy River, and Evanoff Park areas are provincially designated as open areas for snowmobiling, and cover a total of 13,000 ha. These recreational activities are located in the southern part of Narraway range, which overlaps with the Hart Ranges LPU. **Future or less likely activities** About 10 to 15% of the BC portion of the Narraway range in the farthest north is within the Montney unconventional shale gas resource play. Therefore, development is expected here, but depending on the timing of the arrival of gas markets. If the export market for LNG proceeds in the next 5 years then development is expected in this area over the next 25 years. If LNG proceeds in the next cycle in about 15 years, Montney gas development is expected to proceed over the ensuing 25 years if it has not occurred in the first LNG cycle. Otherwise, development is dependent on domestic western Canadian markets (Canada and BC 2017). The Belcourt/ Saxon Coal Mines are at a preliminary scoping stage for environmental assessment. The Red Willow Wind Farm is at the pre-application stage for a BC Environmental Assessment. It is on hold pending a clean power call from BC Hydro, which is considered unlikely within the next decade given Site C approval.
Jasper-Banff	Tonquin, Maligne, Brazeau, Banff	**Ongoing and new activities** Activities present and ongoing in this LPU include backcountry recreation in both winter and summer, and commercial infrastructure development including a downhill ski area. These are at a smaller scale than activities outside national parks. Parks Canada Agency has managed public backcountry winter recreational activities in Jasper National Park in an adaptive manner, considering caribou conservation and visitor experience, primarily by enforcing winter closures in areas frequented by caribou in early winter. Human activity is managed to reduce probability of disturbance of caribou (e.g. dogs prohibited in caribou habitat, trails re-routed to avoid key caribou areas, guidelines for aircraft flying over caribou habitat). Speed limits have been reduced in key caribou corridors to reduce caribou mortality. The Banff subpopulation has been extirpated since 2009, so recreational activities in Banff

Local Population Unit (LPU)	Subpopulation (s)	Activities
		National Park are not specifically managed for caribou conservation. Throughout the LPU, habitat and primary prey are managed to reduce predator density, and fire is managed to reduce loss of habitat from severe wildfires.
Other LPUs with populations larger than 100 individuals and that were not the subject of public petitions		
Upper Fraser	North Cariboo Mountains, George Mountain, Narrow Lake	**Ongoing and new activities** *Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 1100 ha per year *Mining* Giscome Quarry and Lime Plant - BC Environmental Assessment Certificate was issued in December 2016; no federal EA approval required. Applications for permits under the provincial *Environmental Management Act* and *Mines Act* were accepted by the Major Mines Permitting office in February 2017[26]. The project is located on the periphery of this LPU. The BC Environmental Assessment Office determined during review of the project that suitable habitat did not exist in large enough quantities in the local study area to be sustainable for supporting caribou, and were satisfied that the project would not have adverse effects on caribou and caribou habitat[27]. *Recreation* Preliminary analysis of tenure data from the province of BC indicates that 11 existing licences of occupation are in place for commercial recreation, including approximately 160,000 ha tenured for heli-skiing, approximately 1000 ha for heli-hiking and less than 1000 ha for commercial snowmobiling. Less than 1000 ha is tenured for alpine skiing. *Other Tenure* Preliminary analysis of tenure data from the province of BC shows less than 9000 ha tenured for a variety of purposes, including approximately 5000 ha associated with the investigative and monitoring phase of windpower development, approx. 1300 ha for quarrying, and approximately 1100 ha reserved under section 16 of the *Land Act* for a First Nations treaty area. Applications have been submitted for an additional less than 7000 ha, the majority of which is associated with an application for commercial recreation (multiple use; snowmobiling and horseback riding).
Quesnel Highlands	Barkerville, Wells Gray North	*Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 3408 ha per year. Other information not yet gathered.

[26] http://giscomeproject.ca/wp-content/uploads/2017/03/Giscome-Newsletter-6-March-2017.pdf

[27] https://projects.eao.gov.bc.ca/api/document/5892311db637cc02bea16277/fetch

Local Population Unit (LPU)	Subpopulation (s)	Activities
Pine River	Scott/Moberly (Klinse-za), Kennedy Siding, Burnt Pine	**Existing disturbances** Canada and BC (2017) report that 62% of the area likely considered to be low elevation winter range or type 1 matrix range categories of critical habitat is disturbed, using the definition of disturbance from the 2014 recovery strategy, which includes a 500 m buffer on anthropogenic features. This is based on analysis of satellite imagery from approximately 2011. ECCC 2017b (Annex 2) notes that uncertainty exists about how disturbance in high elevation ranges should be quantified. The direct footprint of anthropogenic features visible on Landsat imagery from 2011 is estimated at 0.9% of the high elevation habitat in this LPU. With a 500 m buffer added, the area becomes 7%. With various zones of influence depending on feature type added, the area becomes 15%. **Ongoing and new activities** *Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 4432 ha per year. The combined area of Quintette, Pine River, and Narraway LPUs in BC is approximately 3 million hectares. 14% of high elevation habitat and 46% of non-high elevation habitat in this combined area is inside the timber harvesting landbase. Those areas, unless otherwise constrained, are assumed to be harvested at some point in a normal forest rotation (between 80 and 100 years). Any particular stand has a low probability of being harvested in the short term, but a high probability of being harvested in the long term. (Canada and BC 2017). *Mining* 21% of high elevation habitat and 24% of non-high elevation habitat in the combined area of Quintette, Pine River, and Narraway LPUs in BC is currently tenured for coal leases or licences (Canada and BC 2017). Some of these tenures are in the Pine River LPU. Tenure does not imply development is guaranteed to occur, and site-specific activities occur within a smaller area than tenured. However, mineral exploration activities and mine development potential is higher within tenured areas. Carbon Creek Coal Mine is substituted project at the pre-application phase. Possible impacts are thus far unquantified. The project overlaps with approximately 1100 ha of land within the LPU boundaries. The Gething Coal Mine is a potential future project at the pre-application phase with no filings submitted to the BC Environmental Assessment Office since 2011. *Oil and Gas Development* Canada and BC 2017 indicate that the entire Pine River range is west of and outside any unconventional Montney resource play; therefore no Montney development will occur. Due to the nature of the geology and absence of hydrocarbon reservoirs, there is no oil and gas potential in the west half of the Pine River range. A small area in the southeast contains existing title, but it has been developed and no further activity is expected. The remaining area of the eastern part of the range contains conventional gas potential but there is no current title and no interest in conventional exploration, for the reasons noted in the general comments above. Therefore, no conventional exploration is expected in the next 50 years or more.

Local Population Unit (LPU)	Subpopulation (s)	Activities
		Pipelines High Pine Expansion project – the National Energy Board issued an order under section 58 of the *National Energy Board Act* in 2016. Conditions attached to the order were intended to address residual impacts to caribou habitat, which was estimated by the proponent to be direct disturbance of 101 ha of matrix habitat and indirect disturbance of 25 ha of matrix habitat, including 14 km of new linear disturbance. Right of way clearing began in 2016; construction began in 2017 and was expected to continue into early 2018. Cleanup and reclamation is scheduled for July – October 2018[28]. 2BL Crossover Assemblies Replacement Project (Pipeline replacement) NEB s.58. Wyndwood Pipeline Expansion project- the National Energy Board issued an order under section 58 of the *National Energy Board Act* in September 2017. At the time of the order, the project was estimated to intersect the Pine River LPU for 11.8 km, 4.4 km of which would be new permanent linear disturbance. The proponent predicted the project would result in 49 ha of direct disturbance and 354 ha of indirect disturbance to Type 1 matrix critical habitat. Conditions attached to the order were intended to address residual impacts to caribou habitat. Construction activities were still in progress as of January 2018[29].
A La Peche	A La Peche	**Existing disturbances** Government of Alberta (2017) indicates that 88% of the low elevation winter range is disturbed, primarily attributed to seismic lines and forest harvesting (including a 500 m buffer). Summer range areas which include Jasper National Park and Wilmore Wilderness Park are considerably less disturbed; the portion of the summer range which is under Alberta's jurisdiction is 8% disturbed. **Ongoing and new activities** The entire winter range is allocated for forest harvesting and 95% has been made available for petroleum and natural gas development, according to Government of Alberta (2017). Other industrial activities within the winter range include metallic and industrial minerals, and sand and gravel extraction. No information is currently available regarding recreational or other activities. The portion of the range within Jasper national park is subject to very few human-related threats. Parks Canada has also implemented conservation measures within the portion of the range in the national park, such as implementing fire management activities to reduce loss of habitat from severe wildfires and implementing winter closures to key caribou areas in early winter.
Redrock/ Prairie Creek	Redrock/ Prairie Creek	**Existing disturbances** Government of Alberta (2017) indicates that 71% of the winter range is disturbed, primarily attributed to legacy seismic lines and forest harvesting (including a 500 m buffer). Summer range areas (high elevation) are reported as 18% disturbed, presumably using the same methodology, but note that the application of a 500 m buffer may not be appropriate for calculating high elevation disturbance.

[28] https://docs.neb-one.gc.ca/ll-eng/llisapi.dll?func=ll&objId=2839163&objAction=browse
[29] https://apps.neb-one.gc.ca/REGDOCS/Item/View/3070734

Local Population Unit (LPU)	Subpopulation (s)	Activities
		Ongoing and new activities 24% of the range is tenured for forest harvesting, 30% has been made available for petroleum and natural gas development, and 34% is tenured for coal mining and sand and gravel extraction, according to Government of Alberta (2017). Information has not yet been gathered regarding recreational or other activities.
Hart Ranges	Hart South, Parsnip	*Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 1168 ha per year. Other information not yet gathered.
Chilcotin	Rainbows, Charlotte Alplands, Itcha-Ilgachuz	**Existing disturbances** ECCC 2017b (Annex 2) reports that 57% of the area likely considered to be low elevation winter range or type 1 matrix range categories of critical habitat is disturbed, using the definition of disturbance from the 2014 recovery strategy, which includes a 500 m buffer on anthropogenic features. This is based on analysis of satellite imagery from approximately 2011 and updated with wildfire data current to 2015. **Ongoing and new activities** *Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 4113 ha per year. *Caribou Hunting* The *Wildlife Act Limited Entry Hunting Regulation* indicates that there is a limited entry hunt for 5 point bull caribou in Wildlife Management Units (WMUs) (i.e. administrative areas designated by the Government of BC for the purposes of administering the BC *Wildlife Act*) that overlap with parts of the ranges of the Itcha-Ilgachuz subpopulation, and that between 1 and 150 authorizations may be issued for the fall hunting season. *Recreation* Preliminary analysis of tenure data from the province of BC indicates that 18 existing licences of occupation are in place for commercial recreation, including tenures for "multiple use", guided nature viewing, heli-skiing and trail riding. The tenures apply to approximately 380,000 ha, but this does not account for overlap. *Other tenures* Preliminary analysis of tenure data from the province of BC indicates that authorisations are in place for approximately 17,000 ha for purposes including agriculture, quarrying, 'planning/marketing/development projects', and other miscellaneous purposes.
Wolverine		**Existing disturbances** ECCC 2017b (Annex 2) reports that 53% of the area likely considered to be low elevation winter range or type 1 matrix range categories

Local Population Unit (LPU)	Subpopulation (s)	Activities
		of critical habitat is disturbed, using the definition of disturbance from the 2014 recovery strategy, which includes a 500 m buffer on anthropogenic features. This is based on analysis of satellite imagery from approximately 2011 and updated with wildfire data current to 2015. **Ongoing and new activities** *Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 3417 ha per year. The recovery strategy indicates that increased forest harvesting and associated expansion of roads due to pine beetle salvage is expected on most annual ranges in the Northern Group (including Wolverine). *Caribou Hunting* There are open or limited entry hunting seasons for 5 point bull caribou in Wildlife Management Units (WMUs) (i.e. administrative areas designated by the Government of BC for the purposes of administering the BC *Wildlife Act*) that overlap with parts of the ranges of the Chase and Wolverine subpopulations. There is a bag limit of one animal and fall timing restrictions (see Hunting Regulation sections 4, 10, 11, and Schedules 5, 6, and 7 in particular). The 5-year projected allocation for 2017-21 is a total of 27 bull caribou (average of 5.4 animals per year for resident and guide hunters collectively) across the entire "region 6 – Skeena"[30] which includes some of these WMUs, as well as WMUs occupied by Woodland Caribou, Northern Mountain population (a different SARA-listed species, which is listed as Special Concern).
Graham		**Existing disturbances** ECCC 2017b (Annex 2) reports that 66% of the area likely considered to be low elevation winter range or type 1 matrix range categories of critical habitat is disturbed, using the definition of disturbance from the 2014 recovery strategy, which includes a 500 m buffer on anthropogenic features. This is based on analysis of satellite imagery from approximately 2011 and updated with wildfire data current to 2015. **Ongoing and new activities** *Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 412 ha per year. The recovery strategy indicates that increased forest harvesting and associated expansion of roads due to pine beetle salvage is expected on most annual ranges in the Northern Group (including Graham). *Pipelines* North Montney Mainline – NEB and BC EA certificates are issued, construction expected to begin during the first half of 2018, pending additional approvals. The project footprint overlaps with 8 km of non-high elevation range within the LPU, and is contiguous with existing linear features for all but 1.5 km. *Mines* Aley Niobium Mine is a substituted process at the pre-application phase of EA. No documents have been filed by the proponent since

[30] http://www.env.gov.bc.ca/fw/wildlife/management-issues/docs/FAQs-Wildlife-Allocation-2017-2021_20161222.pdf

Local Population Unit (LPU)	Subpopulation (s)	Activities
		2014. Potential impacts are thus far unquantified. Other information not yet gathered.
Tweedsmuir		**Existing disturbances** ECCC 2017b (Annex 2) reports that 57% of the area likely considered to be low elevation winter range or type 1 matrix range categories of critical habitat is disturbed, using the definition of disturbance from the 2014 recovery strategy, which includes a 500 m buffer on anthropogenic features. This is based on analysis of satellite imagery from approximately 2011 and updated with wildfire data current to 2015. **Ongoing and new activities** *Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is approximately 2380 ha per year. The recovery strategy indicates that increased forest harvesting and associated expansion of roads due to pine beetle salvage is expected on most annual ranges in the Northern Group (including Tweedsmuir). *Mines* Huckleberry Mine was constructed in 1997, primarily extracting copper as well as molybdenum, gold, and silver. An expansion was approved in 2012; the mine was anticipated to be operational until at least 2021, but was put into care and maintenance status in August 2016, pending a sustained improvement in the price of copper. The property encompasses 19,780 ha. Blackwater Gold is currently undergoing review by CEAA and the BC EAO. As such, potential impacts are yet to be determined. There are widespread mineral and placer claims (over 2,500 km^2) throughout the LPU, which require exploration activities to maintain. *Energy* Some investigative licenses for windpower are in place, but site-specific disturbances are much smaller than the tenured area. *Recreation* Levels of recreational activities are relatively low throughout the range, with some summer guided angling, hiking, and hunting services based out of scattered lodges or cabins. ATV use may be higher in a few locations. In winter, some ad hoc snowmobiling occurs in a portion of the winter range.
Chase		**Existing disturbances** ECCC 2017b (Annex 2) reports that 43% of the area likely considered to be low elevation winter range or type 1 matrix range categories of critical habitat is disturbed, using the definition of disturbance from the 2014 recovery strategy, which includes a 500 m buffer on anthropogenic features. This is based on analysis of satellite imagery from approximately 2011 and updated with wildfire data current to 2015. *Forestry* Based on recent forest harvesting data from the Government of BC, the short term projected forest harvesting activity for this LPU is

Local Population Unit (LPU)	Subpopulation (s)	Activities
		approximately 994 ha per year. The recovery strategy indicates that increased forest harvesting and associated expansion of roads due to pine beetle salvage is expected on most annual ranges in the Northern Group (including Chase). *Caribou Hunting* There are open hunting seasons for 5 point bull caribou in Wildlife Management Units (WMUs) (i.e. administrative areas designated by the Government of BC for the purposes of administering the BC *Wildlife Act*) that overlap with parts of the ranges of the Chase and Wolverine subpopulations. There is a bag limit of one animal and fall timing restrictions (see Hunting Regulation sections 4, 10, 11, and Schedules 5, 6, and 7 in particular). The 5-year projected allocation for 2017-21 is a total of 27 bull caribou (average of 5.4 animals per year for resident and guide hunters collectively) across the entire "region 6 – Skeena"[31] which includes some of these WMUs, as well as WMUs occupied by Woodland Caribou, Northern Mountain population (a different SARA-listed species, which is listed as Special Concern).

[31] http://www.env.gov.bc.ca/fw/wildlife/management-issues/docs/FAQs-Wildlife-Allocation-2017-2021_20161222.pdf

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