PROPOSED

Species at Risk Act
Management Plan Series

Management Plan for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus caribou*) in Canada

Woodland Caribou

Northern Mountain Population



2011

Canada

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DECLARATION

This management plan has been prepared in cooperation with the jurisdictions responsible for management of woodland caribou (Northern Mountain population). Environment Canada and Parks Canada have reviewed and accept this document as their management plan for the woodland caribou (Northern Mountain population), as required under the *Species at Risk Act* (SARA). This management plan also constitutes advice to other jurisdictions and organizations that may be involved in conserving the species.

Success in the conservation of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this plan, and will not be achieved by Environment Canada, Parks Canada or any other jurisdiction alone. In the spirit of the Accord for the Protection of Species at Risk, the Minister of the Environment invites all responsible jurisdictions and Canadians to join Environment Canada and Parks Canada in supporting and implementing this plan for the benefit of the woodland caribou (Northern Mountain population) and Canadian society as a whole. The Minister will report on progress within five years, as required under SARA.

RESPONSIBLE AGENCIES AND JURISDICTIONS

Environment Canada
Parks Canada Agency
Government of Yukon
Government of British Columbia
Government of Northwest Territories
Yukon Fish and Wildlife Management Board
Sahtu Renewable Resources Board
Gwich'in Renewable Resources Board

CONTRIBUTORS

The following was drafted through an inclusive process whereby the responsible agencies and jurisdictions, listed above, invited participation from all governments and First Nations within the range of the Northern Mountain population of woodland caribou. A technical team (the Technical Working Group) with expert knowledge researched and drafted the document. This team received guidance and assistance from a steering committee comprised of representatives from responsible agencies, jurisdictions and governments. A subgroup of the Steering Committee (the Co-chairs Committee) was responsible for coordination, ensuring the most inclusive and timely process possible. A complete list of participants is found in Appendix 1, Terms of Reference.

ACKNOWLEDGMENTS

Special thanks to everyone who contributed to community surveys in 2007 and 2008.

STRATEGIC ENVIRONMENTAL ASSESSMENT STATEMENT

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

SARA Management Plans are intended to benefit species at risk and biodiversity in general. However, it is recognized that plans may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts on non-target species or habitats. The results of the SEA are incorporated directly into the plan itself, but are also summarized below.

This management plan will clearly benefit the environment by promoting the conservation of woodland caribou (Northern Mountain population). The potential for the plan to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this plan will clearly benefit the environment and will not entail any significant adverse effects. The reader should refer to the following sections of the document in particular: description of the species' habitat and biological needs, ecological role, limiting factors and recovery measures.

PREFACE

The Northern Mountain population (NMP) of woodland caribou was assessed by the Committee on Status of Endangered Wildlife in Canada (COSEWIC) as a species of special concern in 2002 and was listed as such under the *Species at Risk Act* in 2005. Section 65 of the Act requires the competent minister to prepare management plans for species of special concern.

The Canadian Wildlife Service (Pacific and Yukon Region, Environment Canada) and Government of Yukon led the development of this management plan in cooperation with all of the jurisdictions that have responsibility for management of lands and wildlife within the range of this population of caribou, and therefore have the jurisdictional mandate to implement the plan. Two territories, one province, more than 30 First Nations and three wildlife management boards were invited to contribute to the development of this plan. The resulting Northern Mountain Caribou Management Team included a Technical Working Group, Steering Committee and a Co-Chairs committee. The Technical Working Group was formed to collectively draft the management plan and provide guidance, relevant information, and technical support. The Steering Committee assessed the adequacy of the plan in addressing jurisdictional concerns regarding status and management of the Northern Mountain population of woodland caribou. The Co-Chairs committee held meetings and discussions to coordinate activities and achieve

tasks as directed by the Steering Committee. Terms of Reference for this process are included in Appendix 1. After the draft plan was completed by the Northern Mountain Caribou Management Team, formal consultations occurred with all governments, boards and agencies within the range of NMP.

EXECUTIVE SUMMARY

The Northern Mountain population of woodland caribou (NMP; *Rangifer tarandus caribou*) was assessed by COSEWIC in 2002 and listed under the federal *Species at Risk Act* as a species of "special concern" in 2005. The purpose of this plan is to summarize the threats facing Northern Mountain caribou, set out management goals and objectives and recommend a series of recovery measures for consideration by the responsible authorities for the management of the population's 36 herds. **This plan does not address management of individual herds but should be used as a guide for developing herd-specific plans.**

The 2008 population estimate for the NMP is approximately 45,000 animals (about one quarter of all woodland caribou in Canada). Population trends, based on data gathered since 2009, report that trends for 22 herds are unknown; seven herds are considered stable, four are increasing, and three are decreasing.[1] **The goal of the management plan is to prevent the NMP from becoming threatened or endangered, by having responsible agencies cooperatively work together to carefully manage these caribou and their habitat.**

This goal will be accomplished by achieving the following results. Progress towards achieving these results will be reevaluated every 5 years.

- Herds comprising the NMP are maintained or recovered, and populations operate within the natural range of variability;
- The ecological integrity of key habitats and ecosystems required by the NMP are maintained; and
- First Nations, local communities, government agencies and other interested parties are meaningfully involved in the stewardship of the NMP and its habitats.

The objectives and recommended recovery measures are based on a set of principles developed by the Northern Mountain Caribou Steering Committee and Technical Working Group. Recommended management objectives for the NMP are:

[1] The species assessment information from COSEWIC (Section 1.1, Thomas and Gray 2002) states that there are 39 local herds but this number divides herds that occur both in YT and BC into separate herds (e.g. Atlin, Little Rancheria).

Objective 1:	Determine herd status and trends over time.
Objective 2:	Manage harvest for sustainable use.
Objective 3:	Assess health risks and maintain caribou health.
Objective 4:	Increase understanding of the dynamics of predator-prey systems and potential competition with other herbivores.
Objective 5:	Identify and assess the quality, quantity and distribution of important habitats for the population.
Objective 6:	Manage and conserve important habitats to support caribou herds.
Objective 7:	Promote conservation of the NMP through environmental and cumulative effects assessments.
Objective 8:	Foster opportunities to share knowledge and information and develop education and stewardship programs.

The implementation schedule (Section 3.1) outlines the priorities (High, Medium and Low) and recommended timelines (year initiated) to complete the recovery measures based on four possible herd scenarios. These scenarios are: herds of small size (<200), declining population trends, stable/increasing population trends or herds where the size and population trend is unknown.

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1. SPECIES INFORMATION

1.1 Species Assessment Information from COSEWIC

Date of Assessment: May 2002

Common Name (population): Woodland Caribou (Northern Mountain population)

Scientific Name: *Rangifer tarandus caribou*

COSEWIC Status: Special Concern

Reason for Designation: Forestry, roads and other developments in the range of this population are beginning to affect some herds, through habitat modification and increased human access. Most of the habitat is currently remote and has changed little. Most of the population of over 35,000 adults appears stable but is particularly dependent on conservation actions, such as management plans. Two of the 39 herds within this population are declining and may be at risk from changing predator-prey relationships and greater motor vehicle access.

Canadian Occurrence: Yukon Territory, Northwest Territories, British Columbia

COSEWIC Status History: The Northern Mountain population was designated *Not at Risk* in May 2000. This population was formerly designated as part of the "Western population" (now de-activated). Status re-examined and designated *Special Concern* in May 2002.

1.2 Description of the Species

COSEWIC identified five 'populations' of woodland caribou in Canada for the purpose of assessing conservation status: Boreal, Atlantic-Gaspésie, Newfoundland, Southern Mountain and Northern Mountain. The NMP is generally found in areas of moderate snow depths where they make seasonal altitudinal migrations and forage on terrestrial lichens (Heard and Vagt 1998).

Caribou are an ancient member of the deer family (*Cervidae*) and are broadly distributed across Canada (Banfield 1974). The woodland subspecies (*R. t. caribou*) ranges from 1.0 to 1.2 meters high at the shoulder. Mature females and males of woodland caribou weigh 110-150 and 160-210 kg., respectively. Their coat is mostly brown in summer with more grey in winter, but the neck, mane, shoulder stripe, underbelly, underside of tail, and patch just above each hoof are creamy white.

Unique among species of deer, both sexes bear antlers, although up to five percent of females have only one antler and less than one percent lack antlers all together (Bergerud 1971; Reimers 1993). Another distinctive characteristic of all caribou is large, rounded hooves that reduce sinking in snow and wetlands and act as shovels when digging for food under snow. The 'dew claws' are large, widely spaced, and set back on the foot, which greatly increases their weight-bearing area and reduces 'foot loads'.

Female caribou produce a single calf and these calves may suffer from high neonatal mortality rates. Woodland caribou produce about 70-74 calves per 100 females with only 30-50% of calves surviving their first year (Thomas and Gray 2002). The mortality rate of adult female woodland caribou (>1 year old) ranges from 5 to 15% (Thomas and Gray 2002). Although there may be some localized differences between NMP and Boreal ecotypes of woodland caribou, this combination of single calves, high calf mortality and variable adult female mortality limits the ability of a woodland caribou to recover from population declines. For more information on the physical description and general biology of woodland caribou, see Banfield (1961, 1974), Miller (2003), Kelsall (1984), Geist (1991) and Bergerud (2000).

1.3 Population and Distribution

The NMP is comprised of 36 local herds in Yukon (YT), western Northwest Territories (NT), and northwestern British Columbia (BC; Figure 1).[2] Three of these herds may be considered a "herd complex" or meta-population (i.e. Nahanni Complex). The species assessment information from COSEWIC (Section 1.1, Thomas and Gray 2002) states that there are 39 local herds but this figure divides herds that occur both in YT and BC into

[2] The COSEWIC designation of the Northern Mountain Population of woodland caribou follows National Ecological Areas to define its boundaries. BC divides caribou based on ecotype (Southern and Northern Mountain populations), therefore BC herd naming conventions may not correspond to COSEWIC designations in this document.

separate herds (e.g. Atlin, Little Rancheria). In 2002 the NMP was considered stable and over 35,000 adults. The 2008 population estimate for the NMP is approximately 45,000 animals (about one quarter of all woodland caribou in Canada). While the COSEWIC status continues to be "special concern", overall the population is stable or increasing. The NMP of woodland caribou are ranked as Vulnerable/Apparently Secure (S3S4) in BC, Vulnerable (S3) in YT and not ranked in NT (NatureServe Explorer 2010). They are ranked as Apparently Secure at a global scale (G5T4Q; NatureServe Explorer 2010).

Individual herd assessments, completed since 2009, indicate that seven herds are stable, four are increasing and three are decreasing (Appendix 2). The trend status of 22 herds (two-thirds of the population) is unknown due to lack of long-term estimates. Herd sizes vary considerably: the Finlay herd may currently consist of fewer than 30 animals while the Bonnet Plume herd may have more than 5,000 animals. These differences may be due to differential hunting pressures, remoteness, predation pressures, habitat quality and differing herd delineation systems among jurisdictions.

There is little information about historical populations of woodland caribou but the range of the NMP has not decreased significantly over time (Thomas and Gray 2002). Herds probably occupied a continuous geographic range (within suitable habitat) throughout northern BC, western NT and the southern two thirds of YT. Suitable habitat for the NMP is generally found in areas of moderate snow depths where they make seasonal altitudinal migrations and forage on terrestrial lichens (Heard and Vagt 1998).

The current area of occurrence and extent of occupancy is approximately 308,000 km^2. Within the range of NMP the effects of human activity and disturbance vary by jurisdiction. The current range of the NMP spans the traditional territories and "statement of intent" boundaries of 33 First Nations in BC, YT and NT (Figures 2 and 3). The NMP overlaps with other populations of caribou including barren-ground and woodland caribou (Boreal and Southern Mountain). The Chisana herd also straddles an international border between YT and Alaska (Farnell et al. 1998). Jurisdictions delineate herds differently: BC's definition is based on where the caribou calve while the YT and NT's base their definition on where the caribou spend the winter. Both conventions are used within this management plan.

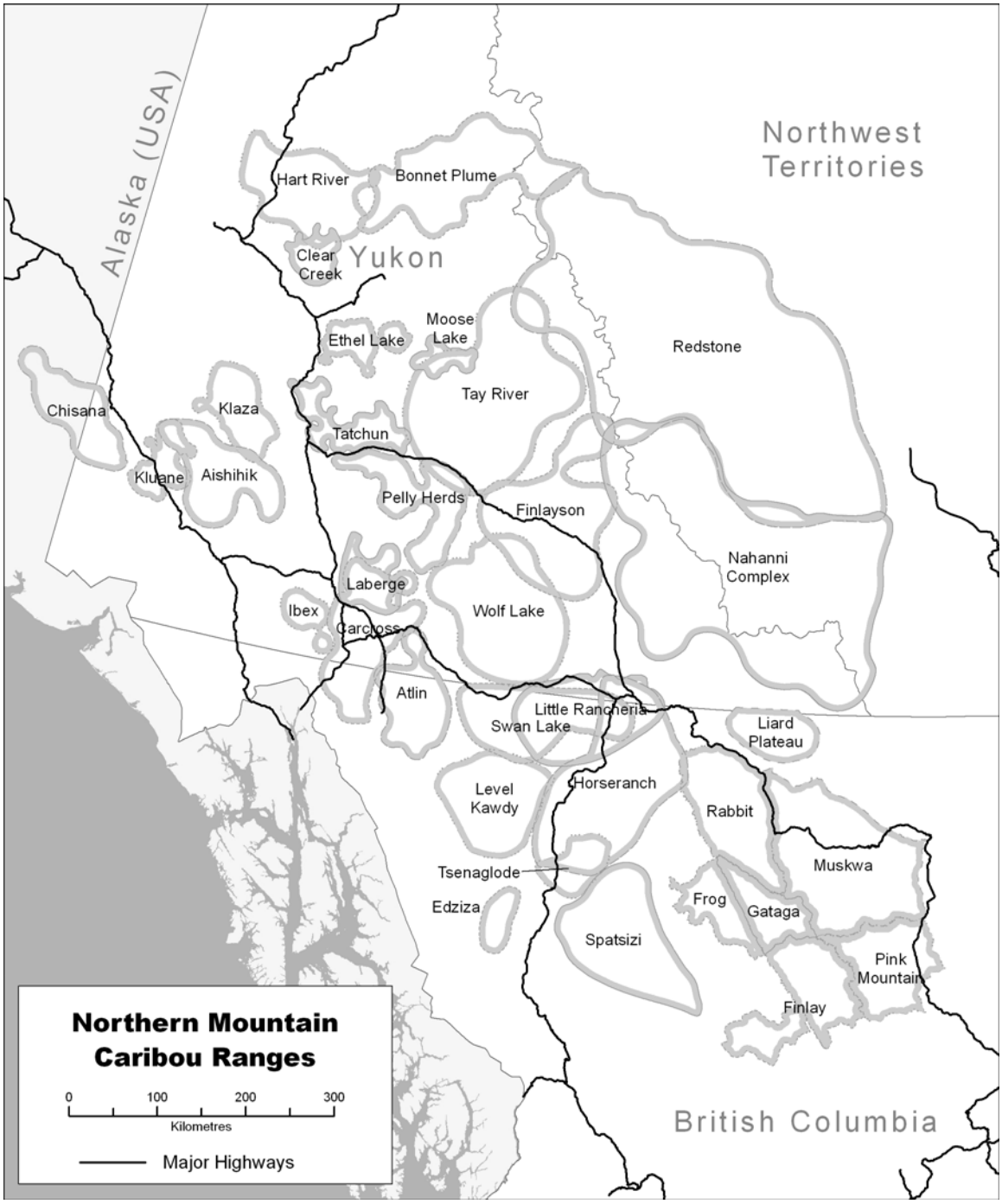


Figure 1: Annual herd ranges of the Northern Mountain population of woodland caribou (NMP).

The South Nahanni, Coal River and La Biche herds are grouped into the Nahanni Complex. Different line conventions are used to differentiate overlapping herds. Gaps shown between herds may have low densities of caribou seasonally or lack survey information but are still considered within the overall range of NMP.

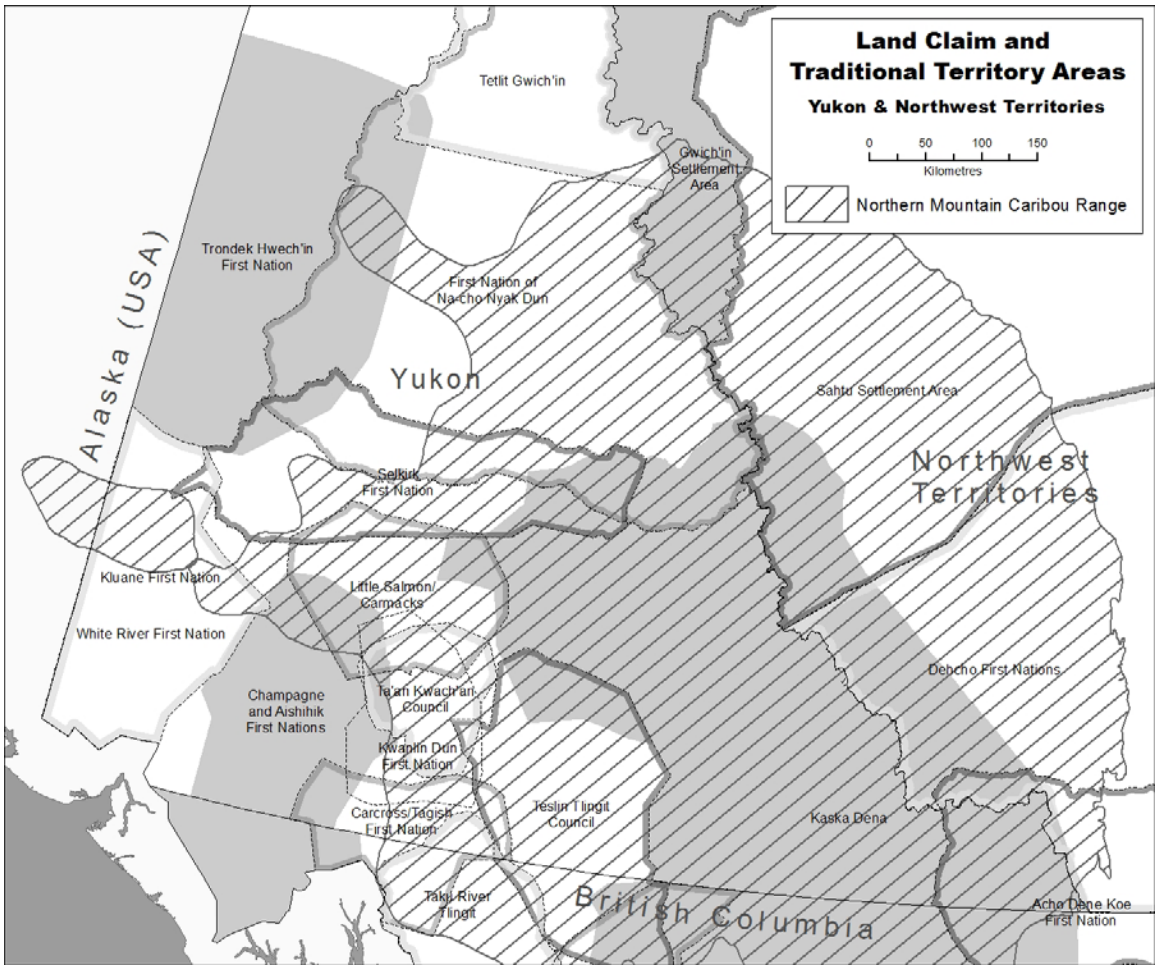


Figure 2: Yukon and Northwest Territories First Nation land claim and traditional territory areas in the range of the Northern Mountain population of woodland caribou.[3] Shaded portions and different line patterns are used to more easily distinguish among the different areas.

[3] The lines on this map illustrate in a general way the areas under land, resources and/or self-government negotiations. In some cases, the lines show where Interim Measures Agreements apply for these negotiations. Publication of this map does not imply that the First Nation, the Government of the Northwest Territories, the Government of Yukon, the Government of British Columbia or the Government of Canada have agreed to the boundaries shown. This map also shows the approximate boundaries established by final agreements.

This map is intended for general information only. It is not a technical reference tool, nor is it a legal document. The publishers will not be held liable for any errors or inaccuracies.

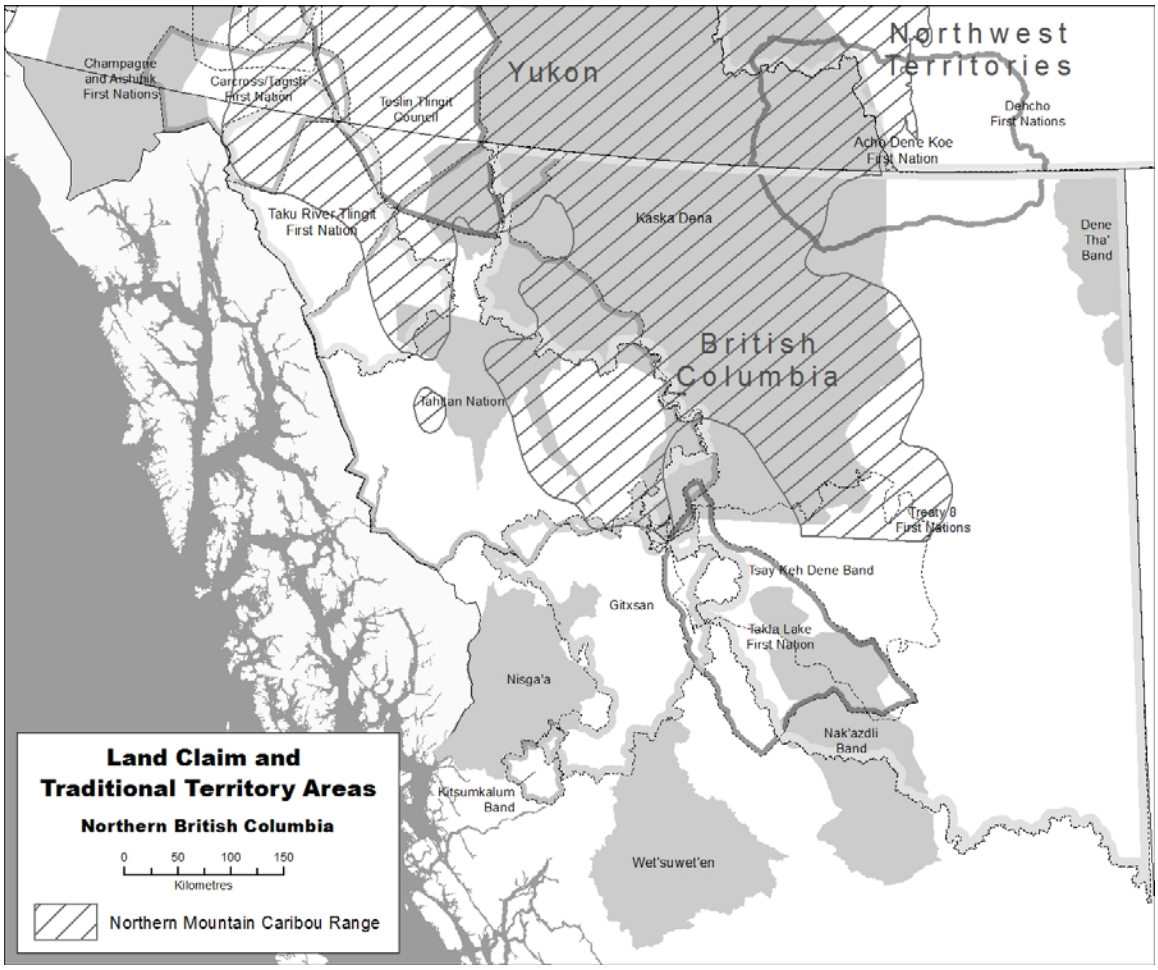


Figure 3: British Columbia First Nation land claim and traditional territory areas in the range of the Northern Mountain population of woodland caribou. [4] Shaded portions and different line patterns are used to more easily distinguish among the different areas.

[4] The lines on this map illustrate in a general way the areas under land, resources and/or self-government negotiations. In some cases, the lines show where Interim Measures Agreements apply for these negotiations. Publication of this map does not imply that the First Nation, the Government of the Northwest Territories, the Government of Yukon, the Government of British Columbia or the Government of Canada have agreed to the boundaries shown.

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1.4 Needs of the Woodland Caribou, Northern Mountain Population

1.4.1 Habitat and biological needs

All populations of woodland caribou have complex movement patterns. Herds within the NMP may spend much of the summer on alpine and upper subalpine range. In winter some herds move down to coniferous forest and lower subalpine, although others herds winter in the alpine. Seasonal movements provide increased forage availability and quality, as well as enhanced security. The ability for all populations of woodland caribou to move between seasonal ranges is vitally important. Barriers restricting these seasonal movements (e.g. roads, fences, pipelines, settlements, unsuitable habitat) may adversely affect their access to seasonally important food sources and areas used as refugia from predators and insects.

Woodland caribou may use different habitat types in winter, but generally the NMP choose areas where snow cover is relatively shallow (Bergerud 1978, Heard and Vagt 1998). Generally, winter ranges are often in areas where a divide or high mountain ridge acts as a snow and rain shadow, leaving the far side of the divide with reduced snow and rain. In addition, these areas tend to have soils and fire regimes that are suitable for substantial ground cover of lichens. For example, seven NMP herds in eastern YT, use low elevation, mature lodgepole pine (*Pinus contortus*) or spruce (*Picea glauca*) forests. These mature forests have relatively abundant terrestrial and arboreal lichens and shallower snow depths due to snow interception by the forest canopy (Kuzyk et al. 1999a). The NMP of woodland caribou depend on terrestrial lichens when snow depths are less than 50-100 cm and arboreal lichens when snow depths exceed those depths. Within the NMP, the Chisana, Kluane, Aishihik, Ibex, and Klaza herds reside on arid, lee slopes and winter in alpine areas. Wind scour on high slopes in alpine areas reduces snow cover and allows access to terrestrial lichens (Bergerud 1978; Heard and Vagt 1998; Kuzyk et al. 1999a).

The NMP of woodland caribou favour birch-sedge communities and gradually switch to sedge meadow and *Dryas*-sedge meadow communities as the season progresses from summer to fall (e.g. Kluane Ranges, YT; Oosenbrug and Theberge 1980). Important food sources in summer include the leaves of willow and sedges (Oosenbrug and Theberge 1980), with lesser amounts of grasses, forbs, lichens and fungi (Thomas and Gray 2002).

For all populations of woodland caribou, forage quality and availability directly affects the body condition of female caribou and in turn calf survivorship (Reimers 1983). This has the potential to influence the population dynamics of caribou through effects on their food supply. Monitoring trends in quantity and quality of available food in a particular habitat is important, but very difficult to obtain. It is generally assumed that food favoured by woodland caribou is plentiful year-round (e.g. Boreal caribou; Weclaw and

Hudson 2004), but caribou may not have access to all of it. A number of abiotic and biotic factors may limit access to this food for woodland caribou. For example, human disturbance (e.g. snowmobiles, off-road vehicles, backcountry recreation) and barriers to movement (e.g. roads, pipelines, habitat fragmentation) may displace caribou from critical feeding areas (Wolfe et al. 2000; Dyer et al. 2001; Nellemann et al. 2001; Powell 2004; Seip 2007). In addition, snow conditions such as snow depth, density, and hardness may limit access to lichen (Johnson et al. 2001).

Fire and forest succession are natural processes that can have direct and indirect effects on woodland caribou. Wildfires can directly affect caribou by altering habitat distribution and quality while indirectly affecting caribou by changing habitat use and movement patterns of other ungulate species and predators. This may cause increases in competition and predation. Woodland caribou in Alaska avoid areas affected by fires for up to 60 years (Joly et al. 2003). Avoidance may be due to the destruction of slow-growing terrestrial and arboreal lichens that caribou depend on in the winter. Deadfall and unfavourable snow conditions within burns may affect caribou movement, alter habitat connectivity, and increase predation risk (James et al. 2004). However, woodland caribou have been shown to expand their ranges to compensate for burned portions or successional vegetative shifts within forested winter range. Recently burned areas may also provide short-term access to vegetative forage. Woodland caribou occasionally feed in young stands immediately following fire and logging (Schaefer and Pruitt 1991; Thomas and Armbruster 1996). Fire can be destructive in the short-term, but is necessary to reduce moss competition and regenerate pine and lichen species (Klein 1982; Schaefer and Pruitt 1991). Therefore, the average fire-return cycle is an important parameter of caribou habitat. In BC, the fire-return cycle within the range of the NMP averages 125-275 years (British Columbia Forest Service 1990) while in YT and NT it is 150-300 years (D. Milne, pers. comm., 2008).

Refuge from insects, predators and thermal stress while foraging, calving and recovering from calving is important and may be hard to find (James and Stuart-Smith 2000). Permanent alpine snow patches provide refuge from insects and heat in the summer months (Ion and Kershaw 1989). Evidence suggests that these snow patches have been used by woodland caribou for thousands of years (Kuzyk et al. 1999b).

During calving (late May to early June), pregnant female woodland caribou may disperse into high mountainous terrain away from predators and other sources of prey (e.g. moose [*Alces americanus]*; Oosenbrug and Theberge 1980; Bergerud et al. 1984; Seip 1992). Since wolves (*Canis lupus*) generally prey on moose and incidentally encounter and prey upon caribou, caribou can avoid wolves by moving to upland areas. Pregnant caribou may also avoid grizzly bears (*Ursus arctos*) by choosing even higher elevation sites (Gustine et al. 2006), resulting in increased neonatal survival (<1 month old). However, dispersing into high mountainous areas may reduce the amount and quality of forage available to female caribou during calving (Bergerud et al. 1984).

1.4.2 Ecological role

Woodland caribou are an important prey species for a multitude of predators and scavengers. However, the relative importance of woodland caribou as a prey species for particular predators varies geographically and seasonally. Wolves and grizzly bears are the key predators of woodland caribou (Bergerud and Elliot 1986; Seip 1992; Gustine et al. 2006). Other carnivores that may occasionally kill woodland caribou include coyote (*Canis latrans;* Crete and Desrochiers 1995), black bear (*Ursus americanus;* Rettie and Messier 1998), wolverine (*Gulo gulo;* Gustine et al. 2006), cougar (*Puma concolor;* Kinley and Apps 2001), Canada lynx (*Lynx canadensis;* Stephenson et al. 1991) and Golden Eagle (*Aquila chrysaetos;* Valkenburg et al. 2004). Numerous vertebrate and invertebrate species are also likely to scavenge on caribou remains. The loss of woodland caribou from some landscapes may have detrimental impacts on their key predators (i.e. wolves and grizzly bears), scavengers (e.g. wolverine) and other prey species that may also be at risk. This may be particularly true in the case of the NMP where the landscape supports a lower abundance of alternate prey species.

1.4.3 Limiting factors

Limiting factors are characteristics of a natural system that act to regulate population size or distribution. For the NMP of woodland caribou these are factors such as forage availability, weather and predation. Within a balanced natural system, caribou populations fluctuate but remain viable. However, human activity, such as hunting and disturbance, may compound the effects of these factors and eventually compromise the persistence of herds and populations.

1.5 Threats

Each herd in the NMP faces a different suite of threats; therefore, threat descriptions in this section are listed by alphabetical order and not in order of importance. While these threats are listed separately, it is assumed that many of these factors interact creating greater management challenges. Herd-specific and known potential threats for the NMP are listed in Appendix 3.

1.5.1 Description of threats

Disturbance

Disturbance resulting from noise, infrastructure development, and linear features may result in increased stress, changes to activity budgets, physical injury or death of adults, unborn fetuses or calves and changes in movement patterns resulting in functional habitat loss through avoidance behaviour. Studies show that aircraft overhead flights may result in physical injury or death, increased energy expenditures or long term behavioural changes (Calef 1976; Maier 1998). Recreational activities (e.g. snowmobiles, ATV’s,

skiing) may change foraging behaviour, cause displacement from suitable habitat, or increase access for wolves along packed trails in winter (Wolfe et al. 2000; Reimers et al. 2003; Powell 2004; Seip et al. 2007). Increased access to caribou ranges may increase predation rates on caribou. Pipelines and associated roads parallelling pipelines may result in delays in crossing or failure to cross linear structures, resulting in increased time spent moving and less time feeding. These associated roads may also contribute to increased vehicle collisions. Caribou group size, insect harassment, and pipeline layout (e.g. buried, elevated, parallell road) may interact to affect crossing success by caribou (Curatolo and Murphy 1986; Wolfe et al. 2000).

Habitat alteration

Caribou cannot exist without habitat of adequate quantity, quality and configuration. Loss, degradation and fragmentation of habitat may be caused by factors both natural and of human origin, and are often exacerbated by the cumulative effects of these factors. The extent of habitat alteration that woodland caribou herds can tolerate depends on minimum viable herd size, the area, quality and connectivity of the habitat mosaic that is sustained, the ability of caribou to accommodate human activities, harvest rates and the level of predation.

Habitat alteration within the range of NMP due to forest harvesting and fire management can affect forage availability. Within the range of NMP, forage availability is most affected by forest harvesting and fire management. Combinations of rain/snow shadow effects on ground lichens may also influence the availability forage availability in localized areas. Forest harvesting converts mature forests to an earlier successional stage which is generally avoided by woodland caribou (Chubbs et al. 1993; Smith et al. 2000; Courtois et al. 2007; Schaefer and Mahoney 2007; Vors et al. 2007). Excessive amounts of early seral habitat on caribou ranges due to industrial activity and wildfire have been associated with declining Boreal caribou populations (Sorenson et al. 2008). Although forestry was listed as the first reason given by COSEWIC for the NMP's designation this may not apply to a significant portion of the NMP range. There has been relatively limited forestry activity in the NT and the YT since the mid-1990's due to limited marketable timber, substantial distance to market and low market prices.

Increased fire suppression, timber harvesting practices and warmer winters have increased the prevalence of insect outbreaks in portions of the range of the NMP. Insect outbreaks have affected 14.5 million hectares in BC (mountain pine beetle; British Columbia Ministry of Forest and Range 2008) and over 350,000 hectares in southwest YT (spruce beetle; Garbutt et al. 2006). Insect outbreaks can change species composition of forests and standing and fallen dead trees can change caribou movement patterns and increase the amount of fuel available during wildfires possibly increasing fire intensity and fire spread rates (Harrington 1996; Page and Jenkins 2007).

Hunting

The ability of caribou herds to sustain harvest depends to a large extent on population size, calf recruitment, adult female survival and harvest rate. Recruitment rates are affected by environmental factors such as climate, habitat quality and predation levels. Recruitment rates can vary from excellent (>35 calves:100 cows at end of winter), to good (25-35 calves:100 cows at end of winter) to poor (<25 calves:100 cows), indicating populations that are increasing, stable to increasing or declining respectively (Appendix 2).

In YT, a harvest rate of two to three percent (adults) is generally considered to be sustainable given a relatively stable, naturally regulated caribou population (Environment Yukon 1996; Hayes et al. 2003). Harvest in excess of three percent generally leads to a decline (Bergerud 1980). Herds in decline (recruiting fewer than 25 calves/100 cows for more than three years) may not be able to sustain any level of harvest. Small herds (<200) are more vulnerable to stresses and less likely to withstand harvest (based on professional opinion or local knowledge). In YT, herds with populations of less than 200 animals are recommended to be closed to licensed hunting (Environment Yukon 1996). For some small populations, BC restricts the licensed harvest to bulls-only, either through limited entry hunting or a 5-point bull only season. In many areas First Nations harvest is not reported, making sustainable harvest rates difficult to calculate for wildlife managers.

The influence of hunting on the NMP has implications for the management of both the caribou population and habitat (Bergerud 1978; Calef 1981; Valkenburg *et al*; 1994, Farnell et al. 1998). If herds are managed for sustainable harvest, their habitat must be managed to support healthy populations that are able to withstand harvest pressures. New road development and subsequent off-road trails often accompany industrial activity and facilitate hunting access. If access to a given herd increases for any reason, management initiatives must meet the challenge of a potential increase in hunting pressure. Access management is therefore integral to harvest management.

Weather and impacts of climate change

Global climate change is raising average temperatures and altering precipitation patterns, resulting in greater climatic variability with extreme events becoming more common. Higher latitudes of North America are expected to experience the effects of global climate change sooner and more severely than many other areas of the world (Christensen et al. 2007; Ruckstuhl et al. 2008). Research on climate change in the boreal region predicts increased summer temperatures and growing season length (Ruckstuhl et al. 2008). These predicted changes in climate can influence habitat conditions, forage availability, and predator-prey relationships for caribou within the NMP.

Habitat conditions and distribution across the range of the NMP may be affected by increased summer temperatures, growing season length and overall warming. These predicted climate changes may cause increased tree growth, tree recruitment and

advancement of the treeline in some tree species (Ruckstuhl et al. 2008). However, the positive effects of warming could be reversed without comparable increases in precipitation (D'Arrigo et al. 2004). Therefore, long-term warming temperatures may result in large-scale tree mortality or browning of some species in the northern forests due to drought stress (D'Arrigo et al. 2004; Wilmking et al. 2004). Critical forested winter range (mature spruce and pine forests) may be lost with more frequent or intense fires as well as intensified insect outbreaks (Logan et al. 2003; Flannigan et al. 2009). Warming temperatures may also reduce the mean age of forest and change species composition altering critical caribou habitat (Fauria and Johnson 2008; Ruckstuhl et al. 2008). Alpine snow patches are being reduced in size (Kuzyk et al. 1999b), which could lead to increased physiological stress on caribou during summer.

Increased snowfall may reduce winter survival of caribou by increasing energetic demands or by reducing forage availability (Pettorelli et al. 2005). Increased snowfall may limit the ability of females to disperse in spring to higher elevations away from predators, thus reducing neonatal survival. Warmer spring temperatures may result in more rapid snow melt with earlier vegetation emergence. This could mean that availability of high quality forage does not coincide with the peak of calving (Post and Forchhammer 2008).

Climate-induced changes in populations of other species, such as moose, bears, deer (white-tailed [*Odocoileus virginianus*], mule deer [*Odocoileus hemionus*]) or wolves may further affect woodland caribou (Post and Forchhammer 2001). Changes in demographic patterns of some barren-ground caribou in Alaska have been linked to a combination of wolf predation and adverse weather conditions (Adams et al. 1995; Boertje et al. 1996; Valkenburg et al. 1996; Mech et al. 1998). Variations in weather can also decrease forage quality and availability or extend the duration or intensity of periods of insect harassment. The result may be a general decline in physical condition, reduced pregnancy rates and neonatal calf survival rates, or may predispose animals to predation.

Predation

Woodland caribou are naturally predator-limited (Bergerud 1978; Bergerud 1980; Gasaway et al. 1983; Bergerud 1988; Miller et al. 1988; Seip 1991; Bergerud and Elliot 1998; Adams et al. 1995; Thomas 1995; Valkenburg et al. 1996; Mech et al.1998). Nearly all of the range of the NMP is an intact multi-predator, multi-prey system. The NMP has co-existed with predators for millennia, as components of healthy, intact ecosystems. The natural balance that develops between predators and woodland caribou is generally characterized by relatively low but stable numbers of caribou (Seip 1991; Hayes et al. 2003; Bergerud et al. 2008).

Wolf control activities on both the Finlayson (Farnell and McDonald 1987) and Aishihik (Hayes et al. 2003) herds where in both cases, human harvest *and* predation were viewed as factors which caused the herds to decline, were initiated because of predation concerns. Wolf control was successful, in the short term, in increasing caribou recruitment (although not adult survival) in the Aishihik herd when combined with

reduced hunting (Hayes et al. 2003) and in increasing the growth rate of Alaska's Delta caribou herd (Boertje et al. 1996). However, wolf control measures did not increase calf survival in the Delta caribou herd in 1993-1994 due to the influence of other predators, the limited extent of wolf control, shifts in calving areas, and concurrent decline in caribou health (Valkenburg et al. 2004). Limited success of wolf control was also documented in the Nelchina herd in south-central Alaska from 1950-1981 (Van Ballenberghe 1985). Documented cases of predation causing a herd's long-term decline or extirpation in the absence of any anthropogenic activity are rare, but there are numerous cases in which human activities can be shown to exacerbate predation pressures and precipitate population declines.

Woodland caribou are often a secondary prey species of wolves where they co-occur with moose. Activities on the landscape, such as clearcut logging or forest fires, which increase the population of other species such as moose, may increase predator populations, thereby increasing predation on caribou (Bergerud and Elliot 1986; Wittmer *et al*, 2005). Seismic lines and roads can increase movement rate and travel efficiency of predators (Musiani et al. 1998; James 1999), thus increasing predation risk on caribou (James and Stuart Smith 2000). Industrial development can also improve access into caribou ranges providing greater harvest opportunities for hunters, although this may be accompanied by stricter hunting restrictions.

Climate and development also need to be considered in the context of predation. Snow conditions play a large role in the ability of cows with calves to disperse away from predators as is seen with newborn boreal caribou (Bergerud and Page 1987). In years where there is an earlier spring resulting in larger snow-free areas females have more space to disperse themselves, are less aggregated and blend in with brown snow-free substrates resulting in higher calf survival (Bergerud and Page 1987). Climate is likely a factor influencing the predator - prey balance for this population as well. Furthermore, a changing climate will make the effects of climate on predation more variable and difficult to predict.

1.6 Recovery measures already completed or underway

Monitoring and management history for each herd is summarized in Appendix 4. Herd boundaries within each jurisdiction are illustrated in Figure 1.

Yukon

The NMP of woodland caribou continues to be a high priority species for the Government of Yukon. Currently, the Government of Yukon monitors eight individual herds on an annual basis. While anthropogenic and environmental influences vary from herd to herd, this work provides the opportunity for comparing features and characteristics of herds over time.

Demographic monitoring of many herds began in the early 1980s. The large number of herds and the geographic remoteness of many of them make it infeasible to monitor every

herd annually; representative herds from each region are monitored regularly while the remaining ones are surveyed on a rotating basis.

As of 2008, there had been over 200 fall composition surveys completed on YT herds. A program of VHF radio-collaring began in the late 1970s. As part of this program, individuals from most herds have been collared and tracked using radio telemetry to determine home range distribution and seasonal movements. Over 1,200 animals have been fitted with radio-collars in YT since this program began. Combined with collaring efforts, periodic surveys are used to determine herd composition, estimate population size and monitor population trends. In recent years, satellite and GPS collars have been deployed on several herds to gather finer scale data on movement and habitat use.

There have been four intensive recovery and maintenance programs directed towards increasing and stabilizing NMP herds in YT. Monitoring of the Finlayson, Aishihik, Carcross, Ibex, Atlin (often referred to as the Southern Lakes caribou) and Chisana herds revealed that they were unstable and declining. In each case, a management program was initiated to stabilize and recover the herd. The Aishihik and Finlayson programs involved a combination of increased monitoring, reduced or suspended harvesting and wolf control. The Southern Lakes Caribou Recovery Program involved increased monitoring, a hunting moratorium and changes to the agricultural and industrial land disposition processes in their range. The Chisana herd was listed as a Specially Protected Species in the Yukon *Wildlife Act*, followed by a four-year captive rearing program, a hunting ban, extensive collaring, and greatly increased monitoring. Each recovery program was successful in stabilizing the targeted herd in the short-term. Conservation and management efforts dealing with the Chisana herd were developed in collaboration with the many agencies and partners in Alaska and Yukon (Chisana Caribou Herd Working Group 2010).

All licensed hunter harvest of caribou has been monitored since 1979 through compulsory reporting. Biological submissions are collected from hunters so animals can be aged and tested for contaminants and disease.

British Columbia

The BC Conservation Framework ranks the NMP as a priority 2 under goal 2: to prevent the species from becoming increasingly at risk (BC Ministry of Environment 2009). However, caribou management priorities for BC government agencies within the range of the NMP are low, relative to Boreal and Southern Mountain woodland caribou populations. Boreal caribou woodland population is ranked a priority 1, under goal 3: maintain the diversity of native species and ecosystems and the Southern Mountain woodland population is ranked a priority 2, under both goal 1: contribute to global efforts for species and ecosystem conservation and goal 3 (BC Environment 2009). These populations also have an increased risk assessment (threatened) by COSEWIC. As a result, the majority of research and monitoring in BC is focused on the Boreal and Southern Mountain woodland caribou populations. The majority of the NMP herds in BC occupy relatively remote areas making access for research and monitoring expensive. The following summarizes the major monitoring efforts on NMP herds in

BC. Information on herds in BC were provided by BC Ministry of Natural Resources Operations staff (C. Theissen pers. comm., 2008; M. Williams pers. comm., 2008). Additional inventory and survey information for BC herds is summarized in Appendix 2.

The Finlay herd was the subject of a recent GPS collaring study that has helped define the herd range. Regular inventory of this herd has not occurred. The Pink Mountain herd has been frequently inventoried and recently was the subject of detailed mortality and habitat-use studies. The Muskwa herd has been infrequently surveyed, but was the subject of an extensive habitat-use study in the mid-2000s. It was subject to wolf control in the early 1980s. The Rabbit herd has received little attention in terms of monitoring, but was subject to wolf control from 1982 to 1985. The Frog herd has had little monitoring or management. Aerial surveys were conducted in 2009 to determine the extent of caribou use in an area east of the Spatsizi herd and west of the Frog herd (S. McNay pers. comm., 2010; Figure 1). This area is currently recognized as having only a "trace occurrence" of caribou, but survey efforts are continuing to validate these findings. Radio collars were put on caribou in the Gataga herd in the early 2000s to examine herd range and seasonal habitat use. The Liard Plateau herd had been monitored only through harvest records until 2002 when the Government of Yukon put three satellite collars on cows. A fall 2002 composition survey showed less than 200 caribou in the herd and very few large bulls.

The Swan Lake herd was the subject of an intensive three-year study to determine herd size, survival, and distribution relative to nearby herds. The Atlin and Carcross herds were intensively monitored as part of the Southern Lakes Caribou Recovery Program. The Little Rancheria and Horseranch herds were studied intensively from 1997 to 1999 to determine herd size, survival rates, and movements relative to adjacent herds. The Spatsizi herd was studied fairly intensively in the early 1990s and the Level-Kawdy and Edziza herds have each been inventoried once.

The range of the Atlin herd was evaluated for potential impacts from mining developments. Significant work has been undertaken by the Taku River Tlingit First Nation (TRTFN), in partnership with BC Ministry of Environment and others that includes an on-going three-year effort to improve habitat modeling, complete a cumulative effects analysis, examine pregnancy rates and evaluate predator diets during the spring and early summer months. Additionally, TRTFN and BC jointly developed a harvest management plan for the herd, which included an intensive evaluation of all existing data and the development of a population model to understand likely future population trends under differing management scenarios. Finally, TRTFN and BC are currently engaged in land use planning which will consider the habitat requirements for caribou. They are committed to undertaking a strategic wildlife management planning effort that will include additional focus on population management for all caribou within the TRTFN traditional territory.

Predator control has a long history in BC, and although the NMP were rarely the ungulate targeted for protection, they did benefit from reductions in predators designed to benefit other species such as wild sheep. Government-sanctioned predator control to increase the number of NMP caribou has not occurred in the province within the last 10 years.

Since 1976, all licensed caribou harvest in BC has been reported through compulsory inspections or surveys of hunter effort and harvest rates.

Northwest Territories

Caribou are the most important game species in the NT. Within the range of the NMP in the NT, there is relatively low harvest by First Nation or resident license holders (approximately 300-350 NMP/year). However, local hunters have recently reported that the number of First Nation and resident hunters has increased the hunting pressure in the MacMillan Pass, NT. Regardless, the NMP remain ranked as "secure" in the NT and there is no immediate cause for concern in-part because roads and access into all NMP ranges in the NT remain very limited (Working Group on General Status of NWT Species *in press*). Increased access (roads) into the range of NMP in the NT would make harvest management a significant issue.

There has been strict monitoring of the harvest of NMP by NT outfitters since 1991. Annual public reports on outfitted harvest levels are produced (see Larter and Allaire 2009 for example) and DNA tissue samples have been collected as much as possible from the outfitter harvest since 2002. There is mandatory reporting of resident harvest of the NMP.

The Bonnet Plume and Redstone herds range between the NT and YT. They are thought to be substantial in size (Veitch *et al* 2000; Olesen *et al* 2001), although they have not been recently surveyed (Appendix 2). Wildlife observation data have been collected and used to provide estimates of the fall (August-September) ratios of calves per 100 adult females and of adult females to adult males for years 1991 to 2009 for NMP in the NT (Appendix 5; GNWT unpublished data). Over the past 19 years there is no indication of increase or decrease in the estimates which strongly suggests that the Bonnet Plume and Redstone herds are stable. It should also be noted that some studies have suggested that the Redstone herd might be a complex of herds (Collin 1983; Creighton 2006). However, these interpretations are based on data from 10 collars and further work would be needed to clarify their status.

The most intensive studies on NMP in the NT have been on the Nahanni complex, where cooperative work has been conducted by the Parks Canada Agency (PCA), YT and NT governments since the mid-1990s. The most recent survey in this region was a census completed in fall 2009. Currently, there are NMP collared in the Nahanni Complex to look at movements and herd delineations. Preliminary results indicate that the collared individuals that wintered together actually calved with a number of different herds, including ones outside the complex.

The recent announcement of the expansion of Nahanni National Park Reserve (30,000 sq km), the ongoing Nááts'ihch'oh National Park initiative (7,600 sq km), the proposed Shúhtagot'ine Néné Protected Area (candidate National Wildlife Area, Canadian Wildlife Service; 25,500 sq km), the Conservation Zones in the mountains in the Sahtu Land Use Plan (Sahtu Land Use Planning Board 2010), and the proposed Ts'ude niline Tu'eyeta Protected Area (candidate National Wildlife Area, CWS;

15,000 sq km but only ca. 1000 sq km in Mackenzie Mountains), in combination with a lack of a timber industry, are all helping to keep the habitat for the NMP in the NT stable and secure in the Mackenzie Mountains.

Alaska

Alaska is a range jurisdiction for the Chisana herd and manages the herd in collaboration with other governments and affected First Nations and Tribes on both sides of the Alaska/Yukon border.

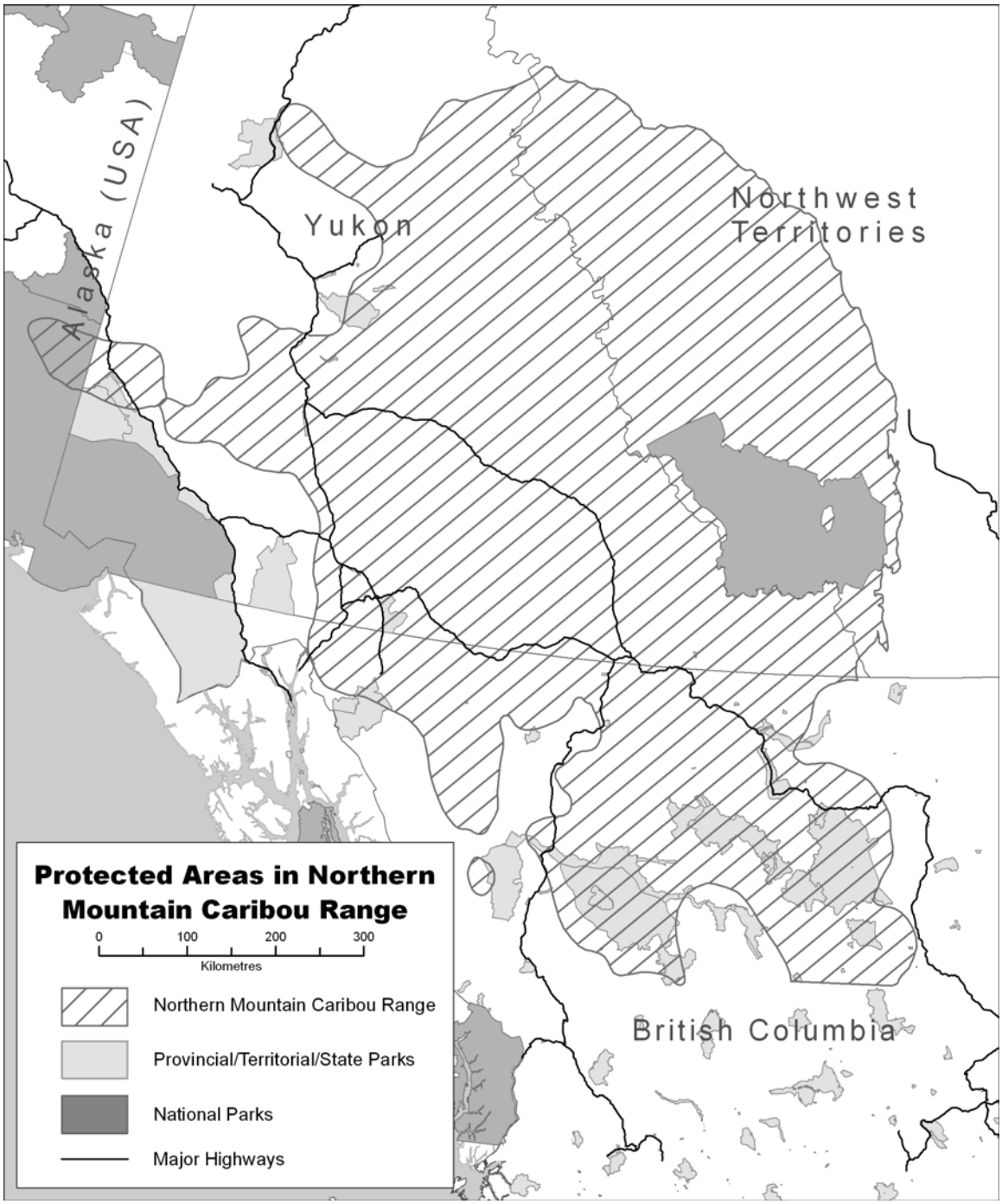


Figure 4: Protected areas within the range of the Northern Mountain population of woodland caribou. [5]

[5] Protected areas designations within Provincial/Territorial/State Parks grouping includes: Habitat Protection Areas, Ecological Reserves, Territorial and Provincial Parks, Natural Environment Parks, Wildlife Sanctuaries Wilderness Preserves and Special Management Areas.

2. MANAGEMENT

Management of woodland caribou herds comprising the NMP is dependent on the following recommended management principles, goals, objectives and recovery measures. It is anticipated that, if needed, herd-specific objectives and recovery measures will be developed in regional or herd specific management plans that are consistent with this plan. These herd-specific management plans will be developed in conjunction with affected First Nations, local communities and relevant wildlife management boards and councils. It is recognized that the implementation of all of the recovery measures identified in this plan would not be required for each herd; rather, select measures will be utilized to achieve herd-specific interests. Implementation of herd-specific management objectives and goals are subject to the priorities and budgetary constraints of local management authorities.

The range of the NMP spans the traditional territories and "statement of intent" boundaries of 33 First Nations in BC, YT and NT (Figures 2 and 3). Management of the NMP must recognize that these caribou have been harvested for thousands of years by First Nations hunters. Therefore, First Nations are key partners in developing and implementing a successful management plan. However, it must also recognize that, in the past 200 years, access to once-remote caribou ranges has increased dramatically and hunting technology has made great advances. The management principles below are intended to be an aid in the local development of regional and herd specific plans. Careful management and stewardship can facilitate the maintenance of the NMP for future generations.

2.1 Management Principles

1. It is recognized that the NMP has long-standing cultural value, is an important food resource for First Nations' peoples and northern communities within its range, and is valued by all Canadians.

2. Plan implementation must recognize and respect the government to government relationships that exist between First Nations' peoples (those with or without final Land Claim Agreements), and federal, territorial, provincial and state governments; as well as the responsibilities of wildlife management boards as provided for in the land claim agreements.

3. Harvest management must reflect priorities as set out in Land Claim Agreements, First Nation Treaties and the inherent rights of non-treaty First Nation communities and individuals.

4. Management of the NMP must use the best available information sources (i.e. traditional knowledge, local knowledge, science), respecting First Nation

systems of wildlife management and traditional laws, and adapt to include new knowledge, research and management approaches.

5. NMP rely on intact, healthy ecosystems.

6. Consistent with the precautionary principle, required recovery measures should not be delayed even though detailed information is limited or lacking.

7. Caution must be exercised to avoid unanticipated effects of human activities to the NMP and their habitat.

8. Management of the NMP and their key habitat will depend on the ability of responsible authorities to develop and implement cost-effective and timely programs and approaches.

9. Methods to manage and conserve the NMP must pose the least possible risk to individual animals. When intensive management is considered, relative costs and benefits must be carefully assessed before proceeding.

10. Successful management of the NMP will require the commitment, collaboration and cooperation among management authorities, First Nations, wildlife management boards, local communities, landowners, industry and other interested parties.

2.2 Management Goal

The management goal for the NMP recognizes that caribou, like other wildlife, have ecological, cultural and spiritual values along with consumptive uses. **The goal of the management plan is to prevent the NMP from becoming threatened or endangered, by having responsible agencies cooperatively work together to care for caribou and their habitat.**

This goal will be accomplished by achieving the following results. Progress towards achieving these results will be reevaluated every 5 years.

- Herds comprising the NMP are maintained or recovered, and populations operate within the natural range of variability;

- The ecological integrity of key habitats and ecosystems required by the NMP are maintained; and

- First Nations, local communities, government agencies and other interested parties are meaningfully involved in the stewardship of the NMP and its habitats.

2.3 Management Objectives

The following potential management objectives and considerations are meant to serve as guidance to provinces and territories, as well as local management planning teams. In most cases, implementation of these objectives and management considerations would need to be determined through the local development of herd-specific management plans, and are subject to competing management priorities and fiscal constraints.

Objective 1: Determine herd status and trends over time.
Objective 2: Manage harvest for sustainable use.
Objective 3: Assess health risks and maintain caribou health.
Objective 4: Increase understanding of the dynamics of predator-prey systems and potential competition with other herbivores.
Objective 5: Identify and assess the quality, quantity and distribution of important habitats.
Objective 6: Manage and conserve important habitats to support healthy caribou herds.
Objective 7: Promote caribou conservation of the NMP through environmental and cumulative effects assessments.
Objective 8: Foster opportunities to share knowledge, information and develop education and stewardship programs.

These management objectives are covered in three broad sections: Population Management, Habitat Management, and Communication and Involvement. The Population Management objectives (#1-4) deal with monitoring, harvest, health, and species interactions. Habitat Management objectives (#5-7) cover the identification and conservation of habitat for the continued use by the NMP to support healthy caribou populations. The sharing of knowledge and promotion of stewardship are contained in the Communication and Involvement objective (#8). Proposed recovery measures for each of these Objectives are presented in Section 2.4.1; priorities and timelines for implementing recovery measures are presented in Section 3.1.

2.4 Recovery Measures

For management purposes, caribou herds have been divided into five types based on herd size or performance in the short-term (3-5 years):

1. **Small, isolated**
   Herds that have <200 adults and are geographically isolated from other herds. Geographic isolation results when there is no emigration or immigration among adjacent herds. An estimate of two hundred adults is based on previous experience in YT; however, this number may be updated when new information becomes available. Despite the trend, these herds require special consideration as they are inherently vulnerable due to their small population size. It is important

to recognize, however, that some herds may occur naturally at low numbers which are not the result of a historic or current decline.

2. **Stable**
   Herds where loss due to mortality and emigration equals increases due to recruitment and immigration resulting in no appreciable increase or decrease over the short-term (3-5 years) in herd size or demographic indices.

3. **Increasing**
   Herds where increase due to recruitment and immigration exceeds losses due to mortality and emigration such that overall herd size or demographic indices show an increasing trend over the short-term (3-5 years).

4. **Decreasing**
   Herds where loss due to mortality and emigration exceeds increases due to recruitment and immigration such that the overall herd size or demographic indices show a decreasing trend over the short-term (3-5 years).

5. **Unknown**
   Herds where information on size, trend or demographics is lacking. This lack of data may be due to remoteness of herd, cost and logistics of sampling and differing research priorities.

Figure 5 is a decision key that was developed to determine the need for recovery measures, monitoring and research for a herd where information is lacking or there is a conservation concern. “Population” in this decision key refers to the adult population of an individual herd. See sections 2.41, 2.4.2 and 2.4.3 for specific recovery measures.

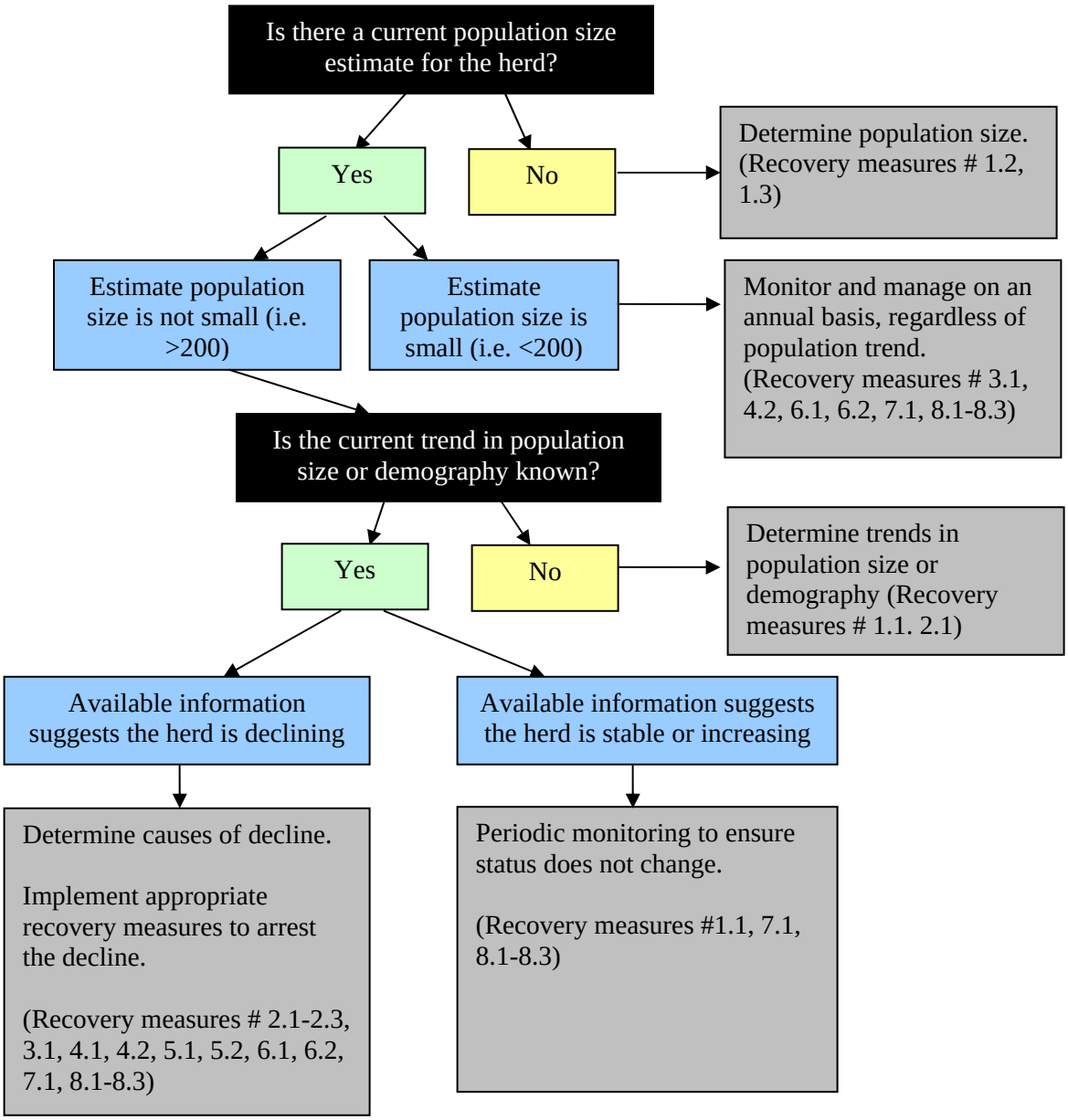


Figure 5. Decision tree to guide what potential recovery measures may be useful for a herd, depending on its population size and trend. "Population" in this decision key refers to the adult population of an individual herd. Gray shaded boxes are final outcomes.

2.4.1 Population Management

Objective 1: Determine herd status and trends over time.

Recovery measures:

1.1 Conduct monitoring to track herd distributions, trends and composition.
1.2 Collect baseline information (numbers and map distribution).
1.3 Based on priorities, conduct census of herd.

Objective 2: Manage harvest for sustainable use.

Recovery measures:

2.1 Track harvest data to provide information on age and composition of herd.
2.2 Use population modelling to develop sustainable harvest rates and thresholds below which harvesting restrictions should be considered.
2.3 Develop harvest strategies within and among jurisdictions, particularly for transboundary herds (adhere to Management Principle 3.).

Objective 3: Assess health risks and maintain caribou health.

Recovery measures:

3.1 Assess natural and human-caused health risks that limit or influence the population (disease and parasites, contaminants, genetic composition and climate change).

Objective 4: Increase understanding of the dynamics of predator-prey systems and potential competition with other herbivores.

Recovery measures:

4.1 Map distribution and conduct census of predators and other large herbivores.
4.2 Assess the relative importance of predators and/or competitors when identified as a possible limiting factor (e.g. determine if intensive management of other species applicable to the NMP).

2.4.2 Habitat Management

Objective 5: Identify and assess the quality, quantity and distribution of important habitats.

Recovery measures:

5.1 Delineate key habitats (e.g. winter range, calving grounds, post-calving summer range, rutting range, insect avoidance areas, travel/movement corridors, mineral licks, predator avoidance sites or other locally important sites).

5.2 Map and evaluate current habitat availability in relation to human footprint, hunting activity, connectivity, fire, forest disease outbreaks, access and development (including seasonal shifts, barriers to movement and overlaps).

Objective 6: Manage and conserve important habitats to support healthy caribou herds.

Recovery measures:

6.1 Conserve key habitats utilizing existing land designation tools (Appendix 7).

6.2 Manage human disturbances of caribou and their habitat including mechanized (e.g. off-road vehicles, snowmobiles) and non-mechanized access.

Objective 7: Promote conservation of the NMP of woodland caribou through environmental and cumulative effects assessments.

Recovery measures:

7.1 Provide input into land and resource use planning forums (e.g. Environmental Assessment/Land Use Planning), including cumulative effects, to maintain caribou populations.

2.4.3 Communication and Involvement

Objective 8: Foster opportunities to share knowledge, information and develop education and stewardship programs.

Recovery measures:

8.1 Develop products (e.g. print, web-based) to disseminate information about the NMP and management plan implementation.

8.2 Develop educational programs (or existing programs) about caribou.

8.3 Support and develop stewardship programs and projects (Appendix 8).

2.5 Measuring Progress

To meet the goal and objectives of this management plan, it is essential to measure progress on the implementation of the plan. Performance measures are necessary for measuring progress in conserving caribou and their habitat in a manner recommended by this plan. Under SARA, the competent Minister must monitor the implementation of the management plan and access its implementation every five years and every subsequent five-year period until its objectives have been achieved. COSEWIC reviews the classification of each species at risk at least once every 10 years or at any time if it has reason to believe that the status of the species has changed significantly. Based on these schedules, the timeline for measuring progress for this management plan is once every five years.

Caribou herd sizes and trends, the conservation of habitat and the reduction in threats affecting herds should be used as the main performance measures to gauge success of caribou conservation in addition to progress made in implementing recovery measures. **The ultimate performance measure of the management plan is that the NMP do not become further at-risk (i.e. threatened or endangered) when reassessed by COSEWIC.** Specific performance measures to gauge successful implementation of the plan include:

Conservation of the caribou

1. All 36 caribou herds in the NMP remain extant.
2. Knowledge of the distribution and status of all herds is improved.
3. The distribution of caribou on the landscape does not decrease.
4. Declines in herd size or other demographic indices are stabilized and, where feasible, reversed.
5. Anthropogenic threats to the herds are reduced or eliminated.

Conservation of caribou habitat

1. Key caribou habitats are identified and mapped.
2. Measures are in place that effectively protect key caribou habitat.

Cooperative management of caribou and their habitat

1. Small herds and those needing special attention (e.g. declining herds) have herd-specific management plans developed collaboratively with affected First Nations, local communities and other relevant agencies and organizations.
2. Affected First Nations and local communities are engaged in caribou monitoring, management, and recovery efforts.

3. IMPLEMENTATION

The management objectives and recovery measures presented above are to be used as guidelines when developing herd-specific management plans. The extent of herd-specific recovery measures will depend on threats identified by local management authorities. Implementation is subject to the priorities and resource constraints of local responsible authorities (See section 3.2).

In the early stage of plan implementation, agencies working on multi-jurisdiction herds should coordinate their respective approaches and methods for monitoring populations and apply the decision key that has been developed for this plan (Figure 5). In all instances efforts should be made to coordinate monitoring and sampling methods among jurisdictions and incorporate traditional ecological knowledge into the decision-making processes. Herd-level management strategies should also recognize that with increasing climatic variability, ecological complexity will increase. Caribou management should account for and include mechanisms to deal with this uncertainty.

Notes on the Implementation Schedule:

- Scenarios – Recovery measures may differ based on the status of each herd. Therefore, priorities are divided up into four scenarios; small herd size (<200), declining population trend, stable/increasing population trend or herds where the size and population trend is unknown. Stable/increasing population trend designations are combined in the plan because they require similar priority levels and recovery measures.

- Priority – Each recovery measure is assigned a high, medium and low priority for implementation. These designations are designed to be relative to each other and to other recovery measures within the plan.

- Herd-specific – Some recovery measures are focused at the individual herd level using management plan objectives to provide overall guidance and direction.

- Timeline – The year that the recovery measure should be initiated once the herd is identified as a conservation concern. Timeline is defined as ‘ongoing’ for herds where recovery measures should be conducted on a yearly basis. The timeline is based on a 5-year implementation schedule.

3.1 Implementation Schedule

3.1.1 Population Management

Objective 1: Determine herd status and trends over time.

Recovery measure		Priority based on scenarios				Threats or concerns addressed	Herd-specific	Recommended Timeline (year initiated)
		small	declining	stable/increasing	unknown			
1.1	Conduct monitoring to track herd distributions, trends and composition	High	High	Medium	Low	Low numbers	Yes	2
1.2	Collect baseline information (numbers and map distribution)	Medium	Medium	Low	High	Low numbers	Yes	1
1.3	Based on priorities, conduct census of herd.	High	Medium	Low	High	Low numbers	Yes	1

These recovery measures should be conducted on herds where information is lacking or there is a conservation concern. Survey and monitoring techniques should be coordinated among jurisdictions to aid in comparisons among herds within the NMP. In addition to science-based techniques, TEK and community information could be used to determine and track changes and trends in distribution (e.g. where have people observed concentrations of caribou in the past). When trends are known, further research should be conducted to discover potential cause of change (Appendix 9).

Objective 2: Manage harvest for sustainable use.

Recovery measure		Priority based on scenarios				Threats or concerns addressed	Herd-specific	Recommended Timeline (year initiated)
		small	declining	stable/increasing	unknown			
2.1	Track harvest data to provide information on age and composition of herd.	High	High	High	High	Hunting	Yes	Ongoing
2.2	Use population modelling to develop sustainable harvest rates and thresholds below which harvesting restrictions should be considered.	High	High	Medium	Low	Hunting	Yes	4
2.3	Develop harvest strategies within and among jurisdictions, particularly for transboundary herds. (Adhere to Management Principle 3.)	High	High	High	High	Hunting	Yes	3

Objective 3: Assess health risks and maintain caribou health.

Recovery measure		Priority based on scenarios				Threats or concerns addressed	Herd-specific	Recommended Timeline (year initiated)
		small	declining	stable/increasing	unknown			
3.1	Assess natural and human-caused health risks that limit or influence the population (body condition, disease and parasites, contaminants, and genetic composition, climate change).	Medium	High	Low	Medium	Disease, Parasites	No	4

There are a number of emerging threats to the health of the NMP (e.g. game farming, climate change). These recovery measures are important to document, monitor and track changes in health risks to caribou. Jurisdictions should coordinate development and implementation of standardized protocols for monitoring caribou health (e.g. CARMA). This data could lead to a better understanding of the natural and human-caused health risks that limit or influence the population under different climate change scenarios.
First Nations and communities can contribute to the assessment of health risks to caribou by working with hunters to monitor and/or determine body condition, disease and parasites, contaminants and genetic composition.

Objective 4: Increase understanding of the dynamics of predator-prey systems and potential competition with other herbivores.

Recovery measure		Priority based on scenarios				Threats or concerns addressed	Herd-specific	Recommended Timeline (year initiated)
		small	declining	stable/increasing	unknown			
4.1	Map distribution and census of predators and other large herbivores	High	High	Low	Low	Predation	Yes	5
4.2	Assess the relative importance of predators and/or competitors when identified as a possible limiting factor (e.g. determine if intensive management of other species applicable to the NMP).	Medium	High	Low	Low	Predation	Yes	3

Woodland caribou are often a secondary prey species of wolves and bears where they co-occur with moose. Increasing diversity and abundance of other prey species from reintroductions (e.g. elk and bison) and climate change (e.g. deer) may also increase predation risk to caribou. Competition for food between caribou and other herbivores may also occur if food is a limiting factor. Other ungulates may also transmit disease to caribou populations if habitat overlap occurs. Therefore, it is important to understand the dynamics of this multiple predator-prey system.

3.1.2 Habitat Management

Objective 5: Identify and assess the quality, quantity, and distribution of important habitats.

Recovery measure		Priority based on scenarios				Threats or concerns addressed	Herd-specific	Recommended Timeline (year initiated)
		small	declining	stable/increasing	unknown			
5.1	Delineate key habitats (e.g. winter range, calving grounds, post-calving summer range, rutting range, insect avoidance areas, travel/movement corridors, mineral licks, predator avoidance sites or other locally important sites).	High	High	High	High	Habitat loss, degradation and fragmentation	Yes	3
5.2	Map and evaluate current habitat availability in relation to human footprint, hunting activity, connectivity, fire, forest disease outbreaks, access and development (including seasonal shifts, barriers to movement and overlaps).	Medium	Medium	Low	Low	Habitat loss, degradation and fragmentation	Yes	4

Objective 6: Manage and conserve habitat to support healthy caribou herds.

Recovery measure		Priority based on scenarios				Threats or concerns addressed	Herd-Specific	Recommended Timeline (year initiated)
		small	declining	stable/increasing	unknown			
6.1	Conserve key habitats utilizing existing land designation tools (Appendix 7)	Medium	High	Medium	Medium	Habitat loss, degradation and fragmentation	Yes	3
6.2	Manage human disturbances on caribou and their habitat including mechanized (e.g. off-road vehicles, snowmobiles) and non-mechanized access.	Medium	High	Medium	Medium	Access and disturbance, Habitat loss, degradation and/ or fragmentation	Yes	3

Refer to Appendix 7 for techniques that could be used to conserve caribou habitat.

Objective 7: Promote conservation of the NMP of woodland caribou through environmental and cumulative effects assessment.

Recovery measure		Priority based on scenarios				Threats or concerns addressed	Herd-specific	Recommended Timeline (year initiated)
		small	declining	stable/increasing	unknown			
7.1	Provide input into land and resource use planning forums (e.g. Environmental Assessments /Land Use Planning), including cumulative effects, to maintain caribou populations	Medium	High	Medium	Medium	Habitat loss, degradation and fragmentation	No	Ongoing

3.1.3 Communication and Involvement

Objective 8: Foster opportunities to share knowledge, information and develop education and stewardship programs.

Recovery measure		Priority based on scenarios				Threats or concerns addressed	Herd-specific	Recommended Timeline (year initiated)
		small	declining	stable/increasing	unknown			
8.1	Develop products (e.g. print, web-based) to disseminate information about the NMP and management plan implementation.	Medium	High	Low	Low	Lack of engagement	No	Ongoing
8.2	Develop educational programs (or the adaptation of existing) about caribou.	Medium	High	Low	Low	Lack of engagement	No	Ongoing
8.3	Support and develop stewardship programs and projects (See Appendix 8)	High	High	Low	Low	Lack of engagement	Yes	Ongoing

Refer to Appendix 8 for techniques that could be utilized to promote greater stewardship of caribou.

3.1.4 Responsible Agencies

Table 1. The agencies, governments, boards and councils responsible for each herd comprising the Northern Mountain population of woodland caribou in Canada.

Herd	Federal/ International	Provincial/ Territorial	Boards/Councils	First Nation Governments
Aishihik		YT[1]	YFWMB, ARRC, CRRC	CAFN, LSCFN, KFN, WRFN
Atlin		BC/YT	TRRC, YFWMB	TRTFN, TTC, CTFN
Bonnet Plume		YT/NT	GRRB, DDRRC, MDRRC, YFWMB	TH, NND, Tetlit Gwich'in
Carcross	PCA	BC/YT	YFWMB, TRRC, LRRC. KTC	TTC, TRTFN, CTFN, KDFN, TKC
Chisana	EC/AK	YT	YFWMB, ARRC, DKRRC	WRFN, KFN
Clear Creek		YT	YFWMB, DDRRC	NND, TH
Coal River Nahanni Complex)	PCA	YT/NT	YFWMB	Dehcho First Nation, Acho Dene Koe Band, LFN
Edziza		BC	KTC, KDC, TCC	Tahltan, Kaska Dena
Ethel Lake		YT	YFWMB, MDRRC, SRRC	SFN, NND
Finlay		BC	YFWMB, KDC	Tsay Keh Dene Band, Kaska Dena, TLFN, Treaty 8 First Nations, Nak'azdli Band
Finlayson		YT	TRRC, KTC, KDC, YFWMB	Kaska Dena, TTC
Frog		BC	KTC, KDC, TCC	Kaska Dena, Tahltan, TLFN, Treaty 8 First Nations
Gataga		BC	KTC, KDC	Kaska Dena, Treaty 8 First Nations

Herd	Federal/ International	Provincial/ Territorial	Boards/Councils	First Nation Governments
Hart River		YT	DDRRC, MDRRC	NND, TH
Horseranch		BC	KTC, KDC	LFN, Kaska Dena, TLFN, Treaty 8 First Nations
Ibex		YT	YFWMB	CTFN, KDFN
Klaza		YT	YFWMB, CRRC, SRRC	SFN, LSCFN
Kluane	PCA	YT	YFWMB, ARRC, DKRRC	KFN, WRFN
La Biche (Nahanni Complex)	PCA	YT/NT	YFWMB	Dehcho First Nation, Acho Dene Koe Band, LFN
Laberge		YT	YFWMB, LRRC, TKC	KDFN, TKC, TTC, CTFN
Level-Kawdy		BC	YFWMB, TRRC, KTC, KDC, TCC	Tahltan, TRTFN, TTC, Kaska Dena
Liard Plateau (Crow River)		BC/YT	YFWMB, KTC, KDC	LFN, Treaty 8 First Nations, Kaska Dena
Little Rancheria		BC/YT	TRRC, KTC, KDC, YFWMB	LFN, Kaska Dena, TTC, Treaty 8 First Nations
Moose Lake		YT	MDRRC, SRRC, KDC	Kaska Dena, NND, SFN
Muskwa		BC	KTC, KDC	Treaty 8 First Nations, Kaska Dena,
S. Nahanni (Nahanni Complex)	PCA	YT/NT	SRRB, SDC, KDC, YFWMB	Dehcho First Nation, Acho Dene Koe Band, LFN, Sahtu, Kaska Dena
Pelly		YT	CRRC, KTC, KDC, TKC	LSCFN, Kaska Dena, TKC
Pink Mountain		BC	KTC, KDC	Tsay Keh Dene Band, Kaska Dena, Treaty 8 First Nations
Rabbit		BC	KTC, KDC	Kaska Dena, TLFN,Treaty 8 First Nations
Redstone	PCA	YT/NT	YFWMB, GRRB, SRRB,	NND, Sahtu, Tetlit Gwitch'in, Dehcho

Herd	Federal/ International	Provincial/ Territorial	Boards/Councils	First Nation Governments
			KTC, KDC, MDRRC	First Nation, Kaska Dena
Spatsizi		BC	KTC, KDC, TCC	Tahltan, Tsay Keh Dene, TLFN, Gitxsan, Kaska Dena, Treaty 8 First Nations
Swan Lake (Jennings)		BC	TRRC, KTC, KDC	TTC, Kaska Dena, Tahltan
Tatchun		YT	CRRC, SRRC, KTC, KDC	LSCFN, SFN, Kaska Dena
Tay River		YT	MDRRC, SRRC, KDC	Kaska Dena, NND, SFN
Tsenaglode		BC	KTC, KDC, TCC	Tahltan, Kaska Dena, Treaty 8 First Nations
Wolf Lake		YT	KTC, KDC, TRRC	Kaska Dena, TTC

[1] See Appendix 10 for a list of acronyms.

3.2 Transboundary Coordination

A number of the NMP herds range across the YT-BC, YT-NT, and the YT-Alaska borders, across multiple First Nation traditional territories and onto lands managed by Parks Canada Agency (Table 1). Effective management and conservation will be most readily achieved if jurisdictions coordinate efforts.

Harvest management must consider the potential for varying rates of harvest in accessible populations, where management approaches may not be consistent across jurisdictional boundaries. When herd numbers are lower than what would be expected within the range of natural variation or declining, responsible agencies should discuss, coordinate and monitor the entire harvest and if needed, jointly allocate a sustainable number of permits through government-to-government agreements or a memorandum of understanding.

The relative management priority of the NMP herds between the YT, NT and BC jurisdictions varies. The NMP and Porcupine Caribou herds are both high priorities for all land managers due to their importance to First Nations' peoples and substantial population declines. In the NT, Boreal and Peary caribou are listed as threatened and endangered[6] by SARA and therefore represent a generally higher conservation priority for the territorial government. In BC, woodland caribou management in recent years has been directed more at Boreal caribou and Southern Mountain caribou recovery because these populations are listed as "threatened" by SARA. Different First Nation governments place different priorities on the management of caribou herds that range within their traditional territories. This difference in focus complicates management significantly, but all agencies, jurisdictions and First Nation governments have agreed to establish baseline monitoring for herd size, population trend and seasonal range use, paying particular attention to herds that are road-accessible. In addition, increased cooperation, data sharing, standardization of survey and other monitoring methods, and coordination across borders will ensure that herds can be easily compared to one another.

Northern landscapes are experiencing increasing development pressures and the status of land claims, protected areas planning and land management processes vary across the NT, BC, and YT. Northern BC has unsettled land claims, as do southeast YT and the Dehcho region in the NT. Much of the rest of YT and all other portions of NT (within the range of the NMP) have settled land claims and wildlife management structures (e.g. wildlife management boards, renewable resources councils) are in place. In addition, NT has an active Protected Areas Strategy where YT does not, and BC has a provincial Land Use and Protected Areas planning regime.

Land managers in BC and YT are the provincial, First Nations and territorial governments. In the NT, the federal Department of Indian and Northern Affairs along with the corporations for privately held First Nation lands and Land and Water Boards established under lands claims are the primary land managers for the majority of lands within the range of NMP. Parks Canada Agency manages lands used by NMP that occur within Nahanni National Park Reserve in the NT, Kluane National Park and Reserve and Chilkoot Trail National Historic site in the YT. These varying conditions influence the ways in which trans-border caribou herds can be managed. All agencies and jurisdictions should work cooperatively for the benefit of the NMP and seek ways to use land management tools in complementary ways across their borders.

[6] Peary caribou in the High Arctic and Banks population are listed as "endangered" by SARA. The Low Arctic population of Peary caribou are listed as "threatened".

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5. PERSONAL COMMUNCATIONS

D. Milne, pers. comm. 2008. Planning and Science Supervisor, Wildland Fire Management, Community Services Department, Yukon Government.

S. McNay, pers. comm. 2010. Project manager, Ecologist, Wildlife Infometrics Inc. Mackenzie, British Columbia.

C. Theissen, pers. comm. 2008. Wildlife Biologist, British Columbia Ministry of Natural Resource Operations. Fort St. John, BC.

M. Williams, pers. comm. 2008. Wildlife Biologist, British Columbia Ministry of Natural Resource Operations. Smithers, BC.

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7. APPENDICES

Appendix 1: Terms of Reference for Steering Committee and Technical Working Group

Adopted January 10, 2008

Background:
The Northern Mountain population of woodland caribou was listed as a species of special concern under the federal *Species at Risk Act* (SARA) in January 2005. The Draft Management Plan for the Northern Mountain caribou in Canada will summarize the "state of knowledge" for these herds, including current and historic status, monitoring history, and threats to herds and their habitats. The Draft Management Plan will set out population and habitat goals and objectives, and identify general research/monitoring needs. This overarching plan will be used to guide development of various regional or herd specific plans by the jurisdictions. Some herd specific plans have been previously implemented (e.g. recovery of Yukon Southern Lakes herds), but these were not developed within the context of a management plan for the broader population of Northern Mountain caribou. A formal consultation process will take place once the Draft Management Plan has been posted on the SARA registry.

Mandate:
Under the federal SARA, the Minister of Environment is responsible for preparing a management plan for Northern Mountain population of woodland caribou species, in cooperation with partners that have responsibility for management of lands and wildlife within the range of this population of caribou, and will therefore have a key role in implementing the plan. These partners include Provincial, First Nation and Territorial governments, wildlife Co-management Boards, the Treaty 8 Tribal Association and the Northern Nations Alliance.

The Steering Committee and Technical Working Groups are mandated to collectively develop the content and draft text and of the Draft Management Plan, and provide guidance, relevant information and technical support. In addition, the Steering Committee will assess the adequacy of the Draft Management Plan or interim products developed by the Technical Working Group, in reflecting and addressing concerns regarding status and management of the Northern Mountain population of woodland caribou.

The primary functions:

Steering Committee

- Guide the development of a draft national management plan for the Northern Mountain population of woodland caribou, including overseeing the work of one or more technical working groups established to assist in the development of the Draft Management Plan
- Develop recommendations for the scope and topics to be covered by the Management Plan
- Oversee and guide the technical work required to develop the Management Plan
- Engage in discussions on plan development and provide review and comment on draft components of the Plan as they are developed
- Provide guidance and advice on First Nation and community participation in the plan development, including consistency with policy related to Traditional Knowledge, and on application of Traditional Knowledge where policies are not yet in place

Technical Working Group

- Develop the content of the Draft Management Plan for the Northern Mountain population of woodland caribou in Canada, as directed by the Steering Committee
- Review relevant, available information and assess the information with respect to area covered, span of time, and level of detail
- Identify specific tasks and request direction on those tasks from the working group
- Review and report on threats to and stressors of the population
- Summarize information gaps
- Incorporate comments and suggested changes from the Steering Committee in a timely fashion
- Consult with other interested parties as directed by the Steering Committee
- Facilitate the exchange of information concerning the status and use of the Northern Mountain caribou population and associated habitat
- Other activities as directed by the Steering Committee
- Develop management recovery measures in collaboration with the Steering Committee

General Statements:

- The work of the Steering Committee, Technical Working Group and this Terms of Reference is without prejudice to any party's involvement in treaty negotiations and does not change the rights or responsibilities of any party.
- Participation on the Steering Committee and Technical Working Group does not change the rights, titles or interests of the parties.
- Participation on the Steering Committee and Technical Working Group does not alter the minister's obligation to consult on the draft management plan, once the draft has been posted on the SARA Registry.
- Any Party may withdraw from the Steering Committee or Technical Working Group by giving 2 weeks written notice to the EC Co-chair.

- These terms of reference will apply until the draft plan is submitted.

Structure and Composition:

Membership:
The Steering Committee and Technical Working Group include representatives from co-management boards, First Nation governments, and federal, territorial and provincial governments. The Steering Committee will function as a government-to-government forum to ensure the interests of all represented governments are addressed. Moreover, members can make or bring about decisions and commitments on behalf of their governments.

Steering Committee	Technical Working Group
Gwich'in Renewable Resource Board	Taku River Tlingit First Nation
Champagne and Aishihik First Nations	First Nation of Na-cho Nyäk Dun
Taku River Tlingit First Nation	Gwich'in Renewable Resource Board
Tr'ondëk Hwëch'in	Sahtu Renewable Resource Board
Kwanlin Dun First Nation	Yukon Fish and Wildlife Management Board
Carcross Tagish First Nation	Carcross Tagish First Nation
Little Salmon Carmacks First Nation	Treaty 8 Tribal Association
Treaty 8 Tribal Association	Northern Nations Alliance
Northern Nations Alliance	Environment Canada– NWT
Liard First Nation	Environment Canada– Yukon
White River First Nation	Parks Canada Agency
Teslin Tlingit Council	Government of Yukon
Ross River Dena Council	Government of the Northwest Territories
Environment Canada	Government of British Columbia
Parks Canada Agency	
Government of Yukon	
Yukon Fish and Wildlife Management Board	
Government of the Northwest Territories	
Government of British Columbia	
Ross River Dena Council	
Ta’an Kwäch’än Council	

Co-chairs:

The Steering Committee will have 6 Co-chairs, who would be tasked with leading/ coordinating different aspects of the plan (e.g. one chair focusing on goals and objectives, one on communications planning etc.). This structure will ensure the time input from committee members is applied in the most efficient manner. The Technical Working Group will have 2 Co-chairs, who will coordinate input from working group members.

The Co-chairs are:
Brian Pelchat - Environment Canada
Dan Cresswell - Northern Nations Alliance
Gerry Kuzyk - Government of British Columbia

Graham Van Tighem - Yukon Fish and Wildlife Management Board
Jason Lee - Treaty 8 Tribal Association
Karen Clyde - Government of Yukon
Tom Jung - Government of Yukon
Wendy Nixon - Environment Canada

Responsibilities of Co-chairs:

The Co-chairs of the Steering Committee and Technical Working Group will encourage all members of their respective working groups to engage in development of the Draft Management Plan. The Co-chairs will facilitate the activities of the Steering Committee and Technical Working Group through the following activities for each group respectively:

- Set a schedule of conference calls
- Collaboratively develop the topics and agendas for meetings
- Chair the meetings
- Ensure that tasks and recovery measures identified are completed
- Engage members in focus groups
- Be responsible for the timely distribution of information to members.
- Be responsible for ensuring notes of all meetings are recorded and distributed to members for comment prior to providing a finalized record of the meeting

The Co-chairs will hold meetings and discussions as needed to coordinate activities and achieve tasks as directed by the Steering Committee.

Responsibilities of Members:

Steering Committee

- Members will make a concerted effort to attend all meetings of the Steering Committee and review and comment on materials in a timely manner, as well as contribute to the work of the broad Steering Committee and specific focus groups
- If an alternate is identified, the member is responsible for exchange of information between herself/himself and the alternate, both prior to and following a meeting
- The members of the Steering Committee will be responsible to inform their respective governments (First Nation, Federal, Provincial or Territorial) on the Steering Committee activities, provide independent assessment of the Management Plan progress and content to their decision-makers and constituents, and seek

Technical Working Group

- Members will make a concerted effort to attend all meetings of the Technical Working Group and review and comment on materials in a timely manner, and contribute to the work of the Technical Working Group
- Members will confer with Steering Committee Members and/or their respective managers/directors on an ongoing basis to keep them informed of the draft plan progress

direction as representatives of their respective Governments on the Steering Committee

Operating Procedures:
Meetings will be primarily by conference call. Each jurisdiction is responsible for providing the support necessary for the participation of its representative at meetings. Members may seek options to supplement available funds to support the planning process, and an effort will be made to assist First Nations that do not have funding through land claims agreements, to ensure their effective participation. If funding is obtained, face to face meetings will be scheduled in northern B.C. and in Yukon.

Decision Making:
The Steering Committee and Technical Working Group will make decisions through consensus by those attending the meetings, and will focus on the goal to "Maintain self-sustaining healthy populations in historic range, and ensure continued use and appreciation of caribou, and maintain habitat in a healthy state to support these populations". If consensus cannot be reached, the Steering Committee will use its best efforts to resolve any dispute, and will be guided by a spirit of cooperation and mutual respect and by an understanding of each other's objectives with respect to this Terms of Reference. If points arise that the Steering Committee and Technical Working Group cannot agree on, then senior level managers or executives will be engaged to address these points.

Timelines/Workplan:
Environment Canada has indicated the goal is to complete the Draft Management Plan by spring, 2008. The Steering Committee and Technical Working Group will endeavour to meet this timeline, but will not compromise the integrity of the process or the product to do so.

The Steering Committee and Technical Working Group will develop a workplan by November 30, 2007 that sets out the tasks for developing the Draft Management Plan.

Revisions to the workplan can be proposed by any member for consideration of the Steering Committee or Technical Working Group, and a consensus will be sought on the proposed revisions.

Appendix 2: Population and Trend Estimates for Northern Mountain Population Herds as of 2009.[1]

Herd	Jurisdiction	Traditional Territory	Population Estimate	Last surveyed	Previous Survey Year	Confidence in Estimate[2]	Survey technique[3]	Trend	Confidence in Trend[4]
Aishihik	YT	CAFN, LSCFN, KFN, WRFN	2044	2009	1998	High	Mark/resight	Increasing	High
Atlin	BC/YT	TRTFN, TTC, CTFN	800	2007	1999	High	SRQ	Stable[5]	Moderate
Bonnet Plume	YT/NT	TH, NND, Tetlit Gwich'in	5000	1982	None	Low	Estimate	Unknown	N/A
Carcross	BC/YT/PCA	TTC, TRTFN, CTFN, KDFN, TKC	775	2008	2003	High	SRQ	Stable	High
Chisana	YT/AK/EC	WRFN, KFN	766	2007	2005	High	Mark/resight	Stable	High
Clear Creek	YT	NND, TH	900	2001	None	High	SRQ	Unknown	N/A
Coal River (Nahanni Complex)	YT/NT/PCA	Dehcho First Nation, Acho Dene Koe Band, LFN	450	1997	N/A	Low	Estimate	Unknown	N/A
Edziza	BC	Tahltan, Kaska Dena	175	2005	N/A	Moderate	TC	Unknown	N/A
Ethel Lake	YT	SFN, NND	300	1993	None	High	SRQ	Stable	Moderate
Finlay	BC	Tsay Keh Dene Band, Kaska Dena, Treaty 8 First Nations, Nak'azdli Band	26	2002	2001	Low	SRQ	Decreasing	High
Finlayson	YT	Kaska Dena, TTC	3100	2007	1986, 1991, 1996, 1999	High	SRQ	Decreasing	High
Frog	BC	Tahltan, Kaska Dena, Treaty 8 First Nations	150	2000	Unknown	Low	Estimate	Unknown	N/A
Gataga	BC	Kaska Dena, Treaty 8 First Nations	338	2001	Unknown	Low	Estimate	Unknown	N/A
Hart River	YT	NND, TH	2133	2006	None	High	Mark/resight	Unknown	N/A
Horseranch	BC	LFN, Kaska Dena, Treaty 8 First Nations	600	1999	1998	High	SRQ	Unknown	N/A

Herd	Jurisdiction	Traditional Territory	Population Estimate	Last surveyed	Previous Survey Year	Confidence in Estimate[2]	Survey technique[3]	Trend	Confidence in Trend[4]
Ibex	YT	CTFN, KDFN	850	2008	2003	High	SRQ	Increasing	High
Klaza	YT	SFN, LSCFN	650	2000	1996	Moderate	TC	Increasing	Moderate
Kluane	YT/PCA	KFN, WRFN	180	2009	2003	Moderate	TC	Decreasing	Moderate
La Biche (Nahanni Complex)	YT/NT/PCA	Dehcho First Nation, Acho Dene Koe Band, LFN	400	1993	N/A	Low	Estimate	Unknown	N/A
Laberge	YT	KDFN, TKC, TTC, CTFN	200	2003	ND	High	SRQ	Unknown	N/A
Level-Kawdy	BC	Tahltan, TRTFN, TTC, Kaska Dena	1500	1999	1998	Moderate	TC	Unknown	N/A
Liard Plateau (Crow River)	BC/YT	LFN, Treaty 8 First Nations, Kaska Dena	150	2005	none	Low	TC	Unknown	N/A
Little Rancheria	BC/YT	LFN, Kaska Dena, TTC, Treaty 8 First Nations	1000	1999	1988	High	SRQ	Increasing	High
Moose Lake	YT	Kaska Dena, TTC, Tahltan	200	1991	none	Moderate	TC	Unknown	N/A
Muskwa	BC	Treaty 8 First Nations, Kaska Dena,	1250	2000	Unknown	Low	Estimate	Unknown	N/A
S. Nahanni (Nahanni Complex)	YT/NT/PCA	Dehcho First Nation, Acho Dene Koe Band, LFN, Sahtu, Kaska Dena	2105	2009	2001	High	Mark/resight	Unknown	N/A
Pelly	YT	LSCFN, Kaska Dena, TKC	500	2002	Unknown	Low	Estimate	Unknown	N/A
Pink Mountain	BC	Tsay Keh Dene Band, Kaska Dena, Treaty 8 First Nations	850	2000	1996	High	SRQ	Unknown	N/A
Rabbit	BC	Kaska Dena, Treaty 8 First Nations	1300	2007	N/A	Moderate	TC	Unknown	N/A

Herd	Jurisdiction	Traditional Territory	Population Estimate	Last surveyed	Previous Survey Year	Confidence in Estimate[2]	Survey technique[3]	Trend	Confidence in Trend[4]
Redstone	YT/NT/PCA	NND, Sahtu, Tetlit Gwitch'in, Dehcho First Nation, Kaska Dena	5-10,000	1997	N/A	Low	Estimate	Unknown	N/A
Spatsizi	BC	Tahltan, Tsay Keh Dene, Takla Lake, Gitxsan, Kaska Dena, Treaty 8 First Nations	3000	1996	N/A	Moderate	TC	Unknown	N/A
Swan Lake (Jennings)	BC	TTC, Kaska Dena, Tahltan	400	2005	N/A	Moderate	TC	Unknown	N/A
Tatchun	YT	LSCFN, SFN, NND, Kaska Dena	500	2000	None	Moderate	TC	Stable	Moderate
Tay River	YT	Kaska Dena, NND, SFN	3750	1991	none	High	SRQ	Stable	Low
Tsenaglode	BC	Tahltan, Kaska Dena, Treaty 8 First Nations	200	1999	N/A	Moderate	Estimate	Unknown	N/A
Wolf Lake	YT	Kaska Dena, TTC	1400	1998	1993	High	SRQ	Stable	Moderate

[1] See Appendix 10 for list of acronyms.
[2] The degree of confidence in these population estimates is based on estimation methodology. Confidence is "low" for estimates based on educated guesses, because they are subjective and not based on a quantitative analytical framework. Confidence is "moderate" for estimates based on total counts, because they are based on empirical observations but are not founded on an objective quantitative framework. Confidence is "high" for population estimates based on objective statistical models (adjusted counts, stratified random quadrats), because they are objective, repeatable, and based on quantitative data.
[3] AC = adjusted count, SRQ = stratified random quadrat, TC = total count, N/A = not applicable, Estimate = based on best available knowledge.
[4] Confidence in trend is based on the degree of confidence in the most recent population estimate as well as previous estimates; clear trends are difficult to ascertain and only exist when several sequential high quality population estimates are available. Confidence designations (high, moderate and low) are subjective classifications only. If the trend is unknown, then a measure of confidence is not applicable.
[5] The TRTFN and BC Ministry of Environment estimate that the Atlin herd is in "probable decline" due to chronic low calf recruitment and large confidence intervals around 2007 population estimate (Taku River Tlingit First Nation and British Columbia 2009).

Appendix 3: Herd Specific Details and Known Potential Threats

The following is a summary of perceived threats and stressors to individual NMP herds. Threats and stressors for the NMP herds were obtained by surveying hunters, managers, First Nations' peoples, community members, biologists, and others within the range of this population. Approximately 300 people were contacted and more than 180 people were surveyed in 2008. Information on mineral exploration, oil and gas, and placer mining were also updated to reflect activity up to December 2009. This section was informed by that research.

Although good information exists about government regulated harvest, little or no information is available for subsistence harvest and poaching. Survey respondents identified predation as an issue across the range of the NMP so it was included as one of the overall limiting factors for the NMP (see Section 1.4.3). As some of the threats and stressors may be mitigated through habitat protection, this section also notes if a significant amount of the herd's range is within a protected area.

Aishihik (YT)
The hunting of bison (*Bison bison*) in winter has brought an increase in the number of people and snow machines to an otherwise relatively undisturbed landscape. There is potential for snow machine trails to increase the travel and hunting efficiency of wolves. A widespread spruce bark beetle (*Dendroctonus rufipennis*) infestation may have altered habitat and raises the possibility of widespread fire. Winter ticks have recently been found on elk (*Cervus elaphus*) in the area, and the elk may act as a dispersal mechanism for ticks to adjacent caribou herds. There has been little mineral exploration in recent years.

Atlin/ Atlin East (BC)
The Taku River Tlingit First Nation (TRTFN) have enacted a voluntary ban on harvesting Atlin caribou as part of their involvement in the Southern Lakes Caribou Recovery Program. The BC Ministry of Environment offers a limited entry hunt for resident hunters and a quota system for non-resident hunters on the herd (bulls only). The number of hunting licenses has been reduced in recent years and an allowable annual harvest has been determined for the herd in cooperation with the TRTFN. There is easy access into the alpine and other parts of the winter range via mining roads, which are being used increasingly by snowmobilers. Other potential threats include predation, recreation, industry, and habitat loss (both direct and indirect). Increased road access due to mine exploration and development remains a potential concern. The development of an open-pit molybdenum mine in Ruby Creek (24 km northeast of Atlin), owned by Adanac Molybdenum Corporation, has been suspended since 2010.

Bonnet Plume (YT/NT)
A census has not been conducted on this herd but biologists believe that it may be one of the largest within the NMP. Mineral exploration has taken place within the YT portion of the herd's range near mapped key habitats. There was a one-year interim moratorium

on new mineral staking (2010-2011) until the Peel land use planning process was completed. While there have been acquisitions of oil and gas rights in the Peel Plateau, north of the Bonnet Plume herd area, there has been no exploration in the area of the herd. The closest exploration activities have been at Eagle Plains, more than 150 km away from the northern boundary of the herd.

Carcross/ Atlin West (YT/BC)
The herd is under constant pressure as it ranges in areas of high human density that are frequently interrupted and fragmented by residential, recreational and industrial developments and associated access. The herd has been intensively managed (subject to more than a decade of recovery efforts) and is considered stable. There is a possibility of natural gas pipeline development through this range. There is sporadic mineral exploration in the area. The Skukum Gold property had underground exploration and was shut down in 2008. Decades of fire suppression have increased the possibility of an intense fire that would alter habitat. The continued high density of human activity within this herd's range may necessitate continued intensive management. Some of the herd's range is protected within the Chilkoot Trail National Historic Site.

Chisana (YT/AK)
With very low recruitment, this internationally ranging herd experienced a long and steady decline from 1990 to 2003. Intensive management, initiated by White River First Nation, that included a four-year captive rearing program as well as legislated and voluntary harvest ban, has brought population numbers up to approximately 700-750. There is little harvesting or human influence on this herd as it ranges mostly inside Kluane Wildlife Sanctuary and the Wrangell-St. Elias National Park and Preserve in Alaska. However, forage conditions, predation, and road kill (data for Canada only) may have contributed to the herd's decline.

Clear Creek (YT)
The herd is deemed to be relatively secure as human harvest is thought to be small and there has been strong community support for management. However, the herd is easily accessible, there is potential for future industrial development. There are active placer mining claims and mineral exploration in the herd's range.

Edziza (BC)
There are thought to be few human-based threats as there is limited access to the herd and its range is within Mount Edziza Provincial Park. Natural stressors and the small size of the herd may be cause for concern**.**

Ethel Lake (YT)
This herd has had persistently low recruitment for the past decade and is a relatively small herd (~300). For these reasons the herd has had a voluntary hunting closure. A large part of the winter range was affected by fire in 2005, with associated loss of forage and habitat. It will be some time before caribou use these burned areas in winter.

Finlay (BC)
The Finlay herd experienced a steep decline largely due to human caused habitat change related to the Williston Dam, encroachment of industry, recreation activities and associated access. Predation may also have contributed to the decline of the herd but has become less of a factor in recent years.

Finlayson (YT)
The Robert Campbell Highway and associated access roads have resulted in easy access to winter range and summer/fall range, with resulting increase in harvest pressure. Hunting quotas and limits have been in effect for resident hunters and outfitters since 1998. There is First Nation harvesting of the herd. It is expected this herd will require ongoing harvest management. There are a number of substantial mineral exploration projects in the herd's range (including the Mac Tung project). The Wolverine mine and access road is anticipated to be active for five to seven years, with reclamation of site and access afterwards.

Frog (BC)
The herd is in a remote location, within the Muskwa-Kechika Management Area. It likely experiences few human-caused threats although there is potential for oil and gas development. A change in the extent of deep winter freezing and the subsequent northward extension of mountain pine beetle (*Dendroctonus ponderosae*) could change habitat.

Gataga (BC)
The herd is found in a remote location, within the Muskwa-Kechika Management Area. Human-based threats are likely minimal, although there is a limited annual harvest and potential for oil and gas development. A change in the extent of deep winter freezing and the subsequent northward extension of mountain pine beetle could change habitat.

Hart River (YT)
Winter harvest may be an issue. It is of particular concern if hunting regulations for Porcupine caribou persist. The range of the Porcupine caribou herd (Grant's caribou) overlaps with the Hart River (NMP) herd in some years. When this occurs the Hart River herd is exposed to an incidental harvest by those hunting the more liberally regulated Porcupine caribou herd. Ingress from the Porcupine caribou herd needs to be determined and annual adjustment of hunting seasons based on monitoring of collared animals needs to be continued. Recreational activity has increased in the last few years and there is potential for industrial development.

Horseranch (BC)
The herd is accessible for harvesting on its winter range. There is some logging on the eastern side of the range with mineral development, increasing road access, and use of off-road vehicles occurring in the fall range. Frequent small fires constitute a natural disturbance regime that is maintaining the forest habitat. There is a possibility of natural gas pipeline development through this range.

Ibex (YT)
There have been 13 years of a voluntary harvest ban, supported by the Southern Lakes Caribou Recovery Program's Game Guardian initiative. However, this program has only been funded in winter/spring. The herd's range has been reduced by the activities and developments (e.g. housing, road building and agriculture) associated with Whitehorse's significant human population. Recently, off-road vehicle traffic and recreational activity (e.g. snowmobile and dog mushing activities) have increased within the range.

Klaza (YT)
Activity associated with winter bison hunting may be a source of disturbance to this herd. There is very active seasonal mineral exploration and placer mining activity in the area. The hard rock Minto mine and Carmacks Copper exploration project are near or adjacent to the herd's range. There is also an extensive access network associated with these developments. If the Casino Mine is developed, a new year-round road would bisect the herd's range. Fire has altered traditional winter range but there is still much intact winter habitat.

Kluane/Burwash (YT)
There is very low harvest pressure here, but the Alaska Highway and numerous access roads related to mineral exploration intersect its range. Only a small portion of their range has been impacted by spruce bark beetle (*Dendroctonus rufipennis)* over the last decade; however, these areas represent an increased fire risk associated with standing dead spruce. Some of the range is within Kluane National Park and Reserve.

Laberge (YT)
The herd is relatively isolated. However, there are a few off-road vehicle trails and there is modest hunting pressure in parts of the range. There is some concern that a growing elk herd may displace caribou. A large recent burn has altered much of the range of this herd.

Level-Kawdy (BC)
There may be some overlap with the Atlin herd in the fall. Overlap also occurs with the Horseranch and Little Rancheria herds. It is an isolated herd so human-caused threats are few, however there is potential for coalbed methane development around Tuya Lake. This may pose a potential threat if development occurs.

Liard Plateau/Crow River (BC)
An average of 4.3 bulls per year were harvested by licensed hunters from the herd between 2004 and 2006 (2.9 percent of the total surveyed population). Low numbers of large bulls seen during the 2005 survey may suggest the harvest rate is too high. This herd is in a remote area but there is potential for oil and gas development and associated access issues. There is an active gas plant close by. This herd is considered vulnerable to disturbance since its range appears to be restricted to a very small plateau.

Little Rancheria (BC/YT)
The Alaska Highway goes through the herd's winter range and as many as 12 to 15 caribou are killed annually on the road. In the past, there has been some logging in key winter range; however, there has been no commercial forest harvesting in this area since the late 1990's. Currently, a proposed forest harvest plan, prepared by the Kaska Forest Resources Stewardship Council for 2003-2007, zones the ranges of the Rancheria, Finlayson and Tay River herds as special management areas. This plan includes limits on forestry activities in winter ranges and in migration corridors. Surveys results suggest recreation may also be a concern. There is a possibility of natural gas pipeline development through this range.

Moose Lake (YT)
This herd overlaps the range of the Tay Lake herd, although there is likely little interchange of animals. Harvest is minimal, but the herd may be vulnerable due to its small size.

Muskwa (BC)
The Muskwa herd ranges within the Muskwa-Kechika Management Area. Human threats are probably minimal although there is an annual licensed harvest of 20 (population estimate = 1250). There is a history of wolf control which is no longer active. Prescribed burning in the area may have reduced available forage for caribou while increasing the moose population and thereby increasing predator presence. There is some potential for recreation and access to become issues.

Nahanni Complex (NT/YT)
There is uncertainty about the designation of the Coal River, La Biche and South Nahanni herds and there is discussion about managing these herds together as the Nahanni herd complex.

Coal River
The Nahanni Range Road which provides access to Tungsten and Howard's Pass, NT, intersects the range of this herd complex. There is potential for industrial disturbance and associated access issues such as increased harvest. The herd's winter range is primarily within the boundaries of Nahanni Nationa Park Reserve. Additional stressors could include activities associated with the Prarie Creek Mine, which is located at the northeast edge of the herd's winter range.

La Biche
There are two producing natural gas wells, a gas plant and an existing pipeline in the area. There is potential for further petroleum exploration in the range of the La Biche herd. Further development may result in increased access in the range of the herd. Harvest is assumed to be low. The herd's winter range is primarily within the coundaries fo the Nahanni National Park Reserve. Additional stressors could include activities associated with the Prarie Creek Mine, which is located at the northeast edge of the herd's winter range.

South Nahanni

There is considerable access to the herd via the Nahanni Range Road to Tungsten, NT, and the associated road network towards Howard's Pass, Lenid Creek and trails along the YT/NT border. Additional access into the herd's range is from the southeast into the Prairie Creek mine in NT. The mine is surrounded by the expanded Nahanni National Park Reserve. It is currently permitted for exploration and development of zinc, lead and silver, but permits for mine operations are pending. Amendments to the Canada National Parks Act allow for a mining access road, storage sites and other facilities connected with that road to be built within the national park to the Prairie Creek Area.

The possibility of overharvest in the South Nahanni has prompted a multi-year study on the herd. The herd's summer/fall range is divided into two groups: a southern group in and around Nahanni National Park Reserve, and a northern group north of the Cantung mine along the YT/NT border. There is an increasing amount of mineral exploration activity occurring in this area that may further increase access and disturbance to the herd. Survey respondents identified concerns regarding potential development increasing hunting access and the potential of habitat loss.

The Cantung mine located at Tungsten, NT, became active in the fall of 2010, and advanced exploration with a proposed operation mine for 2010 at Howard's Pass has recently activated the Howard's Pass Road from Tungsten. Both developments occur within the herds range. Most of the herd's winter range is currently protected by Nathanni National Park Reserve.

Pelly (YT)

This relatively isolated group is thought to be a conglomeration of herds including animals near Laberge, throughout the Livingstone area, at Quiet and Little Salmon-Magundy Lakes. There has been no census of this herd. Survey results identified concerns about potential industrial development and increased access.

Pink Mountain (BC)

Industrial development has reduced range use on the east foothills and may be a future concern throughout the range. Prescribed burning has increased moose numbers, which has likely increased incidental wolf predation on caribou. Wolves rebounded following control in the 1980s and there is high caribou calf predation by wolverine. Interactions with other large herbivores and associated predators are not well understood.

Rabbit (BC)

The herd is in a remote location, within the Muskwa-Kechika Management Area. Human-based threats are probably minimal, although there is a limited annual harvest and some potential for oil and gas development. A change in the extent of deep winter freezing and the subsequent northward extension of mountain pine beetle could change habitat.

Redstone (NT/YT)
The North Canol Road provides limited access with some associated hunting pressure. About 300 caribou per year are harvested in the NT and about 100-200 per year in YT. There is concern that this may be too much hunting pressure given that population size and trends are unknown. Local knowledge suggests hunting pressure may be increasing due to decreasing barren-ground caribou populations. There has also been increased seismic exploration in NT and there are mineral interests at MacMillan Pass. The development plan for the MacTung property at MacMillan Pass aims for mine production in 2012, although delays are likely. Plans to upgrade the Canol Road in YT may lead to increased harvest pressures and disturbance due to construction and transportation of ore. Survey respondents indentified concerns about habitat destruction and overhunting on the Canol Road. Additionally, caribou in proximity to the Prairie Creek mine in NT are thought to be part of the Redstone herd. The mine is surrounded by the expanded Nahanni National Park Reserve. The Reserve is currently permitted for exploration and development of zinc, lead and silver, but permits for mine operations are pending. Amendments to the Canada national Parks Act allow for a mining access road, storage sites and other facilities connected with that road to be build within the national park to the Prairie Creek Area. As once-remote areas become less remote, increased monitoring and management will be needed for the herds found in both the NT and YT regions of the Mackenzie Mountains. Some of the herd's range is protected by the new Nahanni National Park Reserve boundary. The proposed Naats'ihch'cho National Park will protect an additional part.

Spatsizi (BC)
Hunting is managed conservatively under a limited entry hunt. There are few threats to this herd because most of its range of the Spatsizi herd is protected within Spatsizi Plateau Wilderness Provincial Park.

Swan Lake/ Jennings (BC)
Vehicle collisions may be an issue when the herd winters close to the Alaska Highway. The herd is subject to some human disturbance such as recreational snow machining.

Tatchun (YT)
High harvest is a concern. Currently, there is little industrial activity in the range of this herd. More than 70 percent of the winter range was burned with major fires in 1958, 1969, 1995, 1998 and 2005. Caribou are using new areas as a result. This herd would benefit from fire management in the Frenchman and Tatchun Lakes area.

Tay River (YT/NT)
There are few human-based threats to the herd because its range is in a remote location with little access. However, it is likely to experience increased access due to mineral interests at YT/NT border.

Tsenaglode (BC)
From November to March the herd is accessible along Highway 37 and all-terrain vehicles are accessing alpine areas which facilitates hunting. There is some mineral exploration in the winter range.

Wolf Lake (YT)
This herd is relatively isolated and is considered to be naturally regulated. Some people are concerned about potential industrial development creating access. Increased access would likely result in increasing harvest pressure and the need for additional harvest management.

Appendix 4: Monitoring and Management History of Northern Mountain Caribou Herds in British Columbia, Yukon and Northwest Territories up to 2009.

Herd (other known/historical names in brackets)	Previous Recovery Measures	Total Number of Females Radio-collared Over the Past 20 Years	Number of Females Radio-collared	Total Number of Bulls Radio-collared Over the Past 20 Years	Number of Bulls Radio-collared	Total Number of Calves Radio-collared Over the Past 20 Years	Overall Confidence in the Knowledge of the Herd[1] (1 - Low; 5 - Strong)
Aishihik	Wolf control (1993-1997)	77	0	13	0	Not specified	4
Atlin (Atlin East)	No	40 (?)	0	0	0	0	4
Bonnet Plume	No	0	0	0	0	0	2
Carcross (Atlin West)	Licensed harvest ban 1994-2007; Voluntary harvest ban 1992-2007	48	6 GPS, 2 VHF	2	0	0	5
Chisana	Captive rearing (2001-2004)	264	120-VHF	0	0	95	4
Clear Creek	No	22	0	0	0	0	4
Coal River (Nahanni Complex)	No	20	7 satellite	0	0	0	2
Edziza	No	2	0	0	0	0	2
Ethel Lake	No	8	0	4	0	0	5
Finlay	No	27	Unknown	19	0	11	3
Finlayson	Wolf control (1983-1989)	51	2 satellite	4	0	0	5
Frog	Wolf control 1980s	55 total for Frog and Gataga	0	0	0	Not specified	2

Herd (other known/historical names in brackets)	Previous Recovery Measures	Total Number of Females Radio-collared Over the Past 20 Years	Number of Females Radio-collared	Total Number of Bulls Radio-collared Over the Past 20 Years	Number of Bulls Radio-collared	Total Number of Calves Radio-collared Over the Past 20 Years	Overall Confidence in the Knowledge of the Herd[1] (1 - Low; 5 - Strong)
Gataga	Wolf control 1980s	55 total for Frog and Gataga	0	0	0	Not specified	2
Hart River	No	77	37 VHF	2	0	0	5
Horseranch	No	42	0	1	0	0	3
Ibex	Licensed harvest ban 1994-2007,;Voluntary harvest ban 1992-2007	21	9 VHF	2	0	0	4
Klaza	Wolf control (1993-1997 mainly Aishihik)	42	0	1	0	0	4
Kluane (Burwash)	Wolf Control (1993-1997; mainly Aishihik)	35	0	1	0	Not specified	3
La Biche (Nahanni Complex)	No	4	1 satellite	0	0	0	2
Laberge	Licensed harvest ban 1994-2007;Voluntary harvest ban 1992-2007	11	4 VHF	0	0	0	2
Level-Kawdy	No	3	0	0	0	0	2
Liard Plateau (Crow River)	Wolf control 1970's; satellite collars on 3 cows 2002	3	0	0	0	0	3
Little Rancheria	No	11 in 1980s (YT); ca 30 in late 1990s (BC)	0	0	0	0	4
Moose Lake	No	4	0	0	0	0	2

Herd (other known/historical names in brackets)	Previous Recovery Measures	Total Number of Females Radio-collared Over the Past 20 Years	Number of Females Radio-collared	Total Number of Bulls Radio-collared Over the Past 20 Years	Number of Bulls Radio-collared	Total Number of Calves Radio-collared Over the Past 20 Years	Overall Confidence in the Knowledge of the Herd[1] (1 - Low; 5 - Strong)
Muskwa	Wolf control 1980s	46	0	0	0	Not specified	3
Pelly	No	52	0	0	0	0	2
Pink Mountain	Wolf control 1980s	80	0	0	0	50	4
Rabbit	Wolf control 1980s	0	0	0	0	Not specified	2
Redstone	No	10	0	0	0	0	1
South Nahanni (Nahanni Complex)	No	100	30 satellite[2]	0	0	0	3
Spatsizi	No	0	0	0	0	0	2
Swan Lake (Jennings)	No	28	16 VHF	0	0	0	3
Tatchun	No	24	0	0	0	0	4
Tay River	No	23	0	0	0	0	3
Tsenaglode	No	0	0	0	0	0	1
Wolf Lake	No	67	0	6	0	0	3

[1]The overall confidence in the knowledge of the herd was determined by local experts/biologists based on quality and quantity of applicable data.
[2]30 collars were put on what was believed to be caribou from the South Nahanni herd but the animals went on to calve with other herds.

Appendix 5: Summary of Survey Results of Northern Mountain Caribou Herds in British Columbia, Yukon and Northwest Territories.

Herd (other known/historical names in brackets)	Number of Surveys Conducted Over the Past 20 Years	20 Year Population Trend	General Risk to the Population due to Small Size and/or Geographic Isolation[2]	Maximum Recruitment Rate over the Past 5 Years (calf/100 cows; season)	Number of Annual Recruitment Rates Estimated Over the Past 20 Years	Average Adult Sex Ratio Over the Past 5 Years (#females per male)	Average % Females in Total Known Harvest Over the Past 5 Years[5]	Average Reported Harvest Level Over the Past 5 years (#harvested/yr)
Aishihik	3	Increasing	Low	32.9 Fall	17	2.16	0	12
Atlin (Atlin East)	5	Stable[1]	Low	25 Late winter	3	Unknown	0	29
Bonnet Plume	0[3]	Stable[6]	Low	37.8 Fall	19	1.17	0	42
Carcross (Atlin West)	3	Stable	Medium	29.7 Fall	14	1.98	0	2
Chisana	4	Stable	Medium	25.5 Fall	17	3.178	0	0
Clear Creek	1	Unknown	Low	48.9 Fall	4	2.303	Unknown	11
Coal River (Nahanni Complex)	0	Unknown	Unknown	12 Fall	2 fall composition counts	2.94	Unknown	11
Edziza	1	Unknown	Low	Unknown	0	Unknown	Unknown	2
Ethel Lake	1	Stable[4]	Medium	25.5 Fall	13	2.54	0	<1
Finlay	5	Decreasing	Low	Unknown	0	Unknown	50%	2-5

Herd (other known/historical names in brackets)	Number of Surveys Conducted Over the Past 20 Years	20 Year Population Trend	General Risk to the Population due to Small Size and/or Geographic Isolation[2]	Maximum Recruitment Rate over the Past 5 Years (calf/100 cows; season)	Number of Annual Recruitment Rates Estimated Over the Past 20 Years	Average Adult Sex Ratio Over the Past 5 Years (#females per male)	Average % Females in Total Known Harvest Over the Past 5 Years[5]	Average Reported Harvest Level Over the Past 5 years (#harvested/yr)
Finlayson	4	Decreasing	Medium	30.5 Fall	24 fall classification counts	2.26	>50%	60-90
Frog	1	Unknown	Medium	Unknown	1	Unknown	0	Unknown
Gataga	1	Unknown	Medium	Unknown	1	Unknown	0	Unknown
Hart River	1	Unknown	Low	29.4 Fall	2	2.424	Unknown	34
Horseranch	3	Unknown	Low	33 Late winter	6	Unknown	Unknown	15
Ibex	3	Increasing	Medium	39.7 Fall	17	2	0	2
Klaza	2	Increasing	Low	30 Fall	12	2.479	Unknown	5
Kluane (Burwash)	2	Unknown	Medium	36 Fall	17	2.34	0	0
La Biche (Nahanni Complex)	0	Unknown	Unknown	Unknown	1 fall composition count	Unknown	0	<1
Laberge	1	Unknown	Medium	21.8 Fall	4	2.76 (1 year)	0	0
Level-Kawdy	2	Unknown	Low	Unknown	0	Unknown	Unknown	65

Herd (other known/historical names in brackets)	Number of Surveys Conducted Over the Past 20 Years	20 Year Population Trend	General Risk to the Population due to Small Size and/or Geographic Isolation[2]	Maximum Recruitment Rate over the Past 5 Years (calf/100 cows; season)	Number of Annual Recruitment Rates Estimated Over the Past 20 Years	Average Adult Sex Ratio Over the Past 5 Years (#females per male)	Average % Females in Total Known Harvest Over the Past 5 Years[5]	Average Reported Harvest Level Over the Past 5 years (#harvested/yr)
Liard Plateau (Crow River)	0	Unknown	High	19.6 Fall	1 fall classification count	3.88 (1 year)	0	5
Little Rancheria	2	Increasing	Low	41 Fall	8 fall classification counts	2.63 (2 yrs)	<30%	50
Moose Lake	1	Unknown	Medium	No surveys past in 5 years	1	no surveys in past 5 yrs	Estimate <20%	Unknown
Muskwa	2	Unknown	Low	Unknown	2	Unknown	0	Unknown
Pelly	2	Unknown	Medium	21.5 Fall	2	2.52 (1 year)	Unknown	12
Pink Mountain	5	Unknown	Medium	Unknown	5	Unknown	0	8
Rabbit	1	Unknown	Low	Unknown	0	Unknown	0	Unknown
Redstone	0	Stable[7]	Low	60.9 Fall	19	3.73	Estimate 30%	260
South Nahanni (Nahanni Complex)	1	Unknown	Unknown	17.4 Fall	7 fall composition counts	Unknown	Unknown	13
Spatsizi	1	Unknown	Low	Unknown	0	Unknown	Unknown	44
Swan Lake (Jennings)	1	Unknown	Low	42 Late winter	1	2.78	Unknown	10

Herd (other known/historical names in brackets)	Number of Surveys Conducted Over the Past 20 Years	20 Year Population Trend	General Risk to the Population due to Small Size and/or Geographic Isolation[2]	Maximum Recruitment Rate over the Past 5 Years (calf/100 cows; season)	Number of Annual Recruitment Rates Estimated Over the Past 20 Years	Average Adult Sex Ratio Over the Past 5 Years (#females per male)	Average % Females in Total Known Harvest Over the Past 5 Years[5]	Average Reported Harvest Level Over the Past 5 years (#harvested/yr)
Tatchun	1	Stable[4]	Medium	29.3 Fall	13	2.437	Unknown	10
Tay River	1	Stable	Low	No surveys in past 5 years	0	no surveys in past 5 yrs	<20%	35-50
Tsenaglode	0	Unknown	Low	Unknown	0	Unknown	Unknown	6
Wolf Lake	3	Stable	Low	Unknown	9	Unknown	Unknown	5

[1]The TRTFN and B.C. Ministry of Environment estimate that the Atlin herd is in "probable decline" due to chronic low calf recruitment and large confidence intervals around 2007 population estimate (Taku River Tlingit First Nation and British Columbia. 2009).
[2]The degree of geographic isolation was determined by local experts/biologists.
[3]Population estimates were completed in 1982-1983; however, wildlife observation data were used to provide estimates of the fall ratios of calves per 100 adult females and of adult females to adult males for years 1991 to 2009 (GNWT unpublished data).
[4]When only one population survey was conducted, the assessment of the twenty-year population trend is based on results of the population survey and composition counts.
[5]First Nation harvest of female caribou is permitted and exact numbers may or may not be reported. Herds that have no female caribou harvested are either in very remote locations or have voluntary First Nation and restricted resident harvest bans in effect.
[6] Suspect stable based upon 19 years time series classification data showing mean fall calf/100 adult female of 34.8.
[7] Suspect stable based upon 19 years time series classification data showing mean fall calf/100 adult female of 47.4 regardless of lower M:F.

Appendix 6: Glossary

Adaptive management: An approach that applies the best available information (including science, local and traditional knowledge) to improve management incrementally as we learn from experience, and as information and social changes demand. Adaptive management requires monitoring and adjustment.

Best management practices: Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on wildlife.

CircumArctic Rangifer Monitoring and Assessment Network (CARMA): CARMA is a network of researchers, managers and community people who share information on the status of the world's wild Rangifer (reindeer and caribou) populations, and how they are affected by global changes, such as climate change and industrial development.

Ecological integrity: A state that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rate of change and supporting processes.

Ecosystem: A dynamic complex of plants, animals and micro-organisms and their non-living environment interacting as a functional unit.

Extirpated: A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.

Harvesting: hunting

Herd: A subset or locally-occurring caribou population that interbreeds and normally does not interbreed with another herd or overlap its range (year round) with another herd.

Management authority: The legal entity (e.g. government) which has been assigned with a mandate to perform certain specified wildlife management functions.

Natural range of variability: The naturally occurring variation in the size or structure of a population over time.

Placer: a place where a placer deposit (glacial or alluvial deposit of sand or gravel containing eroded particle of valuable materials) is washed to extract its mineral content.

Population: A group of individual caribou of the same species adapted to an environment, as expressed primarily by their movements and feeding behavior (e.g. NMP relies on moderate snow depths that allow forage on terrestrial lichens).

Precautionary principle: Implementation of cost-effective measures shall not be postponed for lack of full scientific certainty.

Self-sustaining: The ability of a population or species to sustain itself without human intervention.

Seral community: an intermediate stage found in ecological succession in an ecosystem advancing towards it climax community.

Species of special concern: A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Sustainable harvest rate: The level of harvest that will not compromise the long-term viability of the herd. By not exceeding the sustainable harvest rate, herds can continue to provide ongoing benefits to current and future generations.

Sustainable use: The conservative use of a resource in such a way that it may be used in the present and by future generations.

Traditional ecological knowledge (TEK)**:** The knowledge base acquired by indigenous and local peoples over many hundreds of years through direct contact with the environment. This knowledge includes an intimate and detailed knowledge of plants, animals, and natural phenomena, the development and use of appropriate technologies for hunting, fishing, trapping, agriculture, and forestry, and a holistic knowledge or "world view" that parallels the scientific discipline of ecology.

Winter range: A range, usually at lower elevation, used by Northern Mountain population of woodland caribou during the winter months; usually better defined and smaller than summer ranges.

Appendix 7: Toolbox to Conserve Habitat

1. Utilize existing land designation tools to protect habitat where appropriate (e.g. Wildlife Preserves, Habitat Protection Areas, Special Management Areas, National/Provincial/ Territorial Parks).

2. Develop and implement caribou habitat recovery plans where needed (e.g. restoration of habitat damaged by exploration and development, recreational activity).

3. Collaborate and contribute to Land and Resource Use Planning and Environmental Assessment/Land Use permitting processes to maintain caribou habitat requirements.

4. Where land use activities are deemed to be compatible with conservation of caribou habitat, apply best management practices and adaptive management approach incorporating conditions in Land Use permits as appropriate.

5. Where needed, collaborate with fire management authorities in the development of fire management plans that strive to conserve key caribou winter ranges.

6. Manage human disturbance including regulating seasonal trails, area closures and managing back-country recreation. Utilize a number of regulatory avenues, best management practices, permits, licensing terms and conditions.

7. To reduce human disturbance on caribou, follow best practices guidelines for flying within caribou ranges to reduce displacement of caribou from high quality habitats (e.g. guidelines for provincial and national parks, Provincial/Territorial guidelines).

8. Where and when required (e.g. for rapidly declining herds), establish no-hunt corridors or limited harvest zones to minimize disturbance and displacement of caribou.

Appendix 8: Stewardship Toolbox

1. Identify specific research and monitoring needs (e.g. ground-based monitoring of changes in caribou distribution, habitat and health). Communicate and coordinate with resident and First Nation's hunters, researchers and the public to meet those needs.

2. Develop and implement recognition programs to encourage stewardship among land and resource managers, First Nations and other users.

3. Educate and encourage people to protect or maintain caribou habitat (e.g. limit ATVs and snow machines to travel corridors to reduce damage to lichen cover).

4. Identify methods for stakeholders, communities and First Nations to track activities on the landscape (e.g. game guardian programs, Turn in Poachers [TIPS]).

5. Communicate and coordinate with resident and First Nation's hunters, researchers and the public to foster understanding, support and engagement in meeting in research and monitoring needs.

Appendix 9: Suggested Research to Support Management Plan Implementation using Traditional Ecological Knowledge or Science-based Techniques

1. Assess potential for habitat competition between caribou and other large herbivores.

2. Model population dynamics of multi-predator – multi-prey systems to determine the role of other large ungulates in population dynamics of caribou predators.

3. Determine relative importance of predator-prey relationships on caribou population trends in areas of concern.

4. Identify factors that define complex predator-prey systems and options for managing predator-prey systems at the appropriate scale.

5. Determine the role of disease and parasites in limiting or influencing the Northern Mountain population of woodland caribou.

6. Determine the contributing factors behind changing competition and/or overlap between ungulates (e.g. climate change, introduced species, creation of travel corridors, natural disturbances such as fire, etc).

7. Assess the natural range of habitat variability and describe and compile regional changes in climate and associated ecological changes (i.e. snow conditions, fire susceptibility natural recovery rates), and changes to key habitat (i.e. loss of snow patches for summer insect relief).

8. Assess the potential impact of fire disturbance on key winter range under climate warming scenarios.

9. Identify knowledge gaps in assessing the direct and indirect effects of access and associated human activity on caribou and caribou habitat.

10. Assess cumulative effects of environmental change on the population (e.g. climate change, habitat change, increased access and human activity).

11. Review assessment processes to determine how effective they are at dealing with cumulative effects on caribou.

12. Look at changes and trends in distribution over time and space and relate to potential causes of change (e.g. weather influences, herd health).

13. Using harvest data, assess the effects of harvest rates on population trends.

14. Identify the timing and location if important road crossing areas for caribou if road mortality is an issue within the range.

15. Identify possible road crossing deterrents or alternatives to the application of road salts (e.g. lithium chloride) to reduce amount of time caribou spend on major roadways.

Appendix 10: Acronyms

AC	adjusted count
ARRC	Alsek Renewable Resources Council
BC	British Columbia
CAFN	Champagne and Aishihik First Nations
CARMA	CircumArctic Rangifer Monitoring and Assessment Network
COSEWIC	Committee on Status of Endangered Wildlife in Canada
CRRC	Carmacks Renewable Resources Council
CTFN	Carcross Tagish First Nation
DKRRC	Dan Keyi Renewable Resource Council
DNA	deoxyribonucleic acid
DDRRC	Dawson District Renewable Resources Council
EC	Environnent Canada
GPS	Global Positioning Systems
GRRB	Gwich'in Renewable Resources Board
GTC	Gwich’in Tribal Council
KDC	Kaska Dena Council
KDFN	Kwanlin Dun First Nation
kg	kilogram
km	kilometre
KTC	Kaska Tribal Council
LFN	Liard First Nation
LRRC	Laberge Renewable Resources Council
LSCFN	Little Salmon Carmacks First Nation
MDRRC	Mayo District Renewable Resources Council
N/A	not applicable
NMP	Northern Mountain population
NND	First Nation of Na-Cho Nyak Dun
NT	Northwest Territories
PCA	Parks Canada Agency
SARA	*Species at Risk Act*
SDC	Sahtu Dene Council
SEA	Strategic Environment Assessment
SFN	Selkirk First Nation
SRQ	stratified random quadrat
SRRB	Sahtu Renewable Resources Board
SRRC	Selkirk Renewable Resources Council
TC	total count
TCC	Tahltan Central Council
TEK	Traditional Ecological Knowledge
TH	Tr'ondëk Hwëch'in
TIPS	Turn in Poachers
TKC	Ta’an Kwäch’än Council
TRRC	Teslin Renewable Resources Council
TLFN	Takla Lake First Nation

TRTFN	Taku River Tlingit First Nation
TTC	Teslin Tlingit Council
VHF	very high frequency
WRFN	White River First Nation
YFWMB	Yukon Fish and Wildlife Management Board
YT	Yukon Territory