



Woodland caribou, boreal population, trends in Canada

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PREFACE

The Canadian Councils of Resource Ministers developed a Biodiversity Outcomes Framework¹ in 2006 to focus conservation and restoration actions under the *Canadian Biodiversity Strategy*.² *Canadian Biodiversity: Ecosystem Status and Trends 2010*³ was a first report under this framework. It assesses progress towards the framework's goal of "Healthy and Diverse Ecosystems" and the two desired conservation outcomes: i) productive, resilient, diverse ecosystems with the capacity to recover and adapt; and ii) damaged ecosystems restored.

The 22 recurring key findings that are presented in *Canadian Biodiversity: Ecosystem Status and Trends 2010* emerged from synthesis and analysis of technical reports prepared as part of this project. Over 500 experts participated in the writing and review of these foundation documents. This report, *Woodland caribou, boreal population, trends in Canada*, is one of several reports prepared on the status and trends of national cross-cutting themes. It is based largely upon the results from the *Scientific Review for the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada* (Environment Canada, 2008).

Acknowledgements

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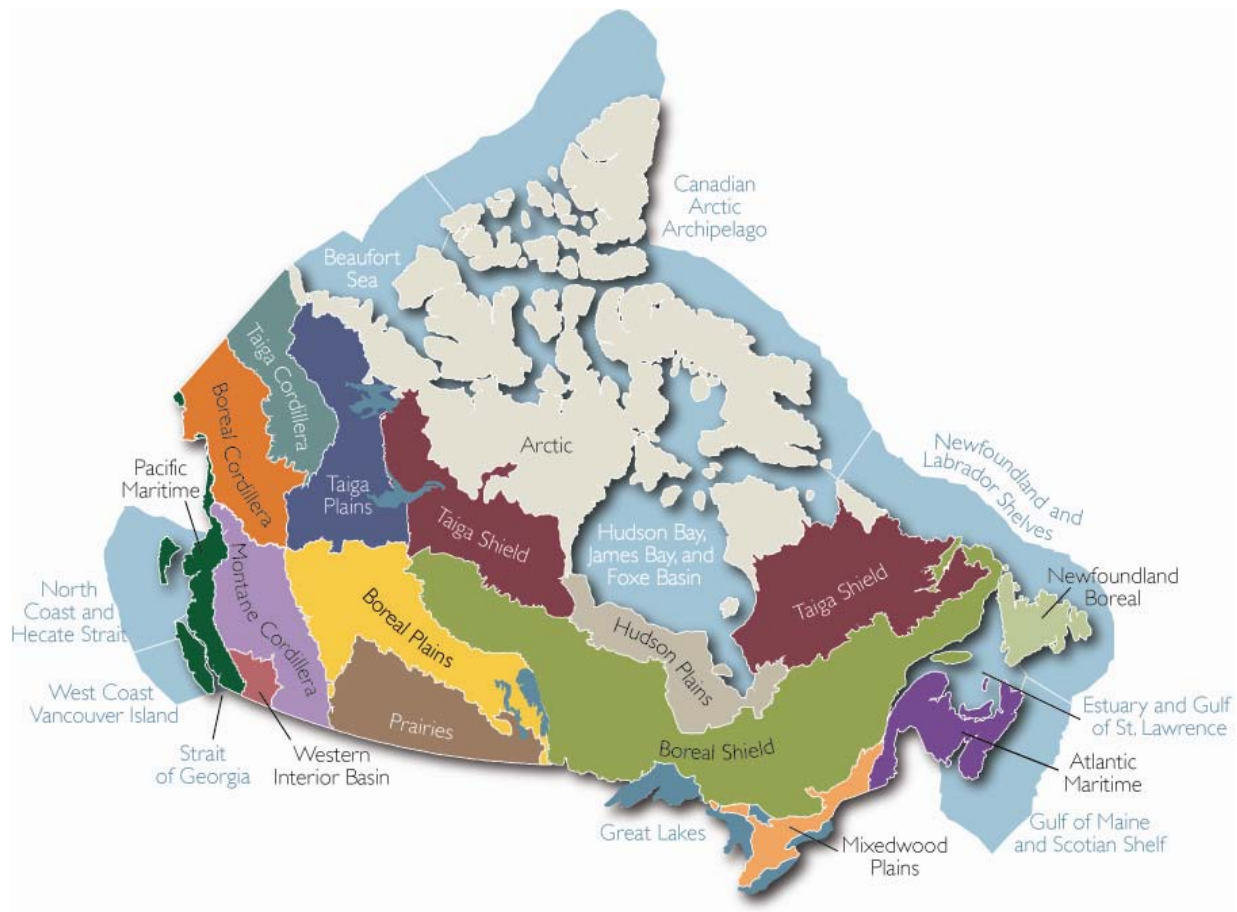
¹ Environment Canada. 2006. Biodiversity outcomes framework for Canada. Canadian Councils of Resource Ministers. Ottawa, ON. 8 p. <http://www.biodivcanada.ca/default.asp?lang=En&n=F14D37B9-1>

² Federal-Provincial-Territorial Biodiversity Working Group. 1995. Canadian biodiversity strategy: Canada's response to the Convention on Biological Diversity. Environment Canada, Biodiversity Convention Office. Ottawa, ON. 86 p. <http://www.biodivcanada.ca/default.asp?lang=En&n=560ED58E-1>

³ Federal, Provincial and Territorial Governments of Canada. 2010. Canadian biodiversity: ecosystem status and trends 2010. Canadian Councils of Resource Ministers. Ottawa, ON. vi + 142 p. <http://www.biodivcanada.ca/default.asp?lang=En&n=83A35E06-1>

Ecological Classification System – Ecozones⁺

A slightly modified version of the Terrestrial Ecozones of Canada, described in the *National Ecological Framework for Canada*,⁴ provided the ecosystem-based units for all reports related to this project. Modifications from the original framework include: adjustments to terrestrial boundaries to reflect improvements from ground-truthing exercises; the combination of three Arctic ecozones into one; the use of two ecoprovinces – Western Interior Basin and Newfoundland Boreal; the addition of nine marine ecosystem-based units; and, the addition of the Great Lakes as a unit. This modified classification system is referred to as “ecozones” throughout these reports to avoid confusion with the more familiar “ecozones” of the original framework.⁵



⁴ Ecological Stratification Working Group. 1995. A national ecological framework for Canada. Agriculture and Agri-Food Canada, Research Branch, Centre for Land and Biological Resources Research and Environment Canada, State of the Environment Directorate, Ecozone Analysis Branch. Ottawa/Hull, ON. 125 p. Report and national map at 1:7 500 000 scale.

⁵ Rankin, R., Austin, M. and Rice, J. 2011. Ecological classification system for the ecosystem status and trends report. Canadian Biodiversity: Ecosystem Status and Trends 2010, Technical Thematic Report No. 1. Canadian Councils of Resource Ministers. Ottawa, ON. <http://www.biodivcanada.ca/default.asp?lang=En&n=137E1147-0>

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INTRODUCTION

The woodland caribou (*Rangifer tarandus caribou*) is a member of the deer family that is distributed throughout the boreal region of Canada (Banfield, 1961). Two genetically distinct varieties, or ecotypes, of woodland caribou have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Forest-dwelling woodland caribou are sedentary (non-migratory), live in relatively small groups, and occupy the boreal forest year-round. Forest tundra woodland caribou (migratory), live in large herds, occupy the boreal forest during winter, and migrate longer distances to the open tundra of the Hudson Bay Lowlands for the calving period. These ecotypes are based on the taxonomy of woodland caribou as proposed by Banfield (1961), the National Ecological Areas adopted by COSEWIC in 1994, and genetic and ecological differences among woodland caribou (COSEWIC, 2002).

The forest-dwelling ecotype of woodland caribou is comprised of five geographically distinct populations, including boreal (Threatened), northern mountain (Special Concern), southern mountain (Threatened), and Atlantic-Gaspésie population (Endangered), and the insular Newfoundland population (Not at Risk). In 2002, COSEWIC assessed the boreal population of forest-dwelling woodland caribou (hereafter referred to as boreal caribou) as Threatened (COSEWIC, 2002) and boreal caribou were added to Schedule 1 of the federal *Species at Risk Act*. The insular Newfoundland population of boreal caribou was assessed Not at Risk by COSEWIC (2002) and is therefore not included in this report. The forest tundra ecotype of woodland caribou is Not at Risk, and includes Leaf River, George River, Pen Island, Cape Churchill, and other populations on the northern Hudson Plain (COSEWIC, 2002). The forest tundra ecotype of woodland caribou is also not included in this report.

A boreal caribou local population is a group of caribou occupying a geographically distinct area that appears to be separate from other caribou groups (i.e., a boreal caribou herd). Local populations of boreal caribou are often characterized by having limited or no interaction or mixing with animals from other local populations (Environment Canada, 2008). However, local populations of boreal caribou are not necessarily genetically distinct (Environment Canada, 2007).

A boreal caribou local population range is a geographic area occupied by individuals of a local population that are subject to the same influences affecting population vital rates (such as, birth and death rates) (Environment Canada, 2008). In some cases, where local populations are restricted by natural geographic boundaries or habitat alteration they are considered to occur in discrete ranges (for example, many portions of caribou range in western Canada, Lake Superior shoreline of Ontario, Charlevoix in Quebec the isolated Charlevoix local population). In other cases, however, where local population ranges are not restricted by natural geographic boundaries or habitat alteration and are distributed across large areas of relatively continuous habitat, the distribution of boreal caribou occurs in continuous ranges (for example, northwestern and northeastern Ontario, central Quebec, and boreal taiga in the Northwest Territories). Future research and monitoring may enable managers to identify additional distinct local populations of boreal caribou within areas of continuous caribou distribution

(Environment Canada, 2007). Range boundaries of local boreal caribou populations may be updated with changes in population size, vegetation (due for example to fire or other landscape disturbances), weather, and human activities (such as hunting and industrial developments) (COSEWIC, 2002). Range is thus a function of spatial extent and habitat conditions (Environment Canada, 2008).

DISTRIBUTION

The range of the woodland caribou, including the boreal population, has retracted significantly from historical distributions. The southern limit of distribution has progressively receded in a northerly direction since the early 1900s (Figure 1), a trend that continues to the present day (Kelsall, 1984; COSEWIC, 2002; Schaefer and Mahoney, 2003; Vors et al., 2007). Pre-1830, woodland caribou resided in their original range across the boreal forest of North America north of 45°- 46° latitude (Banfield, 1961). Between 1839 and 1930, caribou disappeared from Nova Scotia, New Brunswick, Maine, Vermont, New Hampshire, Wisconsin, Michigan, and Minnesota (Bergerud and Mercer, 1989).

Woodland caribou are now distributed in the boreal forest in Canada across nine provinces and territories, from southwest Northwest Territories to Labrador, extending as far south as Lake Superior (Figure 1). Woodland caribou also occur in Alaska and Idaho/Washington. Boreal caribou are distributed throughout the boreal forest region in nine ecozones*: Arctic, Taiga Plains, Taiga Cordillera, Boreal Cordillera, Montane Cordillera, Boreal Plains, Taiga Shield, and Hudson Plains, and Boreal Shield (Environment Canada, 2008) (Appendix 2). The extent of occurrence of boreal caribou includes isolated or semi-isolated local populations (Figure 1).

POPULATION STATUS AND TRENDS

Boreal caribou are estimated to number 31,000 to 39,000 across their distribution in Canada (excluding the Island of Newfoundland), according to estimates provided by jurisdictions responsible for the management of boreal caribou across Canada (Environment Canada, 2008; see also Appendix 1). Using these data, 57 local population ranges of boreal caribou were recognized in the *Scientific Review for the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada* (Environment Canada, 2008) (Figure 2). Of the 57 local populations 5.3% (n = 3) are increasing, 29.3% (n = 17) are declining, 28.1% (n = 16) are stable, and the status of the remaining 36.8% (n = 21) is unknown (Table 1).

Table 1. Estimated population trend of 57 local populations of boreal caribou in Canada.

	Estimated Boreal Caribou Local Population Trend				
	Declining	Stable	Increasing	Unknown	Total
Number of Local Populations	17	16	3	21	57
Percent (%)	29.8	28.1	5.3	36.8	100.0

Data provided by jurisdictions responsible for boreal caribou management across Canada.

Source: Environment Canada (2008)

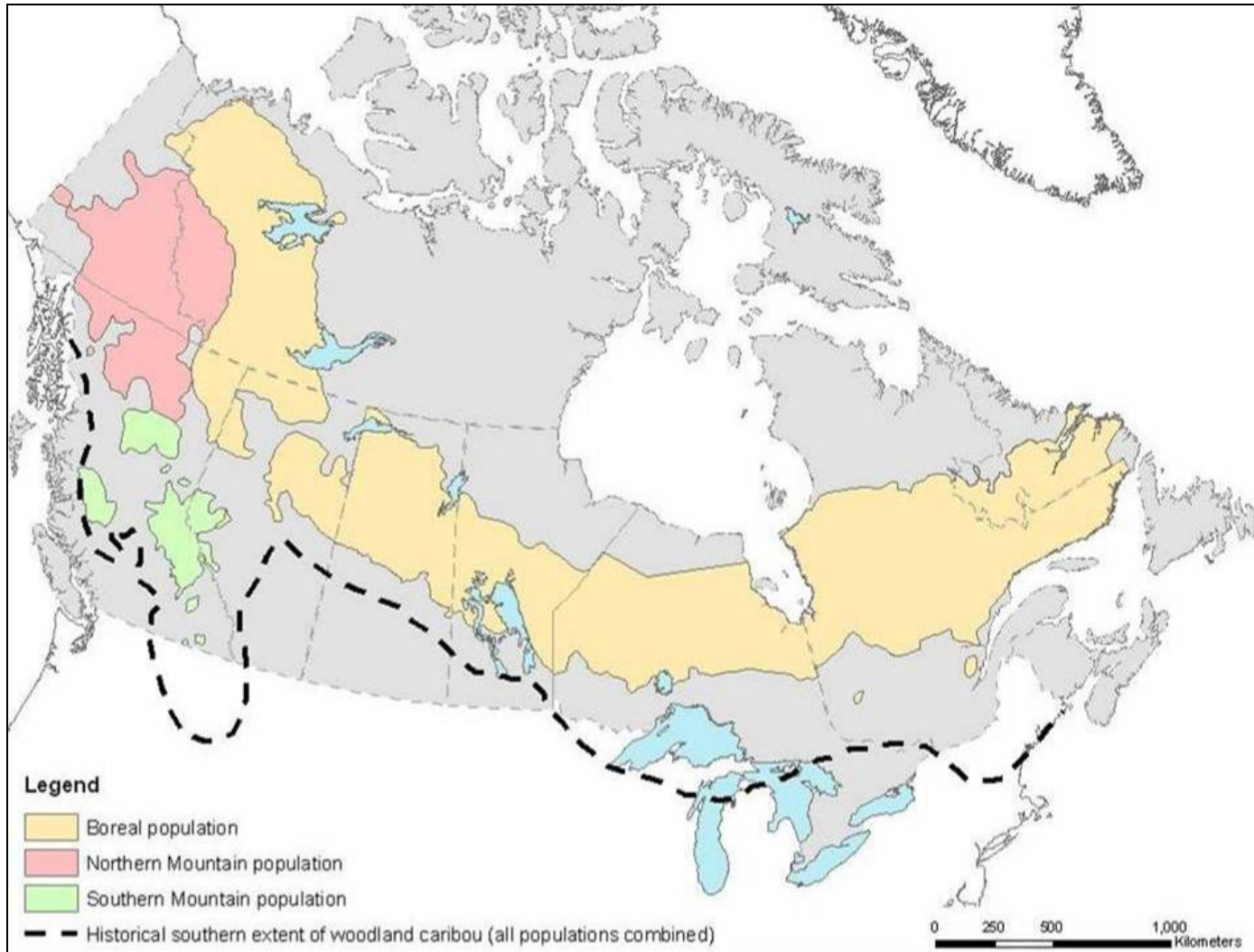


Figure 1. The current extent of occurrence (distribution) of boreal caribou and the historical (early 1900s) extent of occurrence of woodland caribou (*Rangifer tarandus caribou*) in Canada.

Map does not depict the current extent of the Atlantic-Gaspésie or the insular Newfoundland populations.

Source: adapted from Environment Canada (2007)

Note: The boundaries of local populations defined by provincial and territorial borders are jurisdictional artefacts and are not ecologically significant.

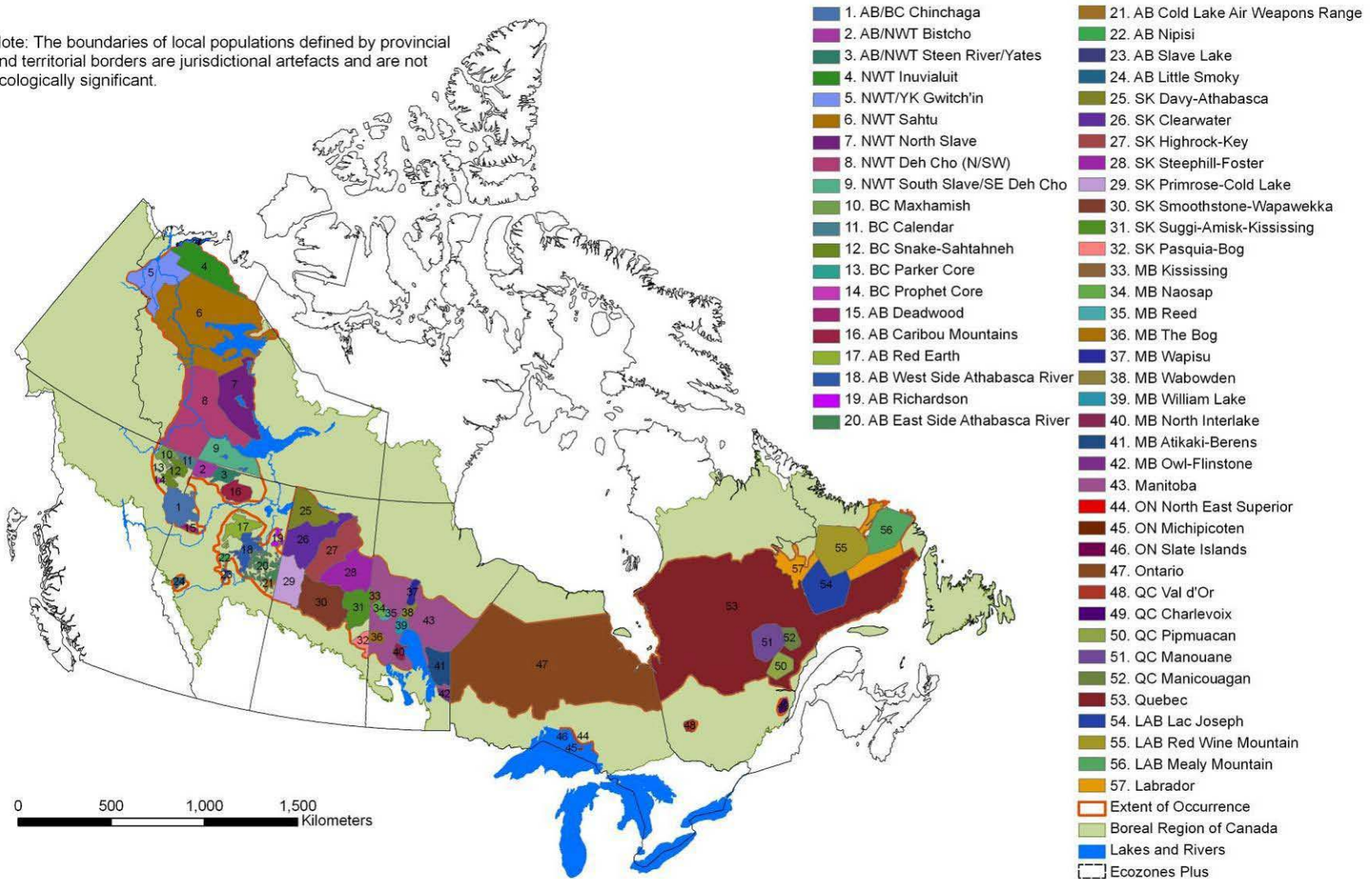


Figure 2. Distribution of local populations of boreal caribou across their range in Canada (excluding the Island of Newfoundland).
Source: Environment Canada (2008)

Note that although several of the local populations may not be separate entities, they are considered to be distinct local populations for management purposes among jurisdictions. For example, until recently, local populations Deadwood in Alberta and Chinchaga in British Columbia were considered to be distinct local populations. They have recently been amalgamated and are both considered to be part of the Chinchaga local population. Since the writing of this report, the Ontario government has delineated preliminary ranges for 12 local populations as units of analysis for management of boreal caribou in Ontario, based on animal survey data, habitat information, and risk factors (Ontario Ministry of Natural Resources, 2009b). These data were not available at the time of writing this report, and thus are not included herein.

Some of the 57 local populations overlap ecozones⁺ boundaries, thus for the purpose of this report, local populations are included in each of the ecozones⁺ where they occurred. For example, if the range of a local population spanned two ecozones⁺, it was considered to be in both ecozones⁺ with the same population trend data reported for both ecozones⁺. Note that the summaries in this report were made for the purposes of reporting on ecozones⁺, and thus differ slightly from summaries made on the 57 original local populations delineated in Environment Canada (2008). When reporting trends by ecozones⁺, results show 5.5% (n = 5) are increasing, 25.3% (n = 23) are declining, 28.6% (n = 26) are stable, and the status of 40.7% (n = 37) is unknown based on current trend data from the last 3 to 5 years.

The low sightability of boreal caribou from aircraft, their relatively solitary habits, and their range over thousands of square kilometres contribute to challenges in accurately determining population trends. In some areas of their distribution, detailed studies and monitoring efforts have produced precise population estimates; in other areas, population estimates are based on few data and are associated with a high degree of uncertainty. The quality of data for boreal caribou local population size and trend thus varies over most of the extent of occurrence, and in many instances is not well known. Appendix 1 provides notes on the intensity of population sampling effort and confidence limits of each local population estimate.

Arctic Ecozone⁺

Three boreal caribou local populations (or components thereof) occur in the Arctic Ecozone⁺. One local population is increasing and the status of the remaining two local populations is unknown (Figure 3).

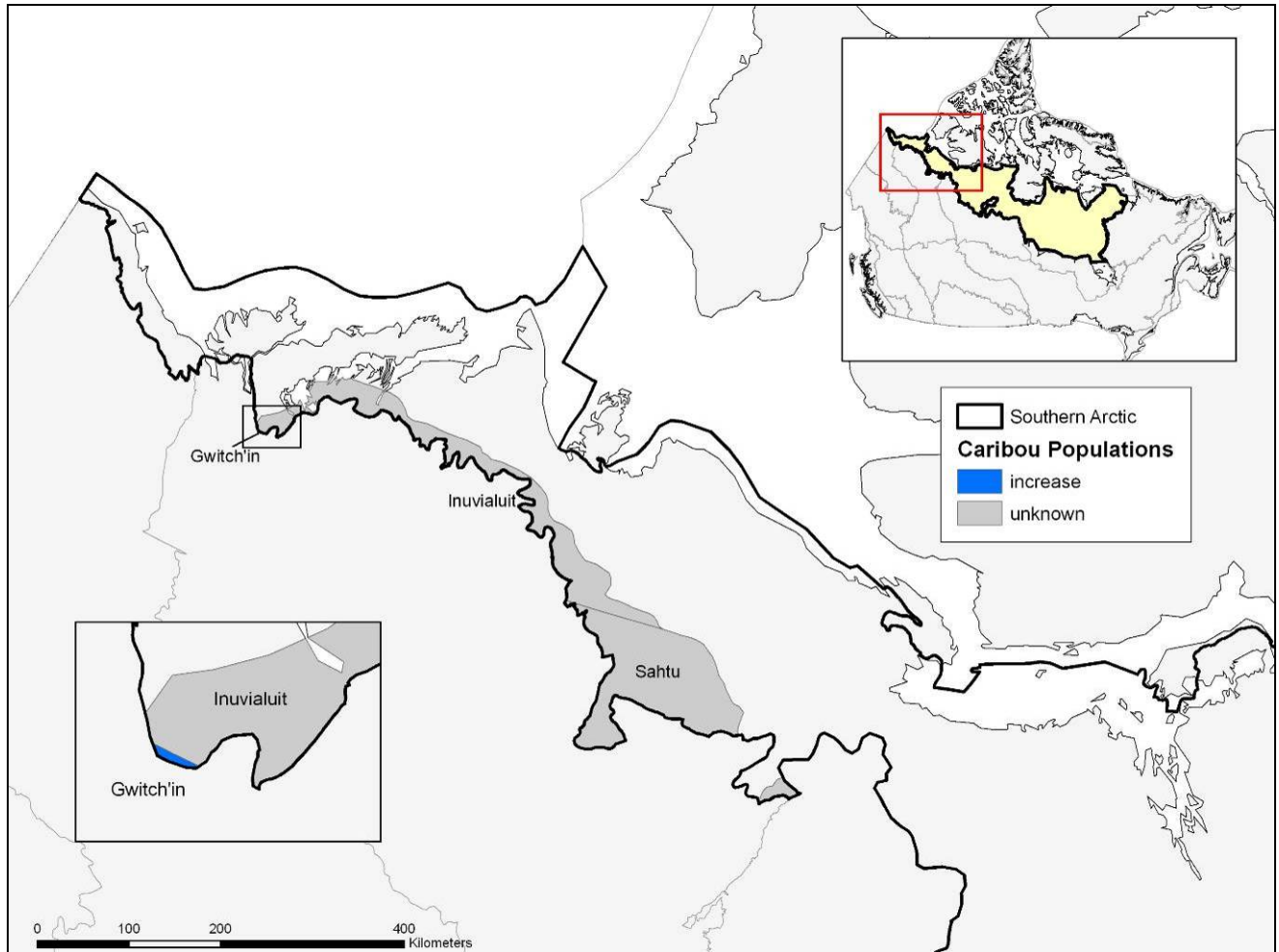


Figure 3. Estimated population status of boreal caribou local populations in the Arctic.

Taiga Plains Ecozone⁺

Fifteen boreal caribou local populations (or components thereof) occur in the Taiga Plains Ecozone⁺. Of these, 33.3% (n = 5) are in decline, 6.7% (n = 1) are increasing, and the status of 60% (n = 9) is unknown (Figure 4).

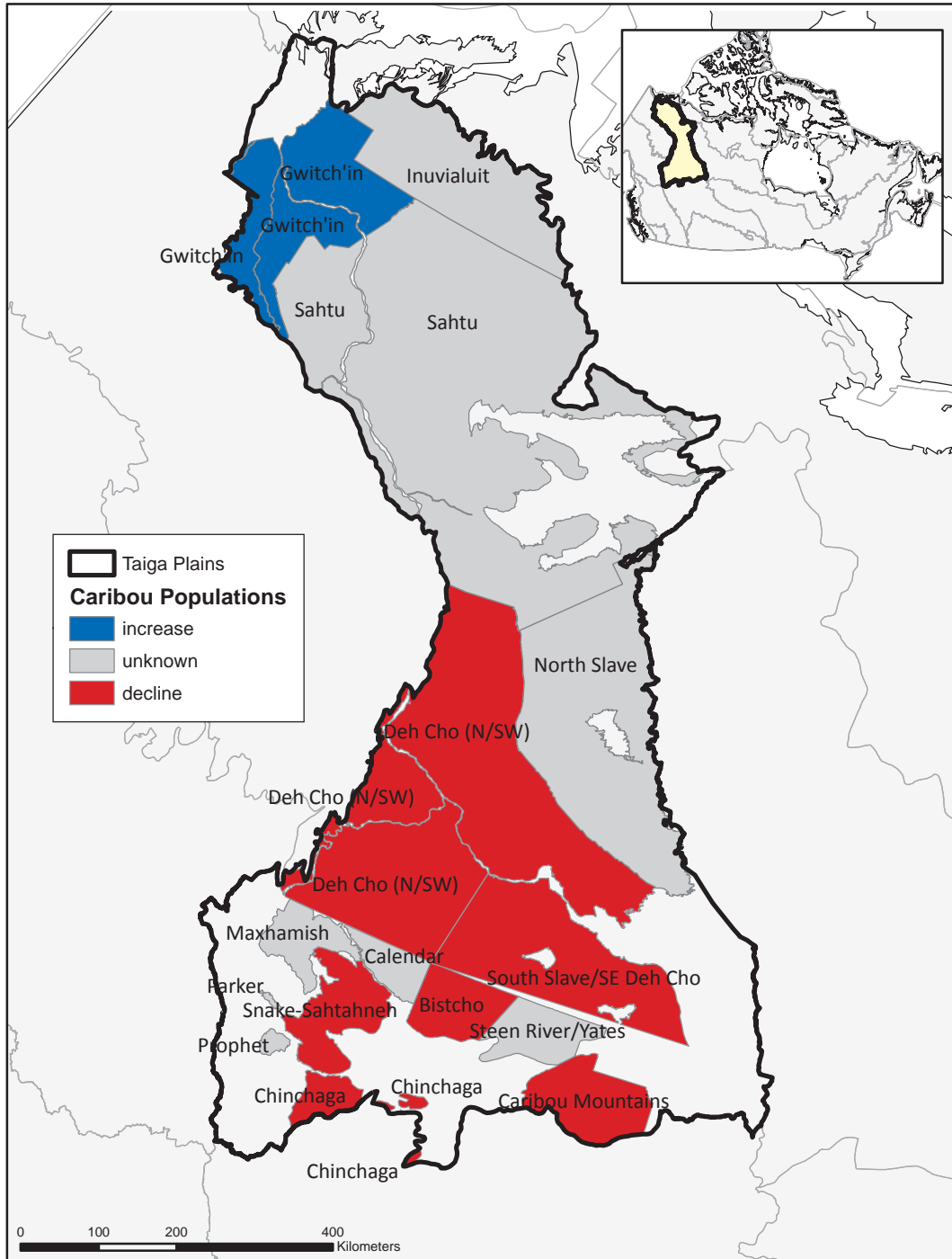


Figure 4. Estimated population status of boreal caribou local populations in the Taiga Plains.

Taiga Cordillera Ecozone⁺

Three boreal caribou local populations (or components thereof) occur in the Taiga Cordillera Ecozone⁺. One local population is increasing, one is declining, and the status of the third local population is unknown (Figure 5).

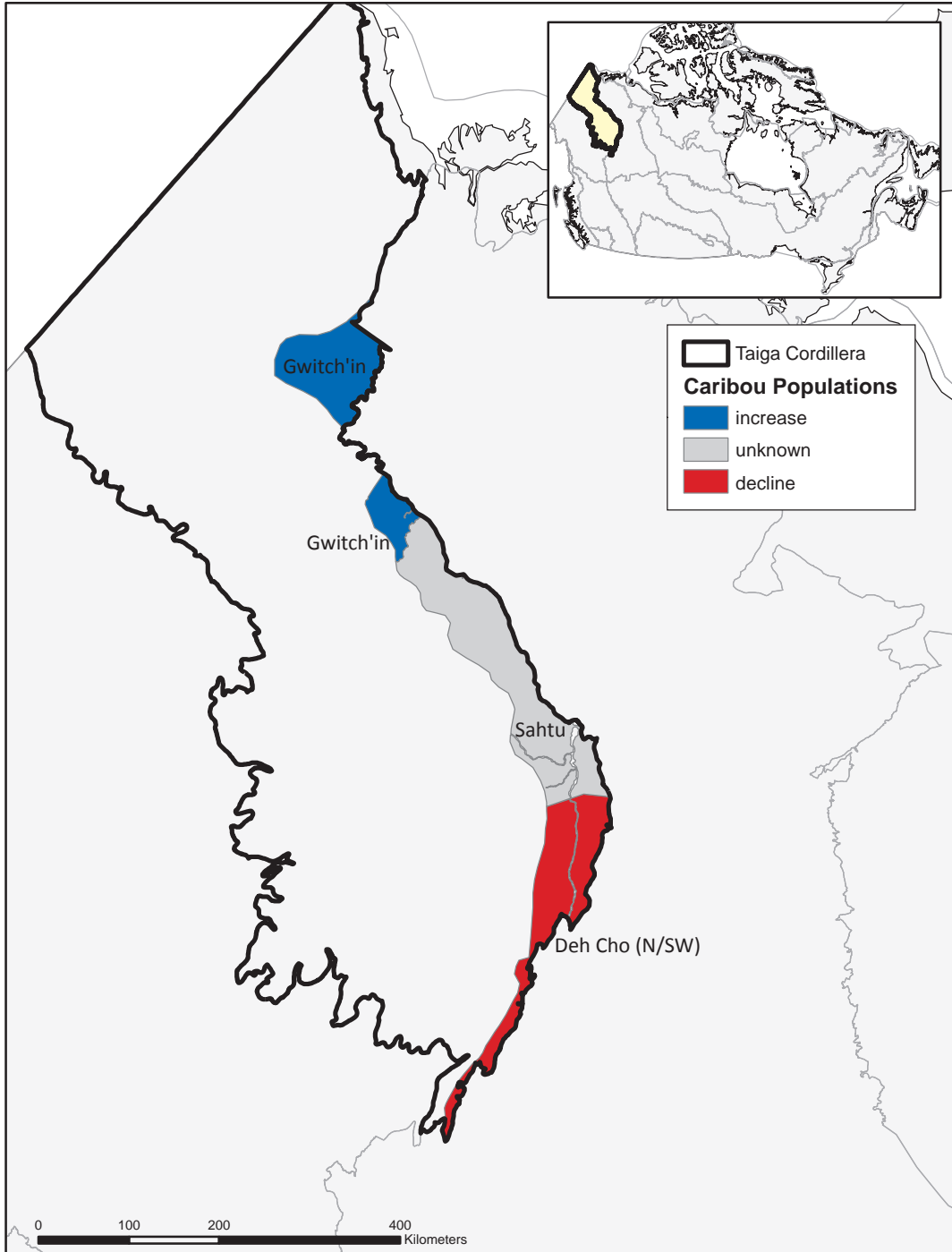


Figure 5. Estimated population status of boreal caribou local populations in the Taiga Cordillera.

Boreal Cordillera Ecozone⁺

One local population (or component thereof) occurs in the Boreal Cordillera Ecozone⁺, and it is declining (Figure 6).

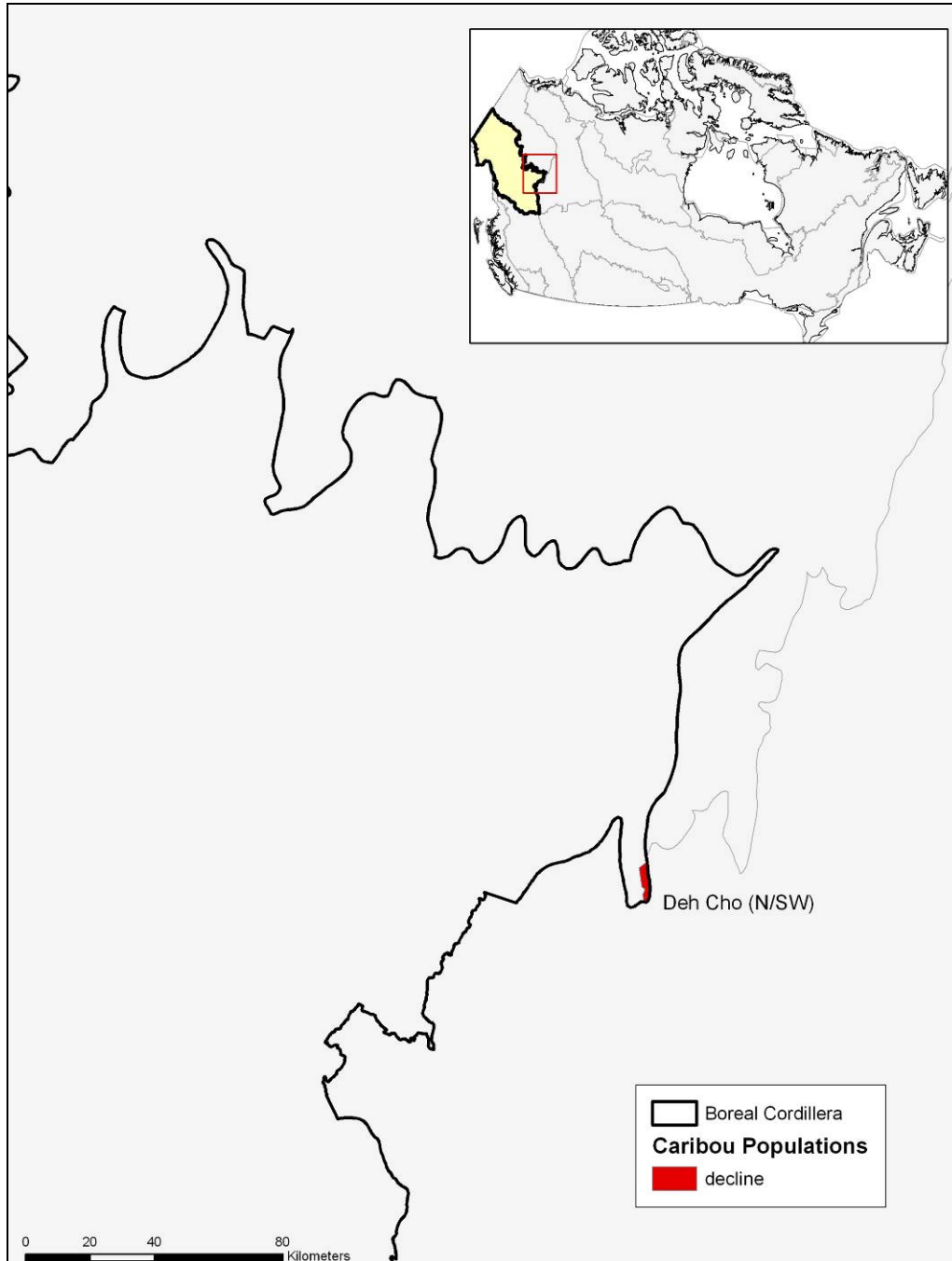


Figure 6. Estimated population status of boreal caribou local populations in the Boreal Cordillera.

Montane Cordillera Ecozone⁺

One local population (or component thereof) occurs in the Montane Cordillera. This local population has had many years of documented population decline, but it is currently stable in response to implementation of an intensive wolf population reduction program (Figure 7).

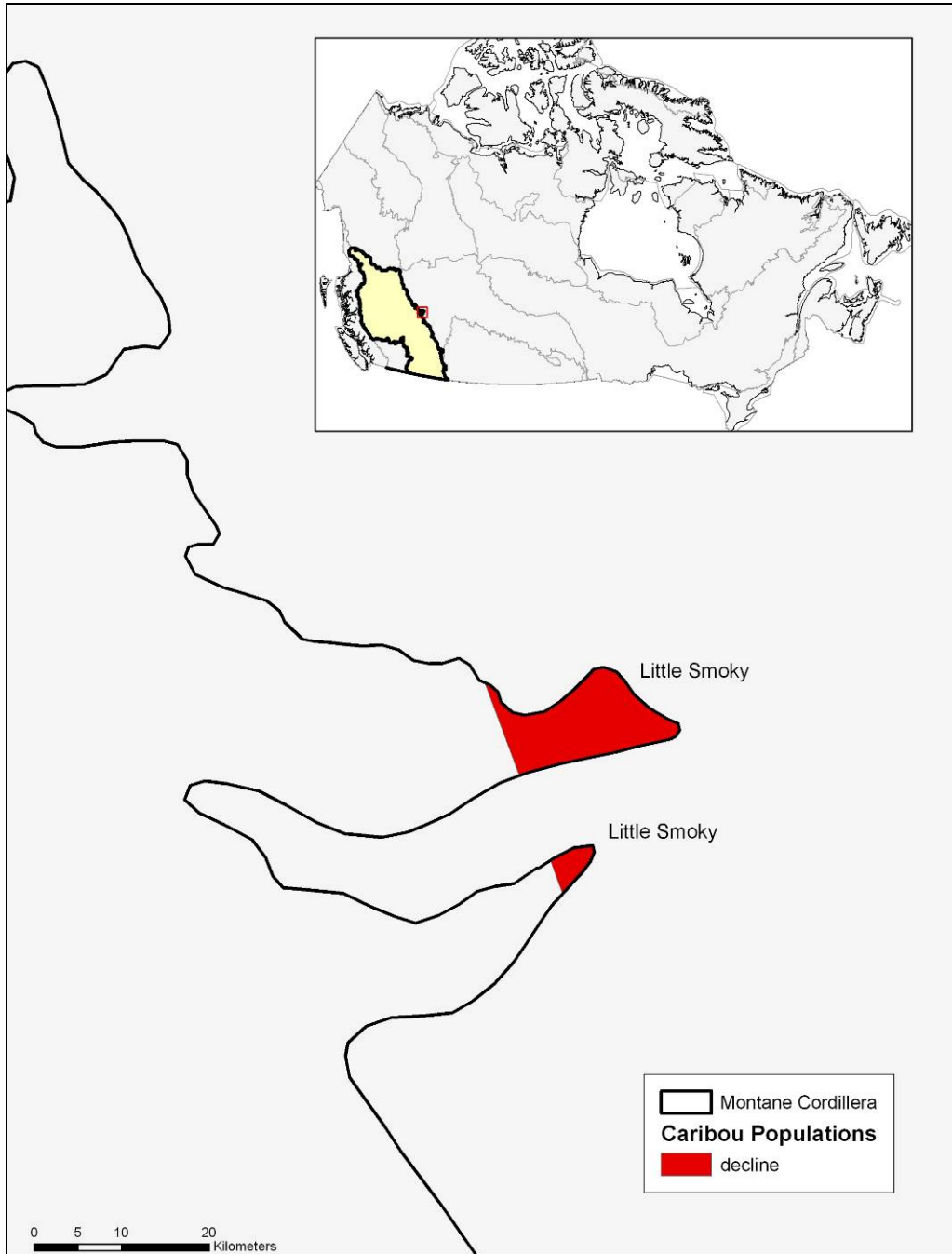


Figure 7. Estimated population status of boreal caribou local populations in the Montane Cordillera.

Boreal Plains Ecozone⁺

Twenty-five local caribou populations (or components thereof) occur in the Boreal Plains Ecozone⁺. Of these, 40% (n = 10) are declining, 32% (n = 8) are stable, and the status is unknown for 28% (n = 7) of these populations (Figure 8).

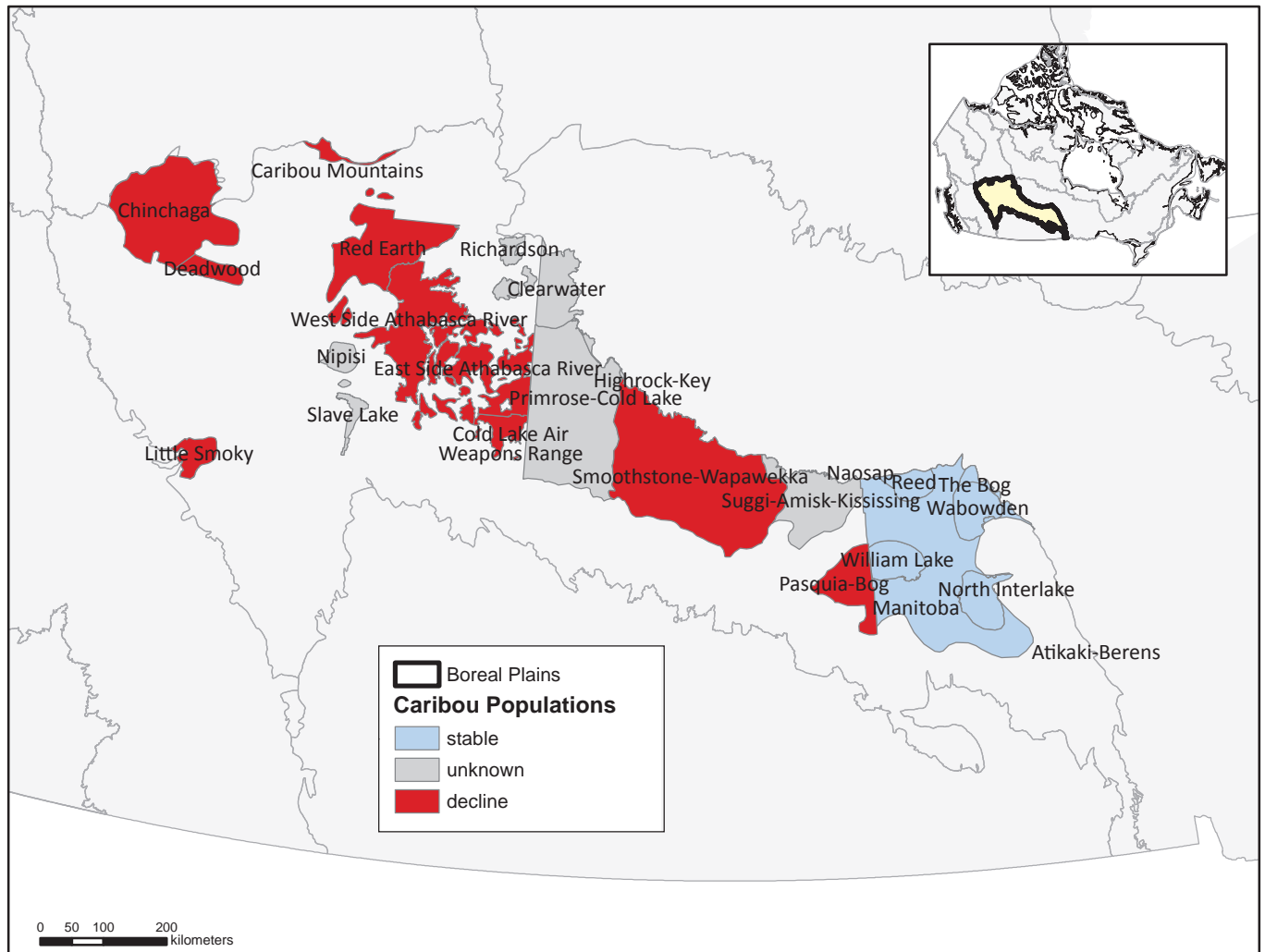


Figure 8. Estimated population status of boreal caribou local populations in the Boreal Plains.

Taiga Shield Ecozone⁺

Ten boreal caribou local populations (or components thereof) occur in the Taiga Shield Ecozone⁺. Of these, 10% (n = 1) are declining, 20% (n = 2) are stable, and the status of 70% (n = 7) is unknown (Figure 9 and Figure 10).

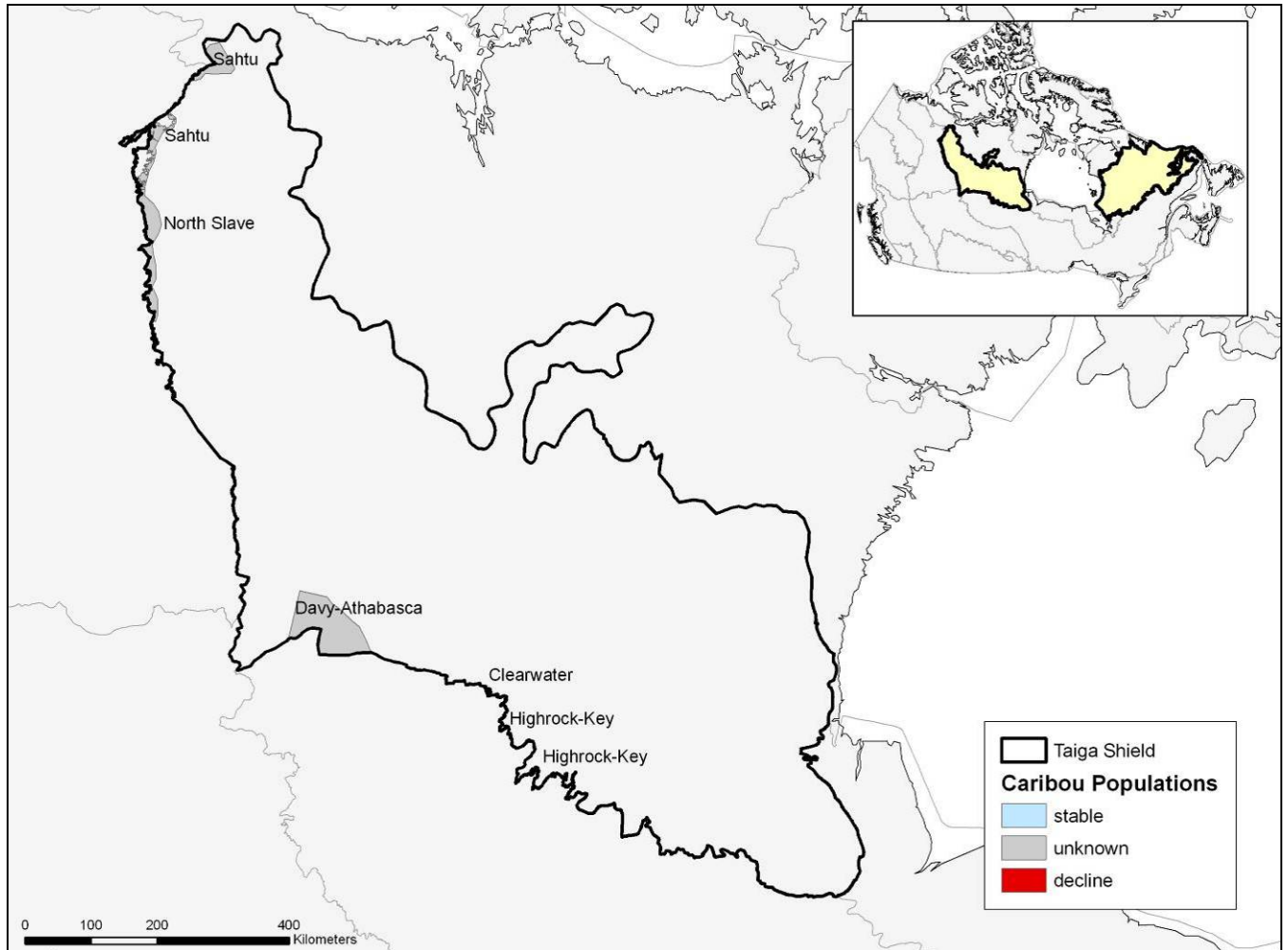


Figure 9. Estimated population status of boreal caribou local populations in the Taiga Shield west.

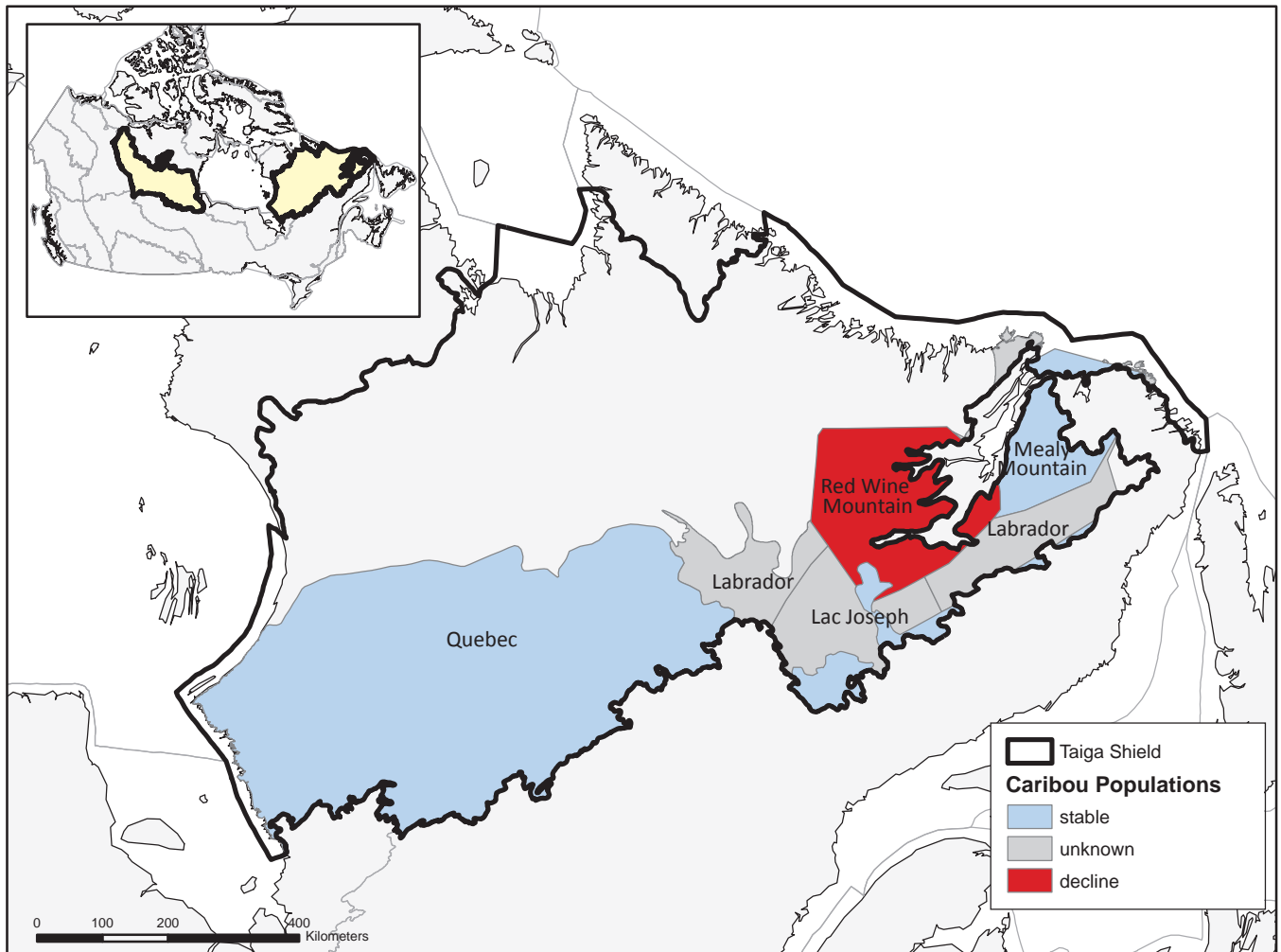


Figure 10. Estimated population status of boreal caribou local populations in the Taiga Shield east.

Hudson Plains Ecozone⁺

Three boreal caribou local populations (or components thereof) occur in the Hudson Plains Ecozone⁺. Two local populations are stable, and the status of the remaining local population is unknown (Figure 11).

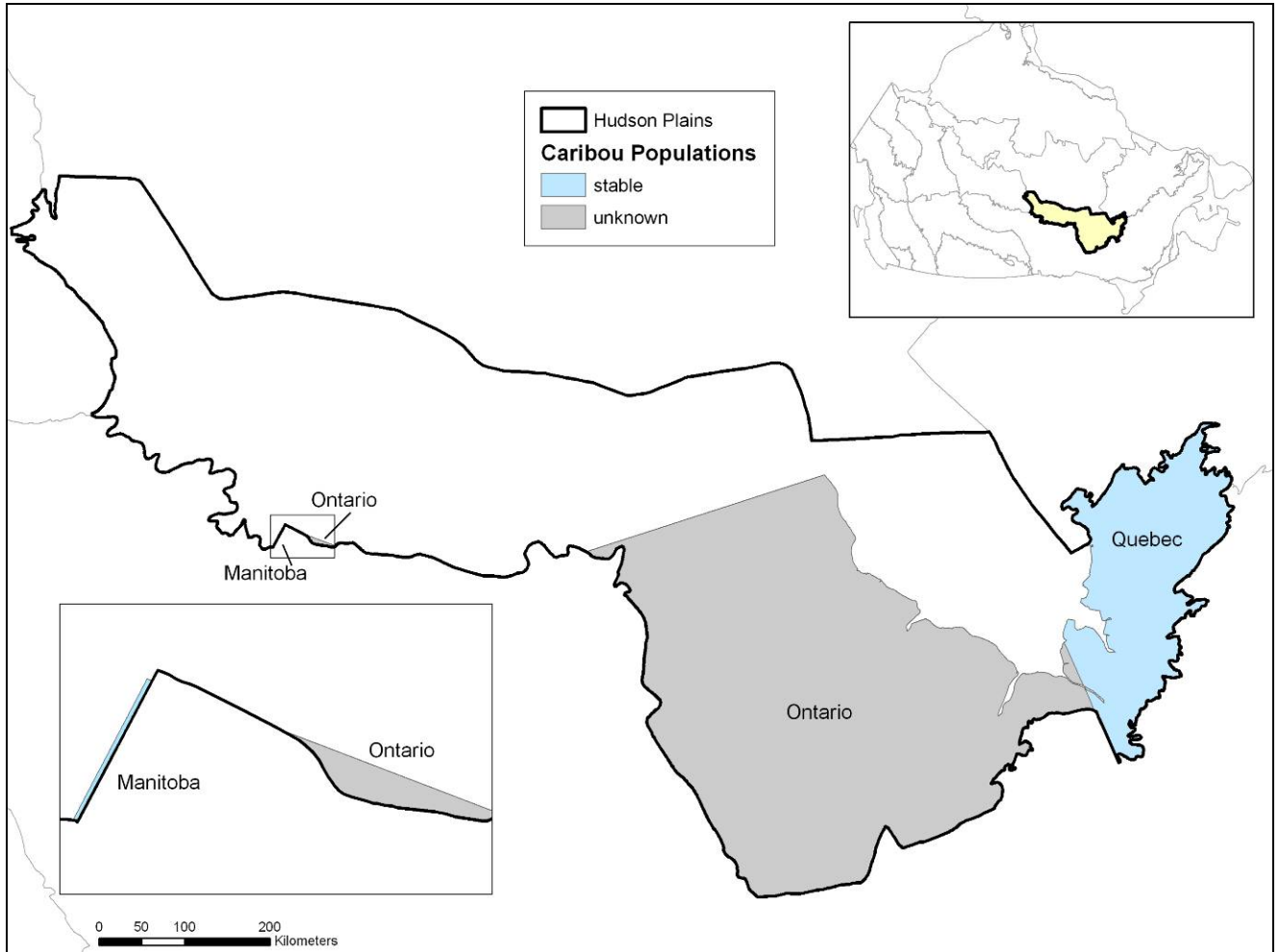


Figure 11. Estimated population status of boreal caribou local populations in the Hudson Plains.

Boreal Shield Ecozone⁺

Thirty boreal caribou local populations (or components thereof) occur in the Boreal Shield Ecozone⁺. Of these, 6.7% (n = 2) are increasing, 13.3% (n = 4) are declining, 46.7% (n = 14) are stable, and the status of 33.3% (n = 10) is unknown (Figure 12).

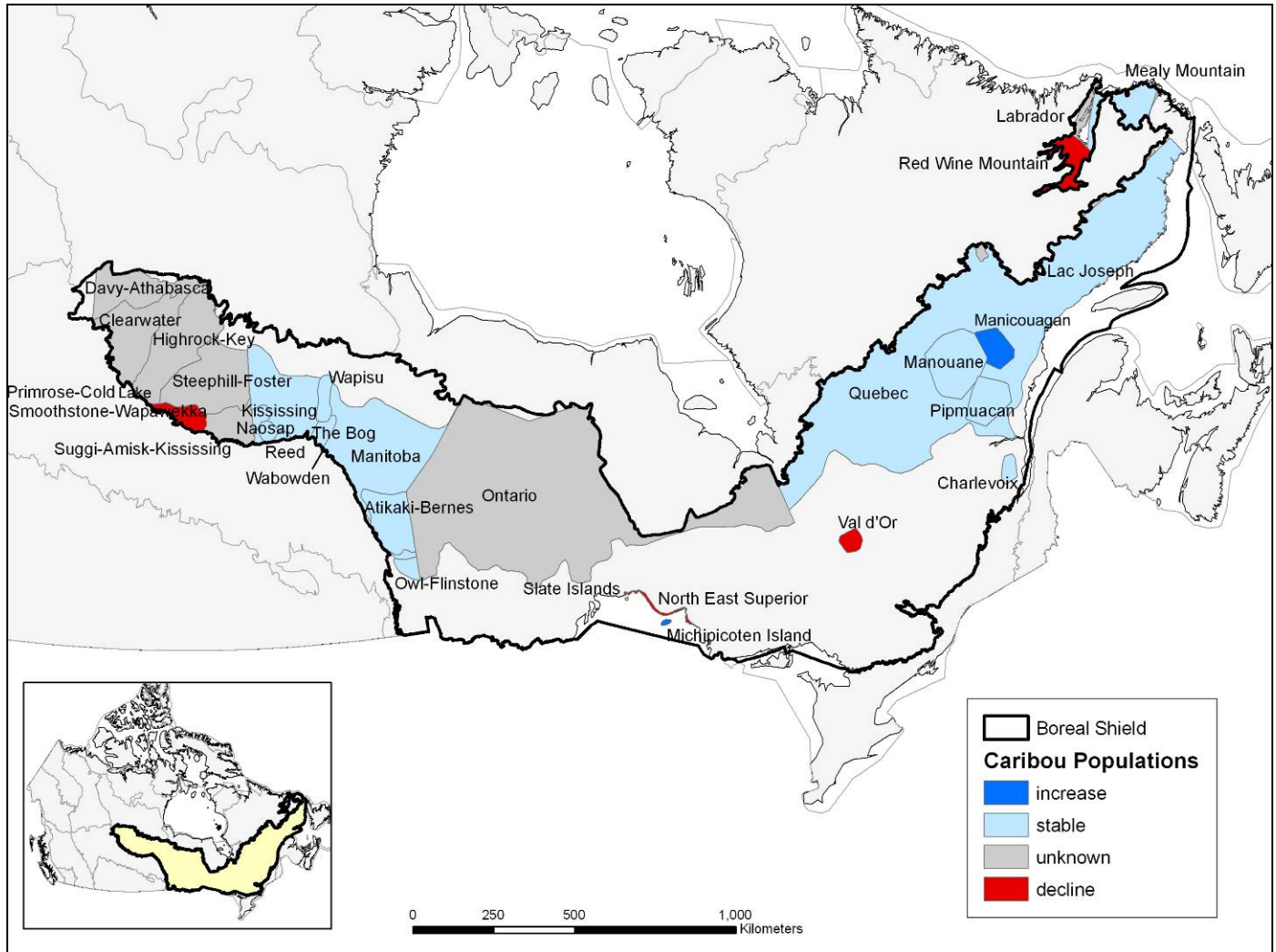


Figure 12. Estimated population status of boreal caribou local populations in the Boreal Shield.

CAUSES OF DECLINE

The broad-scale range recession and population declines of boreal caribou in most provinces and territories within their range are associated with human settlement and industrial resource extraction due to the loss, degradation, and fragmentation of their habitat (primarily mature coniferous forest) (Bergerud, 1974; Mallory and Hillis, 1998; Schaefer, 2003; Vors et al., 2007). Proximate causes of decline associated with landscape-level habitat change include increased predation (Bergerud, 1967; Edmonds, 1988; Seip, 1992; McLoughlin et al., 2003; Environment Canada, 2007; Vors et al., 2007; Vors and Boyce, 2009), overhunting by humans (Bergerud, 1974; Edmonds, 1988), increased risk of disease or parasite transmission from other ungulate species (Bergerud, 1974), and linear disturbance (Dyer et al., 2001; Dyer et al., 2002). Weather and climate change may affect several aspects of boreal caribou ecology by combining with other threats in complex ways that magnify the principle causes of decline.

There is wide agreement that the primary proximate limiting factor for boreal caribou populations is predation, driven by human-induced or natural landscape changes that favour early seral stages and higher densities of alternative prey (Bergerud and Elliot, 1986; Ferguson et al., 1988; Bergerud and Mercer, 1989; Seip, 1992; Cumming et al., 1996; Stuart-Smith et al., 1997; Rettie and Messier, 1998; Schaefer et al., 1999; Racey and Armstrong, 2000; Courtois, 2003; Courtois et al., 2007; Vors et al., 2007; Environment Canada, 2007; Environment Canada, 2008). Boreal caribou are closely associated with late-successional coniferous forests and peatlands (Rettie and Messier, 2000). Such habitats appear to function as refugia, away from high densities of predators and their alternate prey (Bergerud et al., 1984; Bergerud, 1985; Cumming et al., 1996; Rettie and Messier, 1998; Racey and Armstrong, 2000). Although wolves (*Canis lupus*) were very scarce or absent throughout most of the original distribution of woodland caribou (Cringan, 1956), logging and other industrial disturbances have increased the amount of early seral-stage forest and promoted higher densities of prey species such as moose (*Alces alces*) and white-tailed deer (*Odocoileus virginianus*), which support higher predator densities, especially wolves (Bergerud and Elliot, 1986; Seip, 1992; Stuart-Smith et al., 1997; Racey and Armstrong, 2000; Wittmer et al., 2005; Wittmer et al., 2007; Vors et al., 2007; Vors and Boyce, 2009)

Linear disturbances (for example, roads and seismic lines) that accompany industrial development in the boreal forest facilitate greater predator mobility and hunting efficiency (James and Stuart-Smith, 2000; Dyer et al., 2001; McLoughlin et al., 2003; James et al., 2004). In addition, woodland caribou tend to avoid industrial infrastructure such as roads, timber harvest cut-blocks, pipelines, oil and gas well sites, and geophysical exploration lines, all of which essentially reduce the suitability of habitat adjacent to these developments (Chubbs et al., 1993; Smith et al., 2000; Dyer et al., 2001; Lander, 2006). There is also evidence that roads can act as a partial barrier to boreal caribou movements (Dyer et al., 2002) and in some areas boreal caribou are vulnerable to mortality from vehicle or rail collisions (Brown and Hobson, 1998).

The decline of several local populations across Canada is attributed to hunting and other sources of direct human-caused mortality (Bergerud, 1967; Kelsall, 1968; Bergerud, 1974; Bergerud, 1978). For example, hunting is the most significant threat faced by boreal caribou in

Labrador. Hunters from Labrador as well as Quebec target isolated boreal caribou groups as well as mixed groups or those adjacent to the unlisted migratory, forest tundra caribou ecotype (Schmelzer et al., 2004). Uncontrolled hunting has the potential to cause population declines of some local populations in Manitoba (V. Crichton, Government of Manitoba, pers. comm.).

Although the extent of hunting is poorly understood in most areas, analyses of historical population trends, data from radio-collared animals, and current demographic information indicate that hunting remains an important component of adult female caribou mortality and hence is a primary threat to some local populations (for example Dzus, 2001; Schmelzer et al., 2004). Hunting of boreal caribou is facilitated by construction of roads and other linear features and by use of off-road vehicles that permit access to previously inaccessible areas.

Weather affects several aspects of boreal caribou ecology and may combine with other threats in complex ways. Severe winters with deep snow, low temperatures, and strong winds may decrease birth rates and/or calf survival (Boertje et al., 1996; Adams and Dale, 1998). Conversely, it is possible that severe winters could provide a benefit to boreal caribou in some situations by limiting the distribution and abundance of other ungulates and predators (Environment Canada, 2007).

Climate change, particularly greater weather variability, may increase the frequency and severity of wildfires and cause more freeze-thaw cycles, freezing rain, deep snow, hot summer temperatures, and changes in the food supply (see review in COSEWIC, 2002). Changes in fire cycle may reduce the area of mature forest and alter the distribution of plant communities (Racey, 2005). Ice, snow crusting, and deep snow may impede caribou travel and limit access to ground lichens, which are a vital winter forage (Brown and Theberge, 1990). Alternatively, warming trends may allow deer and other prey species to expand into boreal caribou range, facilitating predation (Racey, 2005) and the spread of disease. Warmer and more humid summers may increase harassment by insects (Environment Canada, 2007). Caribou subject to insect harassment spend less time foraging, undertake energetically costly annoyance responses and spend more time in relatively unproductive habitats (Kelsall, 1968). Severe insect harassment could result in a negative energy balance and a subsequent reduction of body condition in the fall (Gunn and Skogland, 1997; Weladji et al., 2003). Moreover, climate change could result in the increased distribution of forest insect species that cause tree mortality (for example, mountain pine beetle, *Dendroctonus ponderosae*). Broad-scale forest insect invasions could cause changes to the fire cycle that diminish the quantity and quality of boreal caribou local population ranges. All of these factors could increase risk to population persistence of boreal caribou.

Although little evidence exists of disease or parasites impacting boreal caribou populations (Jordan et al., 2003), broad scale climate and habitat change may play a role in increasing the risk of disease transmission from white-tailed deer to caribou. For example, caribou are susceptible to a parasitic nematode, the brain or meningeal worm (*Parelaphostrongylus tenuis*) carried by white-tailed deer. The parasite is deadly to caribou (Anderson and Strelive, 1968; Bergerud, 1974). Warmer winter trends combined with landscape-scale habitat change may favour conditions for white-tailed deer range expansion to areas previously inhabited mainly by caribou. Wetter summer conditions may increase survival of the brain worm larvae in deer

feces, thus enhancing potential for transmission of brain worm from deer to caribou. As landscape change increases cohabitation of deer and boreal caribou across Canada, the extent to which disease may limit caribou populations cohabiting with infected deer remain an area of research opportunity.

IMPORTANCE OF BOREAL CARIBOU

As an ungulate species sensitive to habitat change in the boreal region of Canada, boreal caribou are significant from an ecological and cultural perspective. Caribou are a prey animal and thus support predator populations. Although the importance of boreal caribou in the diet of their predators varies across their range with population density, boreal caribou are likely to occur in the diets of all large carnivores within their range, including wolves, bears (*Ursus americanus* and *Ursus arctos*), cougar (*Felis concolor*) and wolverine (*Gulo gulo*). Other predators, such as lynx (*Lynx canadensis*), coyote (*Canis latrans*), and red fox (*Vulpes vulpes*), and a variety of smaller predators (such as ermine *Mustela erminea*) and scavengers (such as raven *Corvus corax* and golden eagle *Aquila chrysaetos*) benefit from the remains of caribou killed by large carnivores or other causes.

As ungulates, boreal caribou populations are capable of influencing plant species abundance; herbivory is an important community structuring process for plants (Elton, 1927). Herbivores such as boreal caribou can reduce the abundance of favoured species. In the case of caribou, where they occur on islands (for example, Slate Islands) and there are no predators, the abundance of certain plant species was reduced (Cringan, 1956; Cringan, 1957; Bergerud, 2007). However, on the mainland, the low density of boreal caribou severely limits their effect on plant species abundance.

In addition to their important ecological role in the boreal forest, boreal caribou are an integral part of the communities of First Nations people across the boreal region, and as such have held cultural, spiritual, subsistence importance for thousands of years (Schmelzer et al., 2004; Hummel and Ray, 2008; Ontario Ministry of Natural Resources, 2009a). Caribou meat has provided an important source of fat and protein to the diets of First Nations people for thousands of years. In addition to using caribou meat as sustenance, First Nations people use caribou skins for clothing, boots, tents, sleeping robes, and drums. Antlers and sinew traditionally had many uses as various tools including knives, cutlery, needles, fish hooks, sleds, kayak and canoe frames (Hummel and Ray, 2008). Caribou have also inspired many artistic expressions among First Nations communities; they are used in traditional arts and crafts and contribute to the economy of northern communities (Hummel and Ray, 2008). Caribou also have significant cultural importance to northern communities. The woodland caribou is a totem animal of Pikangikum people in northern Ontario, and is considered to be a gift from the Creator to use for survival and to enrich their lives (Whitefeather Forest Management Corporation, 2006). Among non-aboriginal Canadians, caribou symbolize the unspoiled wilderness and has been featured on the Canadian 25-cent piece since 1937 (Tesar, 2007). More recently, the declines of boreal caribou across the country have sparked

conservation campaigns among non-governmental organizations across the country (Hummel and Ray, 2008).

Boreal caribou as an indicator species

Boreal caribou have particular life history characteristics that limit their resilience and increase their dependence on large patches of mature coniferous forests. They are also vulnerable to human-induced habitat change (Bergerud, 1988; Sorenson et al., 2008; Environment Canada, 2008). The status of caribou populations may therefore function as a useful symbol for the health of boreal forest ecosystems.

Due to their low reproductive rate, caribou have been considered the least resilient of North American deer. They typically first breed at a later age (more than two years old), produce only one offspring per year, and are especially vulnerable to predators (Bergerud, 1988).

Accordingly, caribou generally require longer time periods to recover from population stresses.

In addition to low reproductive rates, boreal caribou occupy Canada's boreal region at low population densities, often below 0.06 caribou per km². Over millennia, the boreal population of woodland caribou adapted to dynamic forest ecosystem conditions, in which forest fire is the dominant cause of habitat disturbance and renewal. Forest fires vary in frequency and magnitude throughout the boreal forest of Canada, and boreal caribou populations shift their range over time in response to fire-induced changes in habitat quality (Environment Canada, 2008). Consequently, local populations require relatively large ranges to compensate for portions of the range in early seral stages to avoid predators and to find suitable habitat. The median size of a local population range is 9,000 km² (Schaefer and Mahoney, 2003).

Environment Canada (2008) demonstrated a negative relationship between human-induced changes to forest composition and configuration and boreal caribou population performance, indicating that the effects of industrial resource extraction on boreal caribou are additive.

Given the boreal caribou's requirements for large areas and their low resilience to changes in forest structure and configuration, the maintenance of viable boreal caribou populations may be an indicator of healthy boreal forest ecosystems (Canadian Council of Forest Ministers, 2000).

Moreover, given their need for large contiguous patches of suitable habitat, boreal caribou can serve as an umbrella species for other species with smaller habitat area requirements.

Maintaining and restoring habitat for boreal caribou at the local population range has positive outcomes for numerous other forest-dwelling species, such as marten (*Martes americana*) (Thompson and Harestad, 1994), and certain lichens (Selva, 1994). The population dynamics of wolverine, a listed species at risk that also requires large habitat patches in the boreal forest, may be likened to that of boreal caribou, and therefore forest management that considers the spatial and habitat needs of caribou populations may also benefit populations of wolverine (Ontario Woodland Caribou Recovery Team, 2008).

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Appendix 1. Estimates of numbers and trends for the boreal population of woodland caribou

Source: (Environment Canada, 2008)

Note: Caribou local population estimates in the following chart may not fully account for the movement of caribou between jurisdictions within trans-boundary ranges (that is, some caribou that cross provincial/territorial borders may be represented more than once). Also, some of the local population size estimates and trend data are based primarily on professional judgement and limited data and not on rigorously collected field data.

Local Population refers to the 39 recognized discrete local populations; Unit of analysis refers to the remaining units of which six units in NWT are the results of sub-dividing a large area of relatively continuous habitat considered to be occupied by one large population into units of analysis. Eight units in Saskatchewan represent units of analysis for multiple local populations within an area of relatively continuous habitat. The four remaining units of analysis found in parts of Manitoba, Ontario, Quebec, and Labrador include possible multiple local populations within a large area of relatively continuous habitat. In the absence of defined local populations and units of analysis for these areas, the extent of occurrence was considered to comprise the unit of analysis for these four units.

#	Local population or unit of analysis	Year of census	Extent of survey coverage	Local population size estimate	Confidence limits	Current local population trend
Cross-Jurisdictional						
1	AB/BC Chinchaga	AB – Annual BC – 2004	AB – Precise pop. Trend estimate only (AB does not enumerate caribou) BC – Incomplete	250-300 (includes former Hotchkiss local population)	AB – Size estimate based on professional judgement and available field data BC – Average based on several different extrapolations from partial inventory coverage	AB – Rapidly decline (mean $\lambda = 0.93$ during 2002-2006; range $\lambda = 0.80-1.06$) BC – Suspected declining based on professional judgement
2	AB/NWT Bistcho	AB – 2005 NWT – Unknown	AB – Precise pop. Trend estimate only (AB does not enumerate caribou) NWT – Incomplete	300	AB – Size estimate based on professional judgement and available field data NWT – Estimates based on minimum numbers observed from flights	Suspected declining based on professional judgement agreed to by both jurisdictions
3	AB/NWT Steen River/ Yates	AB – 2005 NWT – Unknown	AB – Precise pop. Trend estimate only (AB does not enumerate caribou) NWT – Unknown	300	AB – Size estimate based on professional judgement and available field data NWT – Unknown	Unknown
Northwest Territories						
Reported data: Estimates for the units representing continuously distributed local population were derived from density estimates surrounding collared animals, and then extrapolated to larger geographic areas, or for the North Slave region, a density estimate was developed from aerial surveys. Reported trends are expert opinion from NWT based on size estimates over time.						

#	Local population or unit of analysis	Year of census	Extent of survey coverage	Local population size estimate	Confidence limits	Current local population trend
4	NWT Inuvialuit	2005	Incomplete	Unknown	Unknown	Unknown
5	NWT Gwitch'in	2005	Incomplete	500	The population estimate is based on extrapolation of densities from minimum numbers observed from other areas in NWT with collared animals	Increasing based on professional judgement
6	NWT Sahtu	2005	Incomplete	2000	The population estimate is based on extrapolation of densities from minimum numbers observed from other areas in NWT with collared animals	Unknown
7	NWT North Slave	2005	Incomplete	700	The population estimate is based on extrapolation of densities from minimum numbers observed from other areas in NWT with collared animals	Unknown
8	NWT Deh Cho (N/SW)	2005	Incomplete	2000	The population estimate is based on extrapolation of densities from minimum numbers observed from other areas in NWT with collared animals	Likely decline based on professional judgement
9	NWT South Slave/SE Deh Cho	2005	Incomplete	600	The population estimate is based on extrapolation of densities from minimum numbers observed from other areas in NWT with collared animals	Likely declining based on recruitment and cow survival based on 5 years of trend data
British Columbia						
10	BC Maxhamish	2004	Incomplete	306	Average based on several different extrapolations from partial inventory coverage	Unknown
11	BC Calendar	2004	Incomplete	291 (best estimate)	Average based on several different extrapolations from partial inventory coverage	Unknown

#	Local population or unit of analysis	Year of census	Extent of survey coverage	Local population size estimate	Confidence limits	Current local population trend
12	BC Snake Sahtaneh	2004	Incomplete	365 (best estimate)	Average based on several different extrapolations from partial inventory coverage	Suspected declining. Report had 94% adult female survival and calf recruitment of 5-9 calves/100 cows which is essentially a lambda of 1, but the low calf recruitment concluded that the local population was suspected declining. However, the study was too short to make any firm conclusions.
13	BC Parker Core	2007	Incomplete	24 (best estimate)	Average based on several different extrapolations from partial inventory coverage	Unknown
14	BC Prophet Core	2004	Incomplete	54 (best estimate)	Average based on several different extrapolations from partial inventory coverage	Unknown
Alberta						
15	AB Deadwood*	2005	Local population trend estimate (AB does not enumerate caribou)	40	Local population size estimate based on professional judgement and available field data	Suspect declining. Local population trend not measured
16	AB Caribou Mountains	Annual	Local population trend estimate (AB doesn't enumerate caribou)	400-500	Local population size estimate based on professional judgement and available field data	Rapidly declining (mean λ = 0.92 during 1995-2007; range λ = 0.73-1.14)
17	AB Red Earth	Annual	Local population trend estimate (AB does not enumerate caribou)	250-350	Local population size estimate based on professional judgement and available field data	Rapidly declining (mean λ = 0.94 during 1995-2007; range λ = 0.81-1.30)
18	AB West Side Athabasca River	Annual	Local population trend estimate (AB does not enumerate caribou)	300-400	Local population size estimate based on professional judgement and available field data	Declining (mean λ = 0.99 during 1993-2007; range λ = 0.83-1.14)
19	AB Richardson		Local population trend estimate (AB does not enumerate caribou)	<100	Local population size estimate based on professional judgement and available field data	Unknown. Local population trend not measured
20	AB East Side Athabasca River	Annual	Local population trend estimate (AB does not enumerate caribou)	150-250	Local population size estimate based on professional judgement and available field data	Declining (mean λ = 0.95 during 1993-2007; range λ = 0.80-1.08)
21	AB Cold Lake Air Weapons Range	Annual	Local population trend estimate (AB doesn't enumerate caribou)	100-150	Local population size estimate based on professional judgement and available field data	Rapidly declining (mean λ = 0.93 during 1998-2007; range λ = 0.75-1.05)
22	AB Nipisi			60-70		Unknown

#	Local population or unit of analysis	Year of census	Extent of survey coverage	Local population size estimate	Confidence limits	Current local population trend
23	AB Slave Lake	Annual	Local population trend estimate (AB does not enumerate caribou)	75	Local population size estimate based on professional judgement and available field data	Unknown
24	AB Little Smoky	Annual	Local population trend estimate (AB does not enumerate caribou)	80	Local population size estimate based on professional judgement and available field data	Rapidly declining (mean $\lambda = 0.89$ during 1999-2007; range $\lambda = 0.77-1.04$)
<p>Saskatchewan</p> <p>Data reported: The survey used by Saskatchewan Wildlife Branch in the 1980s and early 1990s was one developed by government staff based on advice from some caribou researchers at the time. Surveys were conducted in late November or early December (but were never successful for a variety of reasons). Staff then chose to fly as soon as possible after a fresh snowfall, conducting a transect survey each morning using tightly spaced lines to pick up fresh caribou signs and record. Each afternoon staff would return with a helicopter to search out the sign, locate, count, and sex/age the animals. In a survey in 1992, a helicopter was used for everything and simply went off transect each time fresh caribou signs were encountered – following up the sign, recording it, and returning to transect. Sunny days with shadows to show up the tracks were preferable in contrast to a typical moose survey. Staff also stratified survey areas for the southern ones that were off the shield. In retrospect minimum counts were obtained rather than total local population estimates and no attempts were made to define confidence limits. (T. Trottier, pers. comm.)</p>						
25	SK Davy-Athabasca	2006	N/A	310	Estimate based on habitat based on a density estimate of 0.031 (A. Arsenault, pers. comm.)	Unknown
26	SK Clearwater	2006	N/A	425	Estimate based on habitat based on density estimate of 0.036 (average of density estimates from two adjacent WCMUs)	Unknown
27	SK Highrock-Key	2006	Incomplete	1060	Estimate based on habitat surveys of portions of range based on density estimate of 0.041 (average of two surveys)	Unknown
28	SK Steephill-Foster	2006	Incomplete	1075	Estimate based on habitat and aerial surveys of portions of range and aerial survey in late 1980s based on density estimate of 0.033	Unknown
29	SK Primrose-Cold Lake	2006	Incomplete	350	Estimate based on habitat and aerial surveys in early 1990s, and data collected by Alberta based on density estimate of 0.047(average of two surveys)	Unknown

#	Local population or unit of analysis	Year of census	Extent of survey coverage	Local population size estimate	Confidence limits	Current local population trend
30	SK Smoothstone-Wapawekka	2006	Incomplete	700	Estimate based on habitat and previous aerial surveys of portions of range in early 1990s, and documented range recession based on density estimate of 0.027 (average of three surveys)	Declining with habitat change based on professional judgement
31	SK Suggi-Amisk-Kississing	2006	Incomplete	430	Estimate based on habitat and previous aerial surveys of portions of range in late 1980s based on density estimate of 0.055 (average of two surveys)	Unknown
32	SK Pasquia-Bog	2006	Incomplete	30	Estimate based on recent genetic work cooperative with Manitoba. Documented range recession based on density estimate of 0.012 (A. Arsenault, pers. comm.)	Threat of decline based on professional judgement
Manitoba						
Data reported: Year of census (except for Owl Flinstone) and extent of survey coverage were not reported. Trend data is based on local population estimates carried out in the 1970s and 1980s and in recent years (2007 for Owl Flinstone), that reported similar estimates.						
33	MB Kississing	N/A (not available)	N/A	50-75	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts
34	MB Naosap	N/A	N/A	100-200	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts
35	MB Reed	N/A	N/A	100-150	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts
36	MB William Lake	N/A	N/A	25-40	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts
37	MB Wapisu	N/A	N/A	100-125	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts
38	MB The Bog	N/A	N/A	50-75	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts

#	Local population or unit of analysis	Year of census	Extent of survey coverage	Local population size estimate	Confidence limits	Current local population trend
39	MB Wabowden	N/A	N/A	200-225	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts
40	MB North Interlake	N/A	N/A	50-75	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts
41	MB Atikaki-Berens	N/A	N/A	300-500	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts
42	MB Owl Flintstone	2007	N/A	71-85	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts
43	Manitoba (remainder of boreal caribou in MB)	N/A	N/A	775-1585	Based on professional judgement and periodic local population counts	Stable based on professional judgement and periodic local population counts
Ontario						
44	ON North East Superior (includes Pukaskwa, Gargantua and Pic Islands)	N/A (not available)	N/A	42	Estimate is based on compilation of expert opinions and local survey efforts	Decreasing based on expert opinion
45	ON Michipicoten	N/A	N/A	200	Estimate is based on compilation of expert opinions and local survey efforts	Increasing based on expert opinion
46	ON Slate Islands	N/A	N/A	250	Estimate is based on compilation of expert opinions and local survey efforts. Bergerud et al. 2007 suggests a population fluctuating between 100-500 caribou.	Unknown. Population has varied considerably over time.
47	Ontario (remainder of boreal caribou in Ontario)	1996 (questionnaire survey)	Incomplete	5000	Largely based upon an aggregation of individual Ministry of Natural Resources district and park estimates (Cumming, 1998)	Unknown
Quebec						
48	QC Val d'Or	N/A (not available)	Complete	30	Local population size estimate based on professional judgement and available field data	Declining based on professional judgement and available field data

#	Local population or unit of analysis	Year of census	Extent of survey coverage	Local population size estimate	Confidence limits	Current local population trend
49	QC Charlevoix	1998	Complete	75	Local population size estimate based on professional judgement and available field data	Stable based on professional judgement and available field data
50	QC Pipmuacan	N/A	N/A	134	Local population size estimate based on professional judgement and available field data	Stable based on professional judgement and available field data
51	QC Manouane	N/A	N/A	358	Local population size estimate based on professional judgement and available field data	Stable based on professional judgement and available field data
52	QC Manicouagan	N/A	N/A	181	Local population size estimate based on professional judgement and available field data	Increasing based on professional judgement and available field data
53	Quebec (remainder of boreal caribou in QC)	Incomplete	Incomplete	6000-12 000	Local population size estimate based on professional judgement and available inventory data for the southern part of the range extent	Suspected stable. Supported by Quebec's Comité de rétablissement based on surveyed areas and data confirming that the range extent has not changed

Newfoundland and Labrador

Data reported: No Newfoundland local populations are included in the 'Threatened' designation. The following local populations occur in Labrador, not Newfoundland and there fore the abbreviation "LAB" has been used at the beginning of the local population's name.

Lac Joseph: surveyed in 2000. Full Range (38,000 km²), using a mark-recapture method, Lincoln-Peterson/joint hypergeometric maximum likelihood estimator. We have conducted late-winter classifications (March, best indicator of recruitment as calves are 9.5 months old) every year since 2000. Percent calves has ranged between 15 and 20% over that time period, and sex ratios of males/females indicate there are approximately 50 adult males per 100 females (or about 33% males). Between 1999 and 2006 adult survival ranged between 0.788 to 0.913 with a mean value of 0.852 in this herd, and mean calf survival over the same period is 0.4. Collectively, these suggest that this herd is either stable or slightly declining. Calf recruitment is good, but adult female survival could be better.

Red Wine Mountain: The survey in 2001 covered the full range of this herd, or 29,900 km². The estimator used was also a maximum likelihood estimator (mark-recapture technique). The minimum count (number of unique animals observed) was 67, and revised to 87 in 2003 based on a partial survey of animals associated in groups with radio-collared females in 2003. Calf recruitment is similar to LJ, as is adult female survival. However, survival rates need to be adjusted to account for losses of adult animals due to illegal hunting.

Mealy Mountain: survey in 2005 covered an area of 62,000 km² (full range). Type was a density-distribution survey (after Gasaway 1986). Survey repeated methods/extent of 2002 census and estimates of population size do not differ significantly (statistically speaking), which suggests that the population is stable. This herd declined sharply from 2,600 to 284 between 1958 and 1975, and has recovered to numbers in excess of 2,000 since 2002. Calf recruitment in 2005 was 16%, and adult female survival averaged 89% between 2002 and 2006. The current rate of growth in this herd appears to be 0. However, observed parturition, recruitment, and survivorship schedules suggest this herd has the potential to increase. It is possible that any gains in recruitment are being offset by enhanced mortality of adult (uncollared) animals.

54	LAB Lac Joseph	2000	Complete	1101	756-1933 ($\alpha = 0.10$)	Unknown
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#	Local population or unit of analysis	Year of census	Extent of survey coverage	Local population size estimate	Confidence limits	Current local population trend
55	LAB Red Wine Mountain	2001	Complete	97	72-189 ($\alpha = 0.10$)	Declining based on professional judgement and available field data; declined from over 800 animals in 1997 to less than 100, and a corresponding change in range size/use has been documented
56	LAB Mealy Mountain	2005	Complete (high density offshore island not included ~ 300 caribou)	2106	765-3447 ($\alpha = 0.10$)	Stable based on professional judgement and available field data
57	Labrador (remainder of boreal caribou in Labrador)	N/A	Incomplete	Unknown	N/A	Unknown

* Local population "Deadwood" was recently amalgamated with "Chinchaga" for management purposes, so Deadwood is no longer considered to be a local population.

Appendix 2. Distribution of boreal caribou local populations by ecozone⁺

#	Local Population	Province/ Territory	Ecozone ⁺
1	Chinchaga	AB-BC	Boreal Plains, Taiga Plains
2	Bistcho	AB	Taiga Plains
3	Steen River/Yates	AB	Taiga Plains
4	Inuvialuit	NWT	Southern Arctic, Taiga Plains
5	Gwitch'in	NWT	Southern Arctic, Taiga Cordillera, Taiga Plains
6	Sahtu	NWT	Southern Arctic, Taiga Cordillera, Taiga Plains, Taiga Shield
7	North Slave	NWT	Taiga Plains, Taiga Shield
8	Deh Cho (N/SW)	NWT	Boreal Cordillera, Taiga Cordillera, Taiga Plains
9	South Slave/SE Deh Cho	NWT	Taiga Plains
10	Maxhamish	BC	Taiga Plains
11	Calendar	BC	Taiga Plains
12	Snake-Sahtahneh	BC	Taiga Plains
13	Parker	BC	Taiga Plains
14	Prophet	BC	Taiga Plains
15	Deadwood	AB	Boreal Plains
16	Caribou Mountains	AB	Boreal Plains, Taiga Plains
17	Red Earth	AB	Boreal Plains
18	West Side Athabasca River	AB	Boreal Plains
19	Richardson	AB	Boreal Plains
20	East Side Athabasca River	AB	Boreal Plains
21	Cold Lake Air Weapons Range	AB	Boreal Plains
22	Nipisi	AB	Boreal Plains
23	Slave Lake	AB	Boreal Plains
24	Little Smoky	AB	Boreal Plains, Taiga Plains
25	Davy-Athabasca	SK	Boreal Shield, Taiga Shield
26	Clearwater	SK	Boreal Plains, Boreal Shield, Taiga Shield
27	Highrock-Key	SK	Boreal Plains, Boreal Shield, Taiga Shield
28	SteePhill-Foster	SK	Boreal Shield

29	Primrose-Cold lake	SK	Boreal Plains, Boreal Shield
30	Smoothstone-Wapawekka	SK	Boreal Plains, Boreal Shield
31	Suggi-Amisk-Kississing	SK	Boreal Plains, Boreal Shield
32	Pasqui-Bog	SK	Boreal Plains
33	Kississing	MB	Boreal Shield
34	Naosap	MB	Boreal Plains, Boreal Shield
35	Reed	MB	Boreal Plains, Boreal Shield
36	William Lake	MB	Boreal Plains
37	Wapisu	MB	Boreal Shield
38	The Bog	MB	Boreal Plains, Boreal Shield
39	Wabowden	MB	Boreal Plains, Boreal Shield
40	North Interlake	MB	Boreal Plains
41	Atikaki-Bernes	MB	Boreal Plains, Boreal Shield
42	Owl-Flinstone	MB	Boreal Shield
43	Manitoba	MB	Boreal Plains, Boreal Shield, Hudson Plains
44	North East Superior	ON	Boreal Shield
45	Michipicoten Island	ON	Boreal Shield
46	Slate Islands	ON	Boreal Shield
47	Ontario	ON	Boreal Shield, Hudson Plains
48	Val d'Or	QC	Boreal Shield
49	Charlevoix	QC	Boreal Shield
50	Pipmuacan	QC	Boreal Shield
51	Manouane	QC	Boreal Shield
52	Manicouagan	QC	Boreal Shield
53	Quebec	QC	Boreal Shield, Hudson Plains, Taiga Shield
54	Lac Joseph	LAB	Boreal Shield, Taiga Shield
55	Red Wine Mountain	LAB	Boreal Shield, Taiga Shield
56	Mealy Mountain	LAB	Boreal Shield, Taiga Shield
57	Labrador	LAB	Boreal Shield, Taiga Shield

Appendix 3. Local population range disturbance

Note: The disturbance data is reprinted from Environment Canada (2008). The “Fire %” is the percent of the range area burned within the past 50 years of the most recent recruitment data for each population. Fire data from the Canadian Large Fire Database, augmented by additional coverage for the Northwest Territories that contained wildfires larger than 2 km² were also used. The “Anthropogenic %” is the percent of the range area affected by anthropogenic disturbance, based on GIS layers obtained from Global Forest Watch Canada (GFWC). GFWC has compiled the only available, nationally-consistent coverage of anthropogenic disturbance across forested regions of Canada. All visible linear and polygonal anthropogenic disturbances were digitized from Landsat images from the period 1985 to 2003, and combined with additional coverage of roads, reservoirs, and mines from databases spanning the period 2002 to 2006. Linear disturbances included roads, railroads, seismic lines, pipelines, and utility corridors; polygonal features included recently anthropogenically-converted areas such as settlements, populated industrial areas, croplands (both new and abandoned), reservoirs, cut blocks, and mining activity. All features in the database were buffered by 500 m to create a “zone of influence”, and merged to create a non-overlapping coverage of all anthropogenic disturbances.

Local population or unit of analysis		Local population range disturbance		
		Fire %	Anthropogenic %	Total % of disturbance
1	AB/BC Chinchaga	10.9	58.5	62.8
2	AB/NWT Bistcho	24.3	40.1	57.5
3	AB/NWT Steen River/Yates	29.6	32.2	57.0
4	NWT Inuvialuit	2.5	0.6	3.1
5	NWT/YK Gwitch'in	30.1	7.5	36.0
6	NWT Sahtu	20.4	4.6	23.4
7	NWT North Slave	36.0	1.2	36.9
8	NWT Deh Cho (N/SW)	28.2	17.7	43.3
9	NWT South Slave/SE Deh Cho	34.6	16.0	46.7
10	BC Maxhamish	1.0	45.9	46.4
11	BC Calendar	9.4	47.4	52.2
12	BC Snake Sahtaneh	14.2	56.3	63.1
13	BC Parker Core	0.5	31.1	34.6
14	BC Prophet Core	0.2	71.8	71.9
15	AB Deadwood	10.3	63.1	66.5
16	AB Caribou Mountains	43.8	24.0	54.7
17	AB Red Earth	28.8	39.0	58.6
18	AB West Side Athabasca River	4.1	42.7	44.8
19	AB Richardson	19.7	19.9	37.1
20	AB East Side Athabasca River	26.5	49.5	61.9
21	AB Cold Lake Air Weapons Range	35.0	45.7	65.9
22	AB Nipisi	6.0	46.1	49.9
23	AB Slave Lake	46.8	67.7	81.9
24	AB Little Smoky	0.2	81.5	81.5
25	SK Davy-Athabasca	34.6	1.1	35.4
26	SK Clearwater	53.6	1.2	54.0

Local population or unit of analysis		Local population range disturbance		
		Fire %	Anthropogenic %	Total % of disturbance
27	SK Highrock-Key	45.6	3.0	47.3
28	SK Steepphill-Foster	38.6	1.9	39.9
29	SK Primrose-Cold Lake	38.6	19.5	52.0
30	SK Smoothstone-Wapawekka	14.7	18.2	29.5
31	SK Suggi-Amisk-Kississing	12.6	7.9	19.8
32	SK Pasquia-Bog	12.1	25.5	35.6
33	MB Kississing	39.2	12.5	50.8
34	MB Naosap	15.0	28.1	41.2
35	MB Reed	6.9	22.0	28.0
36	MB William Lake	4.1	24.2	27.6
37	MB Wapisu	10.6	12.9	23.3
38	MB The Bog	10.0	19.6	28.1
39	MB Wabowden	16.9	15.2	29.3
40	MB North Interlake	3.2	14.7	16.6
41	MB Atikaki-Berens	25.9	5.4	28.2
42	MB Owl Flintstone	23.9	23.8	43.8
43	Manitoba (remainder of boreal caribou in MB)	20.5	9.9	29.3
44	ON North East Superior (Note: Range too small to capture range disturbance)	0.0	0.0	0.0
45	ON Michipicoten	0.0	20.8	20.8
46	ON Slate Islands	0.0	0.0	0.0
47	Ontario (remainder of boreal caribou in Ontario)	12.6	6.3	18.5
48	QC Val d'Or	0.2	50.3	50.3
49	QC Charlevoix	3.6	68.4	70.3
50	QC Pimpuacan	10.5	45.7	53.1
51	QC Manouane	17.9	10.2	25.4
52	QC Manicouagan	3.0	28.8	30.5
53	Quebec (remainder of boreal caribou in QC)	16.7	12.9	25.9
54	LAB Lac Joseph	4.1	1.9	5.9
55	LAB Red Wine Mountain	2.4	8.5	10.8
56	LAB Mealy Mountain	0.2	0.4	0.6
57	Labrador (remainder of boreal caribou in LAB)	5.0	5.3	10.0