Components of a Mountain Caribou Conservation Strategy for British Columbia

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ABSTRACT

Mountain caribou (*Rangifer tarandus caribou*, mountain/arboreal-lichen feeding ecotype) are currently Blue-listed in British Columbia. British Columbia currently has an estimated 2,450 mountain caribou, representing about 98% of the world population, distributed in 13 spatially disjunct subpopulations, which comprise a single meta-population. Habitat fragmentation, reduction in winter food supply, human access and disturbance (including hunting and poaching), and predation have probably contributed to past declines in distribution and abundance. To meet national and international responsibilities for the long-term viability of mountain caribou, a provincial Mountain Caribou Conservation Strategy (MCCS) is being developed. The proposed vision is to "maintain caribou and their habitat in perpetuity throughout British Columbia's mountain caribou range" and the proposed goals are to: (1) maintain a population of $\geq$2,500 mountain caribou, distributed throughout their current range in British Columbia; (2) enhance the recovery of threatened subpopulations; (3) provide opportunities for integrated use of caribou habitats, and assess socioeconomic impacts; and (4) provide opportunities for the use and enjoyment of mountain caribou. A proposed conservation approach is outlined. Long-term conservation of the mountain caribou meta-population will require maintenance of caribou core old-growth habitats and protection of habitat linkages between subpopulations. Short-term persistence of several threatened subpopulations may require additional population management measures. Successful implementation of the MCCS will require active participation of the provincial ministries of Environment and Forests, the forest industry, and other stakeholders.

Key words: caribou, forestry, mountain caribou ecotype, *Rangifer tarandus caribou*.

CONSERVATION STATUS

All caribou in British Columbia belong to the woodland subspecies (*Rangifer tarandus caribou*), but they can be further divided into 3 different ecotypes, based on differences in habitat use, feeding behaviour, and migration patterns. Historically, the mountain/arboreal lichen-feeding caribou ecotype was more widely distributed throughout the mountainous region of southeastern British Columbia (Fig. 1). Habitat fragmentation, reduction in winter food supply, human access and disturbance (including hunting and poaching), and predation have probably contributed to past declines in caribou distribution and abundance (Stevenson and Hatler 1985, Seip and Cichowski 1996, Heard and Vagt 1998).

As far back as 1984, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) considered mountain caribou in British Columbia to be Rare, and those in the South Selkirk Mountains to be Endangered. Currently, all western caribou populations in Canada are listed as Vulnerable by COSEWIC. The trans-boundary population of the South Selkirks in the United States has been officially designated as endangered in the United States. British Columbia is currently an active member of the United States-Canada Woodland Caribou Recovery Team to recover this population (U.S. Fish and Wildlife Service 1993). Thus, British Columbia has national and international responsibilities for the long-term viability of mountain caribou.

Mountain caribou have been provincially designated as Blue-listed by the British Columbia Conservation Data Centre. As a Blue-listed ecotype, these caribou are considered vulnerable or sensitive (at risk), and need special management to ensure their survival. British Columbia currently has an estimated 2,450 mountain caribou (Table 1), which represents approximately 98% of the world's population of this ecotype. Currently, they exist in 13 spatially disjunct subpopulations, which comprise a single meta-population (Fig. 1). Some subpopulations are adjacent to each other or are connected through habitat corridors, while others are relatively isolated. At least 3 subpopulations (South Selkirk,

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Table 1. Population size, trend, and density of mountain caribou subpopulations in 1997.

Mountain caribou subpopulation	Population size	Population trend	Range (km^2)[a]	Density (no. /1,000 km^2)
North Caribou Mtns.	425	increasing	6,690	64
Wells Gray South	400	stable	11,238	36
Wells Gray North	300	stable	7,654	39
Revelstoke	400	increasing	8,560	47
Hart Ranges	450	increasing	21,970	20
Central Selkirks	215	stable	5,706	38
Barkerville	40	stable	1,509	27
Narrow Lake	50	declining	432	116
Central Rockies	50	stable	9,734	5
South Selkirks	30	declining	3,456	9
South Purcells	50	declining	6,829	7
Monashee	20	declining	1,745	11
George Mountain	20	unknown	442	45
TOTAL	2,450	stable	85,964	29

[a] Present available range.

South Purcell, and Monashee) appear to be threatened, as they exist at very low density, are relatively isolated, and are currently declining.

The Mountain Caribou-Forestry Controversy

The decline of mountain caribou, particularly within the southeastern part of the province, has been recognized in British Columbia for 2 decades or more (Simpson et al. 1994). Numerous factors have been associated with caribou declines, including wildfire, predation, hunting, poaching, winter recreation, hydroelectric development, mining and mineral exploration, forest logging, corridor development (highways, railways), and human habitation (Bergerud 1978, Heard and Vagt 1998). For more than 20 years, however, forest harvesting has been recognized as the greatest management concern in mountain caribou ranges. During the past 10 years its importance has increased significantly as logging has moved into forest types that were previously avoided, particularly high-elevation subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) types (ESSF), and certain cedar (*Thuja plicata*) and hemlock (*Tsuga heterophylla*) types (ICH).

Stevenson et al. (1994:1) summarized the controversy as follows: "The habitat requirements of mountain caribou, as they are understood today, are incompatible with traditional forest management practices at the stand and landscape levels. Caribou are adapted to use large areas of suitable habitat. Suitable winter habitat for mountain caribou has attributes characteristic of old forests (at least 150 years), including abundant arboreal lichens (*Bryoria* spp. and *Alectoria sarmentosa*). Forests managed under any silvicultural system that eventually eliminates, or substantially reduces, the number of large, old, lichen-bearing trees will not provide winter habitat for caribou. Such silvicultural systems include clear-cut systems on normal rotations and selection systems with heavy, frequent stand entries. The problem of habitat modification by logging is compounded by associated road access, which leads to increased distur-

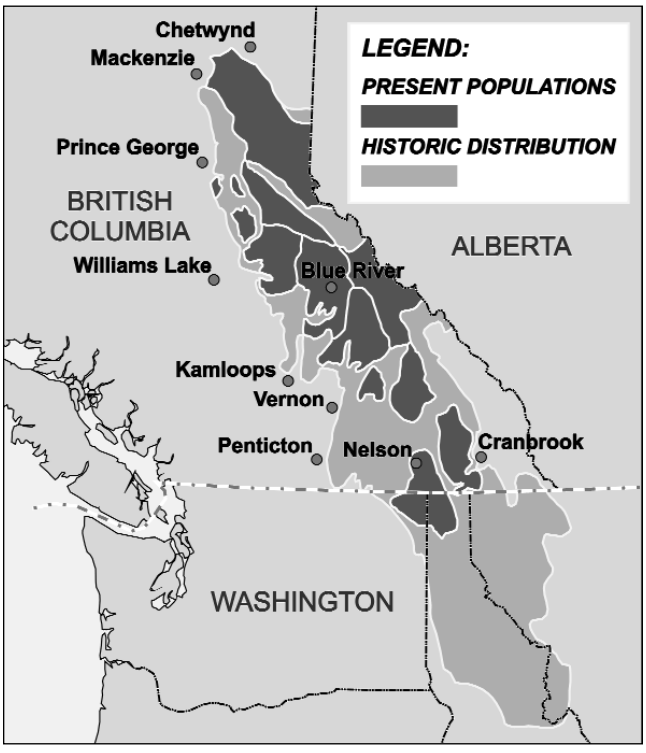

Figure 1. Present and potential historic distribution of mountain caribou. The present distribution includes 13 subpopulations.

bance, human-induced mortality, and potentially to increased predation by wolves (and cougars)."

PROPOSED VISION AND GOALS

The proposed vision for the provincial Mountain Caribou Conservation Strategy (MCCS) is "the maintenance of caribou and their habitat in perpetuity throughout British Columbia's mountain caribou range." This vision reflects the social, cultural, and economic values associated with mountain caribou—including people and caribou living in harmony. The proposed goals of the strategy are:

1) *To maintain a stable population level of ≥2,500 mountain caribou distributed throughout their current range in British Columbia.*— This is the overriding goal for mountain caribou conservation. It seeks to ensure that a viable meta-population is maintained, and that mountain caribou remain an integral component of the large mammal fauna within the Southern Interior Mountains ecoprovince and the Hart Ranges ecosection. While it would be preferable to increase mountain caribou numbers to a level where they could be removed from the Blue List, this may not be achievable, given the need to simultaneously address goal 3.
2) *To enhance the recovery of small, threatened subpopulations.*— Several subpopulations appear to be threatened and could become extirpated unless specific recovery measures are implemented. While the long-term conservation value of these subpopulations for maintaining a viable meta-population is presently unknown, it may be significant. Wherever possible, approved recovery plans should be developed for threatened subpopulations. This goal also recognizes British Columbia's continued commitment to recovery of the "endangered" mountain caribou subpopulation within the South Selkirk ecosystem (U.S. Fish and Wildlife Service 1993).
3) *To provide opportunities for integrated use of caribou habitats and assess socio-economic impacts.*— This goal recognizes that maintaining or enhancing mountain caribou habitat has socioeconomic impacts on other land uses and local communities. Opportunities to provide for integrated use of caribou habitat must be sought, providing they are consistent with mountain caribou conservation. The most effective means for satisfactorily resolving human conflicts with mountain caribou is through research and adaptive management, and by ensuring full participation of all relevant stakeholders in the decision-making process. Thus, responding to the challenge of integrating resource use and caribou management will be a long-term process, based upon negotiation and compromise. That being so, negotiation should be based upon a provincial assessment of conservation risks and economic impacts (Simpson et al. 1997). These include:
   - a comparative evaluation of conservation values of the 13 subpopulations;
   - a comparative evaluation of the economic costs of maintaining the 13 subpopulations;
   - an assessment of the variety of integrated management options available; and
   - an adequate knowledge of mountain caribou ecology.

   The appropriate forum for assessing socioeconomic impacts of protecting caribou habitat will likely be through the regional and subregional land-use planning processes (Land and Resource Management Plans [LRMPs] and the Forest Practices Code's Higher Level Planning processes). Land-use decisions that have already been made by cabinet must also be recognized and accepted.
4) *To provide opportunities for the use and enjoyment of mountain caribou*.— Part of British Columbia's wildlife heritage is the use and enjoyment of wildlife by people. The priority use of mountain caribou is conservation; that is, maintain subpopulations at self-sustaining levels and translocate (transplant) individuals to recover other subpopulations. Other approved uses, where compatible with the overriding goal of conservation, include viewing, First Nations use, and resident/non-resident hunting.

Conservation Approach

Management of mountain caribou must weigh the risks or threats of various management actions with conservation needs. To address this, the MCCS should develop a conservation approach that recognizes the meta-population structure of mountain caribou, employs the precautionary principle, encourages learning through adaptive management, and is based on ecosystem management principles.

Meta-population Persistence

A successful strategy for mountain caribou must recognize their meta-population structure. Dispersal from larger subpopulations augments and possibly even "rescues" small populations (prevents extirpation and ensures genetic interchange for adaptability). Conversely, small subpopulations could be important for recovering larger subpopulations that suffer a catastrophic event. Maintaining subpopulations, as well as "habitat linkages" or dispersal routes between them, is critical to meta-population persistence. Small, isolated populations, which have very little chance for dispersal, may require periodic herd augmentation (transplants) to prevent extirpation and maintain genetic variation.

Precautionary Principle

Application of the precautionary principle to mountain caribou means that where there are threats of serious habitat loss associated with forest development or other industrial activities, lack of full scientific certainty should not be used

as a reason for altering caribou habitats. This principle places the onus on both government and industry (e.g., through joint ventures such as Forest Renewal British Columbia) to demonstrate that environmental impacts that alter mountain caribou habitat, habitat use patterns, or demography, have either nil, negligible, or an acceptable level of impact.

Adaptive Management

While conventional research studies have greatly improved our knowledge of mountain caribou and their habitat, an adaptive management approach is necessary to provide long-term solutions on how to mitigate the impacts of timber harvesting on caribou. However, because the response time of mountain caribou habitats to alterations and management experiments is long, results can be slow in appearing (Armleder and Stevenson 1996). Consequently, interim habitat management guidelines based on existing research, the precautionary principle, and ecosystem management principles should be developed until more definitive results from adaptive management experiments are available.

Ecosystem Management

Ecosystem management is based on the assumption that the more closely managed forests resemble natural forest conditions (i.e., age class distribution, patch size distribution, stand structure), the greater the probability that relatively natural populations of all native species will be maintained (Seip 1998). The MCCS should consider employing a comprehensive ecosystem management approach for mountain caribou. For example, when dealing with ESSF zone forest management issues, it would also be appropriate to stress the multiple conservation values of that zone, both to mountain caribou and to other species, including Blue-listed fish like bull trout (*Salvelinus confluentus*), as well as the production of water supplies for aquatic ecosystems and industrial and domestic use.

MANAGEMENT PRESCRIPTIONS

Current knowledge suggests that the long-term persistence of mountain caribou is dependent upon a perpetual supply of large, contiguous areas of suitable summer and winter habitat, with little or no vehicle access and human disturbance, so caribou can space out at low densities (approximately 40/1000 km2), and thus reduce predation risk (Seip and Cichowski 1996). However, most subpopulations occupy ranges that have been fragmented to varying degrees by logging and access, and have higher predator populations than occurred historically, due to alteration of predator-prey systems. Thus, a combination of both habitat and population management prescriptions will likely be required to maintain viable caribou subpopulations.

Habitat Management

Some form of caribou habitat management guidelines or planning/operational direction is in place throughout mountain caribou range. The impact of these guidelines on the forest industry vary, depending on the extent of conflict between caribou and timber, and the differing regional behavioural and movement patterns of caribou. Current habitat management efforts are focused on the following 4 major issues:

Identify and Protect Core Habitat Areas

At 1 time, most herds included a high-elevation no-harvest zone, which in most areas corresponded approximately to the forest harvesting "operability line" (Simpson et al. 1997). More recently, the Cariboo-Chilcotin Land Use Plan (CCLUP) has replaced a 20-year deferral of upper-elevation, late-winter habitats with a zone that allows up to 35% modified timber harvesting for each CCLUP subunit. Other LRMPs have attempted to maintain 30–40% of the operable landbase in age class 8 or older (>160 yr) within high-elevation, late-winter habitats.

Establish Alternative Silvicultural Systems

The primary focus of the Mountain Caribou in Managed Forests program was to identify silvicultural systems and habitat enhancement techniques that would sustain both timber harvest and mountain caribou winter habitat over the long term (Stevenson et al. 1994). Many of the adaptive management trials established under that program are still underway and require additional testing before implementation.

Maintain Existing Corridor or "Linkage" Areas

Travel corridors of snow-interception habitat should be maintained between low and high elevations to enable caribou movement between seasonal ranges. Current connectivity between subpopulations also needs to be maintained by retaining existing corridors of suitable caribou habitat within identified linkage routes.

Access Management

All subpopulations should require an access management plan to ensure that recreational activities within mountain caribou range, such as use of all-terrain vehicles and snowmobiles, do not negatively impact mountain caribou. The preferred approach for regulating outdoor recreational activities will likely be through the regional and subregional land-use planning process.

Future work though the MCCS should focus on improving the technical/scientific basis for managing caribou habitats and facilitating coordination of regional habitat prescriptions. Maintaining caribou core old-growth habitats, establishing alternative silvicultural systems, regulating recreational activities within caribou range, and protecting habitat linkages between subpopulations should continue to be a high priority.

Population Management

Population management prescriptions have traditionally involved harvest management and herd augmentation by translocation. Our current understanding suggests that managing other ungulate species within mountain caribou habitat and predator management may be equally or even more important for long-term viability of mountain caribou.

Harvest Management

Currently, there is a moratorium on mountain caribou hunting in British Columbia until conservation concerns have been addressed. This should be maintained.

Translocation

Translocation has been used to increase mountain caribou numbers within threatened subpopulations (e.g., South Selkirk subpopulation). Its continued use as a conservation measure will be determined by the availability of source animals for transplant, and the ability to manage predators and other ungulate species within mountain caribou habitat.

Managing Other Ungulate Species within Mountain Caribou Habitat

Maintaining or lowering alternate ungulate prey densities (i.e., deer, elk, and moose) through hunting, as well as curtailing habitat enhancement activities for these species, may be necessary to keep predator densities low within areas occupied by threatened mountain caribou subpopulations.

Predator Management

Several recent studies have implicated predation as an important proximate cause of mountain caribou mortality (Simpson et al. 1997). In some circumstances, it may be necessary to increase predator hunting and trapping opportunities in order to conserve caribou. In extreme situations, where continued predation could extirpate subpopulations, it may be necessary to employ other more intensive lethal or nonlethal means to effectively reduce predation rates on caribou.

Future work though the MCCS should focus on implementing all 4 population management activities within threatened subpopulations. Due to a shortage of "source" mountain caribou for transplants, attention should be given to investigating the genetic and behavioural implications of augmenting these subpopulations with the more numerous northern/terrestrial lichen-feeding caribou ecotype from north-central British Columbia.

STRATEGY IMPLEMENTATION

Successful implementation of the MCCS will require active participation and cooperation between the Ministry of Environment, the Ministry of Forests, the forest industry, and other non-government stakeholders. A Mountain Caribou Technical Advisory Committee, with representation from these organizations, has recently been established to develop a provincial MCCS. This committee has also been charged with developing a list of conservation priorities and activities that will help to ensure the vision and goals for mountain caribou are achieved.

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ADDENDUM (MAY 2000)

Mountain caribou are now Red-listed by the Conservation Data Centre due to current threats and changes in herd status. The current estimate is 2300 caribou. Five herds are declining, 8 herds are stable and none are increasing.