

A Management Strategy for Mountain Caribou: The Cariboo Region Example

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ABSTRACT

We describe how research and monitoring were applied, within higher level plan direction, to craft an integrated management strategy for mountain caribou. Nine years of radiotelemetry on 75 animals with >4,000 relocations have defined the range and habitat selection patterns for this population. Timber harvesting trials since 1990 have tested variations of the selection silvicultural system. The Cariboo-Chilcotin Land-Use Plan has established the size of the area that can be managed for mountain caribou and defined the level of acceptable impact on the timber resource. These inputs were used to develop an initial strategy which zones caribou habitat and describes management in those zones. Recommendations for forest management systems, access, and predation management are part of the strategy.

Key words: access management, land-use planning, logging, mountain caribou, predation, *Rangifer tarandus caribou*, silvicultural systems.

The mountain caribou (*Rangifer tarandus caribou*) within the Cariboo Forest Region (Wells Gray North, Barkerville, and a portion of the North Cariboo Mountains subpopulations) comprise about 300 animals and represent 12% of the provincial mountain caribou population. The importance of these caribou has been provincially recognized (Simpson et al. 1997). In 1980, the British Columbia Ministry of Environment, Lands and Parks delineated high elevation caribou habitat and subsequently negotiated a 20-year timber harvesting deferral over much of the original area of concern. The mid-1980s brought an increase in population surveys and the first radiotelemetry research which established basic habitat use patterns (Seip 1992a).

Mountain caribou require old forest habitat to obtain the arboreal lichen they need for winter food (Stevenson et al. 1994). Clearcutting removes the entire arboreal lichen food resource whereas the new forest will be 100–150 years old before arboreal lichens are abundant enough to be suitable forage for caribou (Armleder and Stevenson 1994). Consequently, researchers at the British Columbia Ministry of Forests began to investigate integrated timber management solutions in 1989. In 1990, a pilot block was harvested using several partial cutting treatments. Because arboreal lichen is a vital winter

food, lichen growth rates and biomass changes in various treatments were also measured. In 1992–93, a major multidisciplinary, replicated silvicultural systems trial was established.

In 1993, the Ministry of Environment, Lands and Parks initiated an intensive radiotelemetry project continuously involving 20–25 caribou relocated 2–4 times/month (>4,000 relocations as of January 1999). In addition, wolves from 3 packs were monitored using radiotelemetry. Trailing research was also conducted to explore caribou habitat use at the stand level. To meet the anticipated data needs arising from the end of the timber harvesting deferral, a major terrestrial ecosystem mapping project covering all the mountain caribou range was completed.

CARIBOO-CHILCOTIN LAND-USE PLAN

While the research was ongoing, regional land use planning was initiated with a plan in 1995. The Cariboo-Chilcotin Land-Use Plan (CCLUP) recognized that mountain caribou in the eastern part of the region are provincially significant and are a species at risk. Maintaining habitat values for mountain caribou was identified as an overriding objective within the plan. To address this objective, the CCLUP mandated a caribou strategy that would recommend how habitat and other factors impacting caribou could be managed. An initial strategy was produced in 1996 with an update in 1998. The final strategy is due in 2000. The CCLUP recognized the value of

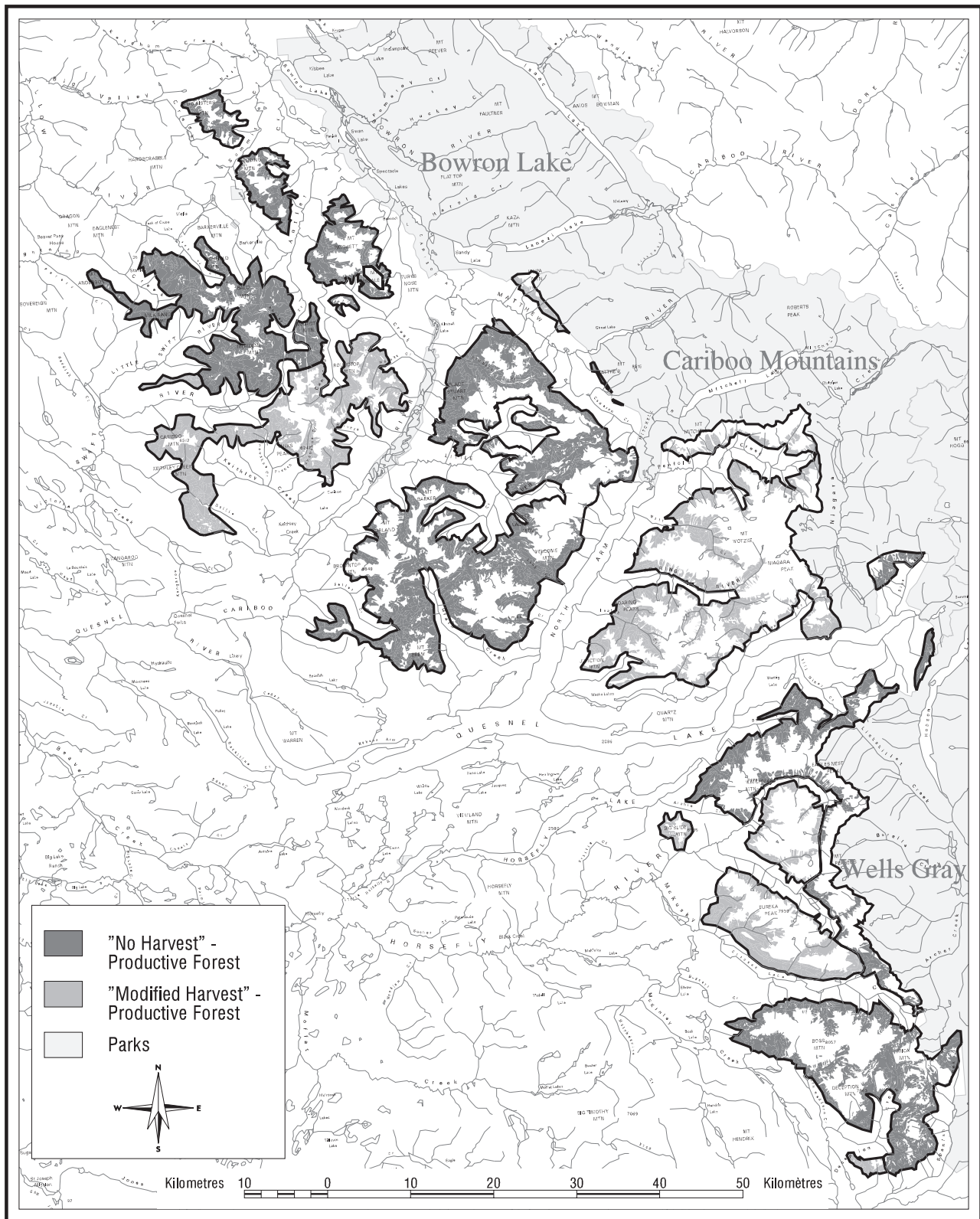


Figure 1. Zonation of mountain caribou habitat within the deferral area in the Cariboo Forest Region, British Columbia, 1998. Of the productive forest, 35% is zoned “modified harvest” whereas 65% is zoned “no harvest” within the deferral area.

ongoing research and therefore deferred the full implementation of the plan for caribou habitat until the year 2000. The entire caribou strategy process involved consultations with the forest industry and the conservation council as well as government agencies. This integrated management approach has led to smoother strategy implementation.

Our paper will review the current strategy (Caribou Strategy Committee 1998) and reference the role played by research, monitoring, and higher level direction to the development of the strategy.

ZONING OF HABITAT

Input from the CCLUP resulted in the adoption of zoning the caribou habitat. The CCLUP specified that 65% of the productive forest land within the deferral area would be zoned “no harvest” and the remaining 35% as “modified harvest” (British Columbia 1995). The Caribou Strategy Committee used the following criteria to delineate the location of “modified” harvest areas for mountain caribou (Fig. 1):

1. Areas of lower caribou use (using data from radiotelemetry studies).
2. Areas of lower suitability for caribou (from terrestrial ecosystem mapping).
3. Areas of lower human accessibility because development will create access concerns.
4. Large areas (typically thousands of hectares) to complement large “no harvest” areas. Additionally, large areas offer a full range of elevation, slope, aspect, and timber types for forest companies to access.
5. Areas peripheral to the range and therefore of less value to caribou.

Interestingly, the deferral drawn in 1980 accurately identified high elevation caribou habitat when considering the >4,000 radiotelemetry relocations. Exceptions occurred mostly in the Barkerville subpopulation and are being

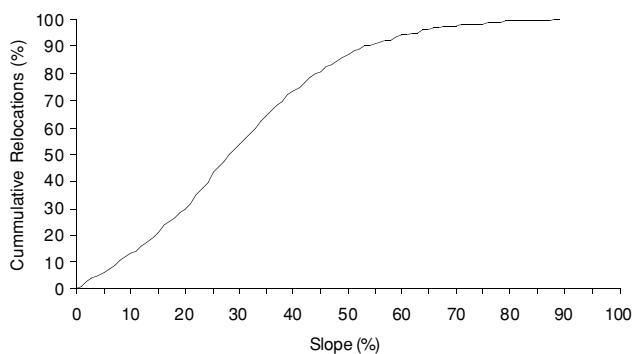


Figure 2. Cumulative frequency distribution of slope use by radiotelemetry-equipped mountain caribou for all seasons combined in the Cariboo Forest Region, British Columbia, 1993–1998.

addressed through possible trades of less valuable areas within the deferral for more recently identified habitat areas outside the deferral. The overriding constraint is that the impact to timber extraction can be no greater than that modelled in the CCLUP. This constraint limits the protection of low elevation early winter range in the Interior Cedar–Hemlock (ICH) zone.

TIMBER HARVESTING STRATEGY

All recommended approaches were designed to be fully compatible with the impacts to timber modelled in the CCLUP (Integration Committee 1998). A 3-fold approach for managing the habitat of mountain caribou is recommended.

1. PARK AND “NO HARVEST” AREAS

These areas provide a core habitat that will have little or no road access (very limited salvage harvesting in “no harvest” areas is permitted according to the CCLUP Integration Report: Integration Committee 1998). This approach provides caribou not only with suitable space (habitat) in which to meet their needs but also a large area free of harvest and harassment by humans, provided the use of snowmobiles and all-terrain vehicles (ATVs), and other activities are adequately controlled. Because logging will not create more early seral habitat (or very little as in the CCLUP Integration Report), moose will not be enhanced which will help protect caribou from additional predation pressures caused by increased wolf numbers. These areas provide a perpetual supply of large, contiguous suitable habitat so that caribou can space out at low densities and avoid predators and harassment (Seip and Cichowski 1996).

2. “MODIFIED HARVEST” AREAS

These areas will be managed to maintain caribou habitat continuously through time and space and will emulate natural disturbance patterns. Harvesting approaches are designed to discourage the enhancement of moose habitat.

“Modified Harvesting” Approach on Arboreal Lichen Sites <45% Slope

Mature and old stands with a slope <45% are most heavily used by caribou (Fig. 2) and therefore should be managed to maintain habitat value continuously through time and space. This strategy should be accomplished as follows:

Maximize the size of cutblocks as allowed in this natural disturbance type (NDT) in the Forest Practices Code (FPC) *Biodiversity Guidebook* (B.C. Ministry of Forests, and B.C. Ministry of Environment, Lands and Parks 1995). This will serve to spatially concentrate harvesting activity.

Harvest by applying 33% volume removal group selection with an 80-year cutting cycle. This approach is supported by 8 years of experimental research which, although not

completed, shows encouraging preliminary results for forest management and for caribou.

Harvest openings should be 2–3 tree-lengths wide and up to 3–4 tree-lengths long. Where windthrow and wind-scouring of lichens are not concerns the openings could be somewhat longer. Openings should be <1 ha in size.

This management approach is not without risks for caribou because we estimate that stands managed this way will, in time, have about half of the available lichen biomass of an uncut old forest (Caribou Strategy Committee 1996). Evidence suggests that caribou will still use stands with these biomass levels. Additionally, immediate postharvest lichen growth rates are up to 15% lower than in an uncut old forest (Fig. 3). Despite these concerns, we feel this approach has the best chance of success in the integrated management environment in which it is recommended.

“Modified Harvesting” Approach on Arboreal Lichen Sites >45% Slope

Stands with a slope of >45% are used less by caribou and are more difficult to harvest with a group selection system. Highlead or helicopter logging could be used to implement the logging prescription on these slopes but its value is reduced because caribou make less use of steep slopes than slopes <45% (Fig. 2). Therefore, clearcutting with reserves on slopes >45% is acceptable. To allow for some caribou use and stay within the impact modelled in the integration report (i.e., 100% of the stand is available for harvest in a 240-year period), 50% of each cutblock should be clearcut every 120 years. This strategy will result in half of each stand being 120–240 years of age at all times, thereby providing some lichen bearing habitat. This approach acknowledges that 50% of each stand will be unsuitable habitat for caribou through substantial periods of the rotation. The harvesting should be applied in the following manner:

Maximize the size of cutblocks as allowed in this NDT in the FPC *Biodiversity Guidebook*.

Harvest using clearcutting leaving 50% of the cutblock in reserves.

Keep the clearcut parts of the block as narrow as logistically possible.

Plan the cutblock so that the 50% reserve area can be logistically accessed for logging in 120 years.

3. EARLY WINTER RANGE OUTSIDE THE CCLUP CARIBOU AREA

Some caribou use mature stands in the ICH during the early winter when these lower elevation sites have less snow than the Engelmann Spruce–Subalpine Fir (ESSF) zone. Later in the winter, as the density of snow increases, they move up into the ESSF zone. These early winter range areas should be managed to emulate the natural disturbance pattern and structure as allowed in the FPC *Biodiversity Guidebook* and

landscape unit emphasis.

Radiotelemetry data show that a few specific areas are especially heavily used as early winter habitat in the ICH zone (Fig. 4). We recommend that these heavily used areas should overlap with the old seral areas of the biodiversity strategy. If harvesting must take place we recommend the group selection system. Unfortunately, the CCLUP does not provide for extended rotations for caribou in the ICH zone because early winter range in the ICH is part of mountain caribou range in the Cariboo Forest Region that the CCLUP has zoned as “conventional” harvest with regard to caribou.

ADAPTIVE MANAGEMENT

The recommended harvesting approaches reflect the best current strategy given higher level plan direction, knowledge of caribou needs, ecology of arboreal forage lichens, silviculture of Engelmann spruce and subalpine fir, and logistics of timber harvesting. Many long-term questions remain to be answered and research installations will continue to be monitored. Some questions can only be answered at other scales of investigation. For example, how would caribou respond to landscape-level development using “modified” harvesting approaches? To address this and related questions, a major adaptive management trial is being planned in the Mount Tom area of the Quesnel Forest District. This trial will involve full development of about 1,700 ha while approximately 2,300 ha will remain as an uncut control. Pretreatment radiotelemetry data show substantial caribou use in the area and radiotelemetry will be expanded by monitoring more animals in the posttreatment period. Timber harvesting on this trial is scheduled to begin later this year.

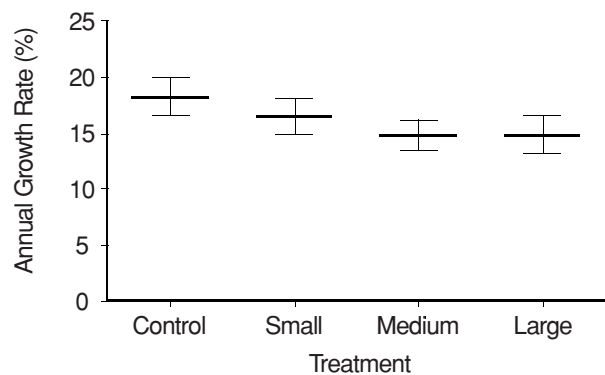


Figure 3. Annual growth rates and 95% confidence intervals of *Bryoria glabra*/*B. fuscescens* in 3 replicates of group selection treatments and controls in the Engelmann Spruce-Subalpine Fir zone of the Cariboo Forest Region, British Columbia, 1994. Small openings are 0.03 ha, medium openings are 0.13 ha, large openings are 1.0 ha, and controls are uncut. All treatments involved 30% volume removal.

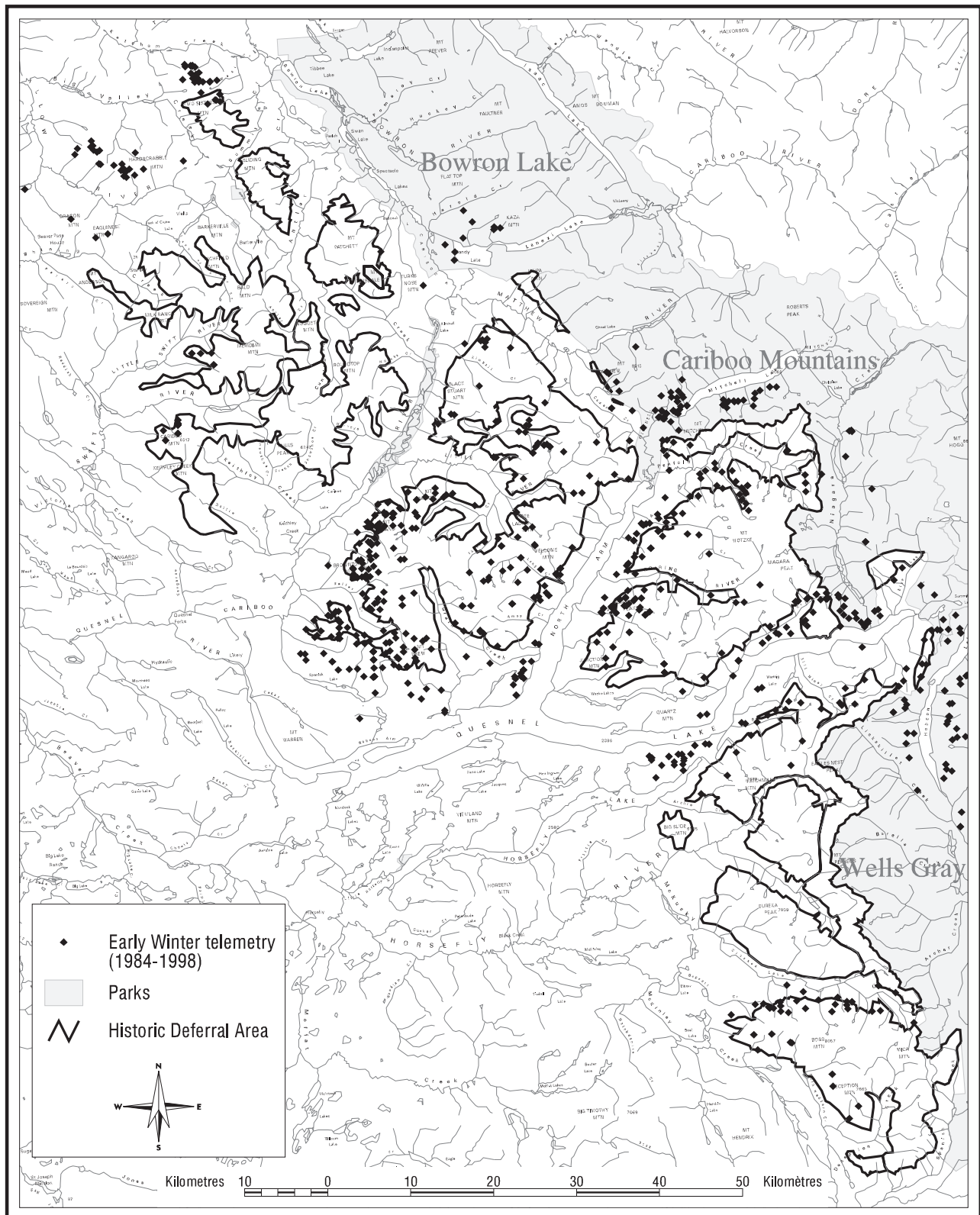


Figure 4. Early winter radiotelemetry relocations (1984-1998) showing areas of use outside of the deferral areas for which the Cariboo-Chilcotin Land-Use Plan has not made provision.

ACCESS

Two access issues are of special concern to caribou—roads and off-road motorized recreation. To address road access we recommend aggregating timber harvesting in specific landscape units over short time periods followed by deactivating roads and not accessing the area again for 20 years. Access control points are recommended for each drainage. Also, by developing caribou habitat based on even timber flow, massive harvesting will be prevented throughout the range of these animals in any single time period.

Our radiotelemetry data have shown that caribou do not use highly suitable habitat when intensive snowmobiling activity occurs in high elevation areas. A strategy is being developed to protect caribou from the negative impacts of snowmobiling by zoning caribou range into 3 categories of use: (1) unrestricted access, (2) careful access with rules to minimize the impact on caribou, and (3) no motorized access. This type of technical input is being provided to subregional planning tables to incorporate into higher level direction. This topic remains a hotly debated issue among user groups.

PREDATION

Wolf predation can dramatically reduce caribou populations where the wolf population is sustained by other prey species (Seip 1992b). This has occurred with mountain caribou in the Cariboo Forest Region. During the 1980s population levels decreased substantially; however, during the past 10 years the caribou population has been stable with enough recruitment to offset mortality. Legal hunting has been closed for mountain caribou in the Cariboo Forest Region to eliminate that source

of mortality. The timber harvesting approaches for slopes <45% were designed not to enhance moose habitat, thus limiting prey species abundance for wolves and controlling predation on caribou. We recommend minimizing the number of snow-ploughed roads in caribou winter range to not enhance mobility of wolves. Also, the Ministry of Environment, Lands and Parks is proposing to manage moose populations in mountain caribou range to levels which will not increase wolf numbers above present levels.

Recent data collected on 2 wolf packs in the range of mountain caribou in the region indicate an elevational separation from caribou during most of the year (Fig. 5). During the caribou decline in the 1980s, the 2 species had more elevational overlap (Seip 1992a). Monitoring of caribou and wolf populations will continue. If current measures are inadequate for maintaining viable caribou numbers then other options will be explored.

OUTSTANDING ISSUES

To successfully maintain caribou, we need to manage many issues within mountain caribou range. These issues include forest management systems (within and outside deferrals), hunting (legal and illegal), predation, and access. The strategy has addressed all of these issues but decision-makers still need to accept the whole package. While questions remain about all these issues, major unresolved areas of concern include (1) the inability to adequately address early winter range in the ICH (outside of the deferral) while forest development is targeting these areas in the short term, and (2) the lack of an accepted snowmobile access plan. Subregional planning must keep pace with these issues and make appropriate decisions before key habitats are lost.

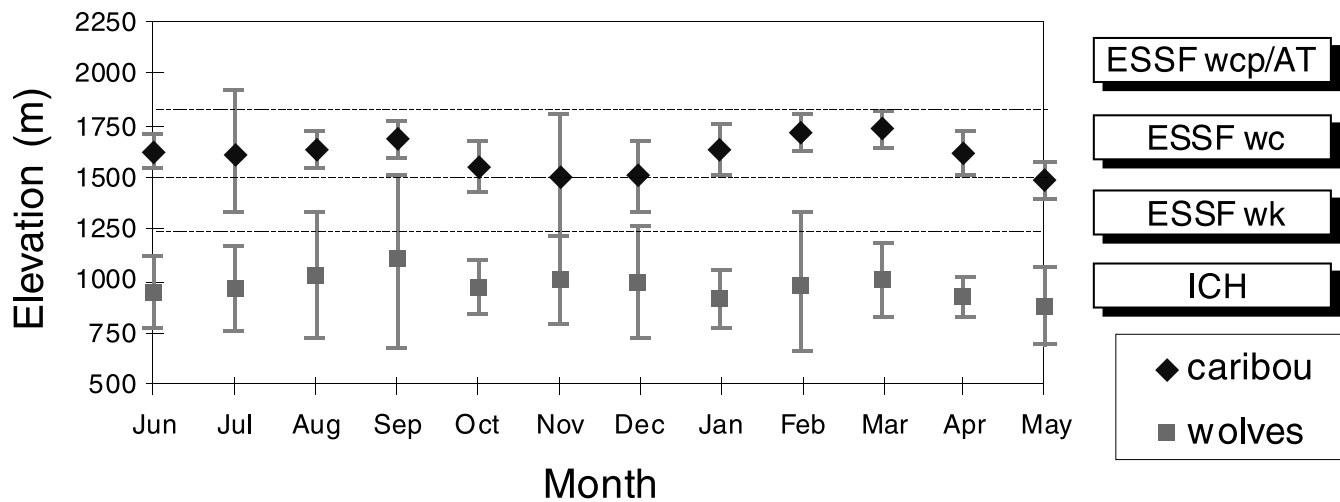


Figure 5. Mean monthly elevations used by radiotelemetry-equipped wolves and mountain caribou in the Cariboo Forest Region, British Columbia, 1993–1998. Error bars indicate $\pm 1SD$.

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