POPULATION CENSUS AND TELEMETRY MONITORING FOR THE CENTRAL SELKIRK CARIBOU INVENTORY PROJECT

Final Report

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Executive Summary

The purpose of the Central Selkirk caribou inventory project is to provide caribou population and habitat information necessary to effectively integrate the needs of caribou with strategic landscape planning and operational implementation. Work in 2001–2002 included telemetry flights in November- December 2001 and February 2002 and a population census in March 2002.

By the March census, 9 functioning radio-collars remained on caribou in the Nakusp block of the herd's range. During the census flight, 6 of 9 radio-collared animals were sighted. In total, 93 animals, including 16 calves, were seen during flights over 2 days. This resulted in a population estimate of 131 adults and calves in the study area. This represents a significant decline from previous years. Population estimates have declined in every census year since surveys began in 1996, although this was the first year in which a trend could be established statistically.

Work should begin immediately on efforts to reverse the decline in the Central Selkirks caribou population.

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INTRODUCTION

In the fall of 1996, a four-year mountain caribou (*Rangifer tarandus*) inventory project was initiated for the Central Selkirks caribou study area (Figure 1). The purpose was to provide caribou population and habitat information necessary to effectively integrate the needs of caribou with strategic landscape planning and operational implementation. The study included caribou capture and radio-collaring, fixed-wing monitoring of collared caribou, population censuses, mortality investigations, field studies, and development of several caribou habitat models at various spatial scales. Multiple logistic regression analysis was used to examine resource selection at the stand and landscape levels (Hamilton *et al*. 1999), multiscale analysis of caribou habitat selection was used to derive a spatially explicit model of caribou habitat at the landscape scale (Hamilton *et al.* 2000) and standardized species-habitat modelling (RIC 1999) was used to develop seasonal capability/suitability habitat ratings and mapping for TFL23 (Hamilton and Wilson *in review*).

Results were subsequently applied in the development of a landscape unit planning pilot project within the Fish, Trout and Halfway landscape units of TFL23 (*in preparation*). The project identifies landscape unit planning objectives that spatially integrated the habitat needs of caribou with old and mature forest retention requirements identified in the Kootenay-Boundary Higher Level Plan Order (January 2001). The plan recommends a caribou population census be conducted at 2-3 year intervals to monitor population trends and overall effectiveness of plan implementation. The last caribou census in the Central Selkirks was conducted in 1999.

The primary purpose of this report is to present the 2002 census results for the Central Selkirks caribou study area. We provide population estimates based on censuses results from 1996, 1997, 1999 and 2002.

STUDY AREA

The Central Selkirks caribou study area is located in the northern portion of the West Kootenay region, stretching from the town of New Denver in the Slocan valley to the south, north to the southern portion of Glacier National Park. It is bounded to the west by the Arrow reservoir and the Lardeau and Duncan valleys to the east.

The study area is located within the North Columbia Mountains Ecoregion and the Central Columbia Mountains and Northern Kootenay Mountains Ecosections (Meidinger and Pojar 1991). The area is characterized by steeply sloping mountainous terrain dominated by mature forest at low elevations, rising to rock and glaciers in the alpine, particularly in the northern section of the area.

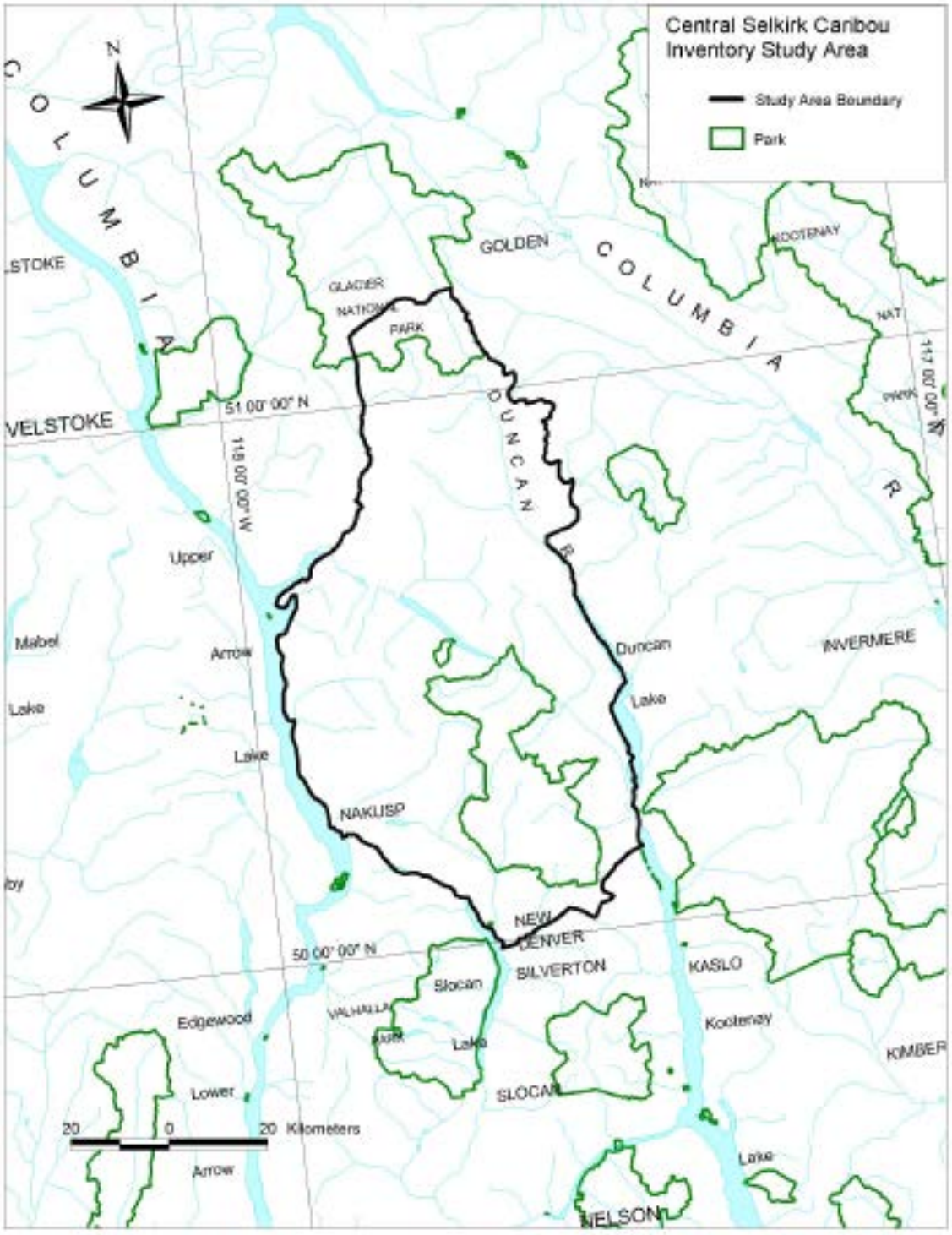

Figure 1: Central Selkirks Caribou Study Area

Lower elevations are dominated by variants of the Interior Cedar-Hemlock (ICH) biogeoclimatic zone, included the ICHdw in the extreme southern portions of the area, the ICHmw2 along south and west-facing portions of the Arrow and Lardeau valleys, ICHwk1 in higher elevation and northern areas, and ICHvk1 in the far north (Braumandl and Curran 1992). The Engelmann spruce-Subalpine fir (ESSF) zone dominates the high elevation forest and is comprised primarily of ESSFwc1 and ESSFwc4 variants with ESSFwm and ESSFvc variants occurring in the north. The Alpine Tundra (AT) biogeoclimatic zone dominates the highest elevations.

METHODS

Population Census and Population Estimates

In March 2002, we conducted a census of the Central Selkirks caribou study area over two days using two experienced observers. Surveys were conducted according to Resource Inventory Committee (RIC) standards (RIC 2002) and methods and flightpaths were the same as those used in previous censuses (Hamilton *et al.* 2000). The area was surveyed two days after a significant snowfall. Because caribou are typically found in high-elevation subalpine areas in late winter, timberline/alpine contours were followed using a Bell 206 helicopter. Helicopter speed and altitude varied along the established flightpath (Figure 2). When tracks or caribou were seen, the helicopter left the flightpath until animals were located and counted, and any radio-collared individuals were identified by frequency.

The study area was stratified into Nakusp and Duncan census blocks (Miller 1996, Hamilton *et al*. 2000). Adults (unmarked and marked by radio-collars) and calves were counted by drainages within the study area. The ratio of marked animals seen to the known number of marked animals was used as a measure of sightability. We calculated a population estimate for the entire study area and separate estimates for the Nakusp and Duncan herds. Population estimates were calculated with the program Noremark, using the maximum likelihood joint hypergeometric estimator for closed populations and 90% confidence intervals (White 1996).

There were no radio-collared caribou in the Duncan block, so sightability corrections were calculated only for the Nakusp area. There was also no sightability corrections applied to calves because no calves were marked. This resulted in a conservative estimate of the overall population.

Aerial Monitoring of Radio-collared Caribou

Using a twin-engine Cessna 337 fixed-wing aircraft and a Lotek STR 1000 scanning receiver, we conducted two monitoring flights to locate caribou previously equipped with VHF radio transmitter collars. Telemetry point locations were recorded on air photos and transferred to an ArcView GIS platform. Digital TRIM (slope, elevation and aspect) and forest cover (timber type, forest age class, tree height, crown class and stocking level) data were recorded for each telemetry location (see Hamilton *et al*. 2000 for detailed methods).

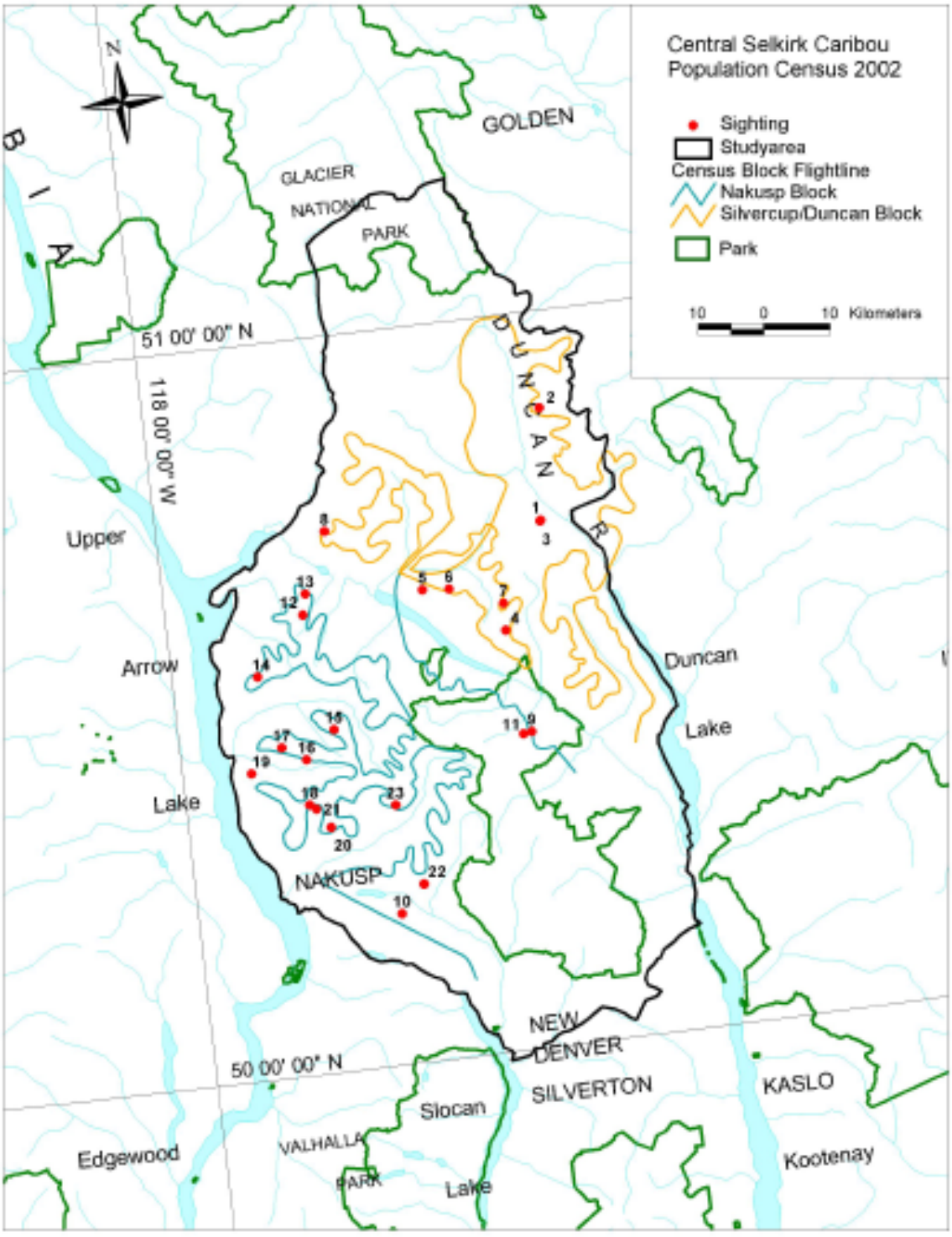

Figure 2: Census of Central Selkirk Caribou Study Area, March 2002

Collars active during the second flight in February were assumed to be functioning during the population census in March.

RESULTS

Population Census and Population Estimate

A total of 93 caribou, including 6 of 9 active radio-collars, were observed during the 2002 census. In addition, 4 sets of tracks were recorded in the Nakusp census block but the caribou were not located (Table 1). Of the 23 sighting locations, 15 were of ≤5 caribou, 5 sightings were of 6-10 caribou, and 1 sighting was of 12 animals in one group (Figure 2). Sixteen calves were observed.

There is strong evidence that the population is in decline (Table 2; Figure 3). Estimates of total population size fell 53% between 1996 and 2002, although 2002 was the first year in which the population estimate was significantly lower than in previous years. In particular, the estimate for adults in the Nakusp block (the only marked component of the Central Selkirk sub-population) was significantly lower in 2002 than in all previous censuses ($P \leq 0.10$). Total counts in the Duncan declined 25% between 1996 and 2002, although few caribou are normally found there and none were radio-collared.

Aerial Monitoring of Radio-collared caribou

Radio-collared caribou were located during a partial flight in late November 2001 (terminated due to poor weather) that was completed in early December 2001. Seventeen of 18 VHF radio-collars were located. Ten of the collars were still active; however, seven collars were on mortality alert and one collar could not be located within the study area. Nine of 10 of the remaining collars were located during a February monitoring flight, but one additional collar could not be located.

As of 31 March 2002, there had been 1942 telemetry point locations collected within the Central Selkirks caribou study area. The telemetry and associated forest cover and TRIM datasets (in Microsoft Access format) were forwarded to the Ministry of Sustainable Resource Management, GIS Coordinator in Nelson.

Table 1: Central Selkirk caribou census results (March 2002)

Date	Drainage	Sighting	Lat + Long		Adult	Calf	Total	Tracks only	Collar
23/03/02	Swedish creek	1	5042.9	11710.5	5	1	6		-
23/03/02	East of Laidlaw	2	5052.0	11708.9	4	1	5		-
23/03/02	Stevens	3	5042.8	11710.6	4	2	6		-
23/03/02	N Healy	4	5034.3	11716.7	7	-	7		1c
23/03/02	Silvercup	5	5038.4	11726.7	1	3	4		-
23/03/02	Silvercup	6	5038.2	11723.3	4	-	4		1c
23/03/02	Silvercup	7	5036.5	11716.6	2	1	3		-
24/03/02	Thompson	8	5044.1	11738.3	3	-	3		-
23/03/02	Mobs	9	5025.8	11715.0	2	-	2		-
24/03/02	Ranch ridge	10	5012.3	11734.2	2	-	2		1c
24/03/02	Tenderfoot	11	5025.7	11716.1	2	-	2		-
24/03/02	Beaton	12	5037.5	11742.3	1	1	2		-
24/03/02	Beaton	13	5039.2	11741.7	5	-	5		-
24/03/02	Nacillawaet	14	5032.9	11749.0	1	-	1		-
24/03/02	Halfway	15	5027.9	11740.1	3	-	3		-
24/03/02	Deep creek	16	5025.7	11744.0	10	2	12		1c
24/03/02	Halfway	17	5026.9	11747.0	7	-	7		2c
24/03/02	St Leon	18	5022.0	11744.3	6	1	7		-
24/03/02	St Leon face	19	5025.1	11751.2	3	1	4		-
24/03/02	Gardner	20	5020.0	11741.9	3	2	5		-
24/03/02	Gardner	21	5021.6	11743.5				2	
24/03/02	Hamling	22	5014.5	11731.0				2	
24/03/02	Kuskanax	23	5021.2	11733.4	2	1	3		-

Table 2: Total and adult-only population estimates for the Central Selkirks Caribou Study Area

Study area	All age classes			Adults only		
Year	Minimum	Estimate	90% CI	Minimum	Estimate	90% CI
1996	211	268	230-354	189	246	208-332
1997	223	231	223-266	206	214	206-239
1999	181	213	190-266	167	199	176-252
2002	96	131	105-207	80	115	89-191
Nakusp only						
1996	186	211	191-264	167	192	172-245
1997	203	211	203-236	186	194	186-219
1999	155	182	162-226	143	170	150-214
2002	76	103	83-162	64	91	71-150
Duncan only						
1996	25	-	-	22	-	-
1997	24	-	-	20	-	-
1999	26	-	-	24	-	-
2002	20	-	-	16	-	-

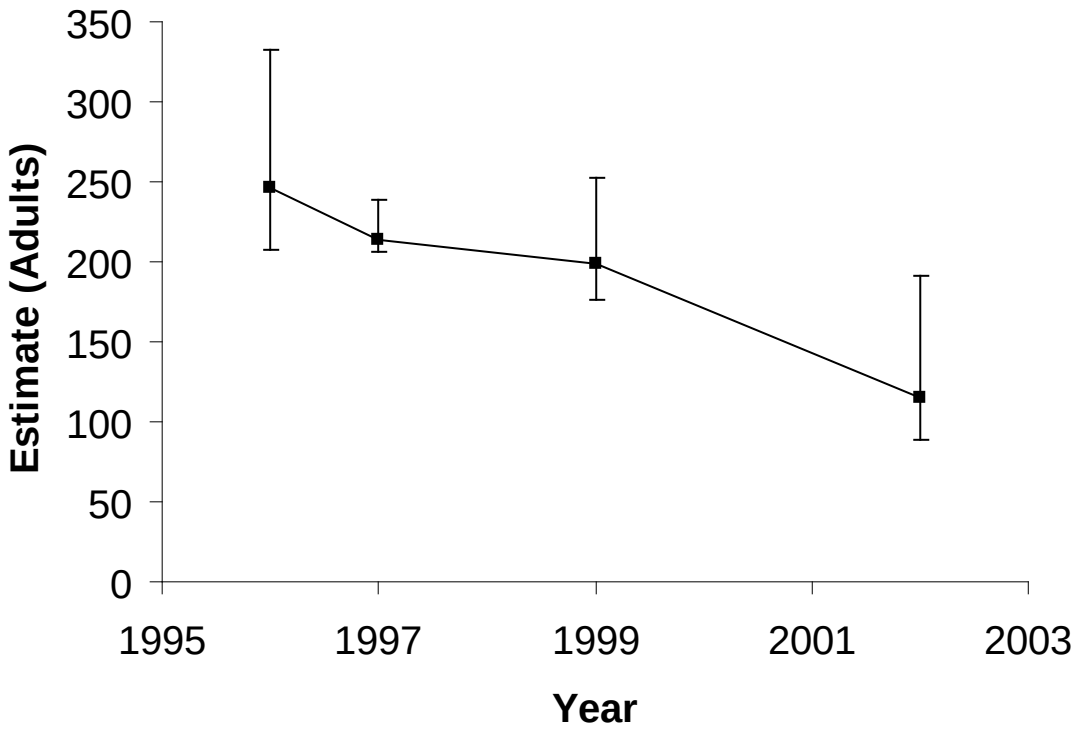

Figure 3: Adult-only population estimates for the Central Selkirk caribou herd (Nakusp and Duncan blocks), based on the maximum likelihood joint hypergeometric estimator for closed populations and 90% confidence intervals

DISCUSSION

Stevenson et al (2001) reported on population size, trend and density of 13 mountain caribou sub-populations within British Columbia. The Kootenay region supports five of these 13 sub-populations, comprising approximately 32% of the total population of mountain caribou found in British Columbia. Mountain caribou have recently been *red-listed* in British Columbia, which means that they are considered endangered or threatened. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) considers most populations in British Columbia and Alberta to be rare and those in the Selkirk Mountains of British Columbia to be endangered. The South Selkirk caribou sub-population, which occupies southern portions of the Selkirk Mountains in British Columbia as well as northern Idaho and Washington, is legislated as endangered under the U.S. Endangered Species Act. Today, it is estimated that mountain caribou occupy about 60 percent of their historic range.

From a regional perspective, both the South Selkirks and South Purcells caribou herds have declined to 35 and 20 individuals, respectively. The South Selkirks population estimate includes translocation of over 100 caribou from other caribou herds in BC.

Recent censuses near Revelstoke suggest that the caribou population in that area is also in decline (B. McLellan, *pers. comm.*).

Population estimates have declined with every survey since 1996, but 2002 marked the first year in which there was a statistically significant decline from any previous year. Based on only three censuses over five years and a small radio-collared sample relative to total population, the ability to detect changes in the population was limited. However, the most recent census results clearly indicate that the Central Selkirk sub-population is in decline. The drop from 246 adults in 1996 to 115 in 2002 represents a 53% decline. In the Nakusp block, where radio-collared adults have allowed the most reliable population estimates and confidence intervals, the population has declined from an adults-only estimate of 194 in 1997 (22 of 23 collars observed) to 91 in 2002 (6 of 9 collars observed).

Reasons for the population decline in the Central Selkirks are unknown, although we speculate that there are likely several factors. First, forest harvesting continues to occur in parts of the caribou's range and is known to reduce the standing crop of arboreal lichens available during critical periods (Hamilton *et al.* 2000). Second, commercial and non-commercial backcountry recreation use continues to increase in the area, which might be disturbing caribou and/or displacing them from preferred habitat. Research on the subject is limited, but Harrington and Veitch (1992) observed declines in calving success of woodland caribou exposed to military overflights in Labrador. Finally, recent mild winters might have restricted access to arboreal lichens at high elevations (*i.e.*, caribou couldn't reach lichens because of shallow snow), forcing them to remain at lower elevations where predators are more common (B. McLellan, *pers. comm.*). Further work is required to determine the causes of the population decline.

CRITIQUE OF INVENTORY PROTOCOLS

The census technique is very effective for estimating caribou populations. The late winter period provides the best opportunity for sighting animals because they are generally at high elevations. The majority of radio-collared animals have been observed during every census, resulting in relatively small confidence intervals.

Our experience, and that of McLellan and Flaa (2002), suggests that discriminating between young males and adult females in large groups is difficult and requires additional census time and, consequently, additional harassment. Although it would increase the ability to collect data on recruitment that could be important in assessing reasons for the population decline, the added expense and harassment do not justify changing the current protocol.

MANAGEMENT RECOMMENDATIONS

The number of radio-collared animals in the Central Selkirks sub-population is going to continue to decline, making a reliable mark-resight population estimate impossible as early as the next scheduled census in 2004 or 2005. There are stresses to caribou

associated with capture and radio-collaring that can result in direct mortality. There is also anecdotal evidence that captures can sensitize animals to future disturbances by aircraft and can create additional stresses that might last for years.

Under these circumstances, it is difficult to justify additional radio-collaring. Rather, effort should shift to flying censuses once or twice per year and relying on relative numbers to identify population trends. We can assume that future censuses are likely to be as efficient at locating caribou as those in the past.

Work should begin immediately on efforts to reverse the decline in the Central Selkirks caribou population. Existing data on caribou and habitat distribution, as well as data on recent, extensive impacts on the landscape should be compiled and reviewed. The purpose of the review should be to frame a recovery strategy.

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